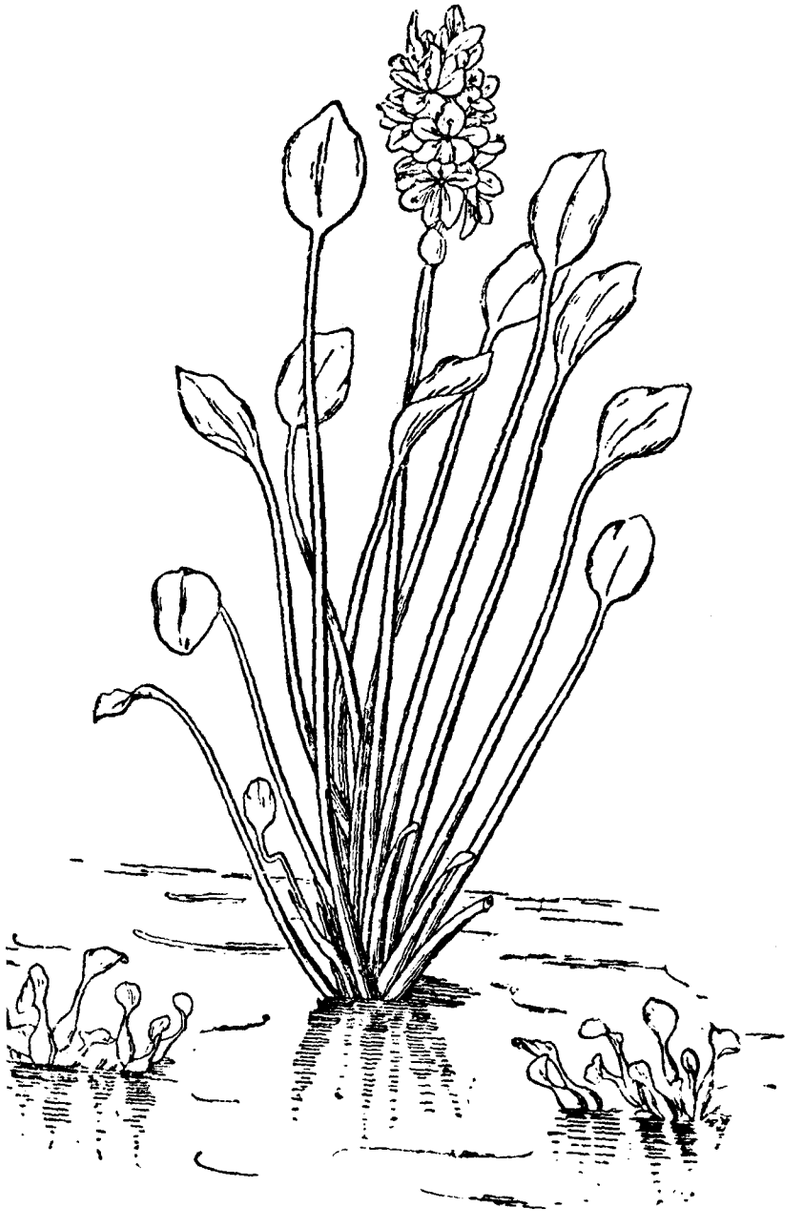


WATER HYACINTH.

A HANDBOOK

OF

SOME SOUTH INDIAN WEEDS

CONTAINING

COMPLETE DESCRIPTIONS AND SHORT NOTES ON SOME OF THE COMMON WEEDS INDIGENOUS AND INTRODUCED IN SOUTH INDIA

(WITH ILLUSTRATIONS)

BY

C TADULINGAM, F.L.S.

Government Systematic Botanist and Principal
Madras Agricultural College, Coimbatore

AND

G. VENKATANARAYANA, B.Sc. *(Ag.)*

Assistant to the Government Systematic Botanist
Agricultural Research Institute, Coimbatore

FOREWORD

By R. D. ANSTEAD, Esq., M.A., C.I.E.

Director of Agriculture, Madras

MADRAS

PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS

PRICE, 4 *rupees*] 1932

AGENTS FOR THE SALE OF MADRAS GOVERNMENT PUBLICATIONS.

IN INDIA.

The Superintendent, NAZAIR KANUN HIND PRESS, Allahabad.

M. C. KOTHARI, Bookseller, Publisher and Newspaper Agent, Raopur Road, Baroda.

R. SUNDER PANDURANG, Kalbadevi Road, Bombay.

D. B. TARAPOREVALA SONS & CO., Bombay.

THACKER & CO. (LTD.), Bombay.

N. S. WAGLE, Circulating Agent and Bookseller, No. 6, Tribhuvan Road, Girgaon, Bombay.

THE BURMA BOOK CLUB (LTD.), 240-A, Merchant Street, Rangoon, Burma.

THE BOOK COMPANY, Calcutta.

BUTTERWORTH & CO. (LTD.), 6, Hastings Street, Calcutta.

R. CAMBRAY & CO., Calcutta.

THACKER, SPINK & CO., 3, Esplanade East, Calcutta.

SHRI SHANKAR KARNATAKA PUSTAKA BHANDARA, Malamaddi, Dharwar.

RAMAKRISHNA & SONS, Lahore.

THE UPPER INDIA PUBLISHING HOUSE (LTD.), Lucknow.

THE CHRISTIAN LITERATURE SOCIETY FOR INDIA, Post Box No. 501, Park Town, Madras.

CITY BOOK COMPANY, Post Box No. 283, Madras.

HIGGINBOTHAMS (LTD.), Mount Road, Madras.

THE LAW BOOK DEPOT (LTD.), 15 and 16, Francis Joseph Street, Madras.

S. MURTHY & CO., Madras.

G. A. NATESAN & CO., Madras.

P. R. RAMA IYER & CO., Madras.

P. VARADACHARI & CO., Booksellers, 8, Lingha Chetti Street, Madras.

S. VAS & CO., Madras.

THE THEOSOPHICAL PUBLISHING HOUSE, Adyar (Madras).

THE UNIVERSAL PUBLISHING CO., Bezwada (Madras).

E. M. GOPALAKRISHNA KONE, Pudumantapam, Madura (Madras).

THE MODERN STORES, Salem (Madras).

THE SRIVILLIPUTTUR CO-OPERATIVE TRADING UNION (LTD.), Srivilliputtur (Madras).

S. KRISHNASWAMI & CO., Teppakulam Post, Trichinopoly Fort (Madras).

NIVASARKAR, Manager, "Hitawada," Nagpur.

THE BOOKLOVERS' RESORT, Booksellers and News Agents, Taikad, Trivandrum.

IN STRAITS SETTLEMENTS.

THE FEDERAL RUBBER STAMP CO., Penang.

NOTICE.

Official publications may be obtained in the United Kingdom either direct from the office of the High Commissioner for India, India House, Aldwych, London, W.C. 2, or through any bookseller.

FOREWORD

A WEED may be quite generally defined as a plant growing in the wrong place from the farmer's point of view. Mother Nature in her lavish way allows plants of many kinds to grow mixed together and to struggle for light and life and to depend upon the survival of the fittest. In her eyes none are weeds. Man, however, when he learned to grow his food and developed the art of farming, desired to grow large areas of one kind of plant only and immediately came into conflict with nature, and to him extraneous plants growing among his crops became weeds. This inevitable clash between civilization and nature is summed up in the words of the writer of the Book of Genesis. "Cursed is the ground for thy sake, in sorrow shalt thou eat of it all the days of thy life; thorns also and thistles shall it bring forth to thee."

A knowledge of the nature and habits of the common weeds of cultivation is essential to the farmer if he is to control them or possibly turn them to his use. This publication, which has long been under preparation, is an attempt to place such knowledge at the disposal of the farmer. It represents a great many years of careful study and patient observation on the part of the authors, and it will, I feel sure, meet with a welcome from them.

It should also be welcomed by teachers in this Presidency, especially those who are engaged in attempts to conduct school gardens and teach nature study.

The Educational Code in England lays it down that one of the purposes of the public elementary school is, "to train the children carefully in habits of observation and clear reasoning so that they may gain an intelligent acquaintance with some of the facts and laws of nature." This is an aspect of education which should receive far more attention

in Indian schools than it has done in the past. What is needed is a system of rural education which will produce ryots especially whose minds are open to new ideas, and who do not, as the present generation are apt to do, condemn a thing off-hand simply on the ground that they have not seen it before. What better way can there be than to introduce a good system of nature study into our rural schools which will aim, not so much at imparting information, as at teaching the children to find out for themselves all that they can about familiar and natural phenomena?

One of the great difficulties in the way of introducing such a system as here advocated is the lack of teachers who themselves know the subject to be taught, and the lack of books of reference which help them. This book will fill one of the existing gaps and it will place in the hands of the teacher a mine of information about the very commonest of plants to be found in the fields round any school, and it will provide a source of a long series of nature study lessons.

MADRAS,
16th August 1929.

RUDOLPH D. ANSTEAD,
Director of Agriculture.

PREFACE

WEEDS occupy an important place in Agriculture. Yet no book exists which deals with South Indian weeds. To meet this want, the present work was undertaken. It is hoped that it will be found to be of much help to all interested in the subject, not only in identifying the most common weeds but also in gaining a fair knowledge of their distribution, time of flowering and the means of control. Teachers and students of Botany also may find it a useful guide.

Most of our weeds rush to flower some time after the rains. However, no two weeds flower and fruit at the same time nor are members of the same species found in flower at different parts of the Presidency simultaneously. A few, even flower almost throughout the year. It is therefore difficult to state with accuracy, what the exact time of flowering of a particular weed is. Still the few notes given in this connection will be found helpful.

Plants have been described in as popular a language as possible without sacrificing accuracy. Nevertheless, technical words could not be altogether avoided and a glossary has been appended for reference.

Methods of prevention and eradication are dealt with in the earlier chapters and a few notes are added in the later portions, regarding the treatment of individual plants. These notes only indicate the lines on which the particular species should be attacked. They are not intended to be taken too literally but would need modification to suit local conditions; because the book deals with a vast expanse of country the agricultural practices of which vary appreciably from place to place and from season to season. Moreover,

these are largely influenced by various other factors which are not within the control of the ryot; therefore it is impossible to lay down definite rules for guidance in the destruction of weeds to meet all conditions.

The weeds included in this publication occur in the plains regions of the Madras Presidency. But a few of them are rare in some localities and entirely absent in others. Still, mention has been made of them for the benefit of the people in other places where they are either very common or unwelcome.

The weeds on the hills and in plantations form an ecological association which differs much from any in the plains and are therefore entitled for treatment in a separate volume.

Some poisonous plants which have only been mentioned could not be considered at any great length due to want of space and other limitations. These will be dealt with in detail in a future publication.

Tamil, Telugu and Malayalam names have been given wherever possible. For obvious reasons the number of vernacular names could not be increased and Kanarese equivalents have been omitted for want of correct information. The Dictionary of Economic Products of India by George Watt and the Flowering Plants of Travancore by Rao Sahib M. Rama Rao were freely consulted for information regarding vernacular names and the economic uses of plants.

In spite of care bestowed, we are not sure whether there may not be mistakes and defects here and there and shall feel grateful to any friendly critic who will help us in this direction and suggest possible lines of improvement which may be carried out in a later edition.

Our thanks are due to R. D. Anstead, Esq., M.A., C.I.E., Director of Agriculture, who has evinced a keen interest in the progress of the work and who is largely responsible for its early publication and to A. G. Green, Esq., Superintendent, Government Press, for the excellent get-up of the book.

Mr. T. R. Naganatha Ayyar, Sub-Assistant to the Government Systematic Botanist, assisted in the preparation of the Index to Botanical Terms and the Glossary, besides doing all typing work. Artists, Messrs. M. S. Royan and N. L. Thiruvengadam, did most of the illustrations in this work. We take this opportunity to thank them.

We will be much pleased to receive any additional information regarding weeds that are either mentioned in this book or may have been omitted.

C. TADULINGAM.
G. V. NARAYANA.

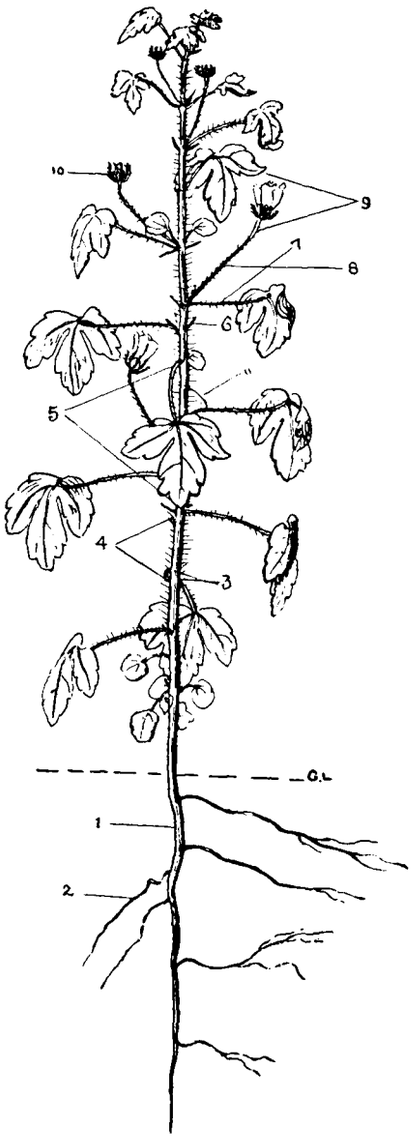
CONTENTS

	PAGE
FOREWORD	iii
PREFACE	v
INTRODUCTION	3
CHAPTER I.—THE PARTS OF A PLANT	3
CHAPTER II.—NOMENCLATURE OF PLANTS	10
CHAPTER III.—THE WEEDS AND THEIR CLASSIFICATION ...	12
CHAPTER IV.—SPECIAL WEEDS	17
CHAPTER V.—LOSS CAUSED BY WEEDS AND THEIR USES ...	27
CHAPTER VI.—HOW WEEDS SPREAD AND THE METHODS OF CONTROLLING THEM	30
DESCRIPTIONS AND NOTES ON WEEDS	61
BIBLIOGRAPHY	329
GLOSSARY	330
INDEX TO BOTANICAL NAMES	345
INDEX TO COMMON ENGLISH NAMES	350
INDEX TO TAMIL NAMES	352
INDEX TO MALAYALAM NAMES	354
INDEX TO TELUGU NAMES	355

ERRATA.

number.	Line.	*Read*	*For*
9	18	Monocot.	Monocot,
9	20	Dicots.	Dicots,
55	2	3. The Meesalu.	3. The Dantulu.
57	7	in which the implements are used.	in which are used.
60	27	would be punished.	will be punished.
83	5 from bottom.	somewhat	somewha
83	8 do.	persistent	-
83	9 do.	and	an
100	2	4. Pistil	4. Pisti.
104	2	5. Staminal	5. Stamina
121	7 from bottom.	flowers,	flowers
128	2	1. Branch rooting	1. Entire plant
131	7 from bottom.	has	Has
133	2 do.	Jussiaea repens	Jussiaea repaes
134	3	3. Male flower	Male flower
135	5 from bottom.	shrub	herb
135	11 do.	climbing	climing
136	4 do.	common	ommon
139	22 do.	fleshy and jointed;	fleshly and jointed,
145	3	number of years	few years
170	last line.	the	n
173	7 from bottom.	4 or 5	5
175	11 do.	four or five	five
188	2	of	of,
193	7 from bottom.	tube;	tube,
209	...	209	290
219	17	white,	white
222	3	calyx	Calyx
268	11	skin	skins
277	9	human beings, and water.	human beings.
279	6	Madras, Coimbatore and Bangalore.	Madras and Coimbatore.
279	3 from bottom.	the species.	thespecies
280	10	Pupalia lappacea	Pupalial appacea
312	2	Young plant.	Plant.
345	13 left column.	Ageratum.	Agrateum
350	16 do.	Conch-flower Creeper,	Couch-flower Creeper,
352	25 right column.	Mana thakkali	Mana thakkal
356	9 do.	Pottakanchi,	Potakanchi,

"ONE YEAR'S SEEDING SEVEN YEARS' WEEDING"



PAVONIA ZEYLANICA, *Cav.*

PLATE I.—G.L. = Ground level. 1. Main or Tap-root. 2. Lateral root. 3. Node. 4. Internode. 5. Leaf. 6. Stipule. 7. Petiole. 8. Pedicel. 9. Flower. 10. Fruit. 11. Axil of the leaf.

SOME SOUTH INDIAN WEEDS.

INTRODUCTION.

CHAPTER I.

THE PARTS OF A PLANT.

A DESCRIPTION of a plant helps in its identification. To give a correct description it is necessary that the various parts of the plant are studied in detail. So botanists have named different organs of plants and have called each organ by a particular name which is usually either in Latin or Greek. A lay man has no names for each and every part of the plant, as he is not acquainted with it. Therefore, even in an attempt at popular descriptions of plants it becomes unavoidable that certain scientific names have to be adopted to make the meaning clear. Moreover, scientific names have the advantage of being more terse and precise than the common ones. With the idea of making the text easy of understanding the present chapter is devoted to treat the arrangement of the parts in as simple a manner as possible.

If any common flowering plant is examined it will be found to consist mainly of two parts. The lower one that is in the soil, is the *root* and the upper one that grows above the ground is the *shoot*. (Plate 1.)

The root is pale in colour, being hidden from light and it serves not only to fix the plant in position but it also helps in getting food for the plant. The root system consists of a main tap-root and branch roots. According to the nature of the plants the roots may either go deep or remain shallow. In the case of plants like grasses the root system is in a tuft without the central tap-root which dies away very early. Ordinarily a root does not produce leaf-bearing branches but in some cases it does develop vegetative buds. At times we see roots springing from the aerial shoots also. These are called *adventitious* roots and their functions are somewhat different from those of the true underground ones. There are various modifications among roots and the most familiar one is the

fleshy or the *tuber-type* containing a large amount of stored food as in radish and sweet potato.

The shoot is often green. It may be prostrate or erect or ascending, bearing branches and leaves. The stem is round or angled or grooved. It may be covered with hairs in a variety of ways. They may be simple, soft and close forming a thick coat or they may be sparse or rough, each hair having a thick base or a gland-tip. Star-like hairs occur in some plants of the brinjal and the castor family. These hairs protect the plant from its enemies and from adverse conditions.

It is not always necessary that the stem should be above the ground. There are many plants in which stems remain underground and are modified in various ways. Each kind of modification has a particular name. For example, in *Panicum repens*, Linn. (the ginger-rooted grass, Plate 132) the underground stem is thick and horizontal resembling ginger and it is called a *rhizome*. The cord-like stems that are in the soil in the *Field-bind weed* (Plate 88) are known as *runners* or *stolons*. Whatever be the name given to the underground stems they are all extremely troublesome so far as the eradication of weeds is concerned. Because they defy all attempts at their destruction by virtue of their position and by their having a large amount of stored food and number of vegetative buds.

Leaves are very important organs of the plant as they are responsible for the manufacture of plant food. But when they happen to be absent as in *Cactus* their functions are taken up by the stem itself. There is extreme diversity of form, size and shape

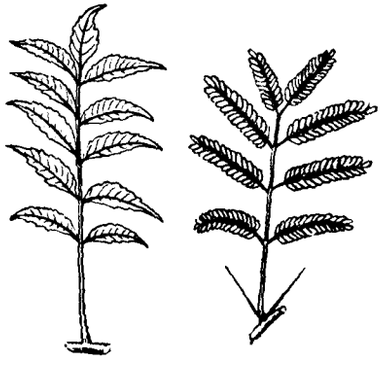
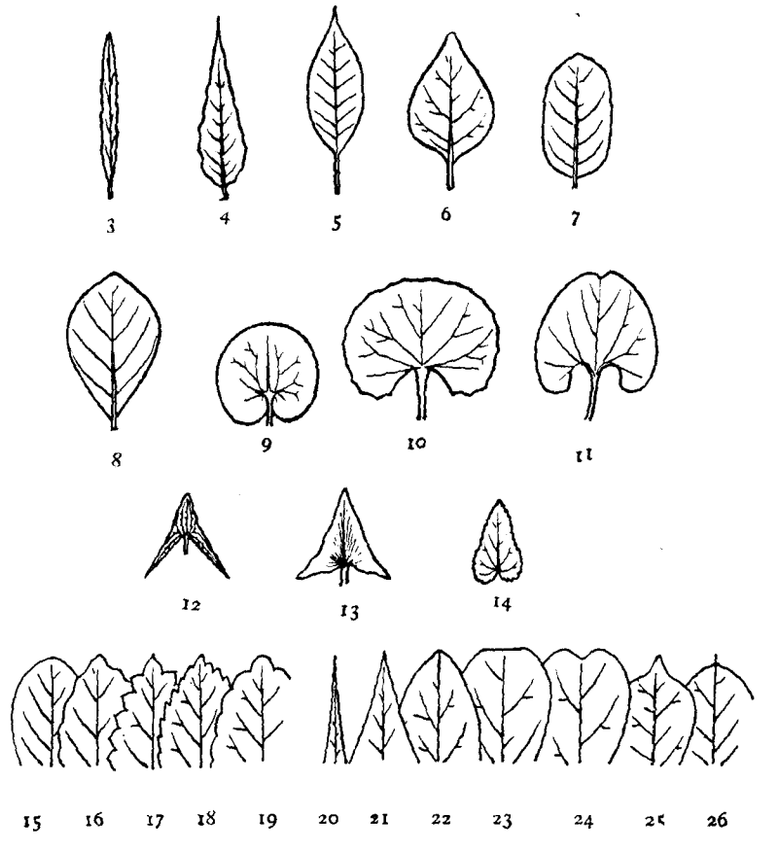


PLATE 2.—Figs. 1. Pinnate leaf of Azadirachta indica *A. Juss.* 2. Bipinnate leaf of Acacia arabica, *Willd.*



Figs. 3—26 (after K. Rangachari).

Shapes of leaves.

3. Linear. 4. Lanceolate. 5. Elliptic. 6. Ovate. 7. Oblong. 8. Obovate. 9. Orbicular. 10. Reniform. 11. Cordate. 12. Sagittate. 13. Hastate. 14. Auricled.

Leaf margins.

15. Entire. 16. Undulate. 17. Dentate. 18. Serrate. 19. Crenate.

Leaf apices.

20. Acuminate. 21. Acute. 22. Obtuse. 23. Truncate. 24. Retuse. 25. Cuspidate. 26. Mucronate.

of the leaf. It consists of two parts, the *stalk* or the *petiole* and the *lamina* or *blade* which is often open and expanded. The angle which the petiole makes with the *axis* or the stem is the *axil* of the leaf. It is in the axils that vegetative or floral buds develop and are said to be *axillary*. Usually, at the base of the petiole are two structures called the *stipules* which at times protect young buds. They may either persist or fall away early.

The leaves are not scattered pell-mell on the stem, but they are arranged in a regular way. The arrangement in any one plant is

constant for the species. When there is only a single leaf at each joint or *node* the arrangement is *alternate*; but if there are two leaves opposite to each other at the same node, they are said to be *opposite*. In some instances as in *Clerodendrons* the leaves are three or more at each node in a *whorl*; then they are described as *whorled*.

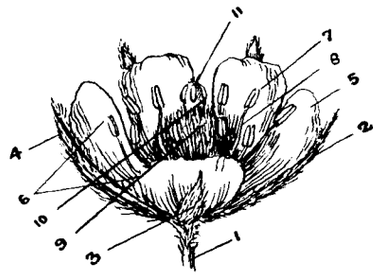
The leaves may be divided into two main classes. If the leaf is all in one piece, it is *simple*. (Plate 2, Figs. 3–14.) This may be variously lobed. In some cases, the leaves are so deeply divided, that each part remains distinct from the rest and it can easily be removed without disturbing any of the remaining parts. Such a leaf is said to be *compound* and each individual bit is the *leaflet* The leaves of *Gynandropsis*, *Melia*, etc., are of this type. (Plate 2, Fig. 1.) When the leaflet is further divided the leaf is called a *bi-pinnate* leaf, i.e., it is pinnate twice, as in *Acacia arabica*, Willd. (karivelan—Tam. Plate 2, Fig. 2.)

There is great variation not only in the size of the leaf but also in its shape and each distinct type is given a name. (Plate 2, Figs. 3–14.) Very often in grasses, leaves are long and narrow and they are described as *linear*. A leaf which has a broad base that tapers into a narrow tip is said to be *lanceolate* as in *Polygonum*. An *elliptic* leaf tapers at both ends as in *Bergia capensis*, Linn. When both margins of a leaf are parallel and broad at the top and base, its shape will be *oblong*, e.g., *Calotropis*. Sometimes a leaf is broad above and tapers towards its base. In such a case the shape will be *obovate*, e.g., Leaflet of *Desmodium triflorum*, DC., and *Pistia stratiotes*, Linn. In the same way a name can be given to any particular kind of shape. Often it will be necessary to combine two different types to correctly describe a particular shape. For example, a cholam leaf is linear and lanceolate. So it is described as linear-lanceolate.

The base of the lamina varies from plant to plant as shown in Plate 2, Figs. 3–14. The tip of the leaf also is a varying character as shown in Plate 2, Figs. 20–26, and the different kinds of margins are depicted in Plate 2, Figs. 15–19.

The various terms that are used in describing leaves may also be employed to describe other structures as the stipules, and the parts of a flower.

A flower is the most important organ of a plant for purposes of identification, because the characters of a flower are more constant than those of any other structure of the plant. Like the leaf, the flower has often a stalk called the *pedicel*; it may arise from the



THE PARTS OF THE FLOWER OF TRIBULUS TERRESTRIS, *Linn.*

PLATE 3.—Fig. A.—1. Pedicel. 2, 3 and 4. Sepals. 5. Petal. 6. Stamen. 7. Anther. 8. Filament. 9. Ovary. 10. Style. 11. Stigma.

Fig. B.—1. Spike of Achyranthes aspera, *Linn.* 2. Raceme of Crotalaria retusa, *Linn.* 3. Head of Tridax procumbens, *Linn.* 4. Cyme of Trianthema decandra, *Linn.* 5. Panicle of Boerhaavia diffusa, *Linn.*

axil of a small leaf-like structure called the *bract*. In fact, a bract is a modified leaf. On the pedicel or at its top sometimes, there may be two or more structures the *bracteoles*. When the pedicel is absent the flower is said to be *sessile*.

Flowers may be single or in groups arranged in various ways. The arrangement is called the *inflorescence*. If there is only one growing point and pedicellate flowers are produced in succession on a stalk with the oldest at base, the *inflorescence* is a *raceme*. (Plate 3, Fig. B-2.) A *spike* (Plate 3, Fig. B-1) is of the same kind of *inflorescence* as the raceme but the flowers are all *sessile*. A *head* (Plate 3, Fig. B-3) is allied to the spike and the axis instead of being long is compressed into a cushion-like structure—the receptacle on which the flowers are placed.

In some cases the *inflorescence* is the result of a number of growing points. Because each of them after growing for a while gets modified or ends in a flower necessitating the production of new growing points. Such a type of inflorescence is called a *cyme*. (Plate 3, Fig. B-4.) In grasses, *Boerhaavia diffusa*, etc., the arrangement of flowers is neither definitely racemose nor cymose. It is a mixed and compound one called the *panicle*. (Plate 3, Fig. B-5.)

The parts of a flower are placed in whorls one after the other. (Plate 3, Fig. A.) The outermost whorl above the bracteoles is the *calyx*. It is often green like the leaves and consists of *sepals* which may be free or united in various ways. They may drop away early or persist. Next comes the *corolla*. It is often coloured and its component parts are called *petals* which like the sepals are free or united. Either *calyx* or *corolla* or both may be absent in certain flowers. In grasses and *Euphorbia* spp. there are no *calyx* and *corolla*. In some *Ammannia* spp., *corolla* is absent. In *Amarantus* no distinction can be made between the *calyx* and the *corolla* and a common name—the *perianth*, is given to represent both.

The third whorl is that of *stamens* or the male elements of a plant. A stamen has a stalk called the *filament* bearing an *anther* at its apex. An anther is somewhat like a small box, often two-lobed and four-celled containing numerous minute bodies, the pollen grains which are liberated when the anther breaks open. The stamens are placed in the flower in a variety of ways. They may be *epipetalous*, i.e., attached to the petals as in *Ocimum* or free from them as in *Argemone*. The number of stamens is definite or indefinite and they may be placed above the ovary or below it.

The filaments may be united with one another, e.g., *Crotalaria*. In plants of the sunflower family the anthers are united and the filaments are free.

The innermost structure of a flower is the *pistil* or the female part. It consists of an *ovary* which is one or more celled with few or many *ovules*. An ovary* is nothing but an undeveloped fruit and the *ovules* are seeds in embryo. Above the ovary is a stalk called the *style* bearing at its top the *stigma* which receives pollen grains on it. These grains germinate and send in tube-like structures into the *ovules* through the style and fuse with the contents of the *ovules*. This act is known as *fertilization*. Only after fertilization, *ovules* begin to develop into seeds and the ovary into fruit.

A fruit may be big or small, fleshy or dry and it may break open in many ways to liberate its seeds which contain embryonic plants. There is great diversity of form and size of a seed. (Plates 4–19.) They may be broadly divided into two classes, viz., the *Monocotyledonous* seed and the *Dicotyledonous* seed. By Monocot, is meant one *cotyledon* or seed-leaf as in *palms*, *grasses*, etc. In Dicots, the seeds have each two seed-leaves. For instance, a germinating bean produces two fleshy structures which come above the soil; these are the cotyledons.

It is not always necessary that both the sexes are represented in the same flower. At times the flowers have only stamens when they are called *staminate* or *male* flowers. If there is only the pistil in a flower it is a *pistillate* or *female* one. A plant is said to be *monoecious* when it bears both the male and female flowers on it. But in *diœcious* plants they are on two different individuals, as in *Coccinia indica*, W. & A., *Vallisneria* and in palmyra among trees.

* If it is below the calyx it is inferior, and if above, superior.

CHAPTER II.

NOMENCLATURE OF PLANTS.

PLANTS are systematically studied by botanists and are divided into classes, series and *families*. A family is a big division comprising of a number of *genera* which in their turn consist of a few or many species.

Let us take, for example, one family *Solanaceae*. *Solanum*, *Capsicum* and *Nicotiana* are three genera belonging to it. These, though distinct from one another, have certain characters which are common to all of them, or in other words they have the characters of the family. In the genus *Solanum* there are *Solanum Melongena*, Linn. (the brinjal), *Solanum tuberosum*, Linn. (the potato), *Solanum xanthocarpum*, Schard. & Wendl. (kandankathiri—Tamil) and many others. All these plants are distinct having different specific names. But they all have the same generic name, because they have the characters of the same genus, viz., *Solanum*. In the same way *Capsicum frutescens*, Linn. (the Bird's eye), and *Capsicum annuum*, Linn. (the chillie) belong to the genus *Capsicum*. The species is the unit of classification.

To get at the botanical name of a plant its characters are studied and the family to which it belongs is first determined. Then the genus, and finally the species are found out. The naming of any plant can be done by referring to books called *Floras*. For instance, by the help of the " *Flora of Madras* " and by comparison with authentic sheets in the *Madras Herbarium* all plants of the Madras Presidency can be accurately named. The botanical name consists of two parts. The first one is the generic name and the second one is the specific name. The name of the botanist who first described and named a plant, or an abbreviation of his name, is usually added after the specific name; e.g., *Linn.* after *Solanum tuberosum* is the short form of *Linnaeus*, an eminent botanist.

At times a species may have one or more *varieties*, example, *Orobanche cernua*, Loefl. var. *desertorum*, Beck., is the common bodu, a bad root parasite on tobacco. But *Orobanche cernua*, Loefl. is a different plant from bodu and it may vary much from the variety. But, *Oryza sativa*, Linn. is the common paddy and the various

kinds of rice met with are only its cultivated varieties. Thus in a botanical name attempt is made to show even small differences occurring in plants that look very much alike.

It will be of interest to note that the same plant found in different parts of the world has the same botanical name. For example, nut-grass is common in India, America, Australia and other countries, and in all these countries it is called *Cyperus rotundus*, Linn.

Vernacular or common names are no doubt simpler and easier to remember than scientific names but they are often inaccurate or cannot be correctly determined. A particular plant has a number of common names some of which are often freely applied to other plants also which are entirely different. Moreover, they vary from place to place and perhaps from person to person. And for certain plants, not to speak of introduced ones, the uses of which are not commonly known, it is extremely hard to find out the common or vernacular names. Therefore. they are bound to lead one to confusion.

For an accurate study of plants it is essential to know their correct names. Therefore, the importance of a knowledge of botanical names of plants cannot be emphasized too much.

CHAPTER III.

WEEDS AND THEIR CLASSIFICATION.

PLANTS are to be found everywhere, i.e., in all kinds of soils, unless they happen to be unable to support plant life. Man tries to grow only the sort of plants that he wants and the original inhabitants of the soil become useless to him and are called weeds. The term weed has been defined in various ways by various authors and most of them convey only a partial meaning. Perhaps the most comprehensive one is that "weed is a plant out of place". Some people define it also as "a plant growing in a place where something else is expected to grow". This definition does not therefore recognize weeds of waste lands; because man does not cultivate any plant in waste places and if he does they are no more such. A cholam plant growing in a crop of cotton is a weed in that crop and *vice versa*. So the same plant can be a weed only in some places and not in others and it is, therefore, only a relative term. Consequently there cannot be many plants which are weeds everywhere and under all conditions. But usually weeds are useless or relatively useless plants causing sometimes great damage to crops or live-stock or making a place ugly.

The recognition of plants as weeds is perhaps as old as agriculture itself. When land is cultivated to raise crops, weeds spring up naturally along with the crop plants. Ordinarily under any sort of cultivation the natives of the soil try to assert themselves and no land is free from them, and as such they become "necessary corollaries of agriculture". Hence the continual struggle between the ryot and the weeds.

Being well adapted to the conditions of soil and environment the weeds are not easily destroyed. Therefore it becomes necessary that they should be studied in various aspects so that, ways and means may be devised to control them.

Classification of weeds.—To classify weeds is perhaps as difficult as to define them. The period of life has been very often taken as the basis of classification, and those that live only for a season and complete their life-history in that season, are called *annuals*, while those that grow in the first season and complete their period of life in the following season are termed *biennials*. *Perennials* ordinarily live for a number of years.

1. *Annuals.*—These are usually small herbs with shallow roots and weak stems. They propagate their species commonly by seeds which they often produce in great profusion. After seeding the annuals die away and the seeds germinate and start the next generation in the season or year following. Thus the cycle goes on, year after year. Plants of this type are *Stemodia viscosa*, Roxb., *Argemone mexicana*, Linn., and many others. In fact most of our common weeds are only annuals.

2. *Biennials.*—It is doubtful whether there are many biennials among our weeds. They generally flower and seed in the second season of their growth and then die. But some of them flower even in the first season. For example, the introduced weed *Alternanthera echinata*, Smith., flowers and fruits long before it appears to die away at the beginning of the summer. But really only the shoot withers and the main tap root is quite healthy and somewhat fleshy with plenty of stored food. As soon as rains are received during the south-west monsoon in June-July or earlier, the crown of the tap-root puts forth fresh branches which spread and establish themselves in a short time. By this means the plant gets a good start early in the season, and consequently few other weeds can smother it; on the other hand, their growth is badly hampered by this weed. This is the reason why very few other plants are seen where *Alternanthera echinata*, Smith, thrives.

3. *Perennials.*—To this class belong some of our worst weeds. They are very well adapted to withstand adverse conditions. Unlike other plants the perennial weeds are capable of propagating their species not only by seed but also by the underground stems and root suckers, which ordinarily defy the common methods of eradication. The shoot under favourable conditions grows and the food it prepares is all stored in the subterranean parts which are ready to put forth fresh shoots whenever conditions are favourable. *Cyperus rotundus*, Linn., *Convolvulus arvensis*, Linn., *Aristolochia bracteata*, Retz., are some of the common examples.

Plants like *Abutilon indicum*, G. Don., *Celosia polygonoides*, Retz., etc., are also *perennials*. But they have neither underground stems nor root suckers.

Weeds may also be classified into four other main divisions.

1. *Weeds of crop lands.*—The majority of weeds with which the ryot is mostly concerned is of this class. They occur in his fields and are detrimental to the successful growth of crops.

2. *Weeds of pasture lands.*—Maintenance of pastures does not usually form a part of the regular cultivation of land in South

India. In many places it is nobody's business to take care of them because grazing grounds are common to all the ryots in the village, and as such most of the pastures are nothing better than waste places, foul with all sorts of weeds. Still, the few that deserve their name have plants peculiar to them which however are not the same in all districts. But there are a few weeds like *Tephrosia procumbens*, Ham., *Indigofera enneaphylla*, Linn, *Tragus racemosus*, Scop, *Boerhaavia diffusa*, Linn. which are common to many pastures.

3. *Weeds of waste places.*—For all practical purposes waste places as corners of fields, margins of channels and hedges, etc., are really nurseries where weeds grow in profusion and disperse themselves. They are some of the common sources from which cultivated places are contaminated. But all of them are not those of arable lands and many are peculiar to waste places only. *Gynandropsis pentaphylla*, DC., *Tribulus terrestris*, Linn., *Opuntias*, *Calotropis gigantea*, Br., are a few examples.

4. *Weeds of playgrounds, road-sides, etc.*—These are usually hardy, prostrate perennials that are capable of withstanding any amount of trampling and are dispersed by the agencies of man and animals. There can be no better example under this class than the introduced *Alternanthera echinata*, Smith. *Euphorbia prostrata*, Ait., and *Euphorbia thymifolia*, Burm., may also be included here.

Weeds may also be grouped according to their ecological affinities.

1. *Weeds of dry lands.*—These are usually hardy plants with rather deep-seated roots, thriving on even a little amount of moisture in the soil. They are adapted to withstand drought on account of the *mucilaginous* nature of the stems and their hairiness. *Trianthema triquetra*, Roxb., *Mollugo lotoides*, O.Kze., are of this type. It does not mean that such plants do not flourish in places with plenty of moisture and plant food. They are characteristic only of dry situations.

2. *Weeds of paddy lands.*—Most of the plants of this class are tender annuals with semi-aquatic habit. They can thrive as well under water-logged as in partially dry conditions. Propagation among these plants is chiefly by seed, e.g., *Sphaeranthus indicus*, Linn., *Moniera cuneifolia*, Michx., etc.

3. *Weeds of garden lands.*—These neither require large quantities of water like the weeds of paddy lands nor can they successfully withstand extreme drought as those of class I mentioned above and they are intermediate between the two classes, so far as their water requirements are concerned. Examples are *Digera arvensis*, Forsk., *Corchorus trilocularis*, Linn., *Trianthema Portulacastrum*, Linn, etc.

From this classification it should not be thought that one class of weeds does not occur in the habitat of the other two classes. In fact most plants on the bunds of rice fields are those of garden or irrigated lands.

Sometimes weeds are considered from the standpoint of soils in which they ordinarily occur and thrive best. Though some plants are usually found in a particular kind of soil they occur in other soils also; so that one class naturally encroaches upon the other and it is very difficult to say whether there are really many weeds which are characteristic of only one kind of soil. For example, *Chrozophora Rottleri*, Klotzsch., is abundant in black cotton soils, but it occurs in tank beds and fallow rice fields also. The flora of a locality does not entirely depend upon the nature of the soil. But it is largely determined by the moisture contents and the physical conditions of the soil. If there happens to be plenty of water in a place which is usually dry, the plants that are found in those conditions disappear and their place is taken up by an entirely different class of weeds. In spite of these limitations and the varying nature of the flora of different kinds of soils we talk of the weeds of—

1. *The black cotton soil.*—These are often closely allied to those that grow in dry conditions. Examples, *Aristolochia bracteata* Retz., *Alysicarpus rugosus*, DC., *Hibiscus vitifolius*, Linn., etc.

2. *Red soils.*—They are like the weeds of garden lands consisting of various classes of plants. Examples, *Leucas urticaefolia*, Br., *Commelina benghalensis*, Linn., etc.

3. *Light, sandy or loamy soils.*—Such soils are rather poor but have very good drainage. *Stenophyllus barbata*, Rottb., *Mollugo oppositifolia*, Linn., *Oldenlandia umbellata*, Linn., *Leucas aspera*, Spr., etc., are a few examples.

As opposed to the indigenous weeds there are the introduced ones.

1. *Indigenous.*—All the native weeds of the country come under this class and the majority of the members of our weed flora are only indigenous ones.

2. *Introduced.*—These are not natives but are introduced from other countries. Weeds of this type though few in number, are very troublesome and are often more aggressive than the indigenous ones. In the country of their origin they may be absolutely harmless, for the natural enemies there, always keep them under check, but in the country they invade, the natural enemies are wanting and the plants flourish unchecked. The recently introduced *Acanthospermum hispidum*, DC., *Alternanthera echinata*, Smith., and *Croton sparsiflorus*, Morong., are good examples. The notorious water-hyacinth is also an introduced weed. In Australia, almost all the troublesome weeds have been only introduced ones.

CHAPTER IV.

SPECIAL WEEDS.

BESIDES the various classes of weeds that have been mentioned in the previous chapter there are a few others that deserve special attention. They are—

I. Poisonous weeds.

II. Parasitic weeds.

III. Pond weeds.

I. *Poisonous weeds.*—These are responsible for the great loss sustained by the country every year, on account of the death of livestock. The plants may be harvested along with fodder crops or cut with grass and fed to cattle, unintentionally. But such neglect may end in serious results. Sometimes cattle graze on poisonous plants in pasture lands and death results only if the quantity eaten is sufficiently large. Even small doses are capable of setting up bad irritation in the stomach and affecting internal organs of animals which show various depressing symptoms. They are very much weakened and become unfit for heavy work. Yield of milk may considerably be reduced in the case of cows or they may abort if they happen to be in calf. Cases of children also being poisoned by eating berries of poisonous plants have been known.

(1) *Datura fastuosa*, Linn., *Datura stramonium*, Linn., and *Datura Metel*, Linn., are poisonous both to man and animals. All parts of the plants are toxic, the seeds being most virulent. The active principles contained by them are said to be alkaloids called *Atropine* and *Hyoscyamine*.

(2) *Solanum nigrum*, Linn.—Though the plant has been cultivated for its fruit it has been said to be poisonous to children in rare cases.

(3) *Withania somnifera*, Dunal.—The berries of this plant are poisonous, the seeds containing an alkaloid called *Somniferine*.

(4) *Lochnera pusilla*, K. Schum.—It has often been reported as causing poisoning in cattle.

(5) *Crinum defixum*, Ker.—It is another plant reported to be poisonous to cattle.

It is a robust herb about two feet high with rather thick, long, narrow leaves and bunches of pretty white flowers on the top of a rather stout peduncle coming up from the middle of the leaf

cluster. The big onion-like bulb which is sometimes partially seen above the ground is characteristic of the plant. The weed is found in wet waste places and irrigation channels of rice fields in the Northern Circars and Malabar.

(6) *Abrus precatorius*, Linn.—The seeds of the plant are employed in *sui-poisoning* of cattle.

It is a twiner found among hedges with pinnate leaves and bunches of rather stiff pods which on opening expose the characteristic shining seeds which are usually bright red with a black spot in each.

Tamil: Kundumani.

Telugu: Guruvinda.

Malayalam: Kunni Kuru.

Whenever poisoning is suspected in cattle or man medical aid should be resorted to without delay.

II. *Parasitic weeds.*—Ordinarily the damage done to crops by weeds is rather indirect. But parasites attack crop plants directly, thereby causing considerable havoc. They may be wholly parasitic like *Orobanche* entirely dependent on the host plants for their growth and development. Plants of this type have no green leaves and as such they cannot prepare their own food. But *Striga* has green leaves and it can manufacture carbohydrates; and solutions of salts are obtained from the host. Such plants are termed *semi-parasites.* These attack only the roots of other plants and are also called *root-parasites.* In parts of Anantapur District young plants of *Santalum album*, Linn. (the sandalwood) are very aggressive, attacking roots of pomegranate. At Penukonda, the sandalwood is a regular pest in gardens. As the young plants of the parasite are destroyed, fresh ones come up in no time, the source of contamination being a hill close to the gardens, which is almost completely clothed with sandalwood trees.

Stem parasites.—These attack only the shoot portion of the host.

(1) *Cuscuta chinensis*, Lamk. (Family: *Convolvulaceæ*).—It is a very slender, leafless, twining herb, pale yellow in colour and sometimes parasitic on *Lucerne.* Flowers are small and white, in clusters. Fruits are capsules and contain small, round, minutely muricate, dark brown seeds. When they germinate a slender coiled, thread-like structure expands and one end of it strikes root in the soil. If the shoot comes in contact with a suitable host it establishes connection with it by producing numerous sucking

organs called the *haustoria.* Then the root no longer functions and it gets separated from the rest of the plant. If there happens to be no suitable host the plant dies away. It is not always possible to save the victim of *Cuscuta* if it gets a strong hold on the host, because it is almost smothered by the parasite and is directly depleted of its food with the result that it dies. A single plant of *Cuscuta* may rapidly spread on to others. Besides *lucerne* it attacks plants like *Ipomœa Pescaprœ*, Sweet., *Lagasca mollis*, Cav. and others.

As *Cuscuta* is a serious pest all possible measures should be adopted to destroy it wherever it is found. Seeds intended for purposes of sowing should be rejected if they are suspected to contain seeds of *Cuscuta.* Attacked plants should be burnt *in situ.*

(2) *Cassytha filiformis*, Linn. (Family: *Lauraceæ*).—It is a twining parasite with numerous, green cordlike branches, spirally wound round the branches of host plants which are very many. Flowers are small and whitish, in short spikes. Fruit is a drupe, somewhat fleshy and surmounted by the superior calyx. Occasionally the parasite is found to attack orange trees in the Northern Circars; but it occurs in almost all districts.

Tamil: Kothan.

Malayalam: Moodilla Thali.

Telugu: Paunch Theega.

(3) *Loranthus longiflorus*, Desv. (Family: *Loranthaceæ*).—A rather shrubby plant with big, thick, opposite sessile leaves, parasitic on mango and very many other trees. Flowers are orange or pink, long, tubular and in racemes. Berries are elongate and pink in colour. Seeds are covered with sticky pulp which is eaten by birds and incidentally dispersed by them. The seeds stick on to the branches of trees where they germinate and the young plants attach themselves to the host by haustoria. The plant is distributed all over the plains of the Presidency.

English: The Indian Mistletoe.

Tamil: Pulluruvi.

Malayalam: Ittukanni.

Telugu: Badanika.

(4) *Loranthus longiflorus*, Desv. var. *falcatus*, Kurz.—This is more commonly met with than the species and occurs on a variety of hosts, some of them being *Albizzias, Acacias* and *Melia.* Sometimes it causes considerable damage to pomegranate plants. Leaves are narrow and often sickle-shaped.

(5) *Loranthus elasticus*, Desv.—This species is particularly common in the West Coast, where it is parasitic on the mango, the cashew nut, the orange, the nutmeg and other trees. It is a big shrub creeping on the branches of the host and sometimes completely covering them. Leaves are opposite, often elliptic and leathery. Flowers are white and in clusters at the swollen nodes. The lobes of the corolla separate elastically and get spirally twisted. Stamens and the round berry are red.

Tamil : Kuruvikkai.

Malayalam : Mavirithil.

Various species of *Viscum* (Family : *Loranthaceæ*) also are parasitic on cultivated trees. Some species are leafless and most of them have unisexual flowers in cymes of threes. *Viscum monoicum*, Roxb. and *Viscum orientale*, Willd. are the two most common species in the plains. They attack the pomegranate, *Albizzia*, *Pongamia* and various other trees. Leaves are ovate or lanceolate and acuminate or obtuse. Flowers are rather small. Unlike the *Loranthus*, the *Viscums* establish connection with the host only in a single place and as such they can be easily got rid of by pruning infested branches.

The parasitic plants are to some extent degenerate species. Many of them are wanting in leaves and the green colouring matter which is essential for ordinary plants for making their food is also absent. But all of them are very well adapted to propagate their species and they have efficient means of dispersing the seed. The flowers are perfect in every way and seeds are usually produced in enormously large numbers, as in *Orobanche* and *Striga*. Moreover, the seeds have great vitality and are said to remain viable for a number of years. In *Loranthus* and *Viscum* though the seeds are not very many their dispersal is ensured by the edible nature of the fruits. Birds pick them and carry them to different trees. The seeds being attached to the pericarp are invariably carried along with it and get stuck to the branches of trees when the birds clean their beaks on them.

III. *Pond weeds*.—Like all other places tanks and ponds also have plants growing in them. But, these plants are entirely different from those on the land and though they belong to various families they have characters common to all of them. This is due to the fact that the environment is the same. There is plenty of water and the plants are well adapted to thrive under aquatic conditions. The many contrivances that are met with in land plants to reduce transpiration and economise water, are absent.

Water-conducting tissues are poorly developed because the whole surface of aquatic plants can absorb water directly. Root system is also ill-developed and their shoot is kept in position by water alone. There are special tissues for storing air. Propagation by vegetative means is common.

The harm done by pond weeds is usually not so great as that caused by those of arable lands. But sometimes they cause considerable inconvenience. Irrigation channels are blocked by them. Baling or lifting water is made difficult. Drinking water is polluted by the decaying of dead plants. Fishing may be made impossible when there are too many weeds in a pond. Clearing tanks of weeds usually entails much expense.

(1) *Nymphæa pubescens*, Willd. (Family : *Nymphæceæ*).—It is a perennial with a creeping underground stem and large floating leaves on long petioles. The leaves are round, rather thick, about 12 inches or more in diameter and deeply cut at the base. The lower surface is densely pubescent, red in colour and has prominent, raised veins ; margin is toothed. Flowers are white or red, showy, about 4 inches across, floating, on long stalks. Petals and stamens are many. Fruit is a many-seeded berry and seeds are small, longitudinally ribbed, covered with pulp and enclosed in the aril. Common in tanks and ponds in most districts.

English : The Water Lily.

Tamil : Alli.

Malayalam : Neerambala.

Telugu : Kaluva.

(2) *Nelumbium speciosum*, Willd. (Family : *Nymphæceæ*).—It is a large herb with the stems creeping on the soil under water and rooting at the nodes. Leaves are round, about 2 feet or more across, either floating or raised above the surface of water and peltate, the petiole being attached in the middle of the lower surface. Flowers are white or red, about 3 inches across on peduncles which are sometimes even 6 feet long. Carpels of the ovary are sunk in a torus and seeds have spongy seed-coats. Common in tanks in all districts.

English : The Sacred Lotus.

Tamil : Thamarai.

Malayalam : Thamara.

Telugu : Thamara.

(3) *Neptunia oleracea*, Lour. (Family : *Leguminosæ*).—A floating herb with bi-pinnate, compound leaves and small leaflets.

The stem is pithy and has white spongy floats. Flowers are in heads on long axillary peduncles. Pods are flat and broad.

Tamil: Sadai.

Telugu: Neeru Thalavapu

(4) *Jussiæa repens*, Linn. (See page 133).—It has, unlike many other aquatic plants, breathing roots that sometimes appear above water.

(5) *Limnanthemum cristatum*, Griseb. (Family: *Gentianaceæ*).—A shallow rooted herb with many long, petiole-like branches, each ending in a round, deeply cordate leaf about 3–4 inches in diameter and floating on water. Flowers are white, rather small on long pedicels, in a cluster, about an inch below the blade, where the stem produces a few roots and leaves also. Common in ponds and tanks in all the districts in the plains.

Telugu: Anthara Thamara.

(6) *Ipomœa reptans*, Poir. (See page 212.)

(7) *Utricularia stellaris*, Linn.f. (Family: *Lentibulariaceæ*).—A herb with the stems floating submerged and spreading under water. Leaves are in whorls and are very much divided into narrow segments with small bladders at their bases. These are really traps for catching small insects. The raceme of yellow flowers alone is seen above the surface of water and it is kept erect by a whorl of floats at the base of the peduncle. Common in tanks and ponds in the Northern Circars, Madras and Tanjore.

English: The Bladder-wort.

(8) *Utricularia flexuosa*, Vahl.—This species closely resembles the previous one but has no floats at the base of the peduncle. Frequently occurs in tanks and rice fields, in Northern Circars and the West Coast.

(9) *Ceratophyllum demersum*, Linn. (Family: *Ceratophyllaceæ*).—A much-branched delicate herb submerged under water. Leaves are in whorls and are divided into narrow lobes somewhat resembling algae. Flowers are solitary, axillary, unisexual and monœcious. Like *Utricularia* this plant also collapses when removed from water. Common in ponds and ditches, in all districts.

Tamil: Velam Pasi.

(10) *Hydrilla verticillata*, Royle. (Family: *Hydrocharitaceæ*).—A branched, submerged herb with sessile, narrow, oblong leaves which are green, somewhat transparent and minutely toothed. They are in whorls of 4–5 at each node. Internodes are often very short. Flowers are axillary sessile, unisexual

enclosed in spathes and both the sexes may be found in the same or different plants. The ovary is produced into a long, filiform tube, its mouth sometimes reaching the surface of water. The male flowers when liberated from the spathe rise to the top of water where they shed the pollen grains. Vegetative propagation by bits of branches is very common. It is frequently met with in still fresh water, in all districts.

(11) *Vallisneria spiralis*, Linn. (Family: *Hydrocharitaceæ*).—A submerged, leafy, grass-like herb growing in tufts at the bottom of tanks, in all districts. Leaves are long and narrow. Flowers are unisexual and diœcious. Males are very small and rise to the top of water by breaking away from the main plant. But, the female flowers have long, spirally twisted stalks which elongate and bring them to the surface of water, and after pollination they are pulled down into the water by the coiling of the stalks. The narrow, elongate fruits ripen under water.

English: The Tape Grass.

(12) *Ottelia alismoides*, Pers. (Family: *Hydrocharitaceæ*).—A leafy herb, growing in tufts at the bottom of ponds, ditches and other places where water stagnates. Leaves are thin, petioled and are of two kinds; those that are submerged are narrow or oblong, while those above water are round and cordate. Flowers are solitary in a spathe having 5–6 wings and are raised to the surface of water on stalks. Fruits have many seeds.

Telugu: Neeru Veniki.

(13) *Monochoria vaginalis*, Presl. (Family: *Pontederiaceæ*).—An aquatic herb with a sub-erect rhizome and ovate, cordate, acuminate leaves about 3 inches broad. Flowers are blue, spotted with red and about ½ inch across. They are arranged in racemes which arise from the leaf sheath. Common along margins of tanks and rice fields in all districts.

Tamil: Neer Thamarai.

(14) *Eichhornia crassipes*, Solms. (See page 307.)

(15) *Typha angustata*, Bory. (Family: *Typhaceæ*).—A very gregarious, robust, grass-like herb attaining a height of even 10 feet. Flowers are small in long, dense, cylindric, terminal spikes somewhat resembling the inflorescence of cumbu. The male spike is towards the top and is continuous with the female one though separated from it. Common along margins of tanks and ponds in many districts along the East Coast.

Telugu: Jammu Gaddi.

(16) *Pistia stratiotes*, Linn. (Family: *Araceæ*).—A gregariously free floating herb. Leaves are pale green, sessile obovate, closely hairy on both sides and form rosettes rooting below. At the ends of short stolons are also small clusters of leaves. Flowers are unisexual and monœcious, in spathes. The presence of this plant in tanks from which drinking water is obtained, is considered desirable; the suspended impurities in water are said to stick on to the roots. Common in many districts especially in Malabar.

Tamil: Akasa Thamarai.

Malayalam: Kudaka Payil.

Telugu: Anthara Thamara.

(17) *Lemna paucicostata*, Hegelm. (Family: *Lemnaceæ*).—A very small, green plant extremely gregarious and floating like scum on stagnant fresh water, in all districts. The plant body or frond is flat, obovate, asymmetric and entire. Root is solitary with an acute root-cap. Flowers are not often seen. They arise in the cleft of the frond and are naked in spathes. Propagation is chiefly by vegetative buds. Common in all districts.

English: The Duck-weed.

Tamil: Veppam Pasi.

(18) *Lemna polyrrhiza*, Linn.—This species has somewhat round fronds bigger than in the previous one; they are slightly purplish below. Roots are many. Habit and habitat are the same as for *Lemna paucicostata*.

(19) *Wolffia arrhiza*, Wimm. (Family: *Lemnaceæ*).—A very minute, extremely gregarious plant without roots and freely floating in old wells and ponds, entirely covering the surface of water like scum. The frond is green and somewhat spherical. Flowers are not often seen. It is the smallest flowering plant and is common in all districts.

(20) *Aponogeton monostachyon*, Linn.f. (Family: *Naiadaceæ*).—A herb with a short tuber. Leaves are submerged or floating, oblong or narrow and usually cordate at base. Petioles are long and arise from the tuber. Flowers are whitish, often densely arranged in a spike on a long stalk rising from the tuber. Common in tanks in all districts especially on the West Coast.

Tamil : Kotti Kizhangu.

Malayalam: Parva Kizhangu.

Telugu: Nama Gadda.

(21) *Potamageton indicus*, Roxb. (Family: *Naiadaceæ*).—A branched herb rooting at the nodes. Leaves are floating and

submerged, alternate or opposite above, oblong or elliptic; petioles are shorter or longer than the blades. Flowers are in axillary or terminal or leaf opposed, dense, pedunculate spikes. Frequently met with in tanks and ponds, in many districts, particularly in the Tinnevelly District.

Many sedges, i.e., plants of the Family *Cyperaceæ* are common in ponds, margins of tanks and water holes all over the Presidency.

(22) *Cyperus Iria*, Linn.—A robust, glabrous herbaceous annual with rather long leaves and bracts and an elegant looking decompound umbel. Spikelets are short and glumes are rather small and rounded.

(23) *Cyperus tegetiformis*, Roxb., *Cyperus corymbosus*, Rottb., *Cyperus tegetum*, Roxb.—These three closely allied species are robust, glabrous perennials with underground creeping rhizomes and few or no leaves. Inflorescence in all of them is a decompound umbel. They occur frequently in many districts in the Presidency.

(24) *Cyperus articulatus*, Linn.—A perennial, leafless herb with stout, jointed, stems tapering towards the top and ending in a decompound umbel. Bracts are very short. Very common in Northern Circars, Salem and Coimbatore districts along margins of tanks.

(25) *Chamæraphis spinescens*, Poir. (Family: *Gramineæ*).—A much branched, aquatic grass with floating stems. Spikelets are rather distantly arranged, lanceolate and long acuminate or shortly awned. Common in tanks and ponds all over the Presidency.

(26) *Hygrorhiza aristata*, Nees. (Family: *Gramineæ*).—A floating, branched grass densely rooting at the nodes. Leaf sheath is dilated and blade is ovate or ovate-oblong and constricted above the sheath. Inflorescence is rather small; spikelets are lanceolate and long acuminate. It occurs in ponds and tanks in many districts of the Presidency.

The various plants that have been mentioned above are all flowering plants. Among flowerless plants also there are some species that are weeds of watery places. Most of this class of plants are rather small and the biggest among them is the water fern.

(27) *Marsilea quadrifoliata*, Linn. (Family: *Marsileaceæ*).—This plant, though it very much resembles a flowering plant is

have been known to break. In wet lands where *Asteracantha longifolia*, Nees., occurs puddling is a hard job due to the spines of the plant.

The poisonous plants mentioned in Chapter IV directly cause serious loss on account of the harm done by them to livestock and human beings. Parasites as *Loranthus, Viscum, Orobanche, Striga,* etc., devastate large areas by actually killing or making host trees and plants wilt.

Weeds are troublesome not only in crop lands but also in playgrounds, road sides, etc. *Alternanthera echinata,* Smith., *Tribulus terrestris*, Linn., occur in almost all the play grounds at Coimbatore and the annoyance they cause to players and spectators, is too well known.

Very often drainage and irrigation channels are blocked by weeds and the flow of water is hindered. In Bengal, navigation in the Ganges and its canals is obstructed where the water hyacinth occurs in large numbers.

Drinking water is often polluted by algæ and similar other plants.

In waste places and hedges also, weeds are undesirable. Primarily it is because they contaminate cultivated places. Also, they make the places unsightly. Some, like *Pupalia atropurpurea*, Moq., *Triumfetta rotundifolia*, Lam., etc., are actually responsible for reducing the quality of wool. When sheep go out for grazing the hooked fruits of the plants are caught in the wool and they cannot be easily separated even at the time of sorting. Such wool is classed as inferior and is employed for making cheap goods. Recently, a rug made at Bangalore was found to contain as many as 67 bits of the fruits of *Pupalia* mentioned above.

Another aspect of the harm done by weeds is that, though they may be comparatively harmless by themselves, they are a great menace by being host plants to various fungi and insect pests which cause very serious loss to the ryot by damaging his crops. When the crop is off the field, the diseases are harboured by weeds which subsequently infect the crops. The paddy stem borer which is a serious pest of paddy in many districts is found on grasses and other weeds in the absence of paddy.

The uses of weeds.—In spite of the fact that weeds cause considerable damage in various ways, they are not absolutely useless and many advantages have been attributed to them.

In the first place, weeds are indirectly responsible for good cultivation. If it is not for them, fields do not receive much attention.

When weeds are ploughed in, they add to the soil plenty of humus which is an important ingredient of rich lands. Excellent compost can be made out of many weed plants. *Calotropis gigantea*, Br., *Tephrosia purpurea*, Pers., etc., are largely used as green-leaf manure for paddy lands. At the Samalkota Experimental Station, experiments were conducted with *Cleome Chelidonii*, Linn., and decided improvement in the yield of paddy was noticed where the weed was made use of, in manuring the fields. Recently, it has been found by the Department of Agriculture, Madras, that prickly-pear is good for making synthetic farm-yard manure. In wet lands, when it is not possible to have a green fallow or a catch crop, weeds are said to form a sort of rotation with paddy and are valuable in preventing loss of nitrates which form part of plant food.

Weeds also serve as human and cattle food in times of famine and scarcity. *Alternanthera triandra*, Lamk., *Portulaca oleracea*, Linn., *Digera arvensis*, Forsk, and many others are frequently eaten as pot herbs. Fruits of prickly-pear are consumed by the children of the poorer classes. It also makes a tolerably good fodder for cattle during times of fodder scarcity.

Many weeds have great therapeutic properties and are largely employed in medicine.

Panicum repens, Linn., *Imperata arundinacea*, Cyrill., etc., are excellent soil binders and are invaluable for keeping bunds in position and for preventing erosion. The stems of *Cyperus tegetum*, Roxb. and *Cyperus tegetiformis*, Roxb., yield good material for making mats. In the Northern Circars, *Typha angustata*, Bory, is made use of for making screens.

Weeds are also useful as indicators of good and bad soils. The habitat of plants is to some extent constant and it is possible to judge the quality of land from the nature of the plants that grow on it. *Panicum colonum*, Linn., invariably occurs in rich soils while *Cymbopogon cæsius*, Stapf., usually, denotes a poor light soil. On the other hand, most sedges are found in ill-drained soils.

Apart from other considerations, certain weeds have æsthetic value of their own. They adorn the places where they are found and are very pleasing to the eye. *Vicoa indica*, DC., a common plant of meadows, *Asystasia gangetica*, T. And., and *Clitoria Ternatea*, Linn., which occur frequently among hedges, are only a few examples of pretty weeds.

only a fern ally. It is often mistaken for *Oxalis corniculata*, Linn., which, however, has yellow flowers. The stem is a long creeping stolon, rooting at the nodes. Leaves are erect on long petioles. Leaflets are 4, rather large, obovate and entire on the margin. Veins are many and forking. There are a few, small, shortly stalked, hard, oblong fruiting bodies called the sporocarps at the base of the petiole and attached to it. A floating herb frequently met with in ponds, ditches and sometimes irrigation channels and rice fields all over the Presidency.

English: The Water Fern.

Tamil: Arai Keerai.

(28) *Marsilea minuta*, Linn.—This closely resembles the above species, but has much smaller leaves. Sometimes it is found on land also. Common throughout the Presidency.

(29) *Chara* sp. (Family: *Characeæ*).—A small branched herb found in large numbers, submerged under water, in rice fields and at the bottom of ponds in many districts. Branches are very slender and rough. The side ones are short in whorls at the nodes of the main stem, and have small orange coloured fruiting bodies.

English: Stonewort.

Frequently channels and ponds are foul with various species of algæ, the commonest being *Spirogyra* and *Oscillatoria*, the former is green occurring in masses and the latter is dark or bluish green usually attached to the soil. *Cladophora* occurs in big, green or yellow, frothing masses floating in old wells and tanks.

The algæ are low forms of plants, their body consisting of long, slender, filamentous structures. Water is made foul and it gets a sort of bad odour by the presence of algæ.

CHAPTER V.

THE LOSS CAUSED BY WEEDS AND THEIR USES.

The harm done by weeds is often indirect, yet it is considerable.

Plants, like animals, require food, water and air for their growth. Most of them make sugars and starch from the carbon-di-oxide in the air by the help of the green colouring matter (chlorophyll) present in the leaves. But various salts and organic matter also are essential for them. They are obtained from the soil in the form of solution. The available plant food in the soil being rather limited it is often supplemented by manures. Weeds also have almost the same food requirements as other plants and naturally they depend upon the soil for the supply. So there is constant struggle between the weeds and the crop plants and often the former win if the latter are not helped by man. The food that is intended to be utilized by crops is robbed of by the weeds to the detriment of crops.

Water is another very important factor for the successful growth of plants and without it they die away; because they cannot get food from the soil when there is no water. After serving its purpose it is lost by transpiration. In this way large quantities of water are removed from the soil and lost. Therefore the presence of weeds decreases the quantity of water in the soil and the results are sometimes rather serious especially in light and dry soils.

Weeds also occupy the space that may otherwise be utilized by crop plants and consequently they suffer for want of light and air and therefore the yield of crops in weedy fields, is much reduced.

Even if a field is naturally rich its value goes down where weeds like Hariali, Nut grass, *Trianthema* and Thalanji (*Clerodendron Phlomidis*, Linn. f.), etc., are present; because in such fields the preparation of the land is made difficult, the cost of harvest is enhanced and weeding itself entails heavy expenditure. Moreover, the quality of produce will be inferior due to the contamination with foreign seed. Ploughing in fields badly infested with *Merremia emarginata*, Hallier f., and *Ischæmum pilosum*, Hack., is a difficult task; it is a great strain on the cattle and ploughs also

atropurpurea, Moq., *Triumfetta rotundifolia*, Lam., *Xanthium strumarium* Linn., *Tragus racemosus*, Scop., have hooks on the fruit-coats or on the bracts, that help dispersal by the agency of animals like sheep and goats.

(2) *Spread of weeds by man and other agencies.*—It is true that man tries to control weeds, but unintentionally, he is, to a very large extent, helping them to spread.

Farmyard manure is often the chief source of contaminating fields. Cattle go out for grazing to all sorts of waste places where weeds are abundant and feed on them, especially, when there is scarcity of fodder and the pasture is poor. The hardy seeds are excreted undigested, in the dung which is stored and applied to fields. Unfortunately, it so happens that some of our very bad weeds like *Trianthema Portulacastrum*, Linn., have very hardy seeds.

The ryot is too well known for his indifferent ways of storing farmyard manure. If it is properly composted very many weed seeds may die away. But the ryot does not do it and when he spreads the manure he sows seeds of weeds also. Very often, all sorts of rubbish and refuse are thrown into the manure pit or rather the manure heap, thereby adding to the number of weed seeds already present. The practice of collecting or buying municipal refuse for purposes of manuring fields is also responsible for increasing the weed population.

Sheep and goats leave very few plants untouched when they go out for grazing and as such their dung contains very many weed seeds, so that they also should be considered as agencies of spreading weeds.

Another way of contaminating cultivated fields, is by sowing impure seed. This is of very common occurrence in South India. The average ryot is very poor and he does not store good seed for sowing. As soon as the monsoon sets in, he borrows money and naturally tries to buy seed at the lowest possible price. Of course, the seed will be adulterated and will give him endless trouble in the form of weeds when it is sown. In this connexion, the costly experience of Australia should not be forgotten. When the country was occupied by settlers, various crop seeds were introduced and along with them seeds of weeds also were imported, and to-day, as has been mentioned in a previous chapter, the most troublesome weeds of Australia are those that have been so introduced.

Very often ordinary field operations as ploughing have resulted in spreading weeds. This is very true in the case of fields infested with plants like the Bind Weed, Hariali, *Clerodendron Phlomidis*, Linn. f., *Aristolochia bracteata*, Retz., etc. They may occur in patches in a field and when it is ploughed the underground stems and roots get broken and spread all over the field, infecting the whole area. Fields that have been lying fallow for a considerable time are often foul with weeds. When the field is ploughed the weeds which may be in seed, are buried and it indirectly means storing trouble.

Weeds are introduced from one farm to the other by means of farm carts, implements, threshing machines, etc. The seeds stick on to the tyres of carts, the bodies of ploughs and they drop off at the time of cleaning or using them.

Sometimes, plants are purposely introduced for growing in gardens. But it may so happen that they escape from the control of man and turn out to be terrible pests. The water hyacinth which has caused considerable havoc in Bengal, is an excellent example.

Indifferent cultivation and neglect on the part of the ryot also aids the spread of weeds. Very often, the lands cultivated by him are not his own. The landowner tries to get as much money from the tenant as possible and naturally the tenant tries to spend the least possible amount on the land in which he has no permanent interest. Because, the tenancy of the land may go out of his hands at any time or at any rate, it will not be under his charge very long. As such the tenant does not care to spend money and eradicate bad weeds or clear waste places or have a proper rotation of crops, with the result that the weeds flourish unchecked and spread in the natural course.

In these days of extensive commercial developments made possible by railways and steam ships there is ample scope for weeds to be carried over vast distances. *Alternanthera echinata*, Smith., *Croton sparsiflorus*, Morong., and *Acanthospermum hispidum*, DC., though natives of America are now abundant in South India. First, the steamer and then the railway is responsible for their presence in this country. *Croton sparsiflorus*, Morong., is found mostly all along the railway line in the East Coast and *Acanthospermum hispidum*, DC., was first noticed near a railway station. The sea ports of the East Coast were the places where *Flaveria australasica*, Hook., first made its appearance in South India.

CHAPTER VI.

HOW WEEDS SPREAD AND THE METHODS OF CONTROLLING THEM.

How weeds spread.—The reason why weeds are very aggressive is largely due to the efficient way of propagating their species and the varied means of dispersing the seed. Propagation in most common plants is by seed, as is the case with our annuals. Vegetative reproduction by means of underground stems, root-suckers and vegetative buds is also common. The most troublesome weeds reproduce their species both by sexual and vegetative means. But, in cases where the asexual method is the rule, as in the bind weed the sex organs degenerate and seeds do not often set. Production of seed is no doubt an advantage to the plant; because, out of the large number of seeds a plant may have, there is chance at least for some of them to germinate and grow into new plants. The chance is largely eliminated where underground stems are concerned. They are hardy, and are well protected from injury on account of their position and are able to defy ordinary means of eradication.

Weeds spread by very many ways which may be classified as (1) Natural means and (2) By man and other agencies.

(1) *Spread of weeds by natural means.*—Naturally plants have various contrivances for dispersing seed or fruit, so that species may spread far and wide.

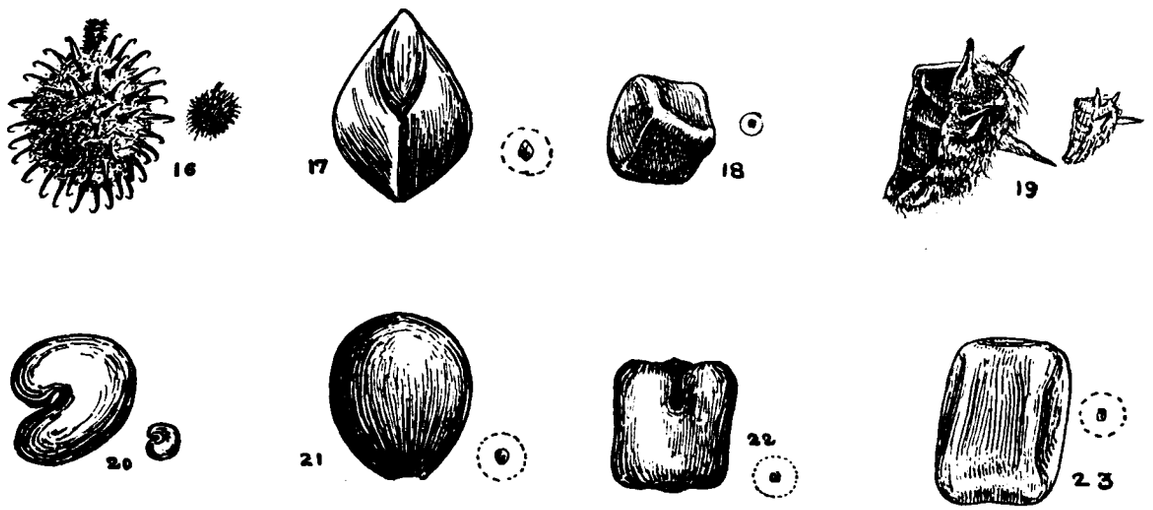
Members of the bean family have pods that dehisce or break open into two valves which by suddenly twisting throw the seeds to a considerable distance, thereby preventing their shedding very close to the mother plant and the consequent struggle when the seedlings come up, e.g., *Clitoria Ternatea*, Linn., *Tephrosia*, etc. In *Argemone mexicana*, Linn., the capsule breaks at the top only, by short valves and the numerous seeds contained in the fruit are scattered over a large area, when the branches are shaken by the wind. The fruits of many species of *Acanthaceæ*, as *Ruellia patula*, Jacq., have elastic valves which spring back with force and a slight explosion, when moistened by rain or water, and the seeds are actually shot out a long way from the plant.

Plants of the composite family have usually pappus or tufts of hairs on the top of the small seedlike fruits. These hairs enable the achenes to travel very long distances, by the help of wind. This is the reason why we often notice plants of this type in various localities. Sometimes seeds also are provided with similar hairs that serve the same purpose. Such seeds are called *comose* seeds, as in *Calotropis gigantea*, R. Br., *Leptadenia reticulata*, W. & A., etc.

Water also aids the dispersal of seeds. The seed of *Nymphæa*, is enclosed in a sac-like structure in which is confined a small air bubble which helps the seed to float and travel for some time and when the air bubble escapes, the seed sinks down under water. Fruits of *Xanthium strumarium*, Linn., are carried over long distances by water. The plant is found in large numbers, in dry tank beds. Pairs of fruits are enclosed in bracts forming a light vase-like structure. They are produced in abundance in the dry season and are shed; when water is received in the tank they float and are carried away by it.

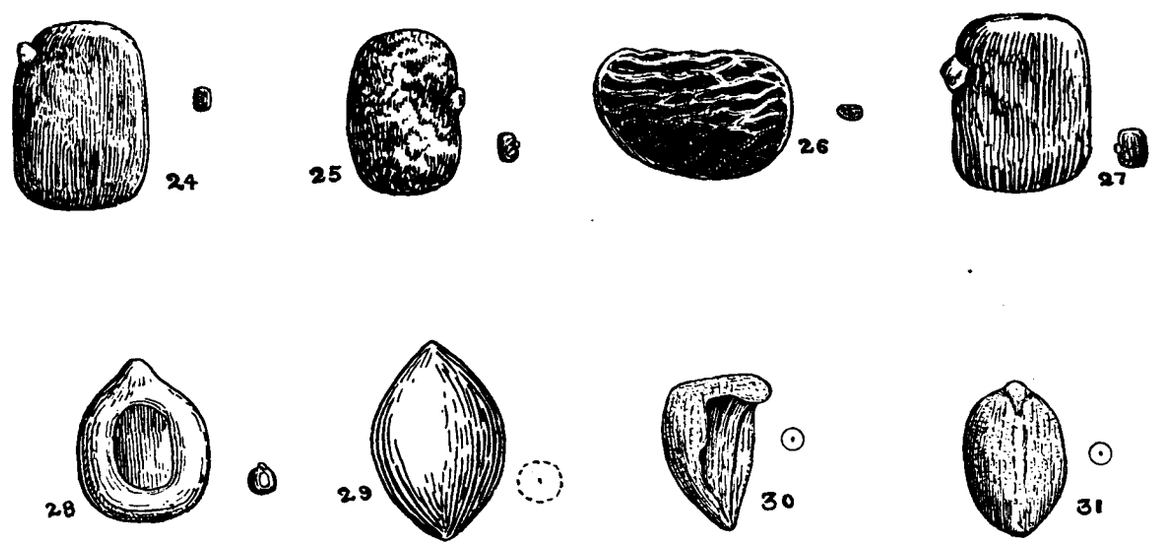
Birds, animals and man also are responsible for the spread of weeds. Some fruits being fleshy and edible are pecked at by birds and dropped in various places. Lantana fruits are said to be dispersed by the common Madras red-vented bulbul. Seeds may also be swallowed and very often pass uninjured through the alimentary canal and are deposited in the excreta, e.g., *Cassytha*, *Loranthus*, *Opuntia*, etc. The seeds of *Croton sparsiflorus*, Morong., somewhat resemble beetles and may be picked by insectivorous birds and thrown away when they are found to be useless. *Abrus precatorius*, Linn., has very brightly coloured seeds that are exposed when the pod breaks open and attract the attention of birds.

Some fruits are so modified as to be easily dispersed by animals and man. Fruits of *Tribulus terrestris*, Linn., are provided with sharp spines that run into the soles of barefooted pedestrians who remove them at once and throw them away, thereby doing a service to the weed. In *Achyranthes aspera*, Linn., the old fruits point downwards, exposing the spine-tipped bracteoles that easily get caught on the clothing of people passing by or on the skin of animals and are carried and dispersed by them. The roadside weed *Alternanthera echinata*, Smith., is also of this type. The perianth containing the fruit is very flat and spine-tipped. It sticks in large numbers to boots, tyres of vehicles and is carried over very long distances, infecting new areas. *Pupalia*



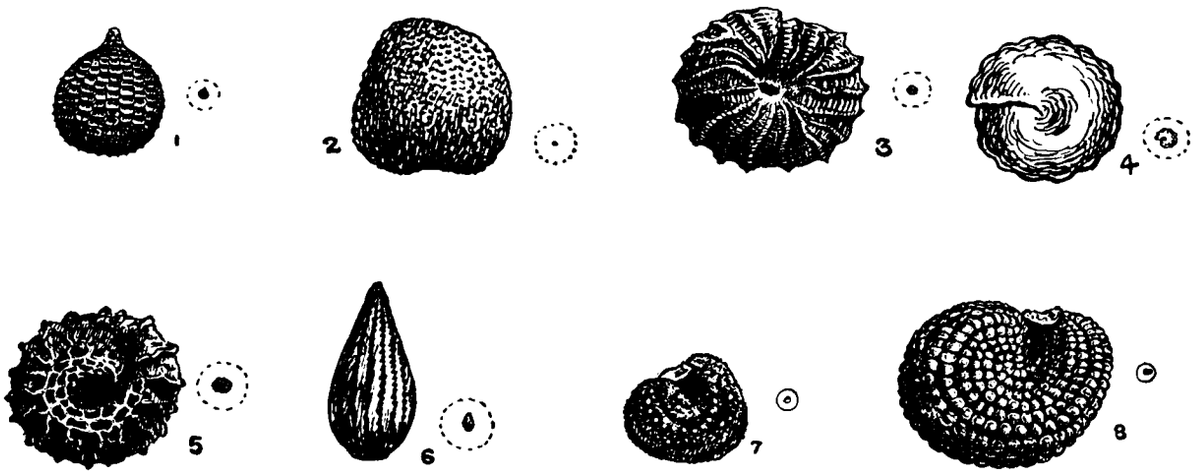
SOME COMMON WEED SEEDS.

PLATE 6.—Figs. 16. Triumfetta rhomboidea, *Jacq.* (Fruit) 17. Corchorus olitorius, *Linn* 18. Corchorus trilocularis, *Linn.* 19. Tribulus terrestris, *Linn.* (Coccus . 20. Crotalaria verrucosa, *Linn.* 21. Indigofera enneaphylla, *Linn.* 22. Indigofera viscosa, *Lamk.* 23. Indigofera trita, *Linn. f.*



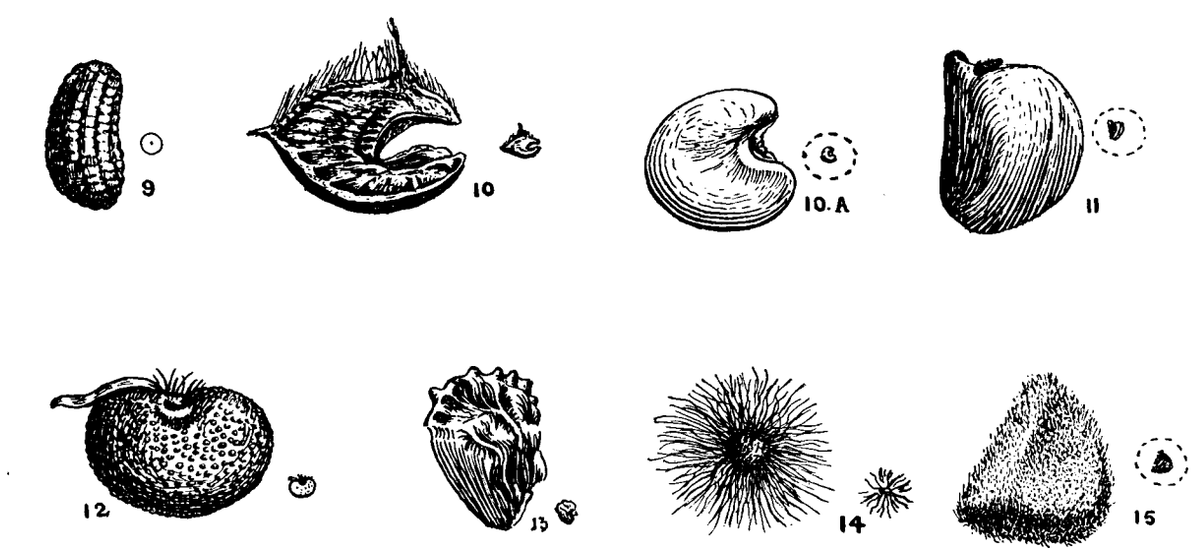
SOME COMMON WEED SEEDS.

PLATE 7.—Figs. 24. Tephrosia spinosa, *Pers.* 25. Tephrosia purpurea, *Pers.* 26. Alysicarpus rugosus, *DC.*, var. styracifolius, *Baker.* (joint of fruit). 27. Clitoria Ternatea, *Linn.* 28. Cassia occidentalis, *Linn.* 29. Rotala densiflora, *Koehne* 30. Ammannia baccifera, *Linn.*, var. ægyptiaca, *Koehne.* 31. Ludwigia parviflora, *Roxb.*



SOME COMMON WEED SEEDS.

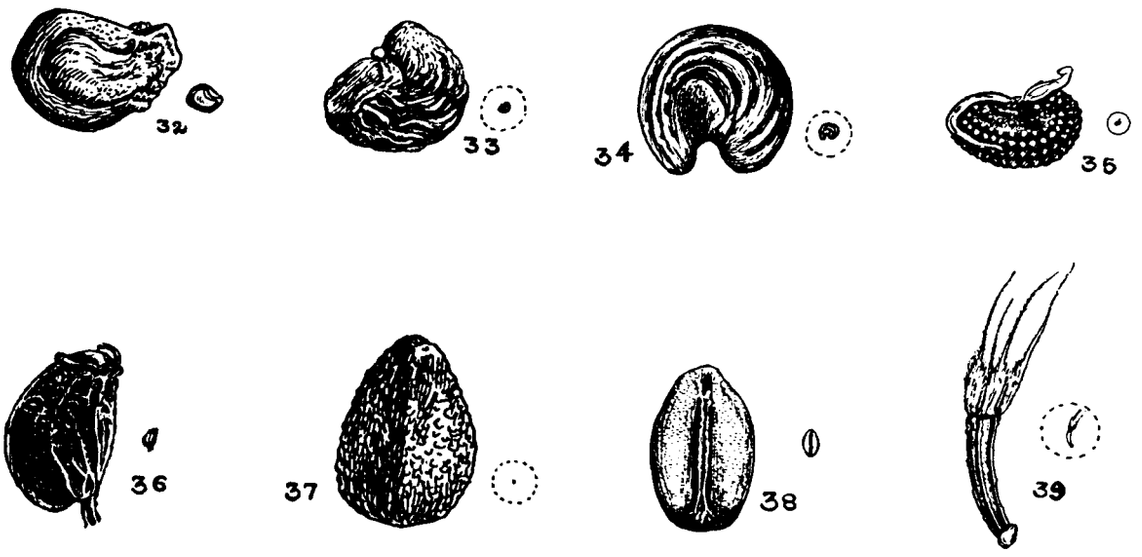
PLATE 4.—Figs. 1. Argemone mexicana, *Linn.* 2. Nasturtium indicum, *DC.* 3. Cleome viscosa, *Linn.* 4. Cleome Chelidonii, *Linn. f.* 5. Gynandropsis pentaphylla, *DC.* 6. Ionidium suffruticosum, *Ging.* 7. Portulaca oleracea, *Linn.* 8. Portulaca quadrifida, *Linn.*



N. L. Tirn.

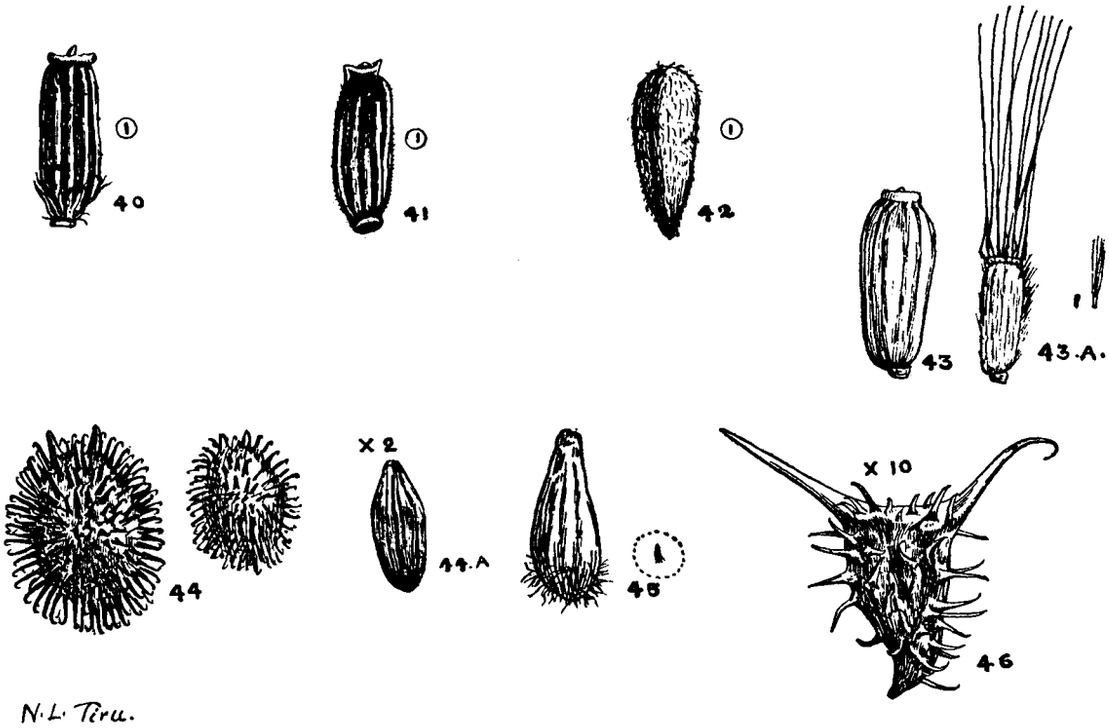
SOME COMMON WEED SEEDS.

PLATE 5.—Figs. 9. Bergia ammannioides, *Roxb.* 10. Malvastrum coromandelianum, *Garcke.* (Coccus). 10-A. Malvastrum coromandelianum, *Garcke.* (Seed). 11. Sida spinosa, *Linn.* 12. Abutilon indicum, *G. Don.* 13. Pavonia procumbens, *Boiss.* (Coccus). 14. Hibiscus micranthus, *Linn. f.* 15. Hibiscus panduræformis, *Burm.*



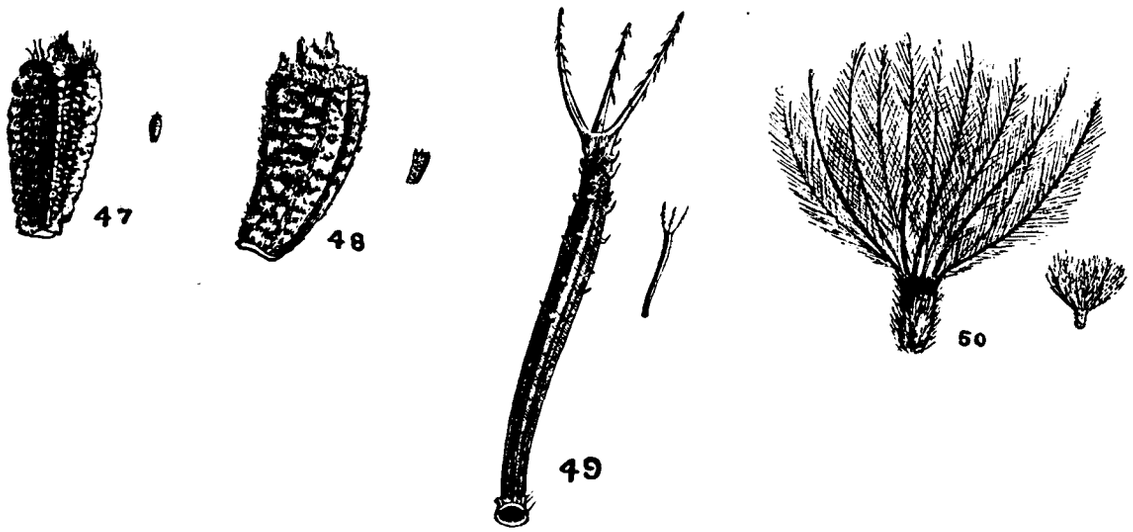
SOME COMMON WEED SEEDS.

PLATE 8.—Figs. 32. Opuntia Dillenii, *Haw.* 33. Trianthema Portulacastrum, *Linn.* 34. Trianthema triquetra, *Rottl.* 35. Mollugo lotoides, *O. Kze.* 35. Centella asiatica, *Urban.* (Mericarp). 37. Oldenlandia umbellata, *Linn.* 38. Borreria hispida, *K. Sch.* 39. Ageratum conyzoides, *Linn.* (Achene).



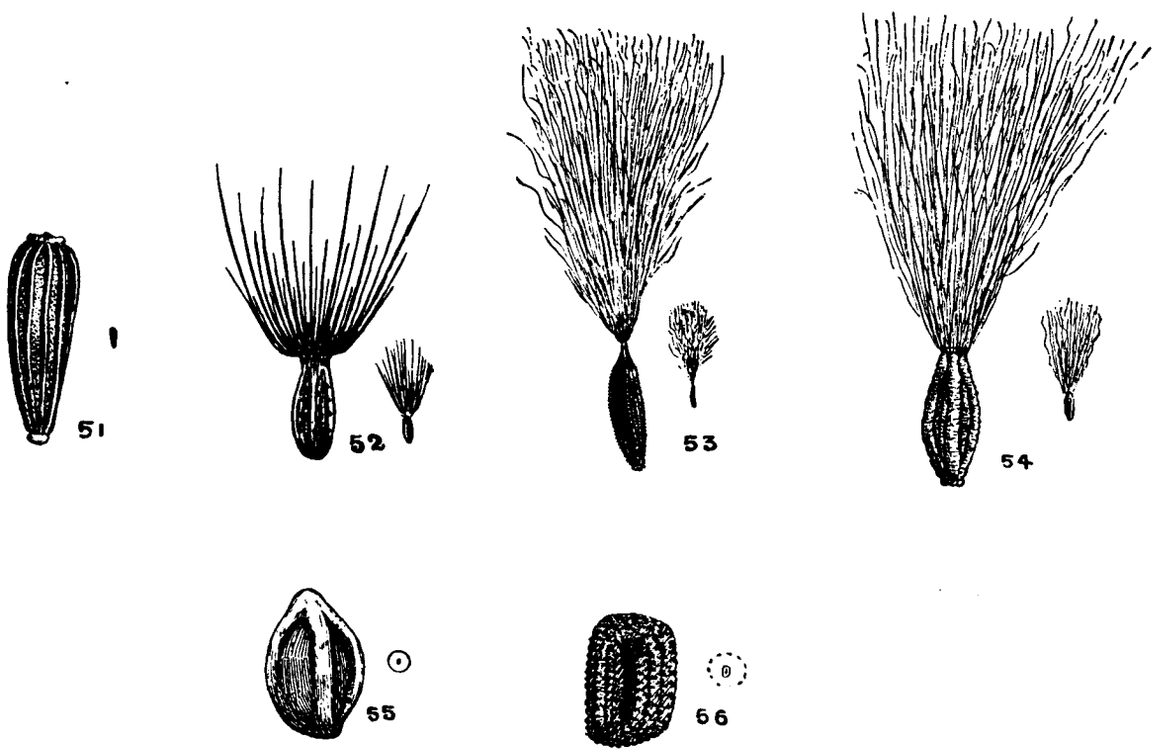
SOME COMMON WEED SEEDS.

PLATE 9.—Figs. 40. Grangea maderaspatana, *Poir.* (Achene). 41. Blumea Wightiana, *DC.* (Achene). 42. Sphæranthus indicus, *Linn.* (Achene . 43 and 43-A. Vicoa indica, *DC.* (Achenes). 44. Xanthium strumarium, *Linn.* (Utricle). 44 A. Xanthium strumarium, *Linn.* (Achene). 45. Lagasca mollis, *Cav.* (Achene). 46. Acanthospermum hispidum, *DC.* (Achene).



SOME COMMON WEED SEEDS.

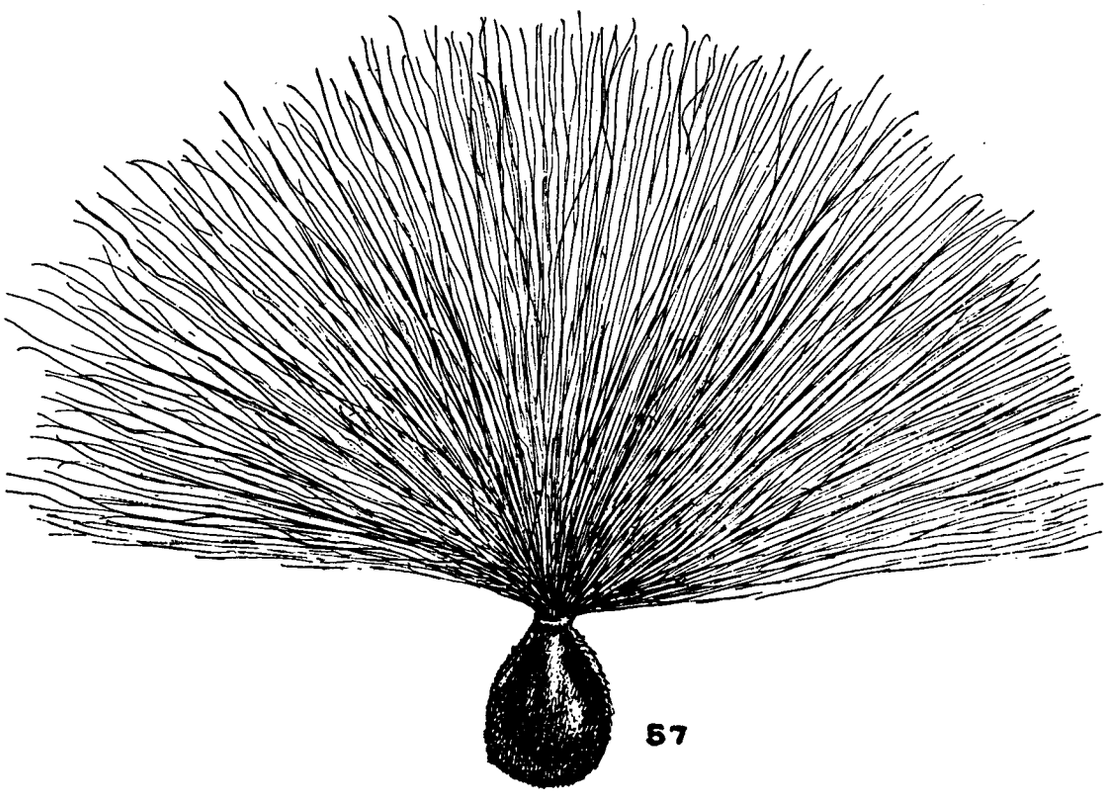
PLATE 10.—Figs. 47. Eclipta alba, *Hassk.* (Achene). 48. Blainvillea rhomboidea, *Cass.* (Achene). 49. Bidens pilosa, *Linn.* (Achene). 50. Tridax procumbens, *Linn.* (Achene).



N L Tiru

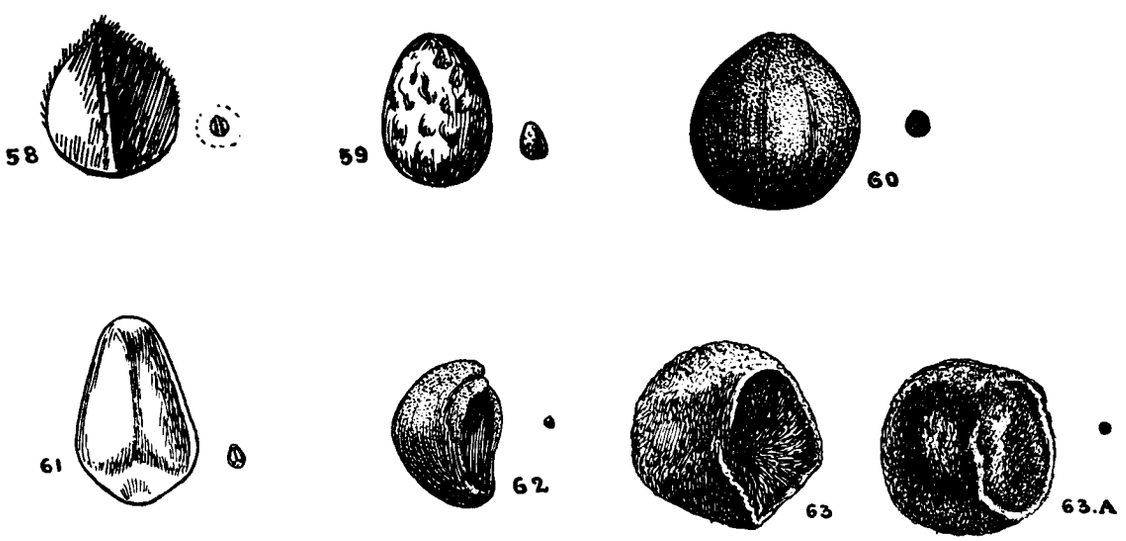
SOME COMMON WEED SEEDS.

PLATE 11.—Figs. 51. Flaveria australasica, *Hook.* (Achene). 52. Volutarella divaricata, *Benth.* (Achene). 53. Lactuca runcinata, *DC.* (Achene). 54. Sonchus arvensis, *Linn.* (Achene) 55. Lobelia trigona, *Roxb.* 56. Lochnera pusilla, *K. Schum.*



SOME COMMON WEED SEEDS.

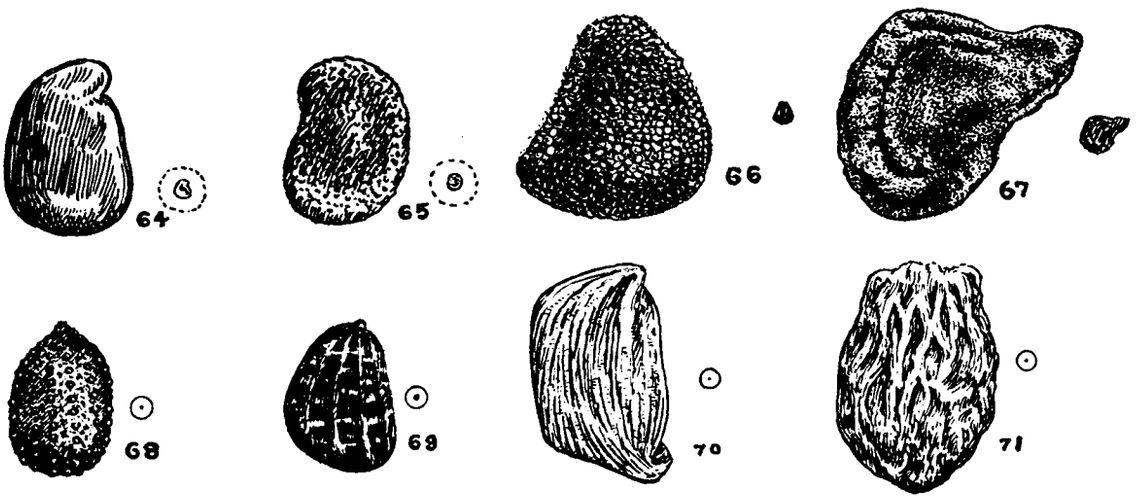
PLATE 12.—Fig. 57. Calotropis gigantea, *R. Br.*



N.L. Tiru.

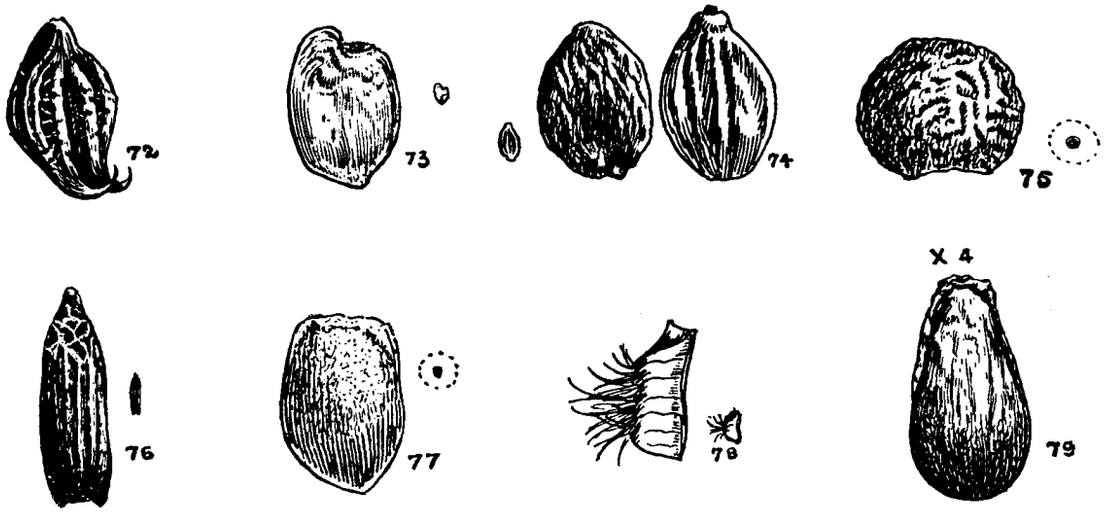
SOME COMMON WEED SEEDS.

PLATE 13.—Figs. 58. Heliotropium ovalifolium, *Forsk.* (Nutlet). 59. Trichodesma indicum, *R. Br.* (Nutlet). 60. Merremia emarginata, *Hallier f.* 61. Convolvulus arvensis, *Linn.* 62. Evolvulus alsinoides, *Linn.* 63 and 63-A. Cuscuta chinensis, *Lamk.*



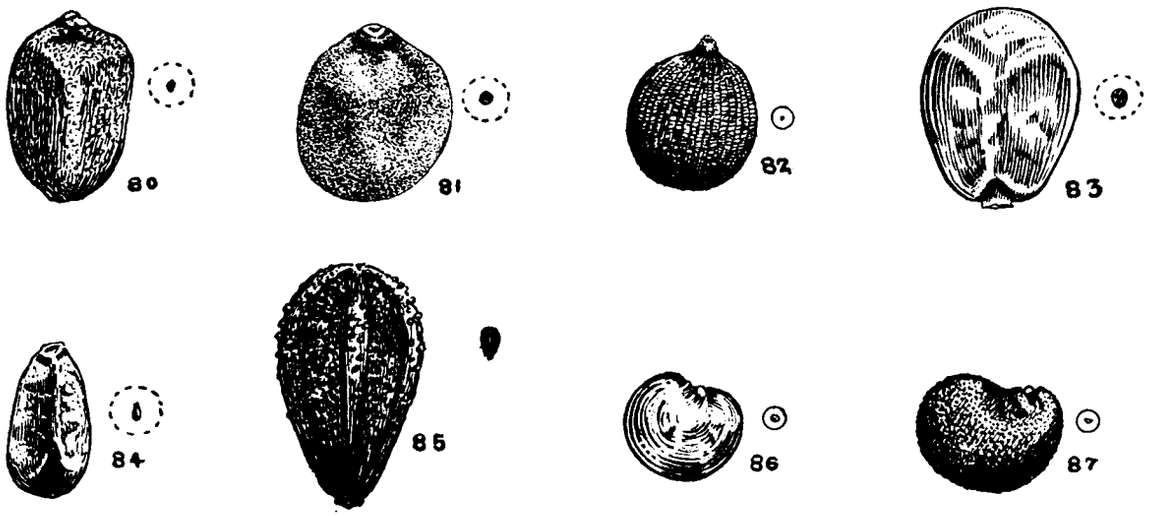
SOME COMMON WEED SEEDS.

PLATE 14.—Figs. 64. Solanum xanthocarpum, *Schrad. and Wendl.* 65. Physalis minima, *Linn.* 66. Withania somnifera, *Dun.* 67. Datura fastuosa, *Linn.* 68. Stemodia viscosa, *Roxb.* 69. Moniera cuneifolia, *Michaux.* 70. Striga lutea, *Lour.* 71. Orobanche cernua, *Loefl.*, var. desertorum, *Beck.*



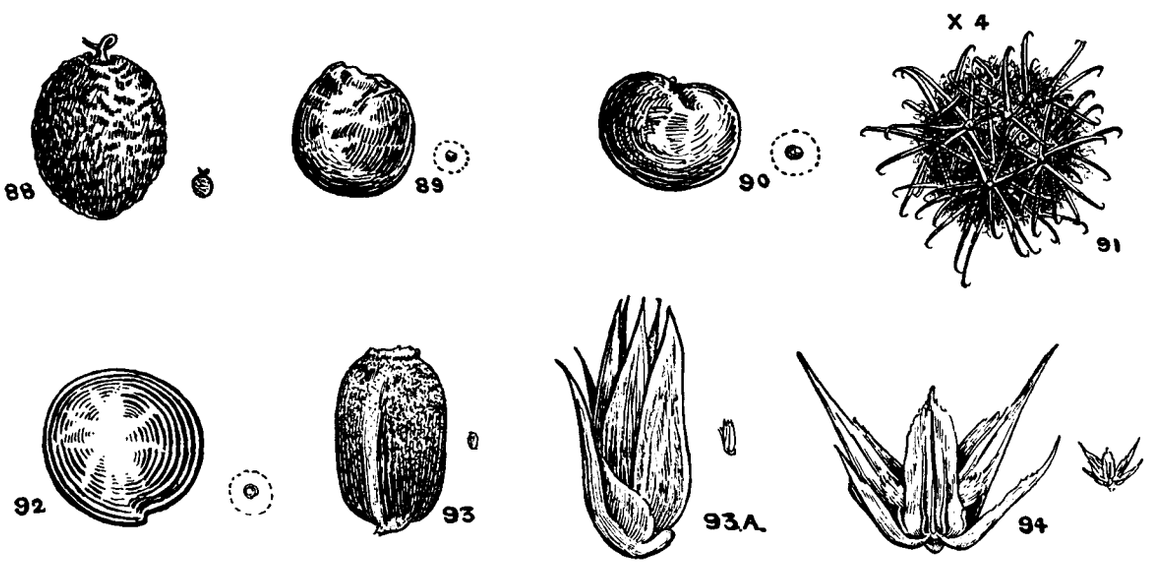
SOME COMMON WEED SEEDS.

PLATE 15.—Figs. 72. Martynia annua, *Linn.* (Fruit without pericarp). 73. Asteracantha longifolia, *Nees.* 74. Blepharis molluginifolia, *Pers.* 75. Rungia repens, *Nees.* 76. Stachytarpheta indica, *Vahl.*, var. Jamaicensis, *Trimen.* (Pyrene). 77. Lippia nodiflora, *Mich.* (Pyrene). 78. Priva leptostachya, *Juss.* (Pyrene). 79. Clerodendron Phlomidis, *Linn. f.*



SOME COMMON WEED SEEDS.

PLATE 16.—Figs. 80. Ocimum canum, *Sims.* (Nutlet). 81. Ocimum adscendens, *Willd.* (Nutlet). 82. Moschosma polystachyum, *Benth.* (Nutlet). 83. Anisomeles indica, *O. Kze.* (Nutlet). 84. Leucas urticæfolia, *Br.* (Nutlet) 85. Boerhaavia diffusa, *Linn.* (Fruit enclosed by the persisting lower part of perianth). 86. Celosia argentea, *Linn.* 87. Celosia polygonoides, *Retz.*

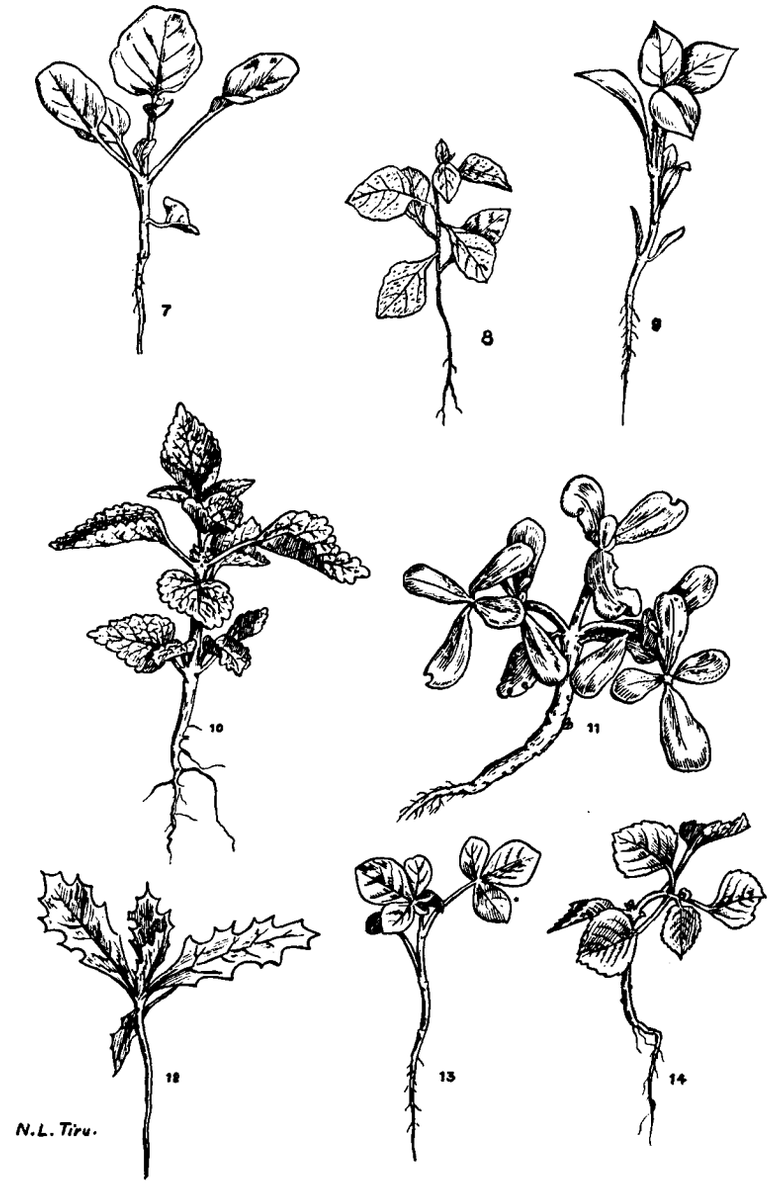


SOME COMMON WEED SEEDS.

PLATE 17.—Figs. 88 Digera arvensis, *Forsk.* (Nut). 89. Amarantus spinosus, *Linn.* 90. Amarantus viridis, *Linn.* 91. Pupalia atropurpurea, *Moq.* (Fruit with perianth and hooks). 92. Aerva tomentosa, *Forsk.* 93. Achyranthes aspera, *Linn.* 93-A. Achyranthes aspera, *Linn.* (Fruit enclosed in the perianth and bracteoles). 94. Alternanthera echinata, *Smith.* (Fruit with perianth).

SEEDLINGS OF WEEDS.

PLATE 20.—Figs. 1. Cyperus rotundus, *Linn.* 2. Merremia emarginata, *Hallier f.* 3. Cyanotis cucullata, *Kunth.?* 4. Lochnera pusilla, *K. Schum.* 5. Cynodon dactylon, *Pers.* 6. Flaveria australasica, *Hook.*



SEEDLINGS OF WEEDS.

PLATE 21.—Figs. 7. Trianthema Portulacastrum, *Linn.* 8. Vernonia cinerea, *Less.* 9. Alternanthera echinata, *Smith.* 10. Leucas urticæfolia, *Br.* 11. Portulaca oleracea, *Linn.* 12. Argemone mexicana, *Linn.* 13. Gynandropsis pentaphylla, *DC.* 14. Acalypha indica, *Linn.*

Methods of controlling weeds.—The methods of control largely depend upon the habit of the weeds and the way in which they multiply and spread. These may be considered under two main heads: I. Preventive measures, and II. Remedial measures.

I. *Preventive measures.*—The old adage that "Prevention is better than cure" is as true in the case of weeds as anything else. It is more wise not to have weeds at all on the farm than to allow them to get a strong hold and then to try and eradicate them.

The most common way of getting weeds into cultivated fields is by means of impure seed. By taking care to sow pure seed a great amount of harm is prevented. If it is not possible to secure good seed in the market, the ryot should collect it from his own crop and carefully clean it and store it for sowing. It is always advantageous to try a small sample of seeds before sowing. A handful of it is taken at random and spread on a flat surface and all bad and weed seeds are picked up and separated; if they are very many the sample should be rejected. Sometimes it may not be possible to find out seeds of weeds in the manner just mentioned, as when they are very small and resemble those of crops. In that case, a small quantity about ¼ to 1 *tola* by weight of seed may be first soaked in water overnight or for about 24 hours and then sown in a small, shallow, wooden tray about 1-2 inches deep, containing powdered stones to which a little dung water filtered through cloth has been added. It is not advisable to use sand or soil or dung lest they should contain seeds of weeds and the results of experiments should be misleading. After about a week all the seedlings in the tray may be examined and if they contain many specimens of weeds, the sample experimented with should be considered undesirable and rejected.

In many western countries especially America there are special officers whose sole business is to test crop seeds and certify as to their purity. No sample should be sold for purposes of sowing unless it bears the certificate of the Seed Testing Officer. In the absence of such facilities in the Madras Presidency, the ryot should devise his own means of testing seeds as has been suggested. He should also be thoroughly acquainted with all the weeds on his lands and know the most harmful ones from the comparatively harmless ones. The plates 4-19 and 20 and 21 will help him to identify some of the common seeds and seedlings of weeds; a small magnifying glass as that used by watch repairers may be used when small seeds are examined. It is also highly desirable that all farms should have collections of seeds of weeds correctly identified, for reference.

When any kind of seed is obtained for sowing from foreign countries, utmost care should be taken to have it tested for weeds before it is actually put in the land. Even after that, the ryot or gardener should have an eye for any new comers and destroy them at the earliest opportunity. If this precaution had been taken, we would not have had the trouble from the introduced weeds to-day.

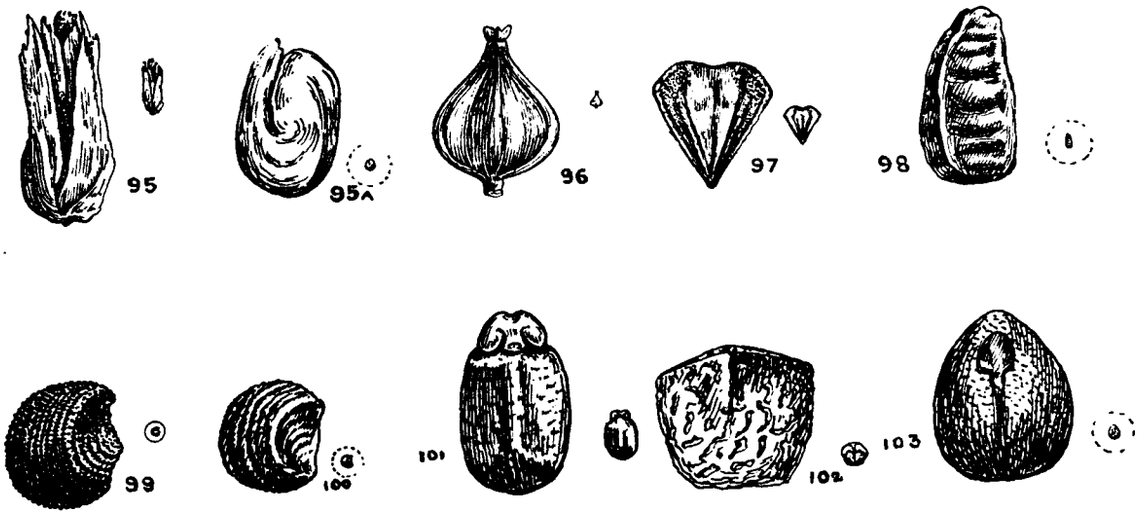
Clean cultivation largely contributes to the suppression of various kinds of weeds. Inter-cultivation, hoeing and weeding operations should not be neglected, and on the other hand they should be done as frequently as possible. The practice of sowing seed by broadcasting which is very common in many parts of the Presidency should be discouraged; because it is not possible to thoroughly weed or inter-cultivate crops so sown. Use of drill should be encouraged. Waste places, corners of fields, field bunds and irrigation channels ought to be cleared of weeds as frequently as possible.

After harvesting a crop and before ploughing the field, a thorough weeding should be given to it. If not, the weeds that are in seed will be buried and come up to the surface of soil whenever opportunities present, as at the time of inter-cultivation or the succeeding ploughing. This precaution should be particularly remembered when fallow fields are ploughed. It is also a matter of common experience to see that thorny plants like *Argemone mexicana*, Linn., are left uncut at the time of harvest and are allowed to seed freely. Special care should be taken to get rid of such plants.

Weeds should be attacked at the most vulnerable period of their life. After one or two ploughings large number of seedlings of weeds germinates and they can easily be destroyed by working a *guntaka*.

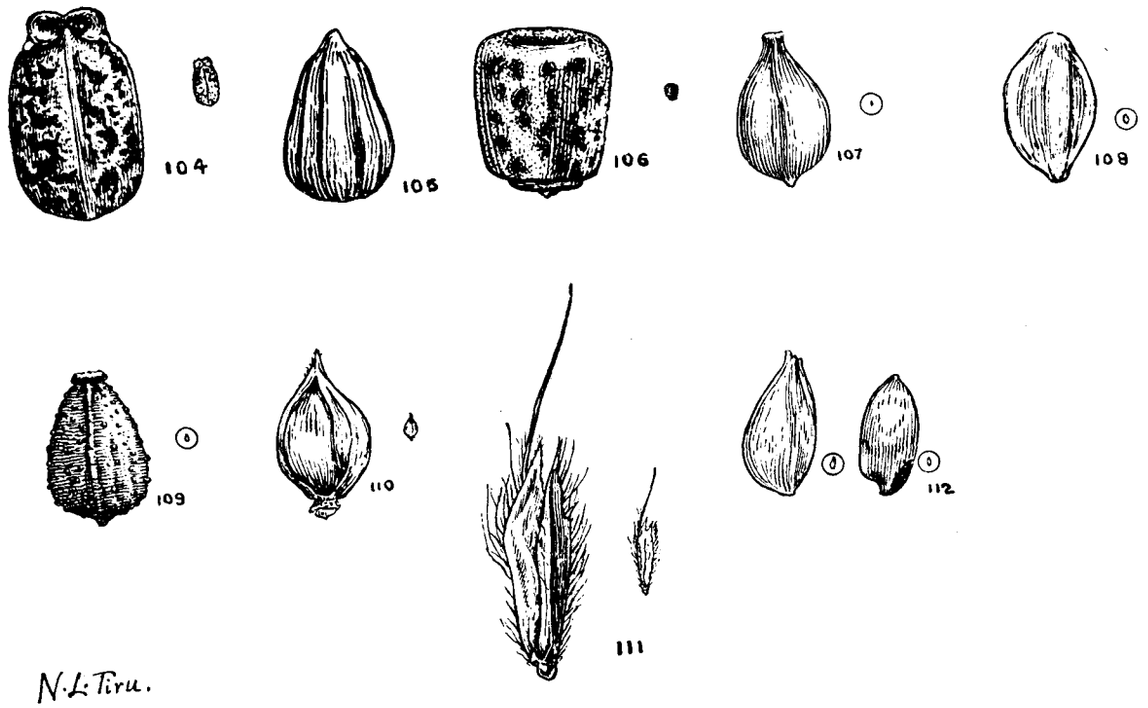
If possible, cattle should be prevented from feeding on bad weeds or their dung should be composted well before it is spread in the field. Manure pits should not be used as receptacles for all the rubbish of the farm, which usually contains many seeds of weeds.

It is also a common practice to collect weeds from the fields and heap them in some waste corner. It is a rather dangerous practice especially with plants like *Trianthema Portulacastrum*, Linn., *Portulaca quadrifida*, Linn., and *Cyanotis cucullata*, Kunth.? are concerned. They are not easily killed by the sun and they often have enough vitality to mature seed. Even bits of branches



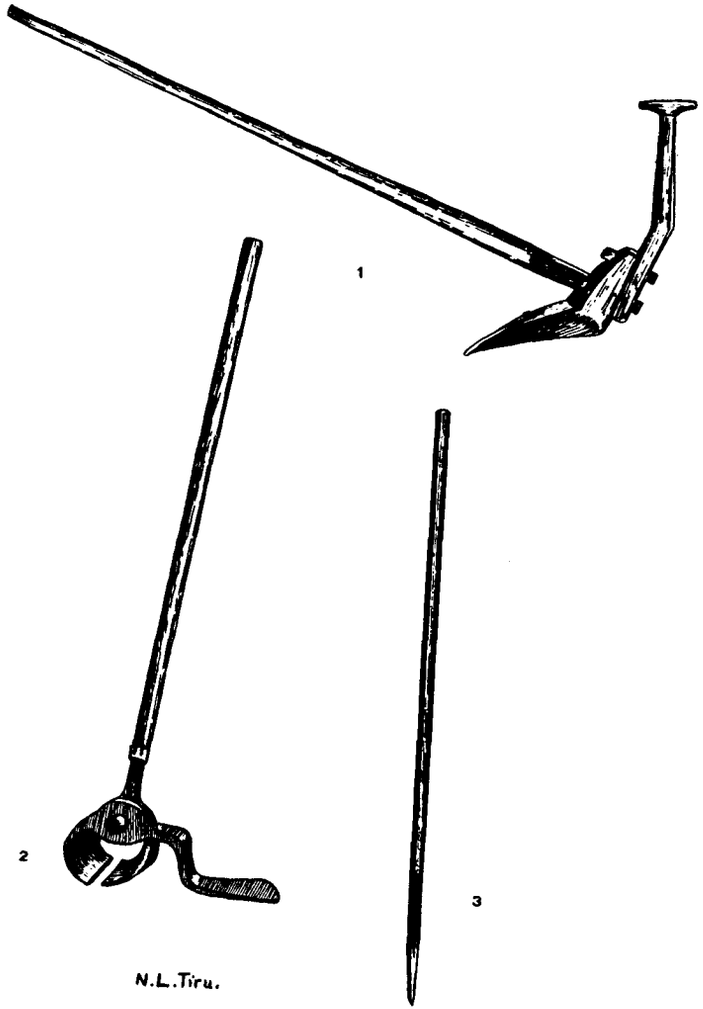
SOME COMMON WEED SEEDS.

PLATE 18.—Figs. 95. Gomphrena decumbens, *Jacq.*? (Fruit enclosed in perianth). 95-A. Gomphrena decumbens, *Jacq.*? (Seed). 96. Polygonum plebejum, *R. Br.* (Nut). 97. Aristolochia bracteata, *Retz.* 98. Euphorbia prostrata, *Ait.* 99. Phyllanthus maderaspatensis, *Linn.* 100. Phyllanthus Niruri, *Linn.* 101. Jatropha gossypifolia, *Linn.* 102. Chrozophora Rottleri, *Klotzsch.* 103. Acalypha indica, *Linn.*



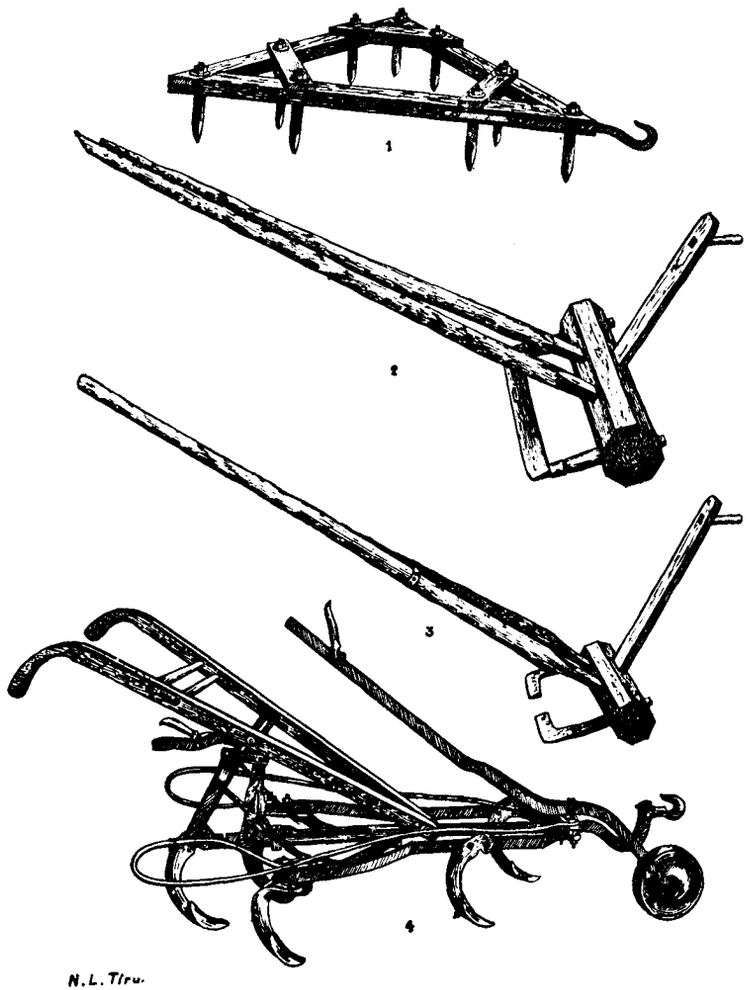
SOME COMMON WEED SEEDS.

PLATE 19.—Figs. 104. Croton sparsiflorus, *Morong.* 105. Eichhornia crassipes, *Solms.* 106. Cyanotis cucullata, *Kunth.*? 107. Cyperus difformis, *Linn.* (Nut). 108. Cyperus rotundus, *Linn.* (Nut). 109. Fimbristylis miliacea, *Vahl.* (Nut). 110. Panicum Cruss-galli, *Linn.* (Grain). 111. Ischæmum pilosum, *Hack.* (Fruit with glumes). 112. Cynodon dactylon, *Pers.* (Grain and fruit).



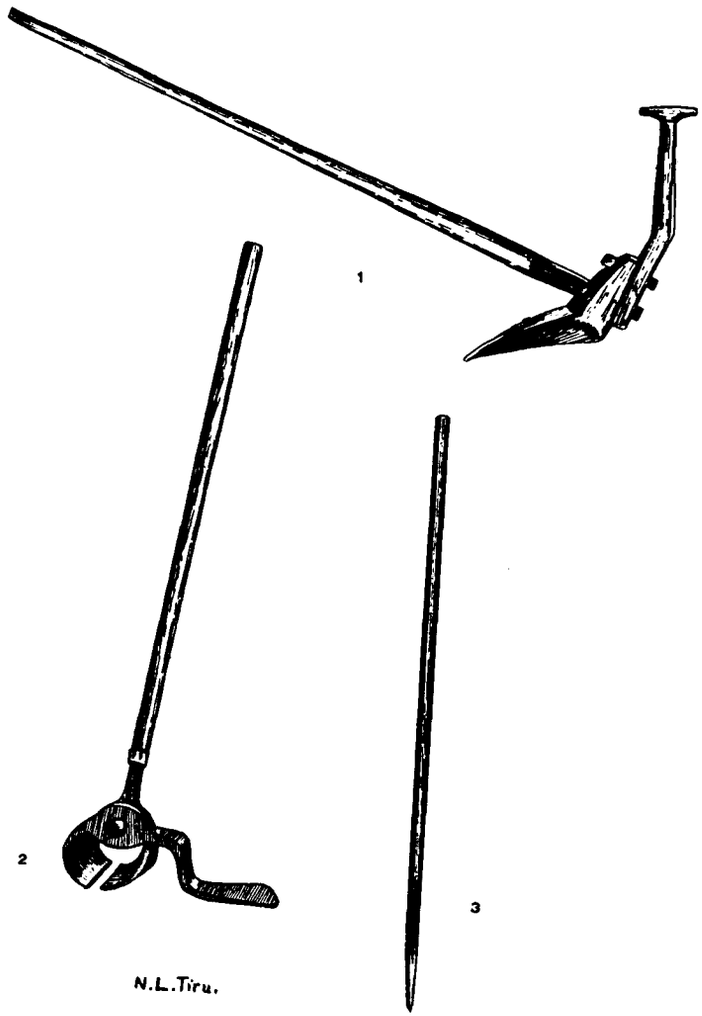
IMPLEMENTS USEFUL IN THE ERADICATION OF WEEDS.

PLATE 22.—Figs. 1. The Country Plough. 2. The Cotton Puller. 3. The Crowbar.



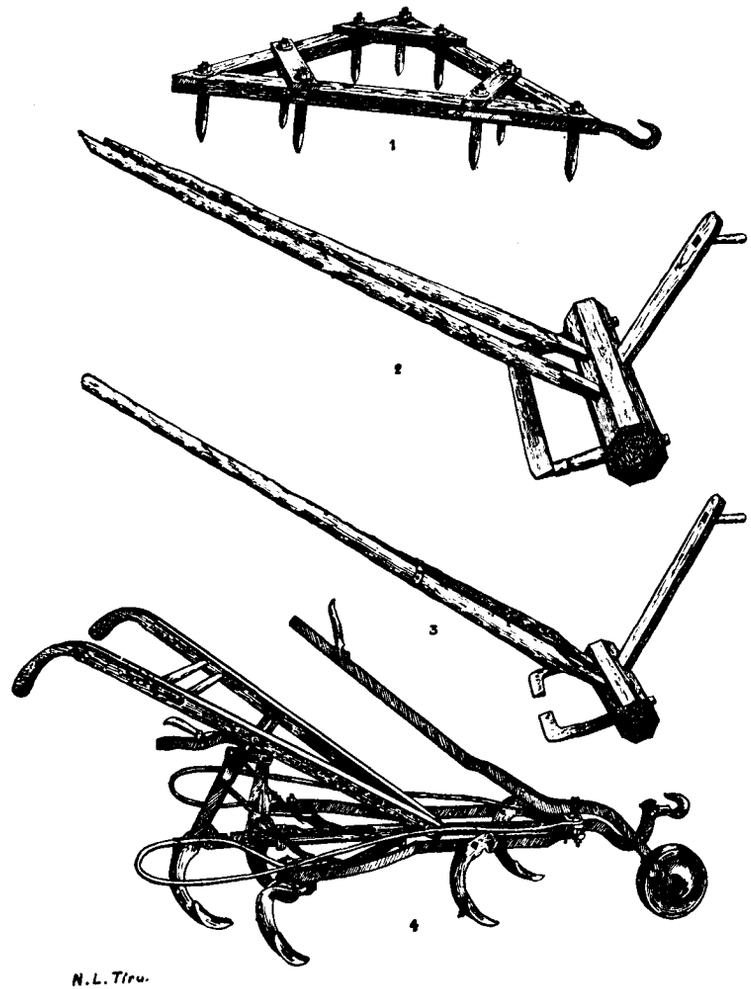
IMPLEMENTS USEFUL IN THE ERADICATION OF WEEDS.

PLATE 23.—Figs. 1. The Triangular Harrow. 2. The Guntaka. 3. The Dantulu 4. The Junior Hoe.



IMPLEMENTS USEFUL IN THE ERADICATION OF WEEDS.

PLATE 22.—Figs. 1. The Country Plough. 2. The Cotton Puller. 3. The Crowbar.



IMPLEMENTS USEFUL IN THE ERADICATION OF WEEDS.

PLATE 23.—Figs. 1. The Triangular Harrow. 2. The Guntaka. 3. The Dantulu 4. The Junior Hoe.

IMPLEMENTS USEFUL IN THE ERADICATION OF WEEDS.

PLATE 24.—Figs. 1. The Swan-neck Hoe. 2. Samalkota Hoe. 3. The Chisel Hoe. 4. The Mammoty Hoe. 5. The Hand Hoe. 6. The Grass-cutting Sword. 7. Godavari Chisel Hoe.

can strike root and become troublesome. Moreover, being in open heaps, they can spread into fields again. All weeds should be burnt or buried after removal.

The various implements and machines when borrowed from a different farm should be first cleaned thoroughly and then used. Bits of underground stems of weeds and their seeds may remain sticking to them and infect the fields in which are used.

A good rotation always serves a useful purpose in checking the growth of weeds. Smothering crops like lucerne and root crops like sweet potato and tapioca are always introduced into a rotation with the best advantage. At the time of digging out the roots, the underground stems of various bad weeds are exposed and they should be collected and burnt. The root crops save the extra expense of digging land entirely for the destruction of weeds. At the Government Agricultural Station, Anakapalle, the nut-grass is said to have been brought under control by a three-year rotation. It is started with sugarcane in the first year followed by sunnhemp and paddy in the second year and followed by ragi and paddy in the third year. Perhaps, the good results of the rotation may be attributed to the alternate dry and puddled condition of the soil and the intensive hoeing given to sugarcane.

Chemical manures like ammonium compounds and calcium cyanamide are said to put down growth of weeds.

II. *Remedial measures.*—These are intended to attack weeds directly and they naturally vary with the species.

All annual weeds are best attacked in the seedling stage as well as at the time of flowering. Hand pulling is undoubtedly a very good means of eradication whenever it is practicable. A frequent use of the various implements shown in Plates 22, 23 and 24 are of great use in combating weeds. The chisel hoe is particularly recommended for weeding with the hand. On no account should weeds be allowed to run to seed. In the case of erect plants found in large numbers, the grass cutting sword is excellent for cutting off flowering tops.

Perennials, however, require a different treatment; the root-stocks are the most troublesome parts and they cannot be easily attacked. Frequent cutting of the shoot so as to starve the underground stems is a good method of attack. Digging them out with crowbars is no doubt effective but very laborious and expensive.

When fields are foul with weed seeds it is always a good plan to force them to germinate by adopting thorough

IMPLEMENTS USEFUL IN THE ERADICATION OF WEEDS.

PLATE 24.—Figs. 1. The Swan-neck Hoe. 2. Samalkota Hoe. 3. The Chisel Hoe. 4. The Mammoty Hoe. 5. The Hand Hoe. 6. The Grass-cutting Sword. 7. Godavari Chisel Hoe.

can strike root and become troublesome. Moreover, being in open heaps, they can spread into fields again. All weeds should be burnt or buried after removal.

The various implements and machines when borrowed from a different farm should be first cleaned thoroughly and then used. Bits of underground stems of weeds and their seeds may remain sticking to them and infect the fields in which are used.

A good rotation always serves a useful purpose in checking the growth of weeds. Smothering crops like lucerne and root crops like sweet potato and tapioca are always introduced into a rotation with the best advantage. At the time of digging out the roots, the underground stems of various bad weeds are exposed and they should be collected and burnt. The root crops save the extra expense of digging land entirely for the destruction of weeds. At the Government Agricultural Station, Anakapalle, the nut-grass is said to have been brought under control by a three-year rotation. It is started with sugarcane in the first year followed by sunnhemp and paddy in the second year and followed by ragi and paddy in the third year. Perhaps, the good results of the rotation may be attributed to the alternate dry and puddled condition of the soil and the intensive hoeing given to sugarcane.

Chemical manures like ammonium compounds and calcium cyanamide are said to put down growth of weeds.

II. *Remedial measures.*—These are intended to attack weeds directly and they naturally vary with the species.

All annual weeds are best attacked in the seedling stage as well as at the time of flowering. Hand pulling is undoubtedly a very good means of eradication whenever it is practicable. A frequent use of the various implements shown in Plates 22, 23 and 24 are of great use in combating weeds. The chisel hoe is particularly recommended for weeding with the hand. On no account should weeds be allowed to run to seed. In the case of erect plants found in large numbers, the grass cutting sword is excellent for cutting off flowering tops.

Perennials, however, require a different treatment; the root-stocks are the most troublesome parts and they cannot be easily attacked. Frequent cutting of the shoot so as to starve the underground stems is a good method of attack. Digging them out with crowbars is no doubt effective but very laborious and expensive.

When fields are foul with weed seeds it is always a good plan to force them to germinate by adopting thorough

interesting development; but it should be done under expert supervision and guidance lest the insects and fungi employed should prove disastrous to crop plants.

Legislation to control weeds.—The Governments of the various important agricultural countries of the world have made certain laws and regulations enforcing compulsory destruction of certain harmful weeds and forbidding the sale and possession of impure seed which, by its being used for sowing, may increase the spread of weeds.

The plants to be destroyed are mentioned in the various Acts. Owners or occupants who fail to do so in their lands are liable to be imposed fines varying from £5 to £50 or their equivalents. "In default of payment six months imprisonment with or without hard labour" is accorded to offenders in *Transvaal.* In *Alberta* Agricultural Inspectors are empowered even "to order partial or complete destruction of grain or hay crops containing noxious weeds." Such rigorous steps taken by the Government to put down noxious weeds denote the great caution exercised by them. In Madras also there is the Agricultural Pests and Diseases Act of 1919, which has been occasionally brought into force as in the water hyacinth campaign.

The Adulteration of Seeds Act of Great Britain, Weeds and Agricultural Seeds Act of Ireland, the Seed Control Act of Canada and the Seed Testing Stations of the various countries have done immense good by way of controlling the spread of noxious weeds. According to these Acts, seeds sold, possessed or imported should be pure; otherwise the offenders will be punished. The work of the stations consists in examining samples of seeds submitted for testing and in certifying as to their purity.

In *Denmark*, though there is no law making destruction of weeds compulsory, "the State makes annual grants to Agricultural Societies for the purpose of awarding prizes to members for weedless fields."—*Long.*

Legislation has no doubt its advantages. Law can enforce certain things but it cannot always prevent the offenders from escaping it, at any rate in India under the present system of Agriculture, as experienced in the water hyacinth campaign in Bengal. What is more important than legislation is co-operation among all those concerned and a firm determination on the part of landowners and tenants to get rid of harmful weeds. The ryot should be educated on the subject and made to realize its importance.

DESCRIPTIONS AND NOTES ON WEEDS.

cultivation; and as soon as the seedlings come up they may be destroyed by working a harrow or a cultivator or even a country plough. The same method may be repeated successively for a number of seasons till the weeds are seen no more.

Sheep and goats may be turned into fallow fields for grazing. They eat away almost all kinds of weeds.

Some of the wet land weeds like *Cyperus Haspan*, Linn., *Chara*, etc., are successfully got rid of by improving the drainage of the soil. At times some of the bad, dry land weeds disappear when the fields are irrigated.* When garden or dry lands are extremely bad with weeds it is very advantageous to convert them into paddy lands, if possible. Under the changed conditions of soil the weed flora changes and those that have been aggressive previously will become harmless.

Parasites are destroyed by cutting off the attacked branches of the host. Tar should be applied to the cut surface to prevent attack of insects and fungi. Care also should be taken to see that the parasites do not ripen fruit. In the case of crop parasites like *Orobanche* and *Striga* change of crops by rotation serves to put them down.

Pond weeds may ordinarily be got rid of by hand picking, in small areas. Perennial plants should, however, be removed with the root-stocks, while floating ones are easily collect ed by passing nets or baskets over the surface of water. A small quantity of blue-vitriol crystals thrown here and there where the plants are in great numbers, kills most of them. Algæ are very easily killed even by an extremely weak solution of this. As water weeds give shelter and food to fish they should not be destroyed wholesale in fishing places.

Weeds of pastures cannot be suppressed by ordinary means of cultivation because the plough and the harrow are not often worked in grazing grounds. The best way of dealing with the problem will be to manure such places, if possible, and encourage the growth of grasses so that they may become strong and luxuriant and smother weeds. The number of the species of good grasses should be increased by sowing their seed freely in pastures. It is only in poor grass lands that weeds can do harm.

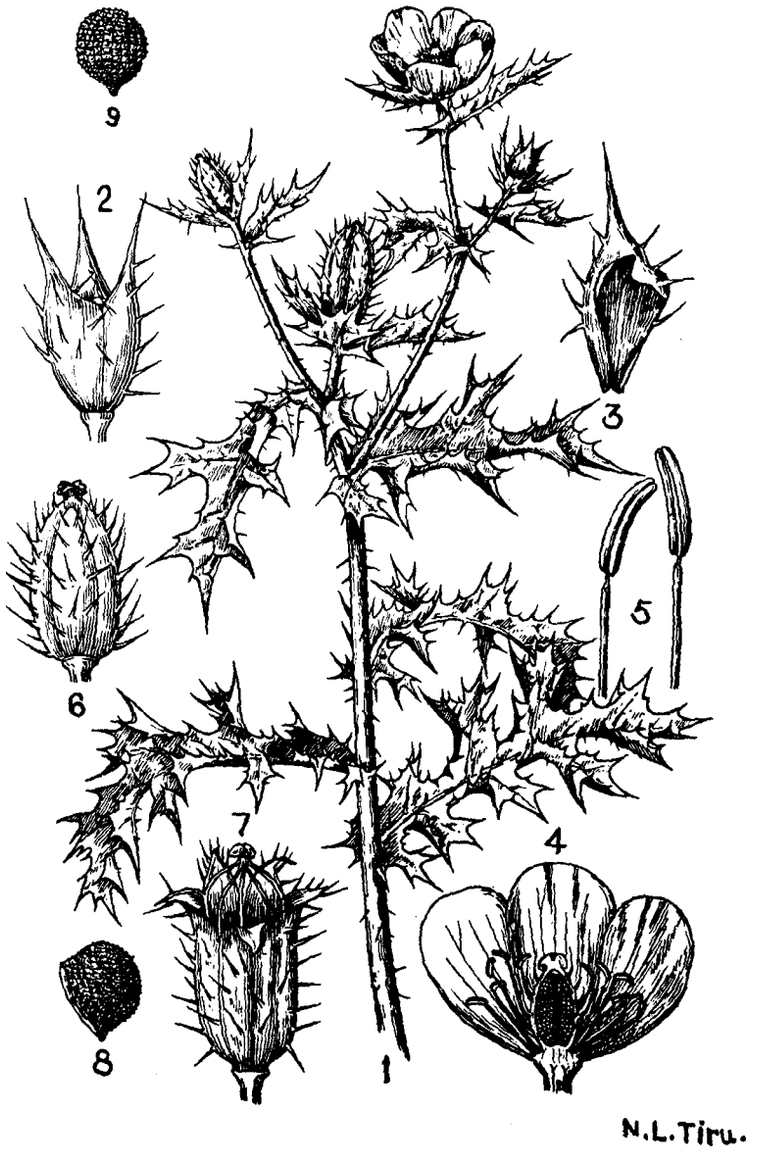
Chemical means.—Chemicals have been coming into prominence as weed killers and herbicides. In America and England they are being used freely. But in India sufficient attention

* This should be practised only with expert advice.

has not been bestowed on the matter till now. The chemicals are used in two ways: (1) As spray and (2) as powder. The most commonly used substances are Copper sulphate and Sodium arsenite. Various others like Iron sulphate, Sodium chloride, Ammonium salts, Carbolic acid and Sulphuric acid have also been tried. The usual strength of the solution is about 2 to 3 per cent. It is not possible to suggest exactly the strength to suit all purposes. It has to be found out by actually conducting field trials. Spraying is generally useful for killing plants having broad, thin leaves. It is comparatively harmless for grasses and similar other plants which have narrow leaves covered with waxy bloom. This fact is taken advantage of and spraying is done to destroy weeds in cereal crops. When poisons like Sodium arsenite are employed care should be taken that the plants treated are not accessible to livestock. In places like tennis courts where it is not desirable to use weeding implements, spraying is of utmost advantage in destroying weeds. The action of spraying fluids consists in their coming into contact with the tissues of leaves and in killing them. Therefore it is necessary that the solution should stick to the leaves. The effect of spraying is naturally lost if it is followed by a rain. Generally the operation is done during mornings when the sky is clear. As the day gets hotter the water evaporates and escapes leaving the chemicals on the leaf. The period in which the results of spraying may be noticed, depends upon the nature of the chemicals used, the strength of solution and the species of plants treated. It may vary from a few hours to a few days. Powdered chemicals are also used in the form of fine dust, to kill weeds. Application is done by the help of a machine.

The chemicals while acting as herbicides are indirectly useful in stimulating the growth of crop plants on account of their manurial value.

Biological methods.—It is a common experience to see crop plants being badly attacked by insects and fungi. In the same way they attack various weeds also. This fact is taken advantage of and the proper sort of insects are bred and liberated so that they may attack the particular weed or weeds which are to be destroyed. In Italy and New Zealand fungi have been similarly used to kill weeds. Cultures were made and the spores were mixed in water and sprayed over certain weeds. Good results are said to have been obtained. The method is still in its infancy and has not been extensively practised. All the same it is a very



ARGEMONE MEXICANA, *Linn.*

PLATE 25.—Figs. 1. Branch. 2. Flower bud. 3. Sepal. 4. Longitudinal section of a flower. 5. Stamens. 6. Fruit. 7. Fruit breaking open. 8 and 9. Seed.

Papaveraceae.

THE POPPY FAMILY.

The members of this family are all herbs with milky juice and alternate or radical leaves without stipules. Flowers are regular, showy and terminal, either solitary or in cymes. Sepals are 2 or 3 falling off when the flower opens. Petals are 4. Stamens are very many and distinct. Ovary is superior and stigma is sessile. Fruit is a capsule, 1-celled or imperfectly many-celled on account of intruded, parietal placentas; it opens by valves or pores. Seeds are numerous with oily endosperm.

Most species belong to the North Temperate regions. *Papaveraceae* is from *Papaver*, an old Latin name for Poppy.

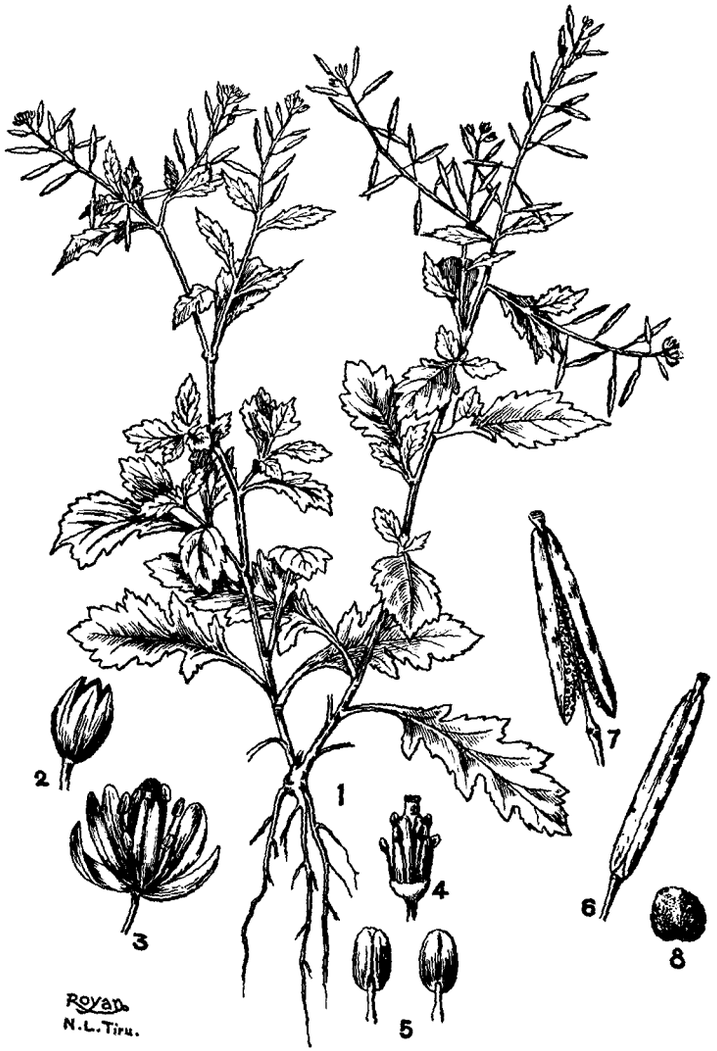
Argemone mexicana, *Linn.*

Plate 25.

English: Mexican Poppy.
Tamil: Brahmadandu.
Malayalam: Ponnumattam.
Telugu: Brahmadandu.
Flowering and fruiting time: Almost throughout the year.
Habit: Prickly annual herb.
Habitat: Waste places, cultivated fields and roadsides.
Range: In most districts.
Propagation: By seed.
Number of seeds: 20,000–30,000.

The plant is a conspicuous, erect, branching, prickly annual 2–4 feet high. Of all the introduced weeds of South India this is perhaps the one most widely spread. It occurs in large numbers in light soils.

The stem is round, glaucous, usually very prickly but sometimes nearly glabrous and full of yellow juice. Leaves are 6″ × 2½″, simple, alternate, sessile and semi-amplexicaul. They are pinnately lobed and the lobes are prickly as also both the surfaces which are often blotched with white patches. Flowers are yellow about 2 inches across, solitary and terminal on pedicels which are prickly. Bracts are 2 and leaf-like. Sepals are 3, long, valvate, prickly on the back and spine-tipped; they drop away when the flower opens. Petals are 6, sub-equal, bright yellow, ob-ovate and rounded, and easily shed. Stamens are numerous and free. Ovary is superior, 1-celled and softly spiny. Ovules are many, on 4 parietal placentas.



NASTURTIUM INDICUM, *DC.*

PLATE 26.—Figs. 1. Entire plant. 2. Flower bud. 3. Open flower. 4. Pistil and stamens. 5. Stamens showing back and front view of anthers. 6. Fruit. 7. Fruit breaking open. 8. Seed.

Stigmas are 4, red in colour and radiating; they are appressed on the top of the ovary. Fruit is a capsule 1½ inches long, elliptic oblong and prickly, opening by valves at the top. Seeds are numerous, round, blackish-brown and reticulate.

The prickly, lobed leaves and yellow flowers are characteristic of the plant.

Means of control.—After the monsoon rains, seedlings appear in large numbers and can be easily destroyed by working a Guntaka Repeat the same operation twice or thrice in the same season especially a few days after each shower. The weed is sometimes abundant in cholam fields. At the time of harvest, being prickly it is left uncut and allowed to ripen its innumerable seeds. Instead of neglecting it, at least the flowering tops should be chopped off with a grass-cutting-sword and the seed production prevented.

Economic importance.—The seed yields a valuable painters' oil which is also used externally for skin diseases. With sugar it is good for stomach troubles. The yellow juice is used in dropsy. Bruised fresh root is good for scorpion sting.

Cruciferae.

THE MUSTARD FAMILY.

Plants of this family are mostly herbs with alternate or radical leaves and sometimes with pungent juice and without stipules. Flowers are usually in terminal racemes. Sepals are 4, each having a gland opposite to it. Petals are 4, and cruciform. Stamens are 6, the inner 4 being longer than the outer 2. Ovary is superior, often 2-celled by the formation of a partition connecting the two parietal placentas, or one or many celled. Fruit is usually a pod-like capsule breaking open by two valves separating away from the persistent dissepiment. Seeds are ex-endospermous.

The family is widespread in the north temperate regions and it gets its name from the cruciform petals.

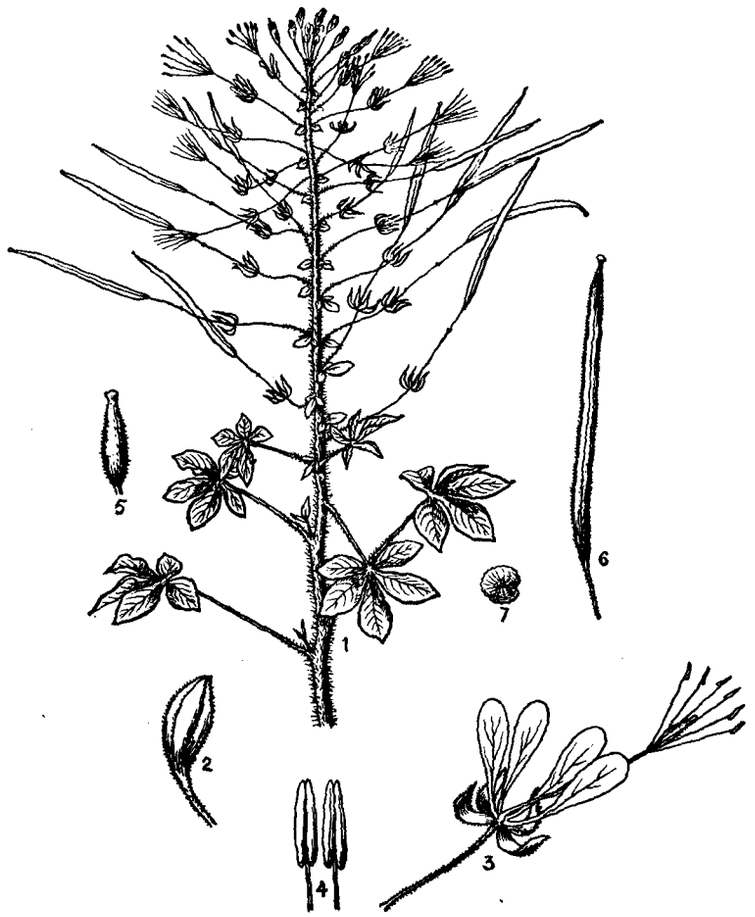
Nasturtium indicum, *DC.*

Plate 26.

Tamil: Kattu-kadugu.
Flowering and fruiting time: June–February.
Habit: An annual herb.
Habitat: Moist situations.
Ragne: Hilly districts—Mysore, Coorg, the Nilgiris, Coimbatore and Travancore
Propagation: By seed.

An erect, annual herb, 8–18 inches high, branched from base, and usually found in damp situations as rice fields.

Stem is 4–5 sided, slightly striate and smooth, except for a few scattered hairs. Leaves are 1–4 inches long, simple and alternate those at the base of the stem are almost in a whorl, larger than those above, petioled and somewhat pinnately lobed. The top leaves



Royan.

GYNANDROPSIS PENTAPHYLLA, *DC.*

PLATE 27.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4. Stamens 5. Pistil. 6. Fruit. 7. Seed.

are up to 2 inches long, sessile, somewhat clasping the stem, obovate, irregularly toothed and tapering at base. Flowers are small, yellow in racemes 1–5 inches long, which are terminal or axillary at the tops of branches. Pedicels are short. Sepals are 4, in two pairs, and oblong. Petals are 4, small, yellowish, obovate and tapering at base. Stamens are 6, four of them being equal and long, the outer two shorter, each with two glands at its base; anthers are yellow and 2-celled. Ovary is superior, elongate and with many ovules on two parietal placentas. Style is very short and stigma is thick and indistinctly bi-fid. Fruit is nearly ¾ inch long, somewhat cylindric and slightly beaked; it breaks open by two valves which fall away leaving the seeds on a septum. Seeds are reddish and minutely tuberculate.

Means of control.—Pull away plants in flower and prevent seeding.

Nasturtium madagascariense, DC.—It is an annual herb with lobed and divided leaves and yellow flowers much resembling *Nasturtium indicum*, DC. An occasional weed on bunds of rice fields in the Northern Circars.

Capparidaceae.

THE CAPER FAMILY.

Herbs, shrubs or trees usually with alternate, simple or palmately divided leaves with or without stipules. Flowers are variously arranged and often bi-sexual. Sepals are generally 4 and usually imbricate. Petals are 4 and imbricate. Stamens are 6 or more placed below the ovary or raised on a gynophore. Ovary is superior, usually stalked and 1-celled. Ovules are on parietal placentas. Fruit is a pod-like capsule, or a berry. Seeds may be surrounded by pulp and have little or no endosperm.

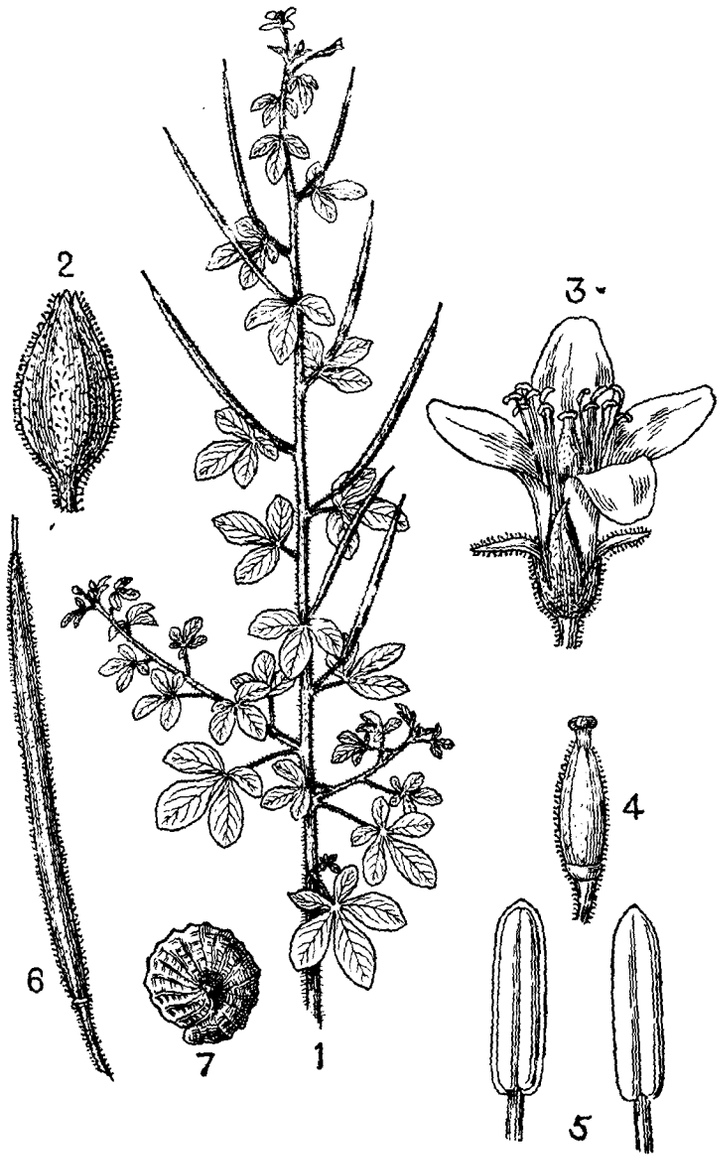
A tropical or sub-tropical family.

Gynandropsis pentaphylla, *DC.*

Plate 27.

English: Caravelle Seed.
Tamil: Kattukadugu; Nai Vélai.
Malayalam: Karvela.
Telugu: Vavinta.
Flowering time: June-July; October-November.
Seeding time: August-September; December-January.
Habit: A leafy, herbaceous annual.
Habitat: Waste places of all plains districts and at low elevations.
Propagation: By seed.
Number of seeds in a plant: 8,000-30,000.

This is a familiar weed of waste places and cultivated dry lands. It is easily recognized by its strong disagreeable odour and the sticky glandular hairs that are found all over the plant.



CLEOME VISCOSA, *Linn.*

PLATE 28.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4. Pistil. 5. Anthers. 6. Fruit. 7. Seed.

It is an erect, freely branching annual 1–2 feet high with a deep tap-root. The stem is round, green or tinged with purple. Leaves are alternate and palmately compound with five or less commonly 3–4 sessile, obovate leaflets with entire or serrulate margins. Leaf-stalks are 1½–3½ inches long and they are covered with small prickles. Flowers are white; they are at first corymbose and then elongate into a long raceme at the tops of branches. Bracts are small leaf-like and tri-fid. The flower stalks are ½–¾ inch long. Sepals are 4, green, narrow and lance-shaped. Petals are 4, round, white in colour and long-clawed. The internodes between the petals and stamens, and the stamens and ovary get elongated. There are 6 stamens in each flower; the filaments are long and purple. Ovary is long, cylindric and is covered with glandular hairs; it is raised on a stalk. Ovules are many and they are attached to the two parietal placentas. Fruit is a capsule, 2–3 inches long, bursting open by two valves. Seeds are small, dark brown, somewhat kidney-shaped and covered with ridges of minute tubercles.

Means of control.—The weed is best attacked in the seedling stage. Hand-weeding is ordinarily very effective. On no account should the fruits be allowed to mature.

Economic importance.—Decoction of the seeds and leaves is given in typhoid fever. Oil expressed from the seeds is useful in the treatment of leprosy and skin diseases; it is also a vermifuge.

Cleome viscosa, *Linn.*

Plate 28.

English: Wild Mustard.
Tamil: Manja Kadugu; Nai Kadugu.
Malayalam: Nai Kadugu.
Telugu: Kukka Vavinta.
Flowering and seeding time: June–August.
Habit: Herbaceous annual.
Habitat: In fields and waste places in most districts.
Propagation: By seed.
Number of seeds in a plant: 1,200–1,600.

This is one of the most familiar weeds. It is easily distinguished by the viscous nature of the whole plant, the 3–5-foliolate leaves and the yellow flowers.

The plant is erect and sparingly branched. It grows to a height of 2 feet or more. Stem is somewhat round, striate and densely covered with glandular hairs. Leaves are alternate, digitately compound with 3–5 obovate leaflets, the middle one being the largest. Flowers are arranged in elongate racemes at the tops of branches and they are subtended by bracts which consist of three leaflets. Flower-stalks are slender, ¾ inch long and hairy. Sepals are 4, green or slightly tinged with purple, narrow, lance-shaped and glandular hairy without. Petals are as many as

CLEOME CHELIDONII, *Linn. f.*

PLATE 29.—Figs. 1. Branch. 2. Flower bud. 3. Open flower. 4. Stamen. 5. Calyx and pistil. 6. Fruit. 7. Seed.

the sepals, yellow in colour with purple streaks; they are oblong-obovate. Stamens are usually 20–24; flowers having 8–12 stamens are rarely met with. Ovary is elongate, sessile, 1-celled and densely covered with glandular hairs; ovules are many. Fruit is a capsule 2–3 inches long, opening by two valves. Seeds are very small, somewhat rounded and transversely striate.

Means of control.—Clean cultivation and a frequent use of the hand-hoe effectively check the weed.

Economic importance.—The seeds are said to be used for culinary purposes. They have anthelmintic and carminative properties. Juice of leaves with common salt is applied to forehead for relieving headache. It is also used in the treatment of rheumatism and disease of the ear.

Cleome Chelidonii, *L.f.*

Plate 29.

Flowering and seeding time: March–May.
Habit: Herbaceous annual.
Habitat: Moist places as on the borders of rice fields in the Northern Circars and in the Deccan.
Propagation: By seed.
Number of seeds in a plant: 1,200–7,000.

The weed is most commonly met with in large numbers in dry tank-beds and in rice fields lying fallow. Its rose-coloured flowers and pointed, erect, fruits are characteristic.

The plant is erect, sparingly branched, growing to a height of 1–2 feet. The tap root goes rather deep into the soil. The stem is compressed, striate, and covered with pointed hairs. Leaves are alternate, digitately compound usually with 7 and occasionally 3, 5 or 9 obovate, obtuse leaflets. The leaf-stalks are about 4 inches long. Flowers have long stalks and they are borne in the axils of leaf-like trifoliolate bracts. The flowers are arranged in a terminal, elongate raceme. Sepals are 4, ovate; petals are 4, obovate. Stamens are numerous rising from below the ovary which is superior, sessile and 1-celled. Fruit is a narrow cylindric capsule 2–3 inches long. It is finely striate and glabrous, dehiscing by means of two valves which separate away from the placentas bearing the seeds. They are small, black and kidney-shaped.

Means of control.—The weed is not often harmful in cultivated fields with a standing crop.

Destroy seedlings by working a blade harrow (Guntaka). In the case of plants in flower which cannot possibly be checked by hand-pulling, the flowering tops may be separated by means of grass-cutting swords.

Cleome monophylla, Linn.—An erect herb with long petioled, narrowly oblong leaves and pink flowers. It is found as a weed in

IONIDIUM SUFFRUTICOSUM, *Ging.*

PLATE 30.—Figs. 1. Entire plant. 2. Flower. 3. Anthers. 4. Pistil. 5. Fruit with calyx and corolla. 6. Seed.

cultivated and waste places in most plains districts, especially in the Circars and also at low elevations in the hills.

Violaceae.

THE VIOLET FAMILY.

Herbs or shrubs with alternate, stipulate leaves. Flowers are regular or irregular. Sepals are 5 and petals are 5, equal or unequal and imbricate in bud. Stamens are 5, free or united. Ovary is superior, 1-celled, and the stigma is variously shaped; ovules are arranged on 3 parietal placentas. Fruit is usually a 3-valved capsule with small endospermous seeds.

The family has representatives all over the world.

Ionidium suffruticosum; *Ging.*

Plate 30.

Tamil : Purusharathnam ; Orela-thamarai.
Malayalam : Orela-thamara.
Telugu : Rathna-purusha.
Flowering and fruiting time : August-March.
Habit : A small undershrub
Habitat : Grassy places, roadsides and in open forest land.
Range : Almost all districts.
Propagation : By seed.

A small, branched herbaceous perennial often woody at base and growing to a height of 4–12 inches. Leaves are minutely hairy, about an inch long, sessile, alternate and much varying in shape in the same or different plants, from linear to elliptic-lanceolate; margin is serrate, each serrature ending in a gland, or entire; tip is acute or obtuse and base is tapering. Stipules are 2, membranous, white, lanceolate and acute. Flowers are red, turning to violet and blue on fading. They are solitary, axillary on slender pedicels jointed above the middle. Bracteoles are 2, small and gland-tipped. The base of the pedicel has usually 1 or 2 glands in the axil of the leaf. Sepals are 5, sub-equal, acute keeled on the back and persistent. Petals are 5, unequal; the lowest is the biggest, somewhat round, long-clawed and spurred at base, the two side ones are somewhat falcate and the two uppermost are oblong and a little longer than the sepals. Stamens are 5, free, the two lower being spurred; anthers are 2-lobed and the connective is produced above. Ovary is superior, 1-celled with many ovules on 3 parietal placentas; style is club-shaped and stigma is dilated. Fruit is a 3-valved, sub-globose or 3-sided

POLYGALA CHINENSIS, *Linn.*

PLATE 31.—Figs. 1. Entire plant. 2. Flower. 3. Corolla. 4. Fruit. 5. Seed.

capsule. Seeds are ovoid, longitudinally striate and yellowish white in colour, becoming mucilaginous when moistened.

Means of control.—The plant is never a bad weed in cultivated places.

If undesirable, use a chisel-hoe and cut deep after the setting in of the monsoon, and prevent the formation of seed.

Economic importance.—Plant is highly medicinal. It is used in affections of urinary and genital organs. It is also given as a tonic with milk for invalids. Decoction of the plant improves memory and vitality. It is a remedy for consumption, asthma and leprosy.

Polygalaceae.

THE MILKWORT FAMILY.

Herbs, shrubs or trees with alternate leaves and without stipules. Flowers are irregular and bracteate. Sepals are 5 and unequal ; petals are 3 or 5 and unequal like the sepals. Stamens are 8 and united; anthers open by apical pores. Ovary is superior, 1–3 celled, with one or more ovules in each cell. Fruti is a 2-celled, 2-seeded, compressed capsule breaking open loculicidally Seeds are strophiolate and endospermous or not.

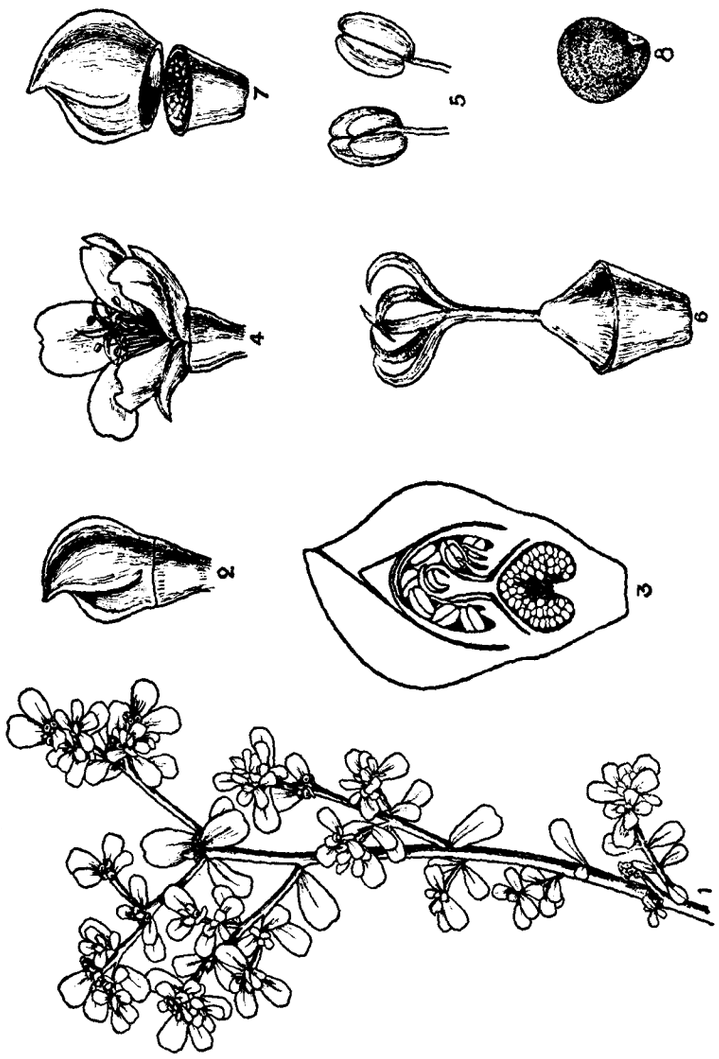
The family is widely distributed in most tropical regions and it derives its name from the supposed property of increasing the secretion of milk when eaten, attributed to some of its species. Greek *polys* = much ; *gala* = milk.

Polygala chinensis, *Linn.*

Plate 31.

English : Indian Milk-wort.
Flowering and fruiting time : September–March.
Habit : An annual herb.
Habitat : Meadows and cultivated fields.
Range : All dry districts of the Presidency and in the hills up to 3,000 feet.
Propagation : By seed.

A small annual herb branching from the very base; the central main shoot is erect, about 4 inches high and all the other branches at the base are prostrate on the ground. The weed appears in large numbers after the setting in of the monsoons. The stem is round, glabrous or pubescent. Leaves are ½–1½ inches long simple, alternate, rather thick, glabrous or slightly hairy. The shape of the leaf varies from sub-orbicular to narrowly oblong; tip is obtuse and emarginate ; petiole is short. Flowers are yellow becoming pink when fading, in dense, few flowered axillary or leaf opposed racemes less than 1 inch long. Pedicels are very short. Bracts and bracteoles are ovate, ciliate and persistent. Sepals



PORTULACA OLERACEA, *Linn.*

PLATE 32.—Figs. 1. Branch. 2. Flower bud. 3. Longitudinal section of flower bud. 4. Open flower. 5. Anthers. 6. Pistil. 7. Fruit breaking open. 8. Seed.

are 5, unequal, the inner being large, ovate-oblong and acute with membranous margins ciliate at the base. The outer sepals are smaller, broadly ovate or oblong with membranous and ciliate margins. Petals are 3, yellow, the lower keel petal is compressed and crested at the top with a branched outgrowth and the lateral ones are round. Stamens are 8, united into a sheath in the lower half. Fruit is a compressed capsule somewhat oblong and slightly ciliate on the margins and enclosed by the persistent calyx. Seeds are small, oblong, black in colour and densely hairy with a short 3-toothed outgrowth at the apex, with or without appendages.

Means of control.—In cultivated places clean cultivation is the best remedy.

Economic importance.—Root is used in fever. Tender leaves are sometimes cooked and eaten.

Polygala erioptera, DC.—An erect herb with yellow flowers, occurring as a weed in grassy places of most plains districts.

Portulacaceae.

THE PURSLANE FAMILY.

Fleshy herbs or shrubs with entire, stipulate leaves. Flowers are regular. Sepals are 2. Petals are 4–5, united or free. Stamens are 4 or more. Ovary is 1-celled, superior or half inferior and style has 2–8 branches. Ovules are 2 or more on a central placenta. Fruit is a capsule dehiscing by 2–8 valves or by a lid. Seeds have floury endosperm.

Most members of the family are natives of tropical and sub-tropical America.

Portulaca oleracea, *Linn.*

Plate 32.

English: Indian Purslane.
Tamil: Karie Keerai, Pasarai or Paruppu Keerai.
Telugu: Pedda Pavili Kura.
Malayalam: Karie Cheera.
Flowering and fruiting time: September–December.
Habit: A prostrate, succulent, annual herb.
Habitat: In all dry districts of the Presidency
Propagation: By means of seeds.

The plant is very prolific in producing seed. As many as 50,000 to 700,000 seeds may be obtained from a single individual. A weed book gives the number of seeds produced by one plant as 1,250,000. The seeds are said to retain their vitality and the power to germinate even after being buried in the soil for 30 years.

It is a weed of the garden and cultivated lands and is commonly met with everywhere.

The main stem is short and erect bearing a number of lateral branches which lie prostrate on the ground; they grow to a length of 4–20 inches and are green or reddish in colour. The leaves are alternate at the base, sub-opposite or opposite at the ends of branches and crowded round the flowers. A well-developed leaf is 1 inch by ½ inch; the tip is rounded; the base is tapering and the margins are red or green. The lower surface of the leaf is pale and is covered with glistening dots. The leaf-stalk is short. Flowers are without stalks, from 2–6 in number and are collected together in clusters at the ends of branches. Sepals are 2 and fleshy; they are united at the base and are free above. Petals are 5 and are yellow in colour. Stamens vary in number from 8–20 and surround the ovary. The ovary is 1-celled, many ovuled and is half inferior; stylar branches are from 3–6. Fruit is dry, dehiscing transversely by the upper part enclosed by the sepals, coming off as a lid leaving the lower part in the plant. Seeds are minute, blackish brown in colour and are covered with concentric lines of tubercles.

The plant is very tenacious of life and can re-establish itself even after it has been completely removed from the soil—the fleshy stems and leaves sustain the plant while doing so.

Means of control.—Killing in the seedling stage by constant shallow hoeing is the best way of exterminating the weed. Old plants with immature fruits should not be left in the field after they are cut off, because the leaves and stems retain enough vitality to mature and distribute the seed. Such plants should not even be thrown into the manure pit as the seeds, which are very hardy, are not likely to be destroyed. It is always best to burn the plant in seed.

Economic importance.—The leaves are astringent and diuretic. When fresh they are also used in external cooling applications. The plant is largely used as a pot herb by poor people.

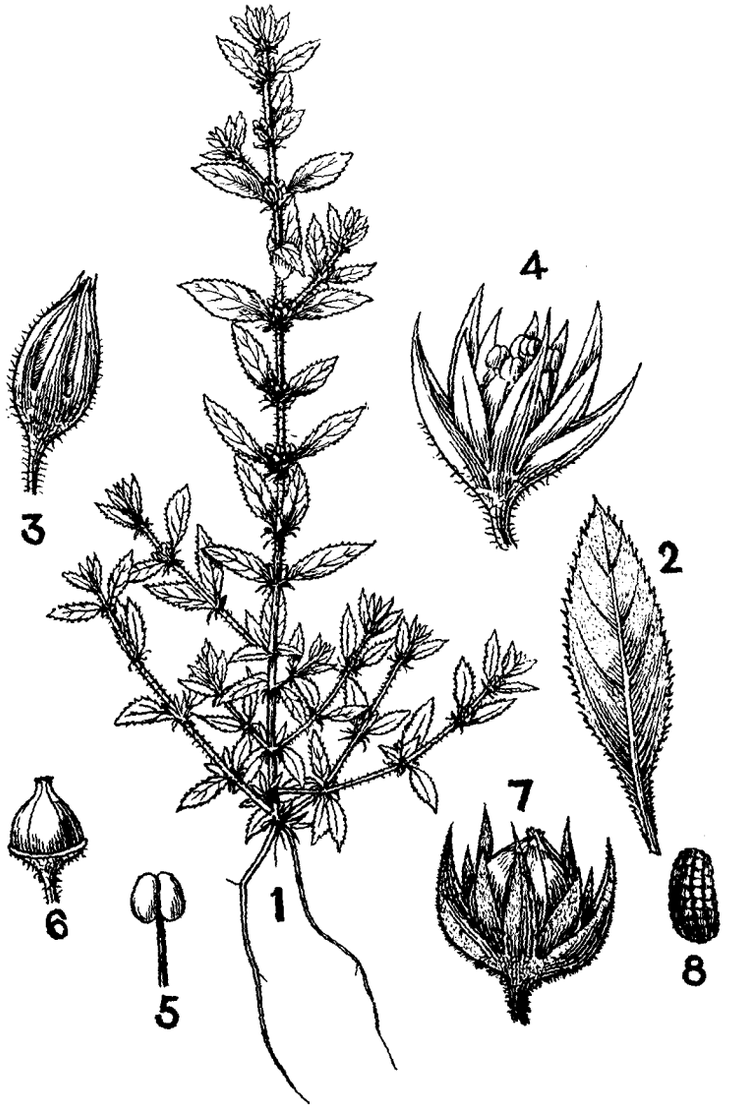
Portulaca quadrifida, Linn.—A small prostrate or sub-erect fleshy herb with many brittle branches that root at the nodes, when they touch the ground; the nodes are clothed with long hairs. Leaves are small, green or sometimes red and fleshy. It is a rather bad weed persisting in large numbers in garden lands of most districts in the plains.

Tamil: Siru Pasarai.
Malayalam: Neela Keera.
Telugu: Gorri Geddam.

Elatinaceae.

THE WATERWORT FAMILY.

Small marsh herbs or shrubs with opposite or whorled, stipulate ves and small, axillary clusters of regular flowers. Sepals and als are 2-5, free. Stamens are as many or twice as many as als Ovary is superior, 2-5 celled, with numerous ovules. Fruit septicidal capsule. Seeds have little or no endosperm.
Distributed throughout the world.



BERGIA AMMANNIOIDES, *Roxb.*

PLATE 33.—Figs. 1. Entire plant. 2. Leaf. 3. Flower bud. 4. Open flower. 5. Stamen. 6. Pistil. 7. Fruit with calyx and corolla persisting. 8. Seed.

Bergia ammannioides, *Roxb.*

Plate 33.

English: Water-fire-wort.
Flowering and fruiting time: August–March.
Habit: A small herb.
Habitat: Marshy places.
Range: Most districts.
Propagation: By seed.
Number of seeds: Innumerable.

An erect, extremely gregarious herb, ½–1½ feet high and branching from the base; the branches are at first prostrate, rooting at the nodes and then ascending. The stem is round and glandular hairy. Leaves are ¼–¾ inch long, simple and opposite. Stipules are lanceolate, pointed, membraneous and hairy. Petiole is almost absent. Lamina is oblong-lanceolate, obtuse or acute with a very finely toothed and glandular-ciliate margin; both the surfaces are hairy. Flowers are very small on short pedicels and in dense axillary clusters. Sepals are 5, lanceolate, membranous and ciliate with acuminate tips. Petals are 5, thin, pale yellow and elliptic-oblong. Stamens are 5, free, opposite the petals. Ovary is superior, 5-celled and many-ovuled. Styles are 5 and short. Fruit is a small, round, beaked capsule enclosed by the persistent calyx and corolla. Seeds are very many, minute, ob-ovoid, greyish brown and shining.

The plant is often mistaken for *Ammannia baccifera*, Linn. which is an entirely different plant with entire, somewhat thick leaves, while in *Bergia ammanniodes* the leaves are hairy and minutely toothed.

Means of control.—Same as for *Ammannia baccifera*, Linn.

Bergia capensis, Linn.—A fleshy, glabrous herb with pink stems rooting at base, and opposite indistinctly serrate leaves. It is commonly found in paddy fields and borders of tanks in Chingleput, South Arcot, Tanjore and Trichinopoly districts.

Tamil: Nandukkal Keerai.

MALVASTRUM COROMANDELIANUM, *Garcke.*

PLATE 34.—Figs. 1. Entire plant. 2. Flower bud. 3. Open flower. 4. Longitudinal section of flower. 5. Staminal column enclosing style with stylar arms. 6. Fruit with persistent calyx. 7. Coccus. 8. Seed.

Malvaceae.

THE MALLOW FAMILY.

THE COTTON FAMILY.

Herbs, shrubs or trees with simple, alternate, usually stipulate leaves. Flowers are regular and often bi-sexual, with or without bracteoles. Sepals are 3-5, united, and petals are 5 attached to base of staminal tube. Anthers are stalked, many, and 1-celled. Ovary is superior, 2 to many celled and the style has free or united stylar arms. Fruit is a capsule; or it breaks into bits (cocci). Seeds are endospermous or not.

Distributed in the tropical and temperate regions.

Malvastrum coromandelianum, *Garcke.*

Plate 34.

Flowering and fruiting time: September–June.
Habit: A small shrub.
Habitat: Along roadsides and waste places.
Range: The Coromandel Coast, Kurnool and Coimbatore districts.
Propagation: By seed.
Number of seeds: 2,000.

The plant is a small, erect, branched undershrub ½–1½ feet high. It is commonly found growing very gregariously in ditches that are dry and shady waste places.

The stem is round, purplish and sparsely covered with rough hairs. Leaves are simple, alternate, oblong-ovate, and covered with sparsely distributed tubercle-based hairs on both the surfaces. Petiole is ¼–¾ inch long. Stipules are 2 and hairy. Flowers are solitary, axillary and shortly stalked. Bracteoles are 3 and linear; they are placed just below the calyx which has 5 valvate lobes; the lobes are broadly ovate and acuminate. Petals are 5, pale yellow, ob-ovate and rounded and their bases are united and adnate to the staminal column. Anthers are one-celled, at the top of the column. Ovary is superior. Stylar branches are 10 an bear round stigmas. Fruit is dry and enclosed by the persisten calyx; it breaks into 10–12 one-seeded bits which are provided with 3 sharp protuberances on the back, and each bit is hispidly hairy at the top. The seed is brownish black and somewha kidney-shaped.

Means of control.—The weed is rarely troublesome in cultivated places. Grub the surface of the soil or cut the plants deep and pull them after the setting in of the monsoons.

SIDA SPINOSA, *Linn.*

PLATE 35.—Figs 1. Branch. 2. Flower bud. 3. Flower. 4. Fruit. 5. Bits of fruit. 6. Seed.

Sida spinosa, *Linn.*

Plate 35.

English: Prickly Sida; Spiny Sida.
Malayalam: Katta-venthiyam.
Telugu: Teranalla Benda, China Muttama.
Flowering and fruiting time: September–March.
Habit: A perennial undershrub.
Habitat: Waste places and dry channels.
Range: All plains districts especially in the Deccan and Carnatic.
Propagation: By seed.
Number of seeds: About 1,000.

It is an erect, branched plant growing to a height of 1–4 feet. The stem is round, sparsely and minutely hairy. The leaves are simple and alternate; stipules are linear; petiole is short and often provided with pointed tubercles at the base. Though these provided with pointed tubercles at the base. Though these tubercles can be hardly called spines, the plant derives its name from these structures. The lamina is ovate-oblong or elliptic-oblong with a toothed margin and obtuse tip. Pedicels are long, solitary or in clusters, jointed below the calyx which is softly hairy, 5-lobed and persistent. The lobes are shorter than the light yellow petals. Stamens are many at the top of the staminal tube. Ovary is superior, 5-celled, each with an ovule. Styles are 5. Fruit is enclosed by the calyx and breaks into 5 bits, and each bit splits at the top into two beaks. Seeds are somewhat trigonous, smooth and dark brown.

Means of control.—Cut the plants deep with a hoe before the flowering time. Mere surface cutting, leaves stumps which put forth fresh shoots in a short time. Small plants can be easily pulled out after a few showers, when the ground is soft.

Economic importance.—Root is a tonic.

Sida glutinosa, *Cav.*

Flowering and fruiting time: October–March.
Habit: An annual herb or undershrub.
Habitat: Waste places
Range: All plains districts.
Propagation: By seed.

It is an erect annual, 1–4 feet high. The sticky nature of the leaves and the stem is very characteristic of the plant and distinguishes it from other species of Sida. Branches are many and spreading. The stem is slender and clothed with stellate bristles and short sticky hairs. Leaves are simple, alternate, about 1½ inches long, 2 inches broad, broadly ovate and acute. The margin is toothed and the base is cordate. The upper surface is covered with stellate hairs. Petioles are long and covered with spreading

ABUTILON INDICUM, *G. Don.*

PLATE 36.—Figs. 1. Branch. 2. Corolla and staminal tube. 3. Pistil with calyx below. 4. Bit of fruit. 5. Seed.

hairs and stipules are narrow. The leaves on the side branches are much smaller than those on the main stem and have very short petioles. Flowers are light yellow, about ⅓ inch across, solitary, axillary or clustered on the side branches. Pedicels are rather long and jointed. Calyx is somewhat cup-like and has 5 triangular pointed teeth. Petals are 5, membranous, ob-ovate and rounded at the tip. Staminal tube is divided into many branches at the top. Fruit is enclosed by the persistent calyx and breaks into 5–6 beaked bits. Seeds are small, somewhat trigonous, dark red, shining and glabrous.

Means of control.—Same as for *S. spinosa,* Linn.

1. *Sida cordifolia,* Linn.—A velvety plant with characteristic, retrorsely hairy, awned carpels that easily stick to the clothing of man or the skin of animals. It is a weed of cultivated, dry soils and waste places of many districts.

English: Country Mallow.
Malayalam: Velluram.
Telugu: Tella Antisa.

2. *Sida acuta,* Burm.—A much branched, shrubby plant, often with lanceolate, acute and prominently toothed leaves. It is very common in waste places in all plains districts.

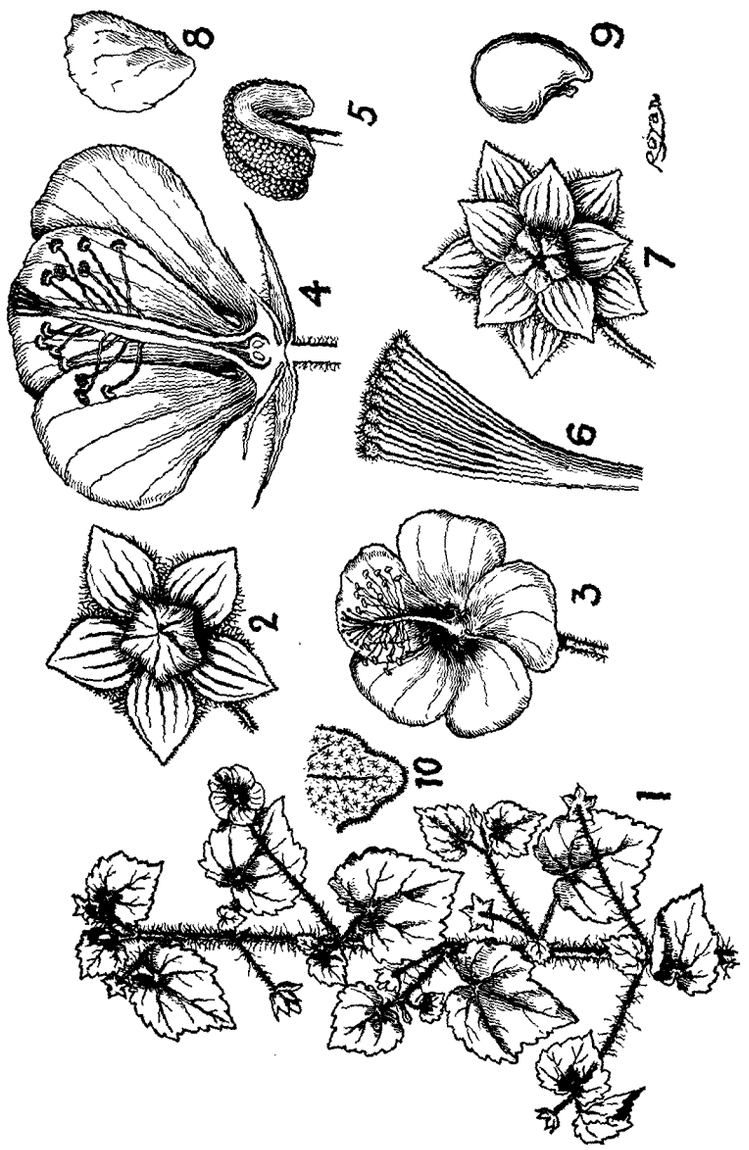
Tamil: Ariva-mooku Keerai.
Malayalam: Cheruparuva.
Telugu: Visha Boddi.

Abutilon indicum, *G. Don.*

Plate 36.

English: The Country Mallow.
Tamil: Tutti.
Malayalam: Uram.
Telugu: Tutturu-benda; Adavi-benda.
Flowering and fruiting time: Almost throughout the year.
Habit: A shrub.
Habitat: Waste places and hedges.
Range: All plains districts and also in the hills.
Propagation: By seed.

It is a diffusely much branched shrub growing to a height of 3–5 feet. The stem is round, softly tomentose and often tinged with purple. Leaves are 5″ × 4½″, simple, alternate, broadly ovate cordate and toothed. The lower surface is pale and silky tomentose. Stipules are linear and deflexed. Petioles are about 4½ inches long. Flowers are yellow, about an inch across, axillary solitary towards the tops of branches. Pedicel is 2½ inches long and jointed at the top. Calyx is tomentose, cupular below with



PAVONIA PROCUMBENS, *Boiss.*

PLATE 37.—Figs. 1. Branch. 2. Flower bud. 3. Open flower. 4. Longitudinal section of flower. 5. Anther. 6. Stylar arms. 7. Fruit with calyx and epicalyx persisting. 8. Coccus. 9. Seed. 10. Leaf tip (enlarged).

5 lobes. Corolla is yellow or sometimes with a purple centre; petals are 5, ob-ovate and rounded with prominent veins. Ovary is superior, globose, about 20-celled and tomentose. Styles are as many as cells in the ovary; stigmas are round. Fruit is dry and separates into laterally compressed bits, when ripe. Seeds are 3–5 in each cell, kidney-shaped, brown in colour, minutely pitted and covered with white points.

Means of control.—Frequent cutting of the shoot helps the prevention of seed formation and the consequent spread of the weed.

Economic importance. Plant is medicinal. The bark is astringent and diuretic. Leaves cooked and eaten, are good for bleeding piles. Stem yields fibre. Root is used in leprosy.

Pavonia procumbens, *Boiss.*

Plate 37.

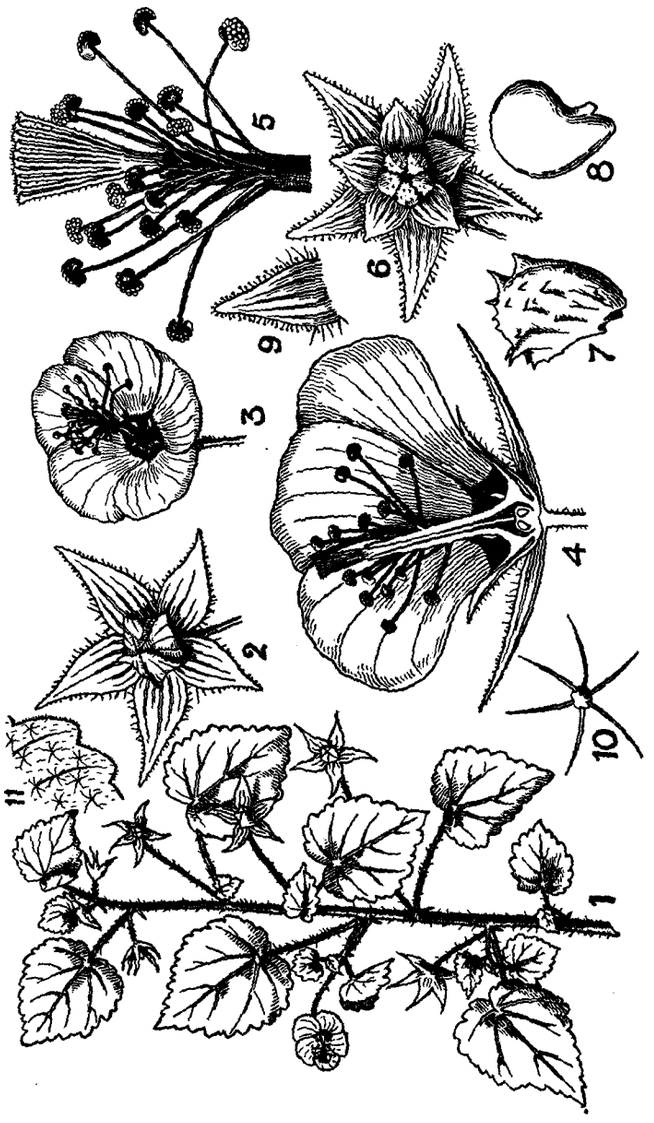
Flowering and fruiting time: Almost throughout the year.
Habit: An undershrub.
Habitat: In hedges and waste places.
Range: Most districts of the Circars, the Deccan and Carnatic as also at Coimbatore.
Propagation: By bits of fruit.

The plant is an undershrub with very long slender prostrate or procumbent branches attaining a length of 2-3 feet and commonly found among hedges. The main stem is very woody at the base and the lateral ones are densely clothed with long spreading hairs. The leaves are simple, alternate, broadly ovate and cordate. They are also somewhat 3-lobed, toothed and sparsely hairy on both the surfaces. Petioles are long. Flowers are yellow, showy, solitary, axillary on long jointed pedicels. Bracts of the involucre are 5–6, leaf-like, elliptic-lanceolate and longer than the deeply 5-fid persistent calyx. Corolla and staminal tube are yellow. Fruit is enclosed by the persistent calyx and it breaks into 5 bits which are rough with short protuberances. Seeds are somewhat kidney-shaped, dark brown and smooth.

Means of control.—The plant is never troublesome in cultivated places and as such no special treatment is ordinarily necessary. But wherever it is undesirable the branches may be chopped off.

Pavonia zeylanica, Cav.—A branching undershrub sticky all over, with deeply lobed leaves and pink flowers that have 8-12 rather long, narrow bracteoles that persist in fruit. It is a common weed on field bunds and waste places in many districts. (Plate I.)

Tamil: Sitha Mutti.
Telugu: Chinna Mudda-pulagam.



PAVONIA COXII, *Tad. & Jacob.*

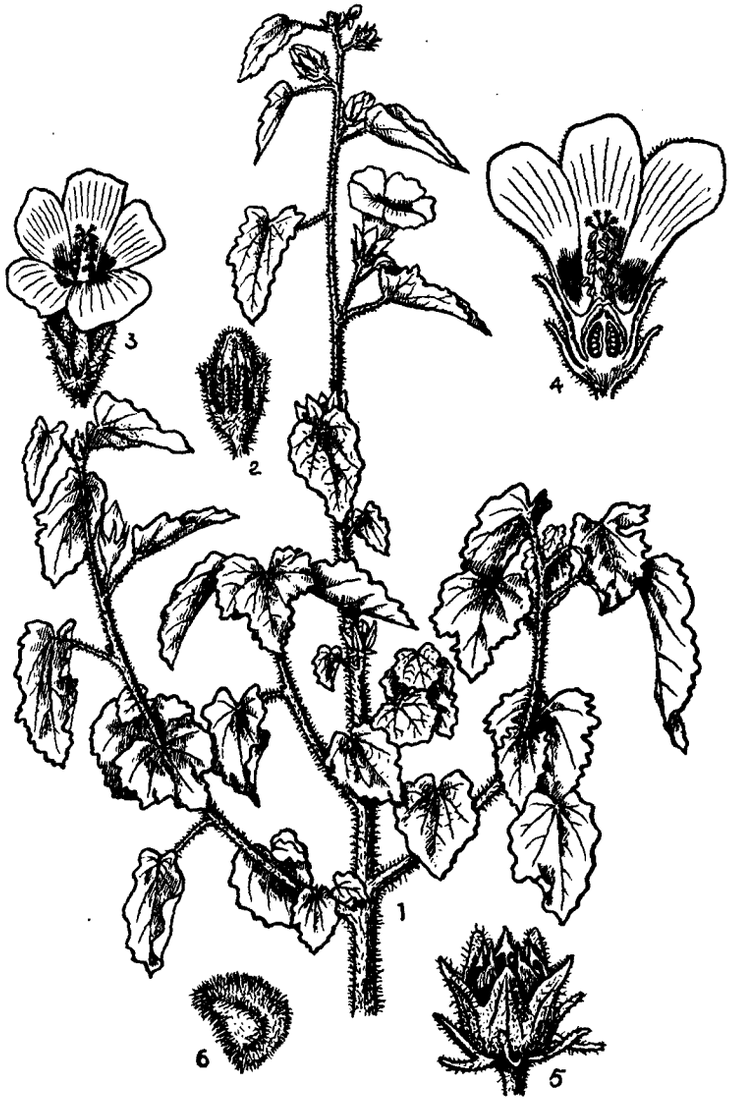
PLATE 38.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4. Longitudinal section of flower. 5. Top of staminal column and stylar arms. 6. Fruit with persistent calyx and epicalyx. 7. Coccus. 8. Seed. 9. Bracteole. 10. Star-like hair (enlarged). 11. Bit of leaf (magnified).

Pavonia Coxii, *Tad. & Jacob.*

Plate 38.

This new species has only been recently christened. It has been so far noted only at Coimbatore and very much resembles *P. procumbens*, Boiss., with regard to the habit and habitat. But it is easily distinguished by means of the glandular and viscous hairy nature of the stem, the creamy yellow corolla with a deep purple centre and the purple staminal column.

Means of control.—Same as for *P. procumbens.*



HIBISCUS PANDURAEFORMIS, *Burm.*

PLATE 40.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4. Longitudinal section of flower. 5. Open fruit. 6. Seed.

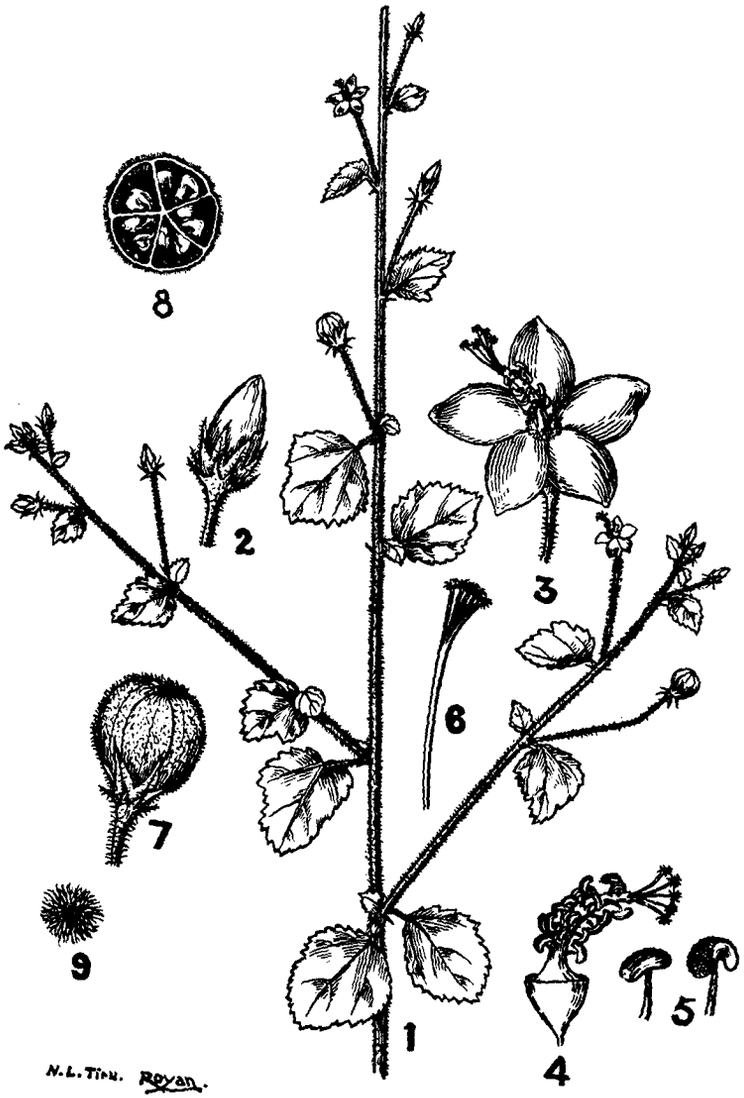
Hibiscus panduraeformis, *Burm.*

Plate 40.

Flowering and fruiting time: August-February.
Habit: A tall herbaceous undershrub.
Habitat: Hedges and waste places.
Range: The Deccan and Carnatic and also at Coimbatore.
Propagation: By seed.

Though not very common in most districts, in the places in which it is found it occurs in plenty. When undisturbed it attains a height of even 6–8 feet. The main stem is rather stout and the whole plant is densely clothed with rigid stellate hairs which are somewhat prickly. The leaves are 2–3 inches long, variously lobed and irregularly toothed on the margin and cordate at the base. Both the surfaces of the leaf are densely silky pubescent. Flowers are showy, axillary, solitary or in pairs. The epicalyx is shorter than the calyx and consists of 6-9 linear bracteoles which are broader at the tip than at the base. Calyx lobes are 5 and 3-nerved. Corolla is bell-shaped, yellow with a prominent purple centre. Fruit is an ovoid capsule enclosed by the persistent calyx and is very densely clothed with hispid shining hairs. The seeds are covered with long hairs.

Means of control.—Handpulling is neither possible nor practicable on account of the prickly hairs and the stout main stem. Cut the stem as close to the ground level as possible by means of a bill-hook.



HIBISCUS MICRANTHUS, *Linn.*

PLATE 39.—Figs. 1. Branch. 2. Flower bud. 3. Open flower. 4. Pistil and staminal column. 5. Anthers. 6. Style and stylar arms. 7. Fruit. 8. Cross section of young fruit. 9. Seed.

Hibiscus micranthus, *Linn. f.*

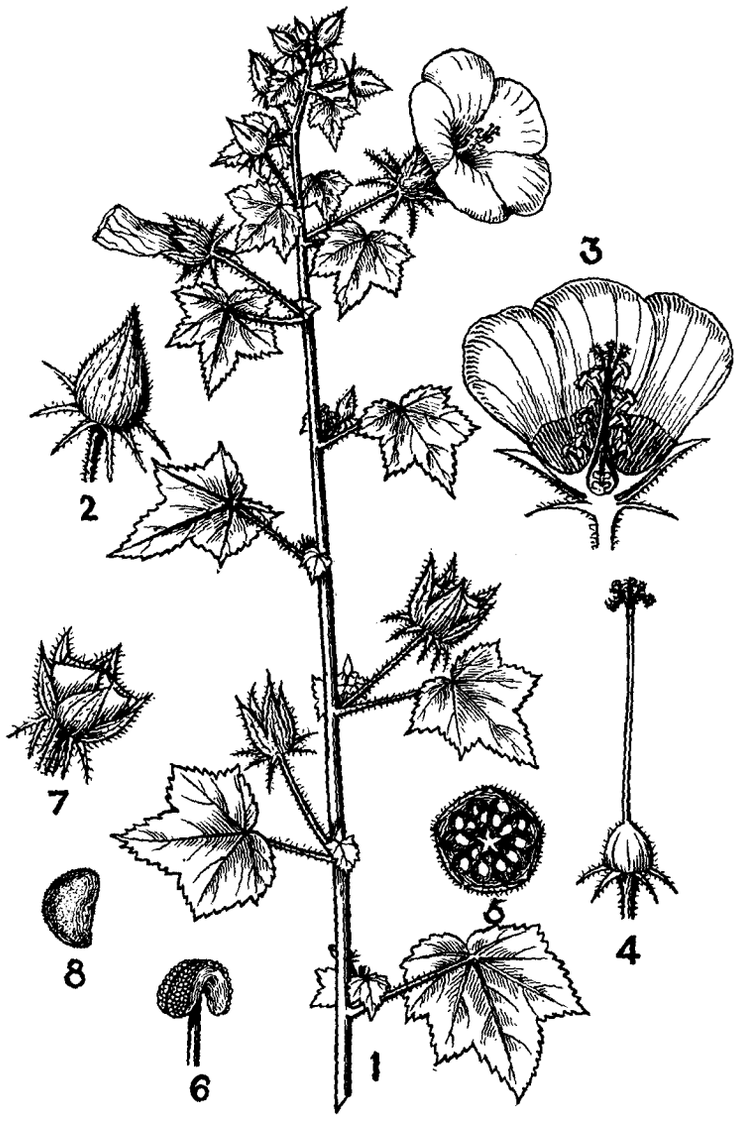
Plate 39.

Telugu : Nityamalli.
Flowering and fruiting time : May–December.
Habit : An erect shrub.
Habitat : Waste places and hedges.
Range : Almost all districts.
Propagation : By means of seeds.
Number of seeds : Five hundred or more.

In the plains of South India there are many species of *Hibiscus*, most of which occur as weeds ; of these *H. micranthus* is the most familiar one.

It is an erect shrub with slender branches, 2–5 feet high. The main root is rather deep-seated. The stem is round, sparsely covered with rough stellate hairs. Leaves are simple, alternate and distant. Stipules are pointed. Petiole is long in the basal leaves, becoming very short in the upper ones. The lamina is about 1 inch long, broadly ovate, obtuse, toothed and covered on both sides with rough stellate hairs. Flowers are small, solitary, axillary on pedicels ½–1¾ inch long, which are always longer than the petioles and jointed above the middle. Bracteoles are 6 below the calyx and shorter than the deeply 5-lobed hairy calyx, the lobes of which are lance-shaped. Corolla is about ⅓ inch across, and white; it has 5 lobes which are oblong-ovate and hairy on the back. These lobes are united at the base with the staminal column which bears many anthers and is deflected to one side in the open flower. Ovary is superior with 5 recurved stigmatic branches and globose stigmas. Fruit is a small globose 5-celled capsule. Seeds are small and are clothed with short cottony hairs.

Means of control.—The weed is not gregarious and plants should be attacked individually. Cut the stem as deep into the soil as possible. If this is not practicable pull the plants with the root by means of a cotton-puller.



HIBISCUS VITIFOLIUS, *Linn.*

PLATE 41.—Figs. 1. Branch. 2. Flower bud. 3. Longitudinal section of flower. 4. Pistil with bracteoles at base. 5. Cross section of ovary. 6. Anther. 7. Fruit with calyx and bracteoles persisting. 8. Seed.

Hibiscus vitifolius, *Linn.*

Plate 41.

Tamil : Mani-tutte.
Telugu : Karu-patti.
Flowering and fruiting time : September-February.
Habit : A herb.
Habitat : Bunds of paddy fields and waste places.
Range : All districts up to 3,000 feet in the hills.
Propagation : By seed.

The plant is a branched annual or a biennial herb growing up to a height of 3-4½ feet. It is densely covered all over with soft matted hairs. The leaves are cordate, 3-7 lobed and toothed. Petioles are up to 3 inches long and hairy. Flowers are showy and conspicuous with yellow petals having a dark purple centre; they are axillary or clustered at the ends of branches. The epicalyx has 7-12 ovate bracteoles. The fruit is a capsule 5-winged and pointed, the wings are reticulately veined and are characteristic of the species. Seeds are dark brown and minutely tubercled.

Means of control.—Use a cotton-puller to remove plants with the root.

Economic importance.—Good fibre can be obtained from the stem.

1. *Hibiscus ficulneus*, Linn.—An erect or procumbent annual with round, lobed leaves often serrate on the margin. The white flowers are solitary, axillary or in terminal racemes. Bracteoles drop off in flower. Fruit resembles a stunted capsule of Lady's Fingers (*Bendai*). The plant frequently occurs in black cotton soils, in all districts.

Tamil: Kattu Bendai; Kasturi Bendai.

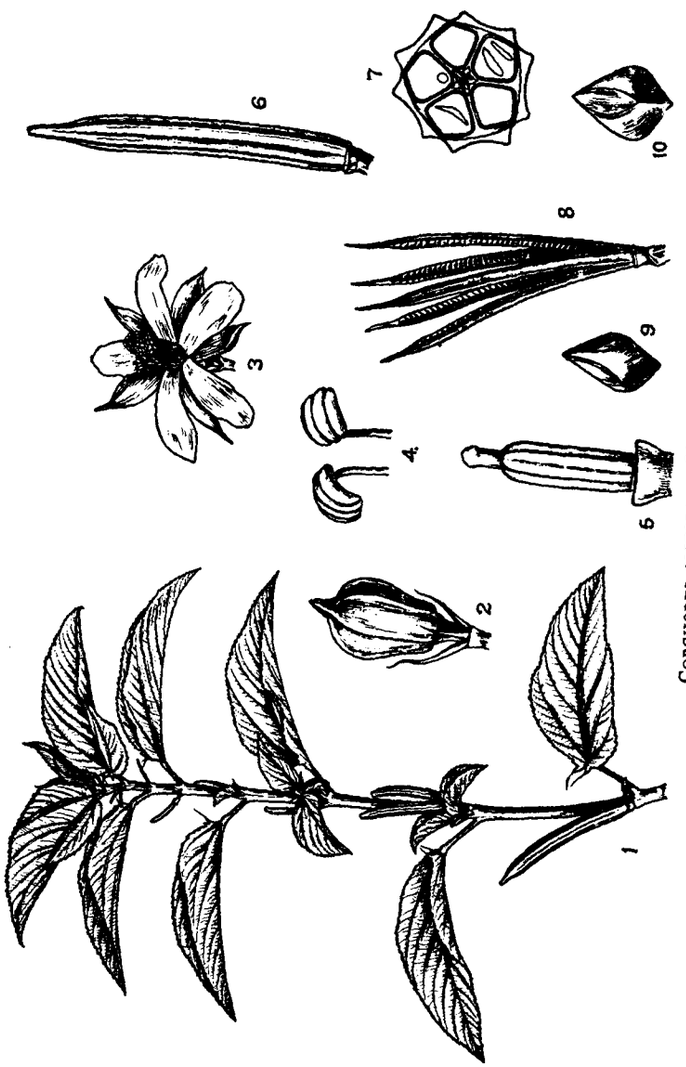
Telugu: Nalla Benda.

2. *Urena lobata*, Linn.—A branched undershrub growing to a height of 4 feet, with round, lobed leaves and pink flowers. Fruit is a sub-globose schizocarp covered with blunt spines which are armed with retrorse hairs. It occurs in waste places in many districts.

Tamil: Ottu Tutti.

Malayalam: Uran.

Telugu: Pedda Benda.



CORCHORUS OLITORIUS, *Linn.*

PLATE 42.—Figs. 1. Branch. 2. Flower bud. 3. Open flower. 4. Anthers. 5. Pistil. 6. Fruit. 7. Cross section of fruit. 8. Dehisced fruit. 9 and 10. Seeds.

Tiliaceae.

THE LINDEN FAMILY.

THE JUTE FAMILY.

Herbs, shrubs or trees with simple, alternate, stipulate leaves. Flowers are regular and usually bi-sexual. Sepals are 3–5, valvate, free or united. Petals are 3–5. Stamens are usually many, inserted on a torus; anthers are 2-celled. Ovary is superior, 2–10 celled. Fruit is a capsule or a berry 2–10 or more celled, breaking open or separating into bits. Seeds are endospermous.

Chiefly a tropical family.

Corchorus olitorius, *Linn.*

Plate 42.

English : Jew's Mallow.
Tamil : Perumpunnakku Poondu.
Telugu : Perinta Koora.
Flowering and fruiting time : September–February.
Habit : A herb.
Habitat : In irrigated areas.
Range : Most districts.
Propagation : By seed.

Though not truly indigenous to South India the plant is so common and wild in many districts that it has become a part of the weed flora of the Presidency. It is the most robust common species of *Corchorus* attaining a height of 5 feet or more. The plant is an erect, branched (in South India) glabrous annual, often found in cultivated soils. Dry conditions are not congenial to the growth of the plant. It thrives best in irrigated soils and reaches its maximum height in wet lands that are in green-fallow. Leaves are 2½–4 inches by 1½–2 inches, elliptic-lanceolate, acute or acuminate, glabrous and serrate. The teeth at the base are produced into thread-like appendages. Leaf-stalk is about an inch long. Stipules are awl-shaped. Flowers are 1–3, yellow and buds are angled, ovoid and provided with a rigid sharp point. Capsules are beaked, stout, cylindrical and glabrous. They are sometimes even 2½ inches long and have 5 valves and 10 ribs.

Means of control.—Sow clean seed. Destroy the weed while young.

Economic importance.—Jute is obtained from this plant as also from *C. capsularis.* Infusion of the leaf is much employed as a fever drink. It is said to be cultivated as a pot-herb in Eastern Bengal. Charcoal prepared from the stalks can be used for making gunpowder.

N.L. Tirn.

CORCHORUS TRILOCULARIS, *Linn.*

PLATE 43.—Figs. 1. Entire plant. 2. Flower bud. 3. Flower. 4. Pistil. 5. Anthers. 6. Dehisced fruit. 7. Seed.

Corchorus trilocularis, *Linn.*

Plate 43.

Tamil : Punnakku Poondu ; Vazhukkai Poondu.
Flowering and fruiting time : August-October.
Habit : A herb.
Habitat : Waste and cultivated places.
Range : Dry districts of the Presidency.
Propagation : By seed.
Number of seeds : 4,000 or more.

The plant is an annual herb with prostrate or erect branches 1–2 feet long. It is commonly met with as a weed in the black cotton soils or the heavy loamy or clayey soils of irrigated lands. The root system consists of a deep well developed tap-root with a few lateral roots. The stem is fibrous, round, pinkish and covered with sparsely distributed tubercle-based hairs. Leaves are simple and alternate. Stipules are linear and pointed. Petiole is 1/6–3/4 inch long. The blade is oblong-lanceolate, 1–3 inches long, the margin being serrate. The basal serratures are sometimes provided with long linear appendages. Both the surfaces of the leaf are glistening. Flowers are yellow, opposite the leaves, either solitary or in pairs. Bracts are filiform and subulate. The buds are ovoid with pointed tips. Sepals are 4–5, free, linear-oblong, acuminate and pale yellow. Petals are as many as the sepals oblong-ovate and yellow. Stamens are numerous, yellow, inserted on a cushion-like structure called the torus. Ovary is superior 3–4 celled and many ovuled. Fruit is an elongate, 3–4 valved, scabrous capsule 2–3 inches long, with a short beak. Seeds are small, trigonous and black.

Means of control.—Clean cultivation followed by an occasional hand weeding will ordinarily keep the weed under check. Complete eradication will be possible only if the plants are destroyed before the pods mature.

Economic importance.—Seeds are administered in fever.

Triumfetta rotundifolia, Lam.—An undershrub with orbicular leaves and small round fruits bearing hooked bristles, arranged in clusters on elongate axes. It is common among waste places and hedges, in most plains districts, especially in black cotton soils.

Tamil : Mudappoondu.

Telugu : Banki tutturi.

TRIBULUS TERRESTRIS, *Linn.*

PLATE 44.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4. Pistil. 5. Fruit. 6. Coccus.

N.L. Tirn.

Zygophyllaceae.

THE CALTROP FAMILY.

Herbs or shrubs. Leaves are compound, usually opposite, stipulate, 1–3 foliolate or pinnate. Flowers are axillary, solitary or in pairs, bisexual, often regular, or irregular. Sepals are 5, free and petals are 5, free. Stamens are 5, 10 or many, inserted at the base of a disk. Ovary is superior, usually 5-celled or sometimes 2–12 celled with 1–2 ovules in each cell. Fruit is a capsule or it divides into 2–10 cocci. Seeds have little or no endosperm.

Distribution.—Chiefly Australia and the Cape region of South Africa.

Tribulus terrestris, *Linn.*

Plate 44.

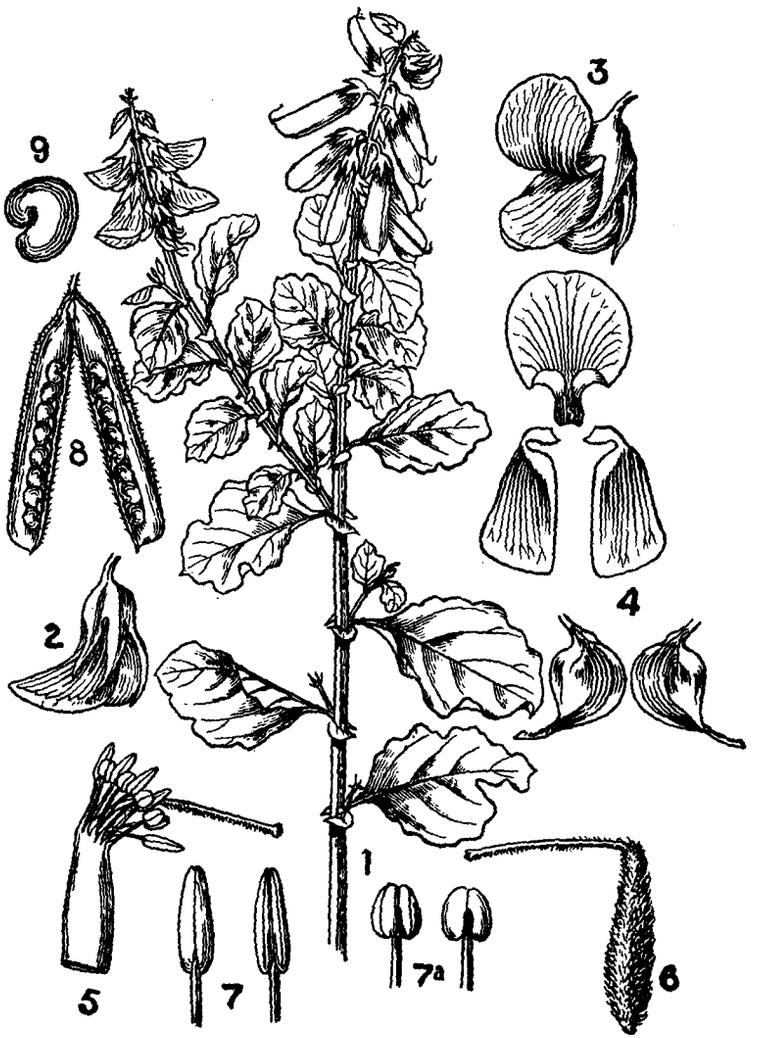
English : Ground Bur-nut; Small Caltrops.
Tamil : Nerinji.
Telugu : Palleru.
Malayalam : Nerunjil.
Flowering time : August–October.
Seeding time : September–December.
Habit : A herbaceous annual with a deep tap root.
Habitat and Range : Throughout the plains of the Presidency except on the West Coast, in pastures and waste places.
Propagation : By seeds carried in cocci (bits of fruit).

The plant is a native of the Mediterranean regions.

It is a procumbent, much branched, spreading herb with densely silky-hairy stems 4 inches–6 feet long. A plant collected at the Central Farm, Coimbatore, in September occupied an area of 24 sq. ft. and produced about 1,000 fruits. The stem is round. Leaves are opposite, compound, evenly pinnate, shortly petiolate with 10 to 14 small oblong leaflets, in unequal pairs. Flowers are axillary, solitary on short pedicels 1–3 inches long, with 5 hairy pointed sepals alternating with 5 yellow fan-shaped petals. Stamens are 10 and free. Ovary is 5-celled and hairy. Style is short or absent. Stigma has 5 ridges. The fruit is a dry sub-globose schizocarp breaking into 4–5 hard bits (cocci) each containing 4–6 seeds and armed with 2 long and 2 short spines on the back.

The ease with which the weed spreads is due to its hardy nature and to the very large number of fruits it produces. The seeds are protected by the woody covering of the fruit which keeps them viable for a long time. The spines are a ready means for wide dispersal.

Means of control.—Destroy all plants before the development of the fruit, by cutting, digging, or grubbing the surface of soil.



CROTALARIA VERRUCOSA, *Linn.*

PLATE 45.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4. Petals. 5. Stamina sheath and protruding style. 6. Pistil. 7 and 7*a* Anthers. 8. Open fruit. 9. Seed.

Never allow the fruit to ripen. In walks and roadsides chemical herbicides like arsenic compounds, carbolic acid, common salt can be tried with advantage.

Economic importance.—The entire plant is a cooling tonic, diuretic and aphrodisiac. It is also used in urinary disorders. In South Africa, the plant is considered poisonous to live-stock and is said to be responsible for a well defined disease in sheep, called "Geeldikkop" (E. P. Phillips).

Leguminosae.

Herbs, shrubs or trees with simple or compound, stipulate leaves. Flowers are regular or irregular. Sepals are five, often united and petals are usually five, free and unequal. Stamens are usually ten or more. Filaments are united or free. Ovary is superior, one-celled, with ovules attached on the ventral suture. Fruit is ordinarily a legume or a pod, breaking open by two sutures or separating into bits or indehiscent. Seeds are usually exendospermous.

The family is the second biggest among flowering plants and its members are distributed throughout the world. Its name is derived from the fruit which is a legume.

There are three sub-families under Leguminosae, viz., (1) Papilionatae, (2) Caesalpinioideae and (3) Mimosoideae.

I. *Papilionatae.*—The Pulses Family. Herbs, shrubs or trees with simple or compound leaves. Flowers are bi-laterally symmetrical. Sepals are five, variously united into a cup. Petals are five, free and papilionaceous, the uppermost petal being the outermost in bud. Stamens are ten usually united or only one, free from the rest.

Crotalaria verrucosa, *Linn.*

Plate 45.

Tamil: Gilugiluppai.
Flowering and fruiting time: August–December.
Habit: An annual or biennial herb.
Habitat: Waste places, fields and gardens.
Range: Almost all districts of the Presidency.
Propagation: By seed.
Number of seeds: 2,500.

There are about 75 species of *Crotalaria* occurring in the Presidency; some of them are found only in the hills while the rest are met with in the plains. The generic name is derived from *Krotalon* which means a rattle, after the rattling ripe pods.

The plant is a diffusely much branched herb 2–3 feet high. The stem is four-sided, puberulus when young becoming smooth with age. Leaves are about 4″ × 3″, simple, alternate, somewhat oblong and round with a wavy margin and a tapering base on short petioles. Stipules are large, leaf-like, semi-lunate, pointed at the free ends and persistent. Flowers are rather large, papilionaceous, 10–20, in terminal racemes 4–8 inches long. Flower stalks are very short and deflexed. Bract is small and narrow. Bracteoles are two, much smaller. Calyx is membranous with a tube and triangular teeth. Corolla is about ¾ inch long, blue or white. Stamens are ten, united into a sheath split on one side. Anthers are alternately long and short. Ovary is superior, elongate, shortly stalked, the stalk being surrounded by a round disk; style is bent at the base and the stigma is surrounded by a ring of short hairs. Fruit is an oblong, cylindric, turgid pod, 1–1½ inches long, softly appressedly hairy, the style persisting at the top as a beak. Seeds are 12–15 in each pod, kidney-shaped, brown and polished.

Means of control.—Cut or pull the plants and prevent seed production.

Economic importance.—Juice of tender stalks is used for scabies. Juice of leaves with salt is a vermifuge.

1. *Crotalaria quinquefolia*, Linn.—An erect herb with digitately five-lobed leaves, large yellow flowers, and beaked, turgid, glabrous pods hooked at the apex. Common in rice fields especially in all coastal districts.

2. *Crotalaria retusa*, Linn.—An erect annual with oblong, simple leaves, obtuse or retuse at apex, and pretty large, yellow flowers in terminal racemes. Pod is stalked, turgid and rattling when dry. It grows in fields and waste places.

Tamil: Peechalankai.

Malayalam: Kilukilukki.

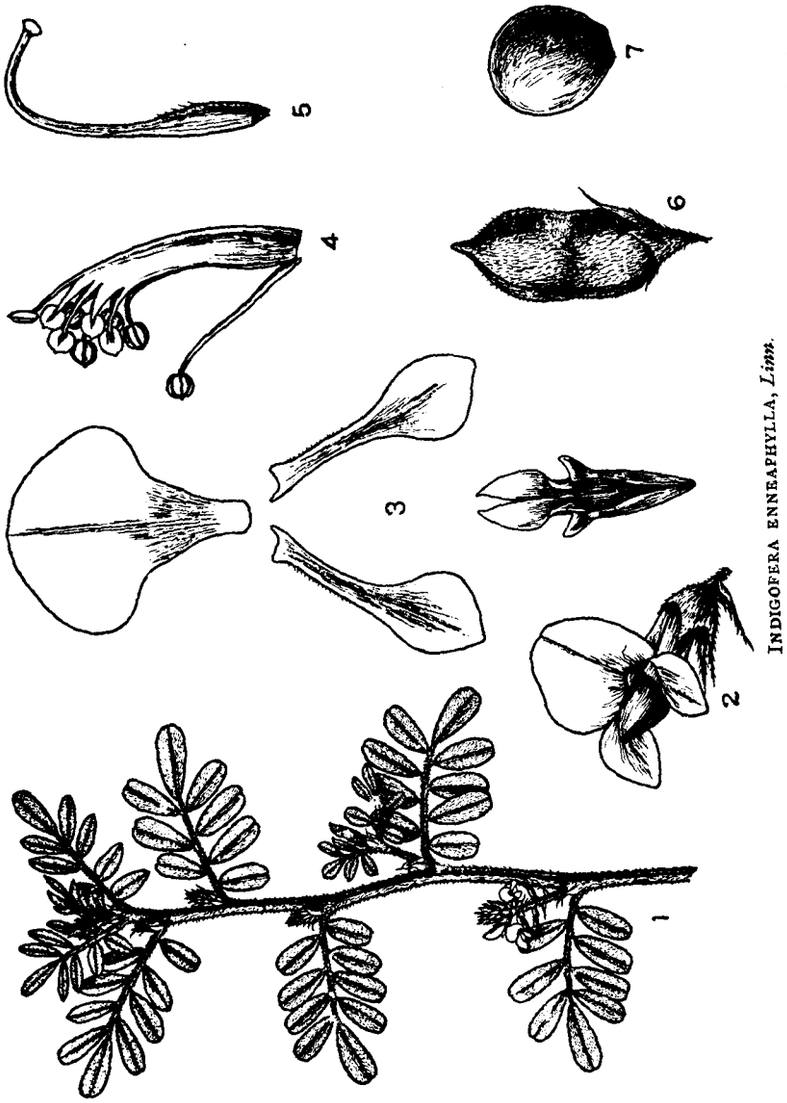


PLATE 46.—Figs. 1. Branch. 2. Flower. 3. Petals. 4. Staminal sheath. 5. Pistil. 6. Fruit. 7. Seed. INDIGOFERA ENNEAPHYLLA, *Linn.*

INDIGOFERA ENNEAPHYLLA, *Linn.*

PLATE 46-A.—Figs. A. Entire plant. B. Root system.

Indigofera enneaphylla, *Linn.*

Plates 46 and 46-A.

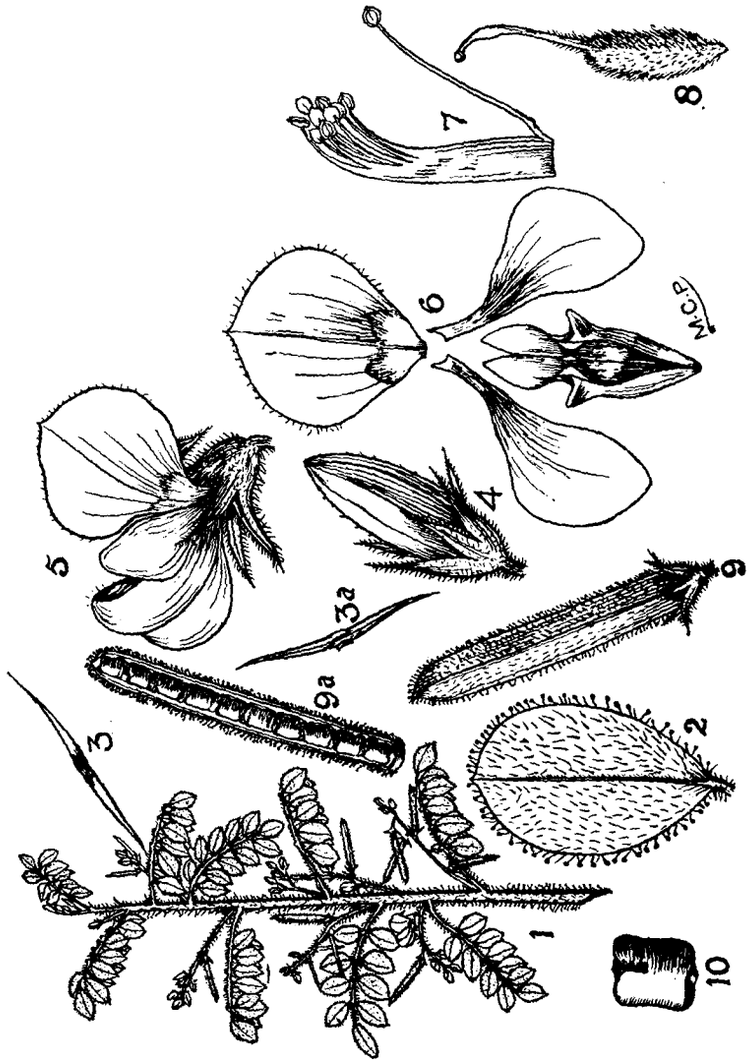
Tamil: Nilamperanda; Segappu Nerinji; Seppu Nerinji.
Malayalam: Cherupulladi.
Telugu: Chera-geddem; Yerra Palleru.
Flowering and fruiting time: September-February.
Habit: A low undershrub.
Habitat: Pasture lands and grassy places.
Range: Circars, the Deccan and Carnatic up to 6,000 feet in the Nilgiris.
Propagation: By seed.

It is an annual or a biennial undershrub with many prostrate, trailing branches 1–1½ feet long and spreading on all sides. In habit the plant resembles *Tribulus terrestris*, the Nerinji of the Tamil districts. It is very prominent after the rains when it is in flower.

The stem is round or angled and sparsely clothed with white hairs. Leaves are compound and alternate, stipules are scarious, somewhat bent and long pointed. Petioles are very short. Leaflets are 7–9, rather small, sessile, ob-ovate, rounded at the tip and tapering towards the base. Flowers are small, sessile, bright red or purple, 10–20 in dense, short, axillary racemes which resemble a head. Calyx teeth are long and slender. Corolla is papilionaceous. Stamens are ten and diadelphous. Pod is short ⅛–¼ inch long, pointed and covered with white hairs. Seeds are small, two in each pod, angled or round and polished, yellowish brown in colour.

Means of control.—In pasture lands its growth is desirable as it enriches the soil and in cultivated places it is scarcely troublesome. But if it happens to be undesirable in any place it may be killed by deep hoe-cutting.

Economic importance.—Juice of the plant is a tonic and its decoction is given in insanity and chronic venereal affections.



INDIGOFERA VISCOSA, *Lamk.*

PLATE 47.—Figs. 1. Branch. 2. Leaf. 3 and 3a. Mid-fixed scale-like hairs. 4. Flower bud. 5. Flower. 6. Petals. 7. Staminal sheath. 8. Pistil. 9. Fruit. 9a. One of the two valves of fruit with seeds. 10. Seed.

Indigofera viscosa, *Lamk.*

Plate 47.

Tamil: Kavalai Chedi.
Flowering and fruiting time: September–February.
Habit: A viscous herb or an undershrub.
Habitat: Sandy or loamy soils.
Range: Circars, the Deccan and Carnatic.
Propagation: By seed.

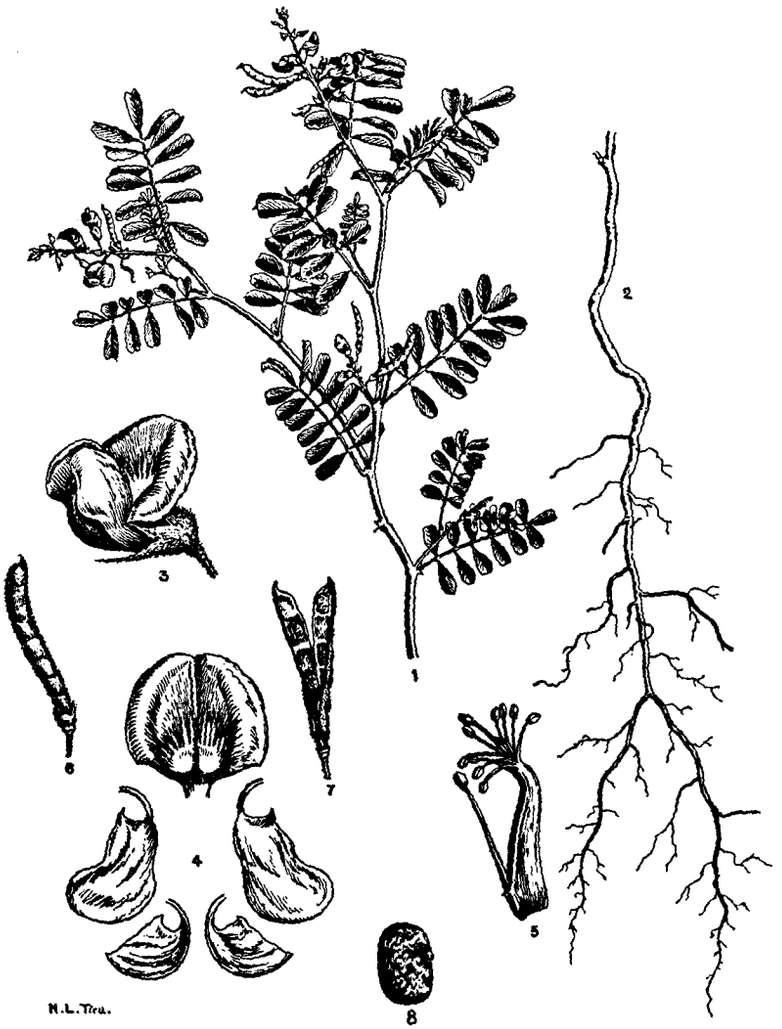
The plant is an erect much branched viscous annual occurring among grass in open places after the rains. The whole plant is densely clothed with minute gland-tipped hairs. Leaves are compound and alternate; stipules are thread-like and petiole is about ½ inch long. Leaflets are 7–15, about ½ inch long, oblong-elliptic, obtuse with a short pointed tip. The lower surface of the leaflets is covered with white mid-fixed hairs. Flowers are red, rather small, 6–12, in axillary racemes 2–3 inches long. Calyx is glandular hairy, small and has bristle-like teeth. Corolla is papilionaceous. Stamens are 10, 9 of which are in one bundle and the other separate. Pod is somewhat cylindric and covered with hairs some of which are gland-tipped. Seeds are 8–10 in each pod, small, dark red, shining, somewhat four-sided and truncate at both ends.

Means of control.—Though not very common the plant is sometimes troublesome. Handpulling seems to be quite effective.

1. *Indigofera trita*, Linn. f.—A hardy stiff, grey, shrubby plant with red flowers and four-sided spreading, pointed pods. It occurs in dry waste places, in almost all districts in the plains.

Telugu: Nakka-naru.

2. *Indigofera parviflora*, Heyne.—An erect, much branched, herbaceous annual with narrow leaflets and racemes of red flowers, occurring as a weed in cultivated fields and grassy places, up to 3,000 feet in Madura, Salem, Coimbatore and other districts.



TEPHROSIA PURPUREA, *Pers.*

PLATE 48.—Figs. 1. Branch. 2. Root system. 3. Flower. 4. Petals. 5. Stamens. 6. Pod. 7. Pod dehisced. 8. Seed.

Tephrosia purpurea, *Pers.*

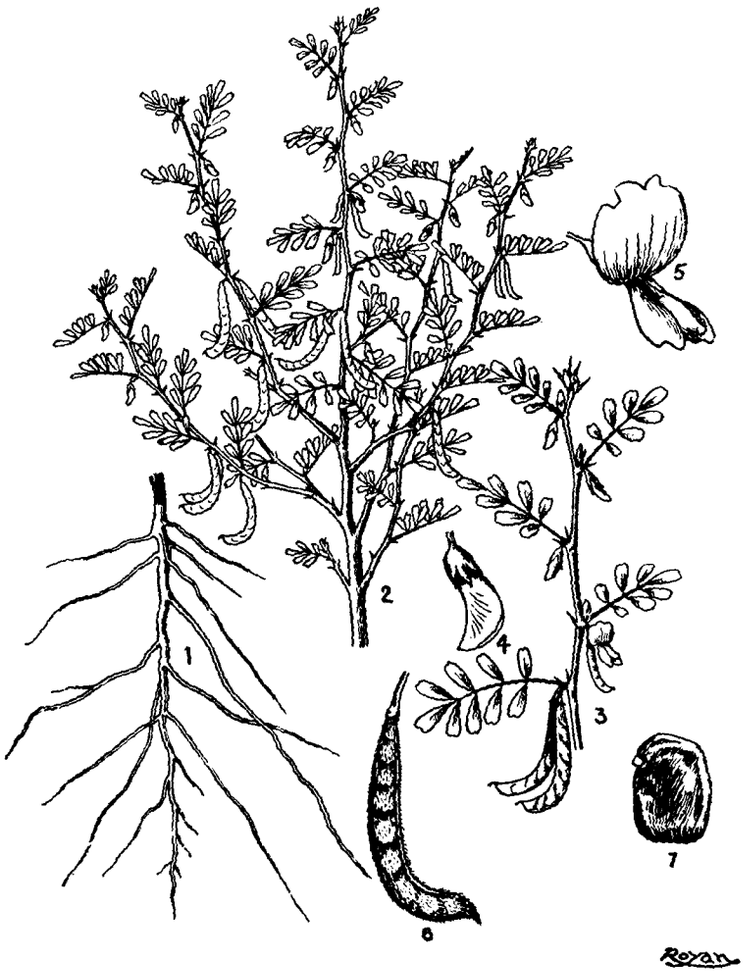
Plate 48.

Tamil: Kolinji.
Malayalam: Kozhinjil.
Telugu: Vempali.
Flowering and fruiting time: May–October.
Habit: A herb or an undershrub.
Habitat: Waste lands.
Range: In all districts in the plains.
Propagation: By seed.
Number of seeds: 2,000 or more.

It is a very freely branching perennial undershrub ¾–2 feet high. It grows in all kinds of soils but thrives best in loamy soils with a fair amount of moisture. The root system is rather deep and is full of bacterial nodules by the presence of which the soil is enriched with nitrogenous compounds which go to form valuable plant-foods.

The stem is woody at the base, round and pubescent in young parts that become glabrous with age. The leaves are compound, odd-pinnate, alternate and 2–4 inches long. Stipules are two and linear. Petioles are ¼–½ inch long. The lateral leaflets are in 5–6 opposite pairs with very short stalks. They are elliptic or ob-lanceolate with a wedge-shaped base and an entire margin, while the tip is obtuse, emarginate and mucronate. Nerves are ascending and parallel. The upper surface of the leaflet is glabrous and the lower one is appressedly hairy. Flowers are purple and are arranged in a receme 2–4 inches or more long, which is either terminal or opposite the leaf. The basal flowers are in whorls. Bracts are small and linear. Pedicel is short. Calyx lobes are five, hairy and acuminate. The corolla is of the papilionaceous type and deep purple in colour; the standard is orbicular and the wings are oblong obtuse, somewhat adnate to the keel petals which are united at the back. Stamens are 10, 9 of which are in a bundle while the one opposite the standard is free; anthers are uniform and two-lobed. Ovary is superior, one-celled and hairy. The style is incurved and the stigma is round with a circle of hairs. Fruit is a flat pod curved at the tip, 1–1½ inches long and 4–6 seeded. It breaks open into two parts. The seeds are cylindric, dark brown, mottled and rounded at both ends.

The weed is collected in cart-loads and is applied as green-leaf manure to crops. It is also sometimes cultivated for the same purpose.



TEPHROSIA SPINOSA, *Pers.*

PLATE 49.—Figs. 1. Root system. 2. Shoot. 3. Branch. 4. Flower bud. 5. Flower. 6. Fruit. 7. Seed.

Means of control.—Where the plant is undesirable it can be destroyed by pulling it out in the seedling stage. Deep cutting by means of a spade will kill old plants. Dormant seeds should be allowed to grow by cultivating the field after the rains; and the seedlings that come up can be easily killed by working a guntaka or any other harrow.

In waste places the growth of the weed is not undesirable as it improves the soil and as such no remedial measures need be adopted there.

Economic importance.—Decoction of fruit has the property of killing intestinal worms. The plant is a laxative and tonic. The root is bitter and is given in dyspepsia and chronic diarrhœa.

Tephrosia spinosa, *Pers.*

Plate 49.

Tamil: Mul Kolinji.
Malayalam: Mukkavala.
Telugu: Mullu Vempali.
Flowering and fruiting time: September–March.
Habit: A low shrub.
Habitat: Barren lands and waste places.
Range: Carnatic from Kistna southwards to Madura and Tinnevelly and Coimbatore district.
Propagation: By seed.

It is a stiff, thorny, low shrub. Though not very common in cultivated fields it sometimes occurs in plenty in dry barren soils. On account of the thorny nature, the weed is rather troublesome. It is a very hardy perennial with a well developed, deep-seated root system. The plant can be easily distinguished by means of the thorns near the axils of leaves, which are really modified stipules. Flowers are in axillary clusters. The pod is somewhat pubescent and sickle-shaped. In the characters of leaf and flower it very much resembles *T. purpurea.*

Means of control.—Handpulling is neither easy nor practicable. As the plant is very hardy, cutting it at ground level is not of much use. Cut the tap-root as deep into the soil as possible.

Economic importance.—Decoction of root-bark is given in rheumatism, diarrhœa and excessive thirst.

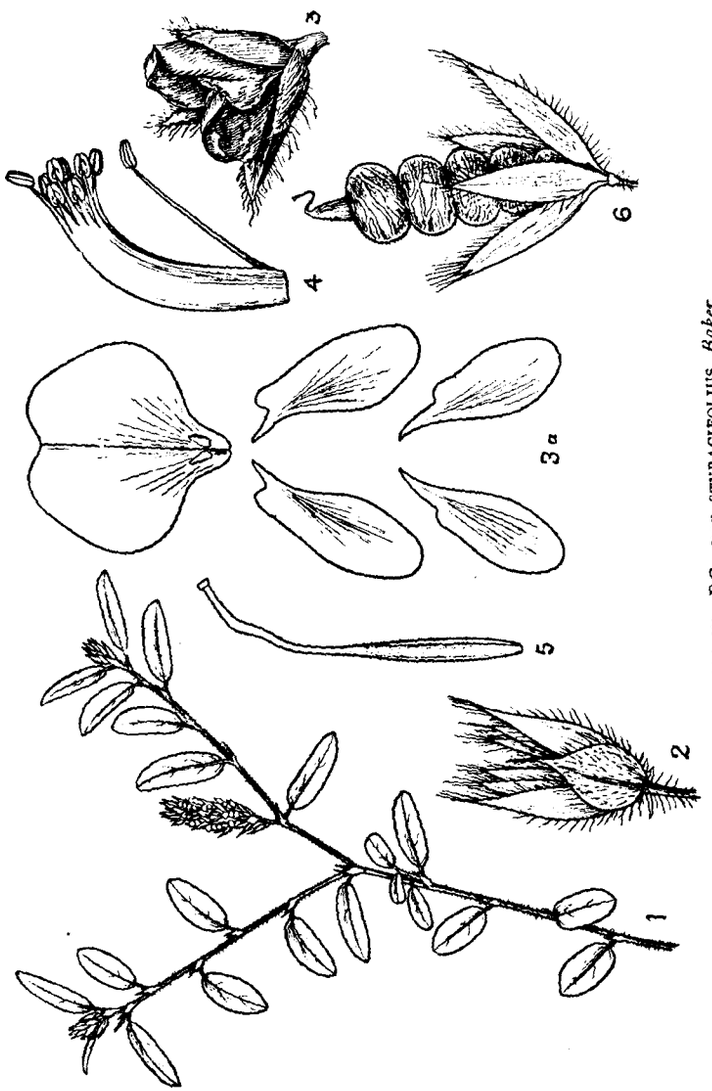


PLATE 50.—Figs. 1. Branch. 2. Pair of flower buds subtended by a bract. 3. Flower. 3-a. Petals. 4. Staminal sheath. 5. Pistil. 6. Fruit with persistent calyx.
ALYSICARPUS RUGOSUS, *DC.*, *var.* STYRACIFOLIUS, *Baker.*

Alysicarpus rugosus, *DC.*, *var.* styracifolius, *Baker.*

Plate 50.

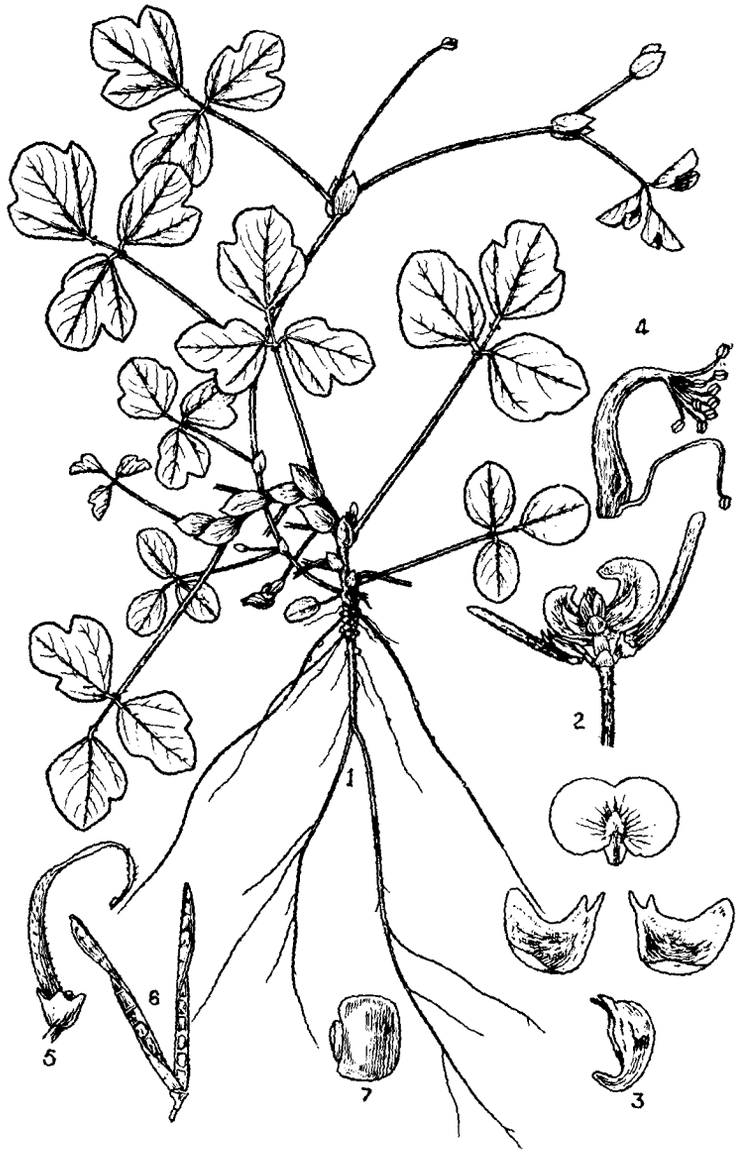
Tamil : Namappoondu.
Flowering and fruiting time : June-December.
Habit : A herb.
Habitat : Waste or cultivated dry places.
Range : The Deccan and Carnatic.
Propagation : By bits of fruits containing seeds.
Number of seeds : 2,000.

The weed is one of the most common plants of the black cotton soil. It is a short herbaceous annual. The main stem is about 8 inches high and it bears at the base many diffusely spreading somewhat prostrate or ascending branches which sometimes attain a length of even 1½ feet. The branches at the top of the main stem are much shorter than the basal ones. The root system is rather deep. The stem is round, and densely covered with long spreading hairs. The leaves are alternate and vary in shape from oblong-elliptic to oblong-lanceolate. The tip is acute or obtuse. Petiole is short, hairy and jointed at the top below the lamina. Both the surfaces of the leaf are clothed with spreading hairs and the midrib is pale green above. Flowers are small, purple and they are densely arranged in pairs along an axis 1-2 inches long which is either opposite the leaf or terminal. The flower stalk is very short. Each pair of flowers is subtended by a bract which is shorter than the calyx, oblong or ovate, long-pointed, ciliate along the margins and hairy on the back. Calyx is ¼ inch long and deeply 4-fid to the very base. The lobes are lance-shaped, acute, long ciliate and hairy outside. Corolla is of the papilionaceous type. Stamens are 10, diadelphous, anthers are uniform and 2-lobed. Ovary is elongate, superior and many-ovuled. Style is incurved above, and stigma is round. Fruit is almost enclosed in the persistent calyx and it consists of a few turgid one-seeded joints which are transversely ribbed. The fruit is characteristic in that these joints get separated easily from each other carrying in each of them a seed.

Means of control.—Clean cultivation is the best remedy ; if the weed happens to be rather old, work a weighted guntaka and destroy it.

Economic importance.—Plants may be fed to cattle.

1. *Alysicarpus monilifer*, DC.—A much-branched, prostrate perennial with oblong or elliptic, variable leaves and small clusters of sticky, moniliform pods having turgid, globose joints. It is a



PHASEOLUS TRILOBUS, *Ait.*

PLATE 51.—Figs. 1. Entire plant. 2. Inflorescence. 3. Petals. 4. Staminal sheath. 5. Pistil with calyx. 6. Dehisced fruit. 7. Seed.

pasture land weed occurring in all dry districts especially on the East Coast.

Tamil: Kalanama-poondu.

Telugu: Amera.

2. *Alysicarpus longifolius*, W. & A.—A tall, stout herb growing up to a height of even five feet, with long, prominently veined leaves and long terminal inflorescences. The standard of flowers is yellow and the wings and keels are red. It is a common weed in black cotton soil areas of the Circars, Ceded Districts, Coimbatore and Tinnevelly.

Phaseolus trilobus, *Ait.*

Plate 51.

Tamil: Pani Payir; Nari-payatthankai.
Malayalam: Ceruvidukol.
Telugu: Pilli-pesara.
Flowering and fruiting time: July–October; January–April.
Habit: A diffuse spreading herb.
Habitat: Fallow fields, river banks, waste places and bunds of rice fields.
Range: All plains districts.
Propagation: By seed.

A trailing herb with many branches prostrate on the ground and reaching a length of even 6 feet. The root system is full of bacterial nodules. Stem is slender, wiry, angled, sparsely pubescent and tinged with purple. Leaves are 3-foliolate, alternate; stipules are large, oblong-ovate and peltate at base; petiole is 1–1½ inches long; stipels are small, ovate, and leaflets are usually 3-lobed, the lobes being obtuse, narrow or almost entire. Flowers are small, yellow, in few flowered cluster-like racemes on long axillary peduncles 4–13 inches long. Pedicels are short, bracts are ovate, concave and deciduous, and bracteoles are oblong-lanceolate, acute and deciduous. Calyx is small, glabrous, with short teeth and corolla is yellow and papilionaceous, the keel petals being twisted into a spiral. Stamens are 10, diadelphous and anthers are uniform. Ovary is superior, 1-celled, many ovuled and surrounded at the base by a glandular cuplike disk. Style is bearded below the oblique stigma. Pod is somewhat cylindric and sparsely appressedly hairy. Seeds are 6–12 in each pod, small, sub-cylindric and dark brown.

The wild perennial form has usually deeply-fid leaflets, while in the cultivated annual plants the leaflets are more entire.

Means of control.—In cultivated fields the usual field operations will ordinarily put down the spread of the weed. In waste lands

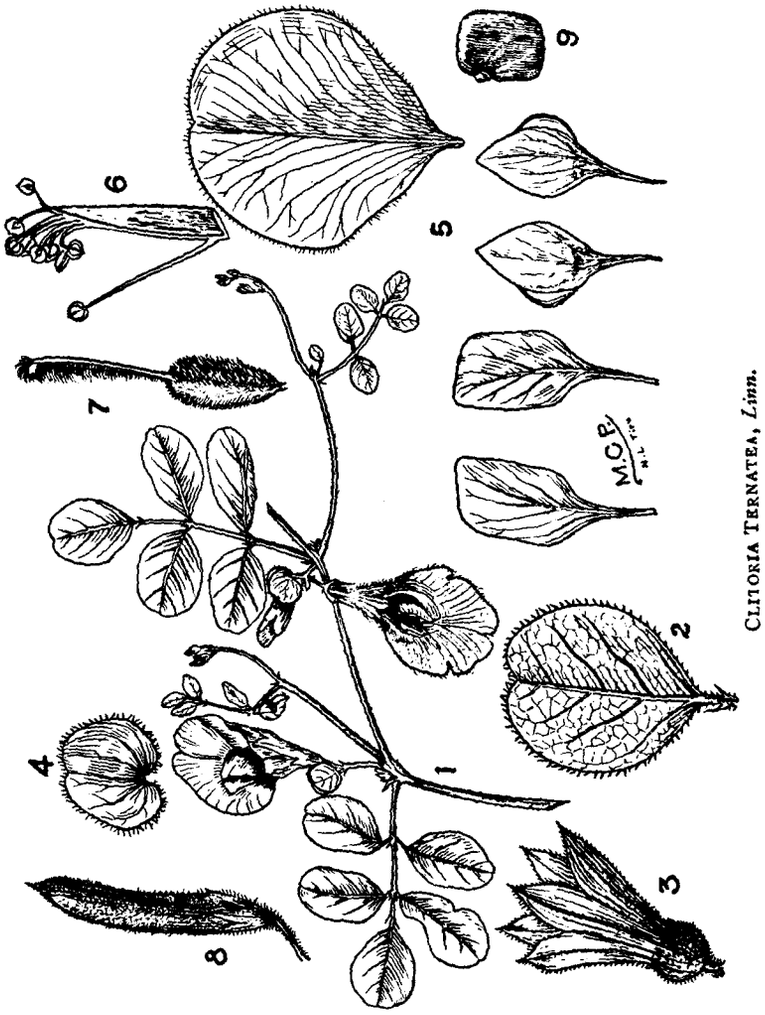


PLATE 52.—Figs. 1. Branch. 2. Leaflet. 3. Calyx. 4. Bracteole. 5. Petals. 6. Staminal column. 7. Pistil. 8. Fruit. 9. Seed.
CLITORIA TERNATEA, *Linn.*

and fallow fields, the growth of the plant may be encouraged as it fixes the atmospheric nitrogen and enriches the soil, and smothers bad weeds.

Economic importance.—It is much relished by cattle and is some times cultivated as a fodder or green manure crop. Decoction of the plant is useful in fevers. This is supposed to have the property of prolonging life.

Phaseolus aconitifolius, *Jacq.*

English: Kidney-bean; Field Gram.
Tamil. Tulukka Payir.
Telugu: Mitekelu.
Habit: A diffuse trailing herb.
Habitat: Sandy or loamy soils.
Range: The Deccan and Carnatic.
Propagation: By seed.

The plant very much resembles *P. trilobus*, Ait., from which it is distinguished by the lanceolate stipules and bracteoles. Leaflets are usually deeply tri-lobed and again variously cut.

It is more commonly cultivated as a fodder or pluse crop than *P. trilobus*, and is also met with as a weed.

Means of control.—Same as for *P. trilobus*, Ait.

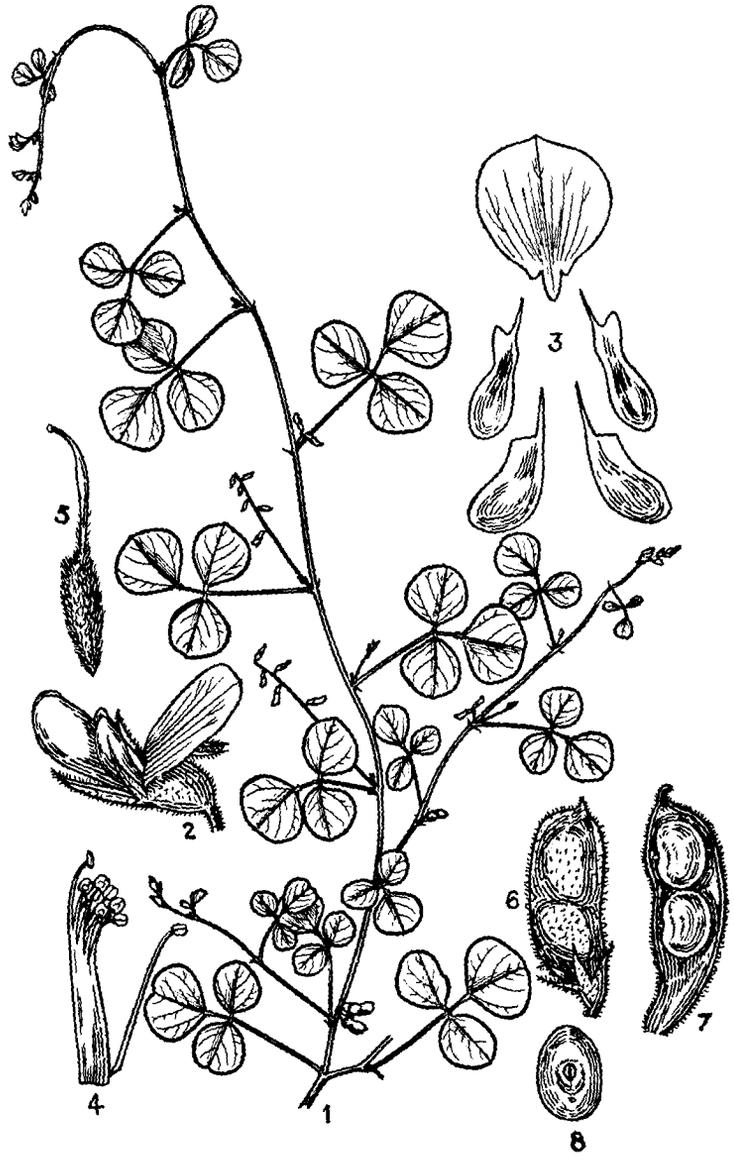
Economic importance.—Leaves and shoots are much relished by horses and cattle. Root is said to be narcotic.

Clitoria Ternatea, *Linn.*

Plate 52.

English: Conch Flower Creeper.
Tamil: Kakattan; Kuvalai
Malayalam: Sankhu Pushpi.
Telugu: Nalla Gentana; Neela Gentana.
Flowering and fruiting time: June-February.
Habit: A climbing herb.
Habitat: Hedges and thickets.
Range: All plains districts and in forests.
Propagation: By seed.

The plant is a perennial creeper with prominent pretty blue flowers commonly found climbing among hedges. Branches are 1-3 feet or more long. The stem is slender, round and hairy. Leaves are 2-4 inches long, alternate and odd-pinnate. Stipules are lanceolate and acute. Stipels are filiform, leaflets are 5-7, the side ones opposite, shortly stalked, elliptic or oblong ovate, obtuse and sparsely hairy on both surfaces. Flowers are usually solitary and axillary. Bracts are two, like the stipules; bracteoles are two,



RHYNCHOSIA MINIMA, *DC.*

PLATE 53.—Figs. 1. Branch. 2. Flower. 3. Petals. 4. Staminal sheath. 5. Pistil. 6. Fruit. 7. Valve of fruit showing two seeds. 8. Seed.

large and prominent, round or oblong. Pedicel is short and jointed in the middle. Calyx is tubular with five pointed teeth. Corolla is large, usually bright blue or white. Standard is large with a yellow centre and many prominent veins. Keel petals are usually white. Stamens are ten and diadelphous. Ovary is superior and many ovuled. Style is slightly curved and densely bearded at the top. Stigma is somewhat round and hairy. Fruit is a compressed oblong pod up to three inches long. Seeds are 6–10, oblong, compressed, smooth, yellow and mottled with black and minutely pitted.

Means of control.—The plant hardly requires eradication as it is never found troublesome in cultivated fields. Being a member of the bean family it enriches the soil. The flowers are very pretty and adorn the hedges. If necessary its spread can be easily checked by picking out flowers and preventing the development of the fruit

Economic importance.—The plant is highly medicinal. Root is emetic. Leaves are antidote to poison. Seeds are powerful cathartic. Extract of blue flowers is a colouring agent and a substitute for litmus. It makes a good garden plant and is cultivated as such.

There is natural crossing taking place between the white and the blue types; a number of crosses showing purple blue, pale blue, mottled blue corollas are common.

Rhynchosia minima, *DC.*

Plate 53.

Tamil: Chitt-avarai.
Telugu: Gedi Chikkudu; Neela Alumu.
Flowering and fruiting time: Throughout the year except April-May.
Habit: A slender trailing herbaceous annual.
Habitat: Most districts in the plains and at the foot of the Western Ghats in dry places.
Propagation: By seed.

The plant is commonly found in loamy soils on the bunds of cultivated fields. It is scarcely a harmful weed. The roots have bacterial nodules which enrich the soil. It makes an excellent fodder and its growth in pastures should be encouraged. The plant is easily made out from the trailing branches, small obtuse leaflets and yellow flowers in open racemes.

Branches are many, thin and wiry growing to a length of 3–5 feet. Leaves are alternate, pinnately compound, with three leaflets which are gland-dotted beneath and glabrous on the upper surface.

times it is found in enormously large numbers and entirely covers the ground absolutely making it impossible for any other plant to grow except perhaps a few grasses.

The stem is four-sided when young becoming round with age. The leaves are alternate and pinnately compound. Stipules are lanceolate, long pointed and deciduous. Petiole is dilated at the base and has a solitary gland. Leaflets are in 3–5 opposite pairs, 2–3½ inches long, ovate-lanceolate and glabrous, on short stalks. The leaflets towards the top of the leaf are always bigger than the rest. Flowers are yellow, in short few-flowered terminal and axillary racemes. The flower stalk is short and it slightly lengthens in fruit. Calyx consists of five oblong, obtuse, membranous, unequal and imbricate sepals. Petals are five, yellow, ob-ovate, rounded and veined. Stamens are ten; six of them are perfect and the three upper and the one lower are modified into staminodes. Anthers open by small pores at the apex. Ovary is superior, one-celled and bent towards one side. Fruit is a legume or a pod, 4–5 inches long, compressed and glabrous. The sides are undulating while the margins are thickened. Seeds are 20–45 in each pod, compressed, smooth, somewhat rounded with an oblong blotch on each side.

Means of control.—The weed is capable of spreading very rapidly on account of its numerous seeds. When found in large numbers after the rains it is best attacked in the seedling stage. Work a harrow once or twice and uproot and kill the seedlings. In the case of old plants deep cutting before the fruiting time seems to be the best possible remedy. The pods should not be allowed to mature seed. The seeds have great vitality and can keep alive for a number of years.

Economic importance.—Leaves are used as a purgative and also for itches. The root is antidote to poisons and is used in snake bite with pepper. Decoction of root is given in leprosy. Seeds also are medicinal.

Cassia Tora, Linn.—An erect herb or an undershrub with obtuse leaflets, yellow flowers and long, slender, curved pods. A common weed of waste places and fallow fields, in most districts.

Tamil: Oosi Thagarai.

Telugu: Tantipu.

III. *Mimosoideae*—The Acacia Family.—Trees, shrubs or rarely herbs. Leaves are pinnate or bi-pinnate. Flowers are usually bisexual in heads or spikes with small bracts and with or without bracteoles. Calyx is gamosepalous, usually with five, valvate lobes; sometimes they are three, four or six and free. Petals are as many as the sepals, united or free. Stamens are definite or indefinite, united or free. Fruit may or may not dehisce and seeds are endospermous or ex-endospermous and sometimes arillate.

The family gets its name from *Mimosa* meaning *mimic*, after the leaves of certain species which " mimic animal sensibility ".

Mimosa pudica, Linn.—The sensitive plant. A diffusely much-branched undershrub with the branches creeping on the ground, and sometimes attaining a height of even three feet. Stems and branches are prickly. Stipules are pectinately bristly along the margin. Leaves are bi-pinnately compound with 1–2 pairs of pinnae; petiole is long. Leaflets are narrow in 12–20 pairs. Flowers are pink, collected in globose heads on prickly peduncles about ¾ inch long. Pods are in clusters and the joints fall away from the persistent sutures which are covered with characteristic spreading bristles.

The plant is very easily made out by the sensitive leaves which droop down when touched or disturbed, and the pink heads of flowers, and the pods.

It thrives best in hot moist situations and spreads very rapidly; its eradication is very troublesome. Very common along roadsides, bunds of paddy fields, irrigation channels and waste places in Tinnevelly, Travancore, Cochin, Malabar, South Kanara, Coorg, etc.

English: The Humble Plant; The Touch-me-not Plant.

Tamil: Thotta Vadi.

Malayalam: Thotta Vadi.

Telugu: Pedda Nidrakantha.

CASSIA OCCIDENTALIS, *Linn.*

PLATE 54.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4 and 5. Stamens 6. Fruit. 7. Seed.

Stipules are linear and lance-shaped. The leaf-stalk is ½-1½ inches long. Flowers are small, loosely arranged in axillary racemes. Bracts are small. Sepals form into a cup with five narrow lanceolate teeth. Corolla papilionaceous and yellowish in colour. Stamens are ten, nine in one bundle and the other separate; anthers are uniform. Ovary is densely covered with woolly hairs and bears a curved filiform style. Fruit is a compressed legume, ¼-½ inch long dehiscing by two sutures. Seeds are 1-2 in each pod and they are somewhat rounded and blackish, slightly compressed and polished.

Means of control.—As the weed is not gregarious handpulling of any stray plants that may be found in cultivated fields, is the best way of eradicating the plant before it is in flower.

1. *Rothia trifoliata*, Pers.—A prostrate or ascending, much-branched annual with digitately three-foliolate leaves and long compressed pods. Common in light soils of most, dry districts, in cultivated and waste places.

2. *Desmodium triflorum*, DC.—A much-branched, gregarious prostrate and ascending herb with wiry branches and usually small, round, trifoliolate leaves and white or pink flowers. A weed in pasture lands and bunds of rice fields, in all plains districts.

Tamil: Nilamparanda.
Malayalam: Cherupulladi.
Telugu: Munta Mandu; Avideru.

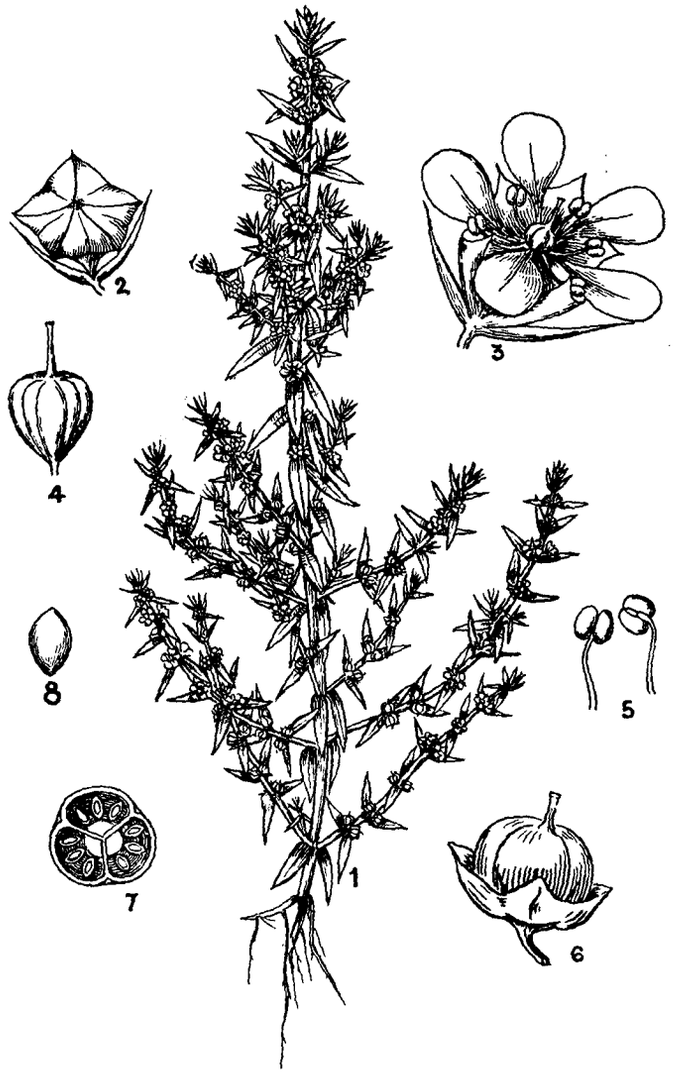
II. *Caesalpinioideae*—The Caesalpinia Family; The Tamarind Family.—Herbs, shrubs or trees with pinnately compound leaves. Flowers are zygomorphic. Sepals are 4-5 and imbricate. Petals are five, the uppermost being innermost in bud. Stamens are ten, some of which are usually aborted. Pod is dehiscent or not. Seeds may sometimes have endosperm.

Cassia occidentalis, *Linn.*

Plate 54.

English: Negro-coffee.
Tamil: Peyavarai; Thagarai.
Malayalam: Ponnaveeram.
Telugu: Kasivinda.
Flowering and fruiting time: June-January.
Habit: An annual undershrub.
Habitat: Waste places, meadows and sometimes in the hills.
Range: All plains districts
Propagation: By seed.

The plant is a fetid smelling, diffusely much branched undershrub, 2-5 feet high with a rather deep-seated woody tap root. At



ROTALA DENSIFLORA, *Koehne.*

PLATE 55.—Figs. 1. Entire plant. 2. Flower bud. 3. Flower. 4. Pistil. 5. Stamens. 6. Fruit. 7. Cross section of fruit. 8. Seed.

Lythraceae.

THE HENNA FAMILY.

Herbs, shrubs or trees usually with decussate leaves. Flowers are regular or not. Calyx tube has 3–6, valvate lobes. Petals, if present, are attached to the mouth of the calyx tube and are as many as the lobes of the calyx and alternating with them. Stamens are usually as many or twice as many as calyx lobes and inserted on the calyx tube within. Ovary is usually superior, 1–6 celled and many ovuled. Fruit is a many seeded capsule.

The family is chiefly a tropical one. The name is given, perhaps, in allusion to the colour of flowers, or the blood coloured dye contained by some species. *Greek* Lythrum—blood.

Rotala densiflora, *Koehne.*

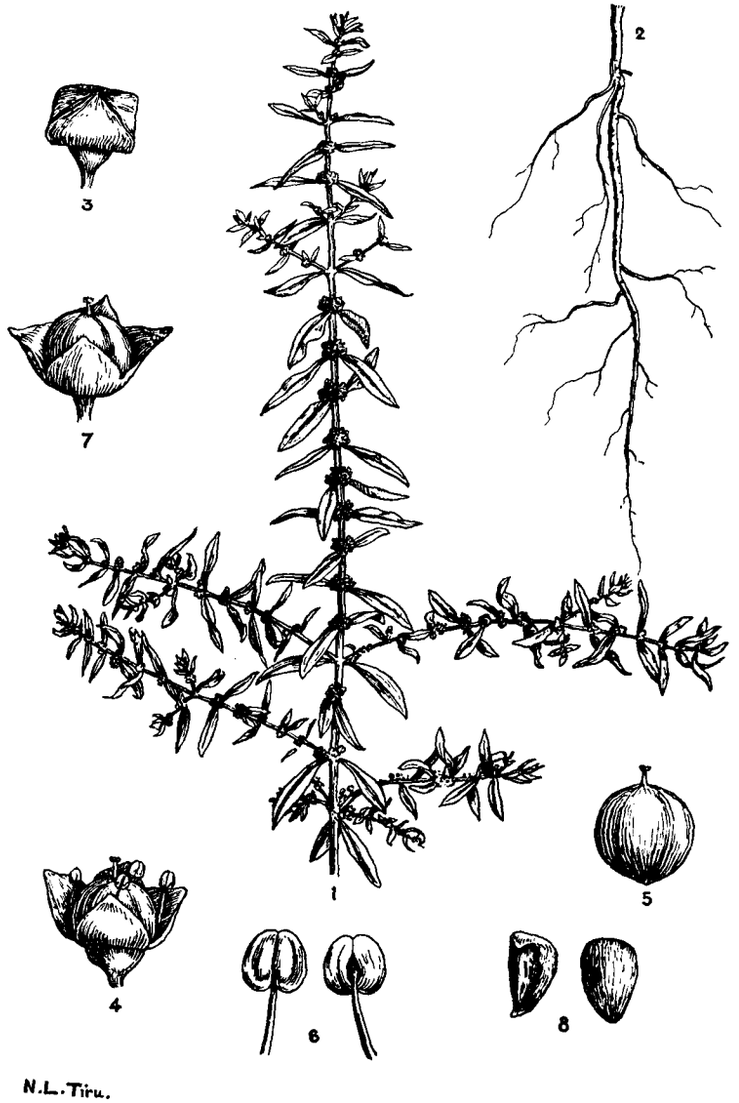
Plate 55.

Habit: A herb.
Habitat: Moist places.
Range: Most plains districts.
Propagation: By seed.
Flowering and fruiting time: November–February.

An erect annual herb with many spreading and ascending branches bearing numerous light blue or purple flowers. It commonly occurs in wet lands along channels.

The stem is four-sided and rooting at the base. Leaves are sessile, opposite, decussate, elliptic-oblong or linear-elliptic and acute at both ends; but those on the side branches are much reduced and look like bracts. Bracteoles are two and narrow. Flowers are very many, small, axillary, solitary or in clusters. Calyx is membranous with five, short teeth alternating with short pointed appendages; it becomes slightly dilated and rounded in fruit. Petals are five, persisting after withering, obovate, slightly emarginate at apex, longer than the calyx lobes and alternating with them at the mouth. Stamens are five and opposite the calyx lobes. Ovary is superior, within the calyx tube; ovules are many; style is short. Fruit is a small, red, globose capsule partly enclosed by the persistent calyx and dehiscing late by three valves. Seeds are straw coloured, somewhat round or broadly ellipsoid and concave on the inner faces.

Means of control.—Destroy seedlings and prevent seeding.



AMMANNIA BACCIFERA, *Linn.*

PLATE 56.—Figs. 1. Branch. 2. Root system. 3. Flower bud. 4. Flower. 5. Pistil. 6. Anthers. 7. Fruit with calyx. 8. Seed.

Ammannia baccifera, *Linn.*

Plate 56.

Tamil: Kalluruvi; Neermael Neruppu.
Malayalam: Kallarvanchi.
Telugu: Agnivenda-paku.
Flowering and fruiting time: August-March.
Habit: An annual herb.
Habitat: Wet places.
Range: All plains districts.
Propagation: By seed.
Number of seeds: Innumerable.

An erect, glabrous, branching herb, 1–2 feet high, usually met with in large numbers in rice fields and tank beds. The branches at the base are long becoming shorter towards the top. Leaves are an inch or more long, opposite, decussate, sessile, narrowly oblong and tapering at base; stipules are very minute and deciduous. Flowers are very small, in dense axillary clusters. Bracts are minute and membranous. Pedicels are very short. Calyx is four-toothed, the teeth being triangular. Petals are absent. Stamens are four on the calyx tube and filaments are very short. Ovary is superior with one cavity and many ovules. Style is short and erect; stigma is somewhat round. Fruit is a small, red, globose capsule breaking open irregularly at the top and partly enclosed by the persistent calyx. Seeds are minute, very many, brownish red, somewhat round and excavated on the inner surface.

The weed is said to be extremely harmful to paddy especially when fields get dry due to scarcity of water-supply.

Means of control.—The best remedy seems to be handpulling before flowering time. On no account should the capsules be allowed to mature.

Economic importance.—Leaves are used to blister skin. Juice in small doses is said to be given to animals in heat, to put down sexual appetite.

Var. *ægyptiaca*, Koehne. Has leaves which are cordate at base and larger flowers and capsules. It is found in most districts of the Circars and the Deccan rising up to 5,000 feet in the Nilgiri Hills.

Ammannia octandra, Linn.f.—An erect, branched, annual herb with cordate leaves and pretty large, red flowers. It is a gregarious weed in rice fields and borders of tanks, in most coastal districts, especially those on the East Coast.

LUDWIGIA PARVIFLORA, *Roxb.*

PLATE 57.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4. Anthers. 5. Fruit. 6. Longitudinal section of fruit. 7. Cross section of fruit. 8. Seed.

Onagraceae.

THE EVENING PRIMROSE FAMILY.

Herbs or undershrubs with alternate or opposite exstipulate leaves. Flowers are bi-sexual, regular or irregular. Calyx lobes are 2–5 and valvate. Petals alternate with calyx lobes. Stamens are as many or twice as many as petals. Ovary is inferior or half-inferior, often 4-celled, with many ovules in each cell. Fruit is often a capsule with numerous small seeds having a little or no endosperm.

Members of the family are distributed mostly in the temperate regions of the world.

Ludwigia parviflora, *Roxb.*

Plate 57.

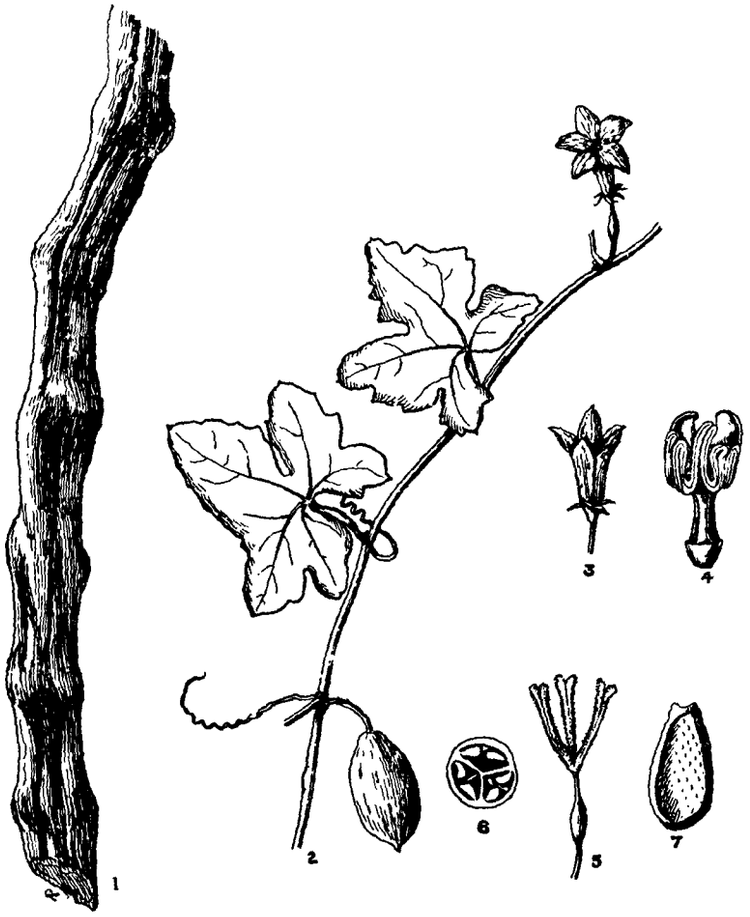
Flowering and fruiting time: October–March and May–June in Ganjām and Vizagapatam districts.
Habit: An annual herb.
Habitat: Wet situations as rice fields, etc.
Range: In most districts.
Propagation: By seed.

An erect, glabrous, many branched annual, ½–2 feet high, with yellow flowers and fruits somewhat resembling cloves.

Stem is smooth, pinkish and angular. Leaves are 2½ inches or more long, simple, alternate, narrowly lance-shaped, acute and tapering at base into a short petiole. Flowers are axillary, solitary, or in clusters of 2–3, subsessile with 2, leaf-like bracteoles at base. Calyx lobes are 4–5, lanceolate and acute; petals are 4–5, yellow, elliptic and inserted below an epigynous disk. Stamens are 4–5, opposite the calyx lobes. Ovary is inferior, four-celled, with numerous ovules in many rows; style is erect and stigma is rounded. Fruit is ⅓ inch long, somewhat four-sided, pinkish or green with the calyx persisting at the top. It first opens by means of a hole at the apex and then by the walls breaking irregularly. Seeds are numerous, minute, ellipsoid, pink in colour and each with a small yellow raphe.

Means of control.—Pull out and destroy the plant in the seedling stage or before the flowering time and prevent seeding.

Jussiaea repaes, Linn.—A pretty herb, either creeping or floating on water, with spongy floats, and rooting at the nodes. Leaves



COCCINIA INDICA, *W. & A.*

PLATE. 58.—Figs. 1. Bit of old stem. 2. Bit of the branch of a female plant. 3. Male flower. 4. Stamens. 5. Pistil. 6. Transverse section of a fruit. 7. Seed.

are rounded at the apex and tapering at the base. Flowers are yellowish or white. The plant occurs along margins of ponds, water channels and in rice fields.

Tamil: Nir-krambu.

Cucurbitaceae.

THE GOURD FAMILY.

Herbs or undershrubs, often climbing by means of tendrils. Leaves are simple, alternate, usually exstipulate, lobed and cordate at base. Flowers are regular, monœcious or dicœcious. Calyx tube is bell-shaped with 5 lobes. It is united with the ovary in female flowers. Petals are 5, united or free. Stamens are three attached to the calyx tube; two of the anthers are 2-celled each and the third is 1-celled. The anther-lobes are straight or wavy. Pistillode in a male flower and staminode in a female flower are usually present. Ovary is inferior, 3-carpelled and 1-celled with numerous ovules on parietal placentas. Style is one and stigmas are three. Fruit is a berry and seeds are exendospermous.

Distribution.—Chiefly in the warm and tropical regions of the world.

Cucurbita is a Latin name for the gourd.

Coccinia indica, *W. & A.*

Plate 58.

Tamil: Kovai.
Telugu: Kakidonda; Kaidonda.
Malayalam: Kova.
Habit: A climbing herb.
Habitat: Hedges and bushes.
Range: Most plains districts.
Propagation: By seed and the tuberous root.
Flowering: July–October.
Fruiting: September–January.

A prostrate or climbing, branched herb with a thick tap-root. The branches are glabrous, grooved and have simple tendrils. Leaves are simple, alternate, exstipulate, 2–4 inches in diameter broadly ovate, cordate at base, with five obtuse, apiculate lobes; sometimes the leaves are deeply lobed and the lobes are sinuately

cut, in the same plant. There are two impressed glands above the leaf base. The leaves are often glabrous but are sometimes rough with pappillæ. Flowers are dicœcious, solitary and axillary. Male flowers: Calyx is cup-like below, with 5 linear teeth. Corolla is about an inch across, white, bell-shaped with 5 lobes divided to the middle and pubescent within. Stamens are 3; filaments are connate; anthers are flexuose and united. Female flowers: Calyx and corolla are as in the male. Staminodes are 3, oblong, hairy and subulate. Ovary is inferior with 3 parietal placentas. Ovules are horizontal. Stigmas are 3 and bi-fid; lobes are unequal. Fruit is an oblong, ovoid berry, 1½–2 inches long, bright scarlet when ripe. Seeds are somewhat obovoid, rounded at the apex, margined and compressed.

Means of control.—The seeds are largely dispersed by birds that eat the fruits. Prevent the ripening of fruits by cutting off branches.

Economic importance.—Fruits are edible. The tap-root is useful in the treatment of diabetes. Leaves are medicinal, used in fevers.

1. *Cucumis trigonus*, Roxb.—A perennial, monœcious, scabrid herb with branches usually 1–2 feet long, trailing on the ground and clothed with stiff hairs. Tendrils are simple. Leaves are rough, deeply or shallowly lobed. Flowers are yellow and males are in small clusters on short peduncles; females are often solitary. Fruit is an ellipsoid or an oblong berry, yellow when ripe and striped with green. It is common in waste places of all dry districts.

Tamil: Thummatti Kai.

Telugu: Budama Kaya.

2. *Citrullus Colocynthis*, Schrad.—A perennial, scabrid herb with rather long, angular and rough branches trailing on the ground. Tendrils are simple or bi-fid. Leaves are deeply divided, lobed and very rough below. The middle lobe is the longest. Flowers are monœcious, yellow and solitary, axillary. Fruit is a globose berry, about two inches across, blotched with green and white ommon in dry, waste or sandy places in many dry districts

English: The Bitter Apple.

Tamil: Pey Kummatti.

Telugu: Karu Pucha Kaya.

Cactaceae.

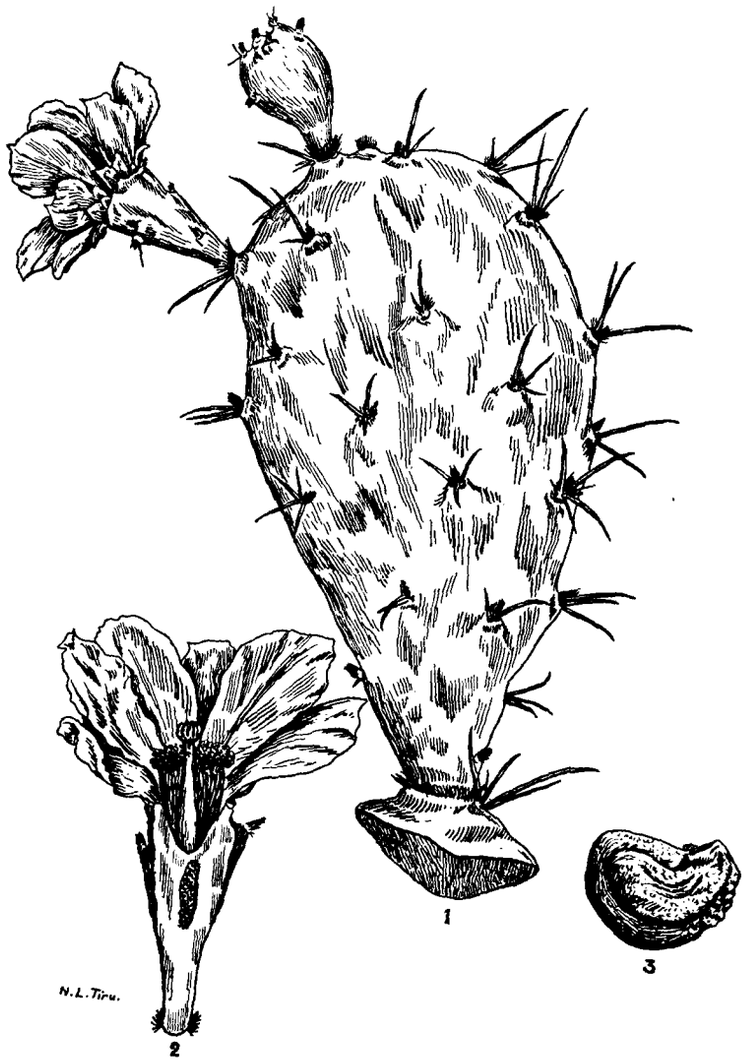
THE CACTUS FAMILY.

THE PRICKLY-PEAR FAMILY.

Herbs, shrubs or trees with fleshy stems, with or without leaves and clusters of spines. Flowers are single, showy and regular. Calyx-lobes are few to many and petals are many. Stamens are numerous. Ovary is inferior, one-celled, with many horizontal ovules on parietal placentas. Fruit is a many-seeded berry.

Most species are natives of the dry tropical regions of America.

Cactus is an old name for any spiny plant.



OPUNTIA DILLENII, *Haw.*

PLATE 59.—Figs. 1. Joint (portion of branch) with flower and fruit. 2. Flower with ovary longitudinally cut open. 3. Seed.

Opuntia Dillenii, *Haw.*

Plate 59.

English: The Prickly-pear.
Tamil: Nagadali; Chappathi-kalli.
Telugu: Nagajemudu; Brahma-jemudu.
Malayalam: Naga-mullu.
Flowering and fruiting time: Perhaps throughout the year, especially from October–June.
Habit: A fleshy shrub.
Habitat: Hedges, waste places, etc.
Range: All plains districts on the East Coast and inland. Not common on the West Coast.
Propagation: By seed and bits of branches.

An extremely gregarious and aggressive plant. It is a native of America, introduced into the Presidency before 1786. It has since spread far and wide and is now found everywhere in thickets, on tank bunds and near villages. Its rapid spread is due to the facility of propagation by its numerous seeds and the tenacity with which cuttings are capable of rooting and establishing themselves even under very dry conditions.

Undisturbed, it grows to a height of even 8–10 feet and is much branched. The branches are cylindric at base, resembling trunks of trees and much spreading above and flattened. They are 6–9 inches long, ovate, fleshly and jointed, the joints are stout, glaucous, bluish green and surrounded by a whorl of spines. Very young branches have small scale-like leaves which drop away early, but the old ones are covered with scattered clusters of 4–5 yellow, sharp thorns which are 1–1½ inches long, somewhat round or flattened at base and slightly bent. Each cluster is surrounded at base by numerous short prickles. Flowers are 3–4 inches across, showy and yellow; they are solitary and often arise on the margin of the flattened branch from amidst a cluster of spines. Sepals are many, the outer being smaller, broadly ovate and pointed; the inner are larger, somewhat wedge-shaped with membranous margins, imperceptibly merging into the petals. Petals are yellow, up to 1½ inches long, nine or more, ob-ovate, rounded above and membranous. Stamens are numerous, free and attached to the sides of an epigynous depression at the base of the petals. Anthers are two-celled and pollen grains are sticky. Ovary is inferior and one-celled. Ovules are many, attached to the sides of the ovary; style is thick and erect and stigmatic lobes are seven or more. Fruit is an ob-ovate berry, narrowed towards the base and depressed at the top. It is full of purple flesh and juicy when ripe. Seeds are many, pink, somewhat kidney-shaped, compressed, with a hard seed-coat.

Means of control *.—The complete eradication of the pest has been found to be a matter of great difficulty.

Before the fruit is ripe, cut the plant as low to the ground as possible and burn or bury it. When sprouts come up gather and burn dry leaves over them and kill the seedlings. Clearing a place once, of the weed and leaving it neglected for a long time as is often done, is absolutely of no use. Because the plant comes up and establishes itself in no time.

It is not quite desirable to use it as a hedge plant for cultivated fields unless it is kept in check by frequently trimming or cutting the branches.

The fruit being edible, seeds are easily dispersed and that increases the spread of the plant. So, ripening of fruit should always be prevented.

Economic importance.—Fruit is eaten by children of the poorer classes and it is a refrigerent. Prickly-pear makes a very good impenetrable fence and can be grown where the cost of land is of no consideration as in jungle areas. Good artificial farm-yard manure can be made by composting the plant.

Opuntia elatior, Mill.—This species is often mistaken for *Opuntia Dillenii*, Haw., from which it is distinguished by the straight spines and pink flowers.

It is common in many districts on the Coromandel Coast and in Bellary.

* The pest is being successfully controlled by the *Madras Agricultural Department* by the help of the Cochineal insect.

Aizoaceae.

THE CARPET WEED FAMILY.

Herbs with simple, opposite or falsely whorled leaves. Flowers are regular and usually bisexual. Sepals are 4–5. Petals may be present or absent. Stamens are few or many. Ovary is superior or inferior, with many ovules. Fruit is a capsule often dehiscing transversely. Seeds are endospermous, and embryo is curved.

Distribution.—Tropical and sub-tropical regions of the world.

The genus *Trianthema* is represented by a few species in the Madras Presidency and three of them *Trianthema Portulacastrum*, Linn., *T. decandra*, Linn., *T. triquetra*, Rottl., are rather common in arable and garden lands. The generic name is given on account of the cymose inflorescence and it means three-flowered (Trei = three ; anthos = flower).

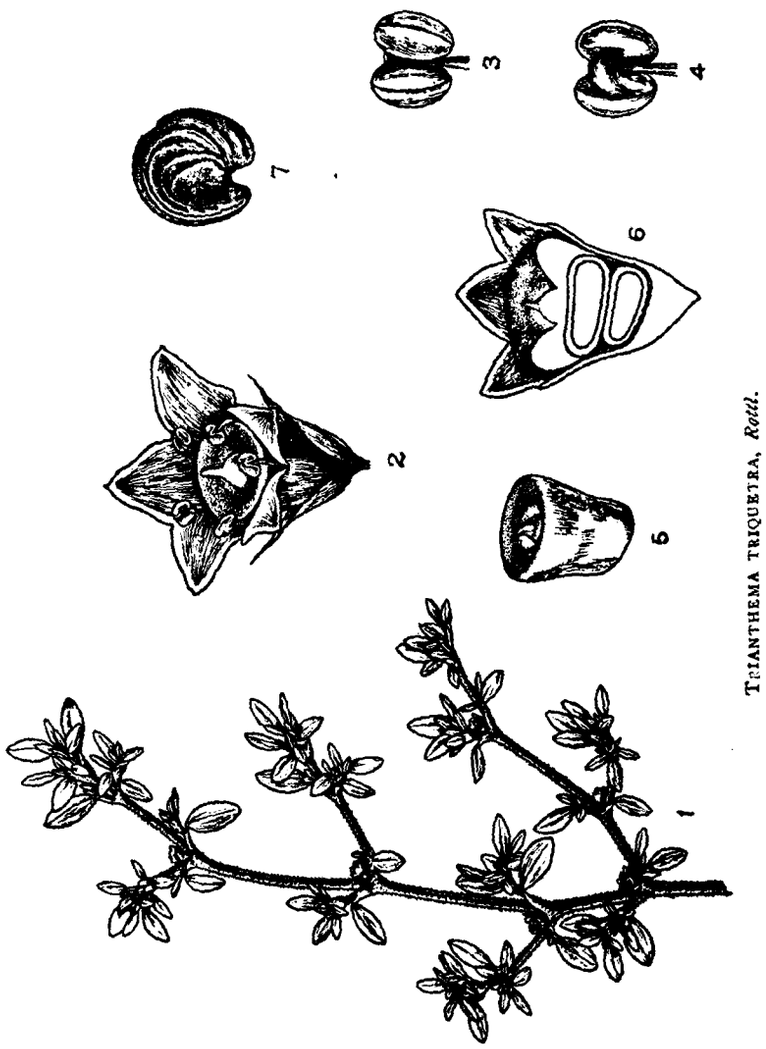


PLATE 61.—Figs. 1. Branch. 2. Flower. 3 and 4. Anthers 5. Fruit. 6. Longitudinal section of fruit. 7. Seed.
TRIANTHEMA TRIQUETRA, *Rottl.*

the plant if it is in fruit; where it is not possible to prevent cattle from feeding on it, their dung should either be composted for a few years so as to kill the seeds or it should be rejected.

Smothering crops do not seem to suppress the growth of the weed.

It is quite possible to eradicate the pest provided the ryot is determined to get rid of it and follows the means of control mentioned above.

Economic importance.—Leaves and stems are said to be used as a vegetable by poor people. Decoction of the plant is a remedy for rheumatism. It is an antidote for alcoholic poison; but it should not be taken with gingelly oil or grape wine. The property of increasing the secretion of milk, when it is eaten by females, is attributed to this plant.

Trianthema triquetra, *Rottl.*

Plate 61.

Tamil: Siru Sharanai.
Telugu: Kukkapula Koora.
Flowering and seeding time: April–November.
Habit: A perennial herb.
Habitat: Coast districts, in sandy or dry places and also in saline soils.
Propagation: By seed.

The plant is commonly met with in dry situations and is sometimes found to encroach upon cultivated fields. It is a very hardy perennial with many prostrate branches spreading in all directions and small, thick, fleshy, mucilaginous leaves. Sometimes the main stalk is very stout and the branches spread to a length of 2 feet or more.

Stem is slender, striate, minutely papillose and the internodes are sometimes very short giving a sort of clustered appearance to the leaves. Leaves are opposite, unequal, narrowly elliptic with short leafstalks. Flowers are many, small, in dense clusters in the axils of leaves. Calyx is 5-lobed and the lobes are triangular. Stamens are 5. Fruit has at its top, a circular corky disc depressed in the centre. The disc falls away with one seed attached beneath, when the fruit breaks open. Seeds are 2 in each fruit, discoid, and they have concentric, broken, undulating raised lines.

Means of control.—The weed is very aggressive only in neglected places. In ordinary cultivated fields it is rarely seen. Clean cultivation is the best remedy for suppressing the growth of the weed.

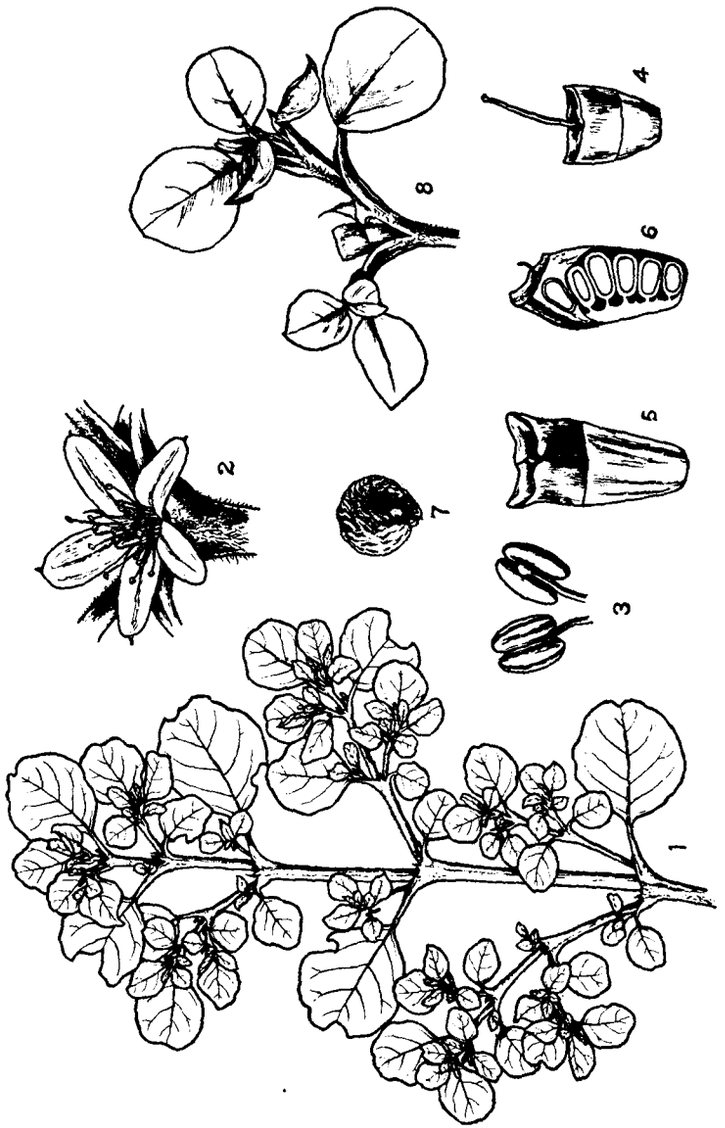


PLATE 60.—Figs. 1. Branch. 2. Flower. 3. Anthers. 4. Pistil. 5. Fruit. 6. Longitudinal section of fruit. 7. Seed. 8. A small branch with stipular sheath open to show position of an immersed fruit.

TRIANTHEMA PORTULACASTRUM, *Linn.*

Trianthema Portulacastrum, *Linn.*

Plate 60.

Tamil : Saranai.
Malayalam : Pasalikeera.
Telugu : Galjeru ; Ambatimadu.
Flowering and fruiting time : May–June ; August.
Habit : A prostrate, much branched herb.
Habitat : Waste lands and cultivated places of most districts in the plains.
Propagation : By seeds and cuttings.

The plant is one of the most conspicuous and aggressive weeds of cultivation. It thrives well in both dry and garden lands. On account of its gregarious nature and prostrate habit it becomes so bad in cultivated fields that the growth of any crop is almost impossible.

It is a succulent herb. The stem is round, striate, glabrous below and hairy above. Branches arise from every node. Leaves are slightly fleshy in opposite unequal pairs. Petioles are dilated at their bases and are united at the nodes to form a sheath. Stipules are two, linear, springing from the edges of the sheath. Leaves are round or ovate, glabrous, green above and pale and glistening below. Flowers are solitary, sessile and seated in the pouch-like petiolar sheath of the smaller leaf. Sepals are five, free, ovate, green outside and pinkish inside. Stamens are 9–21 with white filaments and pink anthers. Ovary is half inferior and truncate, the style being solitary. Fruit is a capsule, almost hidden in the petiolar sheath and breaking transversely into an upper lid containing two seeds and a lower membranous cup containing usually ten, rarely seven or eleven seeds which are dull black with raised, interrupted, concentric lines.

The plant spreads with remarkable rapidity on account of the numerous seeds produced. They have hard seed-coats which enable them to withstand unfavourable conditions and keep them viable for a long time even at 80°C. Cattle eat the plants and the seeds pass through the intestines undigested and come out with dung. When farm yard manure containing the dung is spread in the field the seeds germinate and start a fresh colony of the pest.

Means of control.—Never allow the plant to mature seed. In fields badly infested with the weed always have an eye for the seedlings and destroy them. Repeat the same operation in three or four successive seasons. Do not cut the plants in fruit and leave them in the field as they retain enough vitality to mature the fruit and to distribute the seed. All such plants may be buried deep or burnt if possible. Do not feed cattle with

PLATE 62.—Figs. 1. Branch. 2. Inflorescence. 3. Flower bud. 4. Flower. 5. Longitudinal section of flower 6. Anthers. 7. Pistil. 8. Fruit. 9. Seed.

TRIANTHEMA DECANDRA, *Linn.*

Like its allies *T. Portulacastrum* and *T. decandra* this also, is very profuse in seed production and as such the same methods of control as have been suggested for the above two may be tried with advantage.

Economic importance.—The seeds are said to be eaten in times of famine.

Trianthema decandra, *Linn.*

Plate 62.

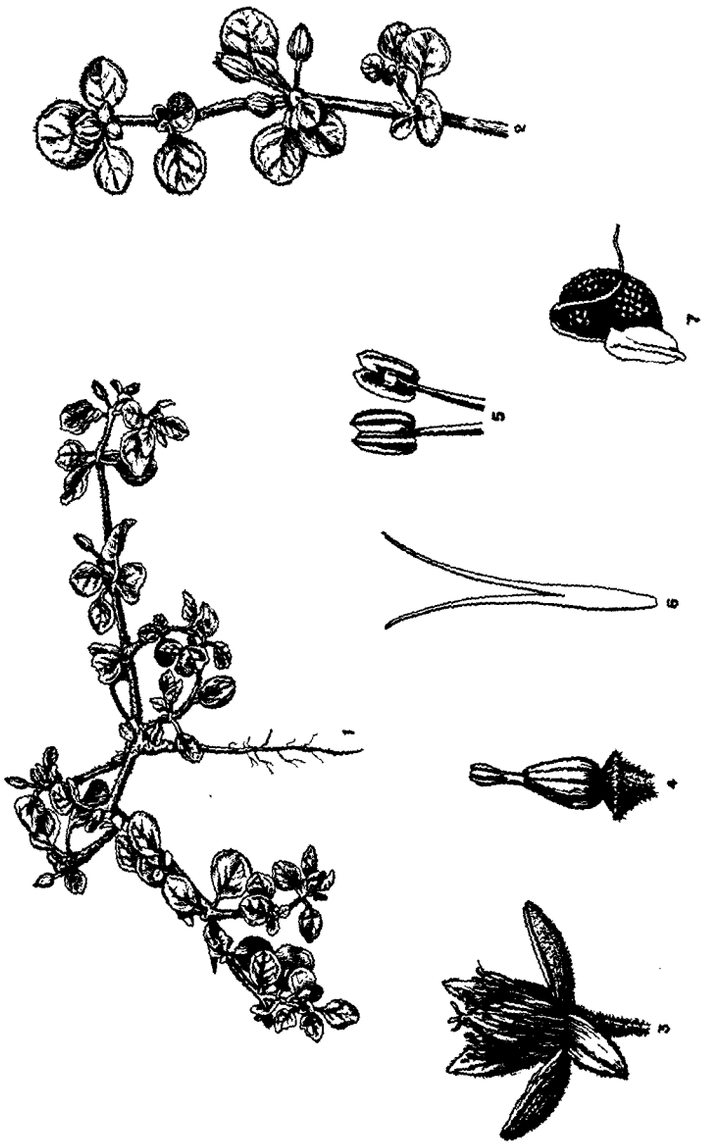
Tamil: Vellai Sharanai.
Telugu: Tella Galijeru.
Flowering time: After the monsoons.
Seeding time: July-August; October-November.
Habit: A prostrate perennial herb.
Habitat: Dry and garden lands of the Deccan and Carnatic.
Propagation: By seed.

The plant is a diffuse, hardy, perennial herb with long prostrate branches 1–3 feet or even 7 feet long, and a stout tap-root ½–1¼ inches in diameter.

The stem is round, slightly angular, glabrous below and hairy above. Leaves are simple somewhat fleshy in opposite unequal pairs. Leaf-stalk is ¼–½ inch long, hairy, dilated at the base and clasping the stem. The blade is elliptic-oblong usually with a wavy margin and almost glabrous on both the sides. Flowers are pink, in dense, axillary, sessile or shortly stalked, sub-umbellate cymes. Bracts and bracteoles are membranous and lanceolate. Sepals are 5, oblong, each with a prominent process on the back close to the apex, green outside and bright pink inside. Petals are absent. Stamens are pink, 10–15 or more. Ovary is superior, with two styles. Fruit is a capsule bursting transversely into an upper truncate portion carrying two seeds and a lower smaller membranous cup also with two seeds. Seeds are round dull black and rugose.

Under favourable conditions particularly in neglected places, this weed is capable of attaining large dimensions. A single specimen collected in August at the Central Farm, Coimbatore, on dry red soil occupied an area of about 80 sq.ft. Still, the weed is neither so troublesome nor so wild in its distribution as *T. Portulacastrum*. It seems to be confined to the Madras Presidency.

Means of control.—Since the weed is very profuse in seed production it is safe to prevent the formation of seed by destroying



MOLLUGO LOTOIDES, *O. Kze.*

PLATE 63.—Figs. 1. Entire plant. 2. Branch. 3. Flower. 4. Pistil with top of pedicel. 5. Anthers. 6. Staminode. 7. Seed.

N.L. Tirr

plants when they are young. The stout stem and tap-root are full of vitality and they are capable of producing fresh shoots when the main shoot is separated; so they should be frequently cut deep into the soil and a small quantity of a strong solution of common salt may be poured into the hole so made. A coating of tar may also be applied to the cut surface.

Economic importance.—Root is medicinal being used in asthma. The juice of the leaves dropped into the nostrils relieves one-sided headache.

Mollugo lotoides, *O. Kze*

Plate 63.

Tamil: Siru Seruppadi; Siruvayal.
Telugu: Chadarasi Koora.
Flowering and seeding time: May–July; February–March.
Habit: Procumbent herb.
Habitat: The Deccan and Carnatic in dry places.
Propagation: By seed.
Number of seeds: About 50,000.

It is a very hardy, annual herb with many prostrate or ascending branches radiating on all sides. It is densely covered all over with stellate hairs; as such the plant is able to withstand severe drought.

Branches are ½–1½ feet long. Tap-root is rather stout and woody with a few slender lateral roots. Leaves are small, simple, unequal in whorls of 3–5. Petioles are short. Blade is sub-orbicular or obovate or elliptic, tapering towards the base, and densely, stellately hairy on both the surfaces. Flowers are 2–6, shortly stalked, in sub-lateral fascicles opposite the leaves. Bracts are small. Calyx is persistent and consists of 5 elliptic acute or obovate oblong sepals which are densely hairy on the back. Petals are absent. Stamens are 10–15. The filaments are free, below the ovary, with a few intervening bi-fid staminodes. Anthers are 2-lobed. Ovary is superior, ovoid, glabrous, 5-lobed and 5-celled, each cell containing numerous ovules. Styles are 5, short and somewhat club-shaped. Fruit is a short, cylindric ovoid capsule with a membranous pericarp dehiscing loculicidally. Seeds are numerous, small, somewhat kidney-shaped, and dark brown in colour. These are covered with many minute raised lines of tubercular points. There is a scale-like white appendage at the hilum with a thread-like process which curves round the seed.

Means of control.—The persistence with which the weed makes its appearance in cultivated areas is largely due to the hardy nature of its seeds. The large number of seeds produced is dispersed all over the field by various agencies. These seeds are covered up and buried in the soil when the field is ploughed before the setting in of the monsoons, and as soon as rains are received the field is again ploughed to sow the coming crop. Then the seeds that have been lying dormant in the soil, are brought up to the surface where they begin to germinate. This is the best time for attacking the weed. Work a Guntaka if there is no crop in the field, or a hoe or a cultivator if the field happens to be in crop. Where this is not possible a thorough weeding with the handhoe ought to be resorted to. Under any circumstances the weed should not be allowed to mature its seed. Old plants in fruit should be burnt *in situ*.

Economic importance.—Dried plant is a useful purgative in abdominal diseases. Young shoots are cooked and eaten in curries.

1. *Mollugo oppositifolia*, Linn.—A much branched perennial sometimes trailing to a length of even 6 feet. The main root is deep seated. Leaves are small, obovate or rounded in whorls. Flowers are white on long pedicels in clusters at the nodes. It is common in most coastal districts, in dry places and fallow fields.

Tamil: Toora.

Telugu: Chedarasi Koora.

This plant may be mistaken for *Gisekia pharnaceoides*, Linn. (*Tamil*: Manali Keerai, *Telugu*: Isukadari Koora) belonging to the same family, which, however, can be easily made out by the apocarpous fruit.

2. *Mollugo pentaphylla*, Linn.—An erect, branched herb with the many basal leaves prostrate on the ground and the nodes having clusters of 3—5 or more, obovate leaves. Flowers are white and in panicles. It is a common weed, a
the Presidency and also at low elevations.

Tamil: Parpadaka Pullu.

Telugu: Parpatakum.

Umbelliferae.

THE PARSLEY FAMILY.

THE CORIANDER FAMILY.

Aromatic herbs, or rarely shrubs or trees with alternate, simple or compound, exstipulate leaves having sheathing petioles. Flowers are in simple or compound umbels. Limb of calyx is 5-toothed or absent. Petals are five, free, and stamens are five alternating with the petals. Ovary is inferior, 2-celled, each cell with a solitary ovule. Styles are two. Fruit breaks into mericarps which have oil canals in the fruit-coat.

Distribution.—Chiefly temperate and sub-tropical regions.

The name of the family is derived from the form of inflorescence.

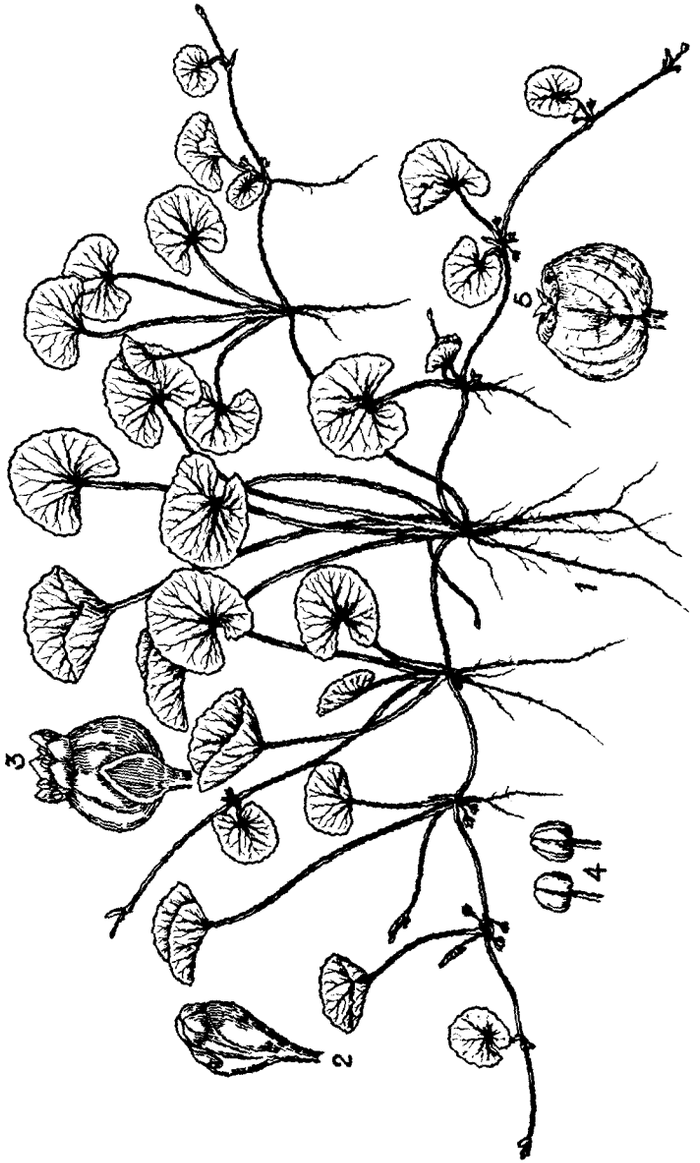


PLATE 64.—Figs. 1. Entire plant. 2. Flower bud. 3. Flower. 4. Anthers. 5. Fruit. CENTELLA ASIATICA, *Urban*.

Centella asiatica, *Urban*.

Plate 64.

English : Indian Penny-wort.
Tamil : Vallarai Keerai.
Malayalam : Kodangal.
Telugu : Manduka-brahma-kooraku ; Saraswathi Aku ; Bokkudu Chettu ; Babassa.
Flowering and fruiting time : September–April.
Habit : A prostrate herb.
Habitat : Moist situations.
Range : All plains districts and up to 6,000 feet in the hills.
Propagation : By bits of fruits.

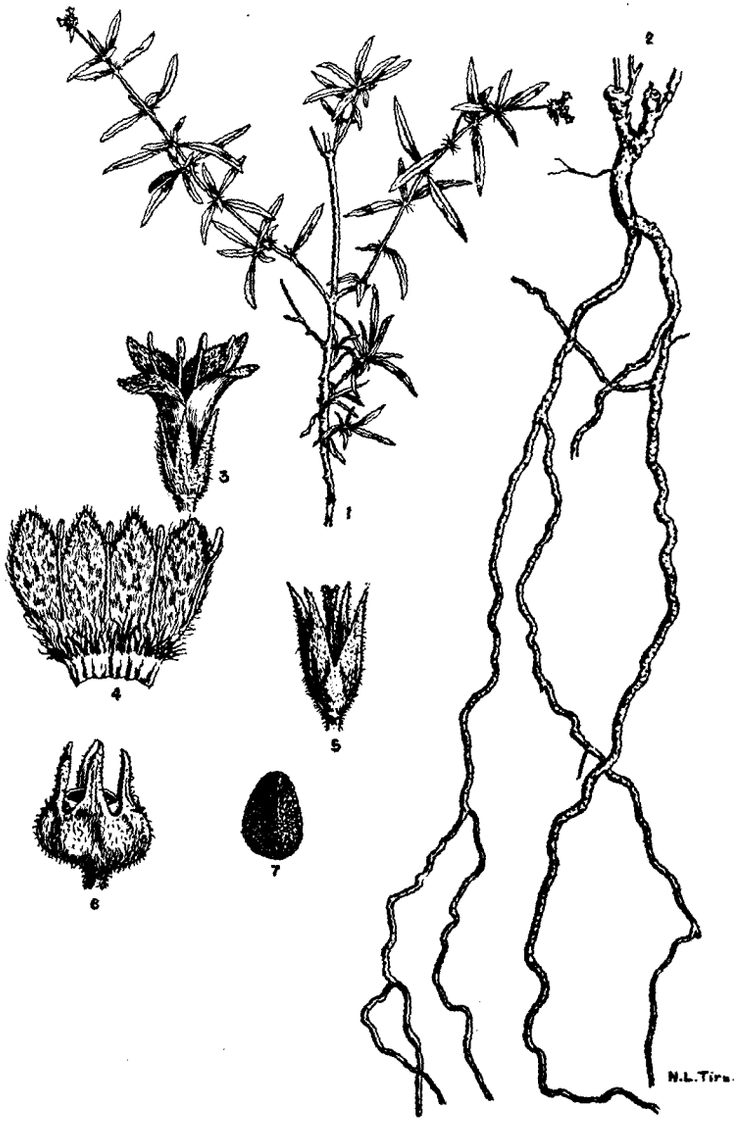
The plant is very often found in rice fields along bunds of irrigation channels. It can be made out from the round, somewhat fleshy, kidney-shaped leaves and long branches which are six feet or more long and trailing on the ground and rooting at the nodes.

The internodes are long, pinkish, glabrous and striate. Leaves are 1–2 inches or more across, simple, alternate, 2–5, arising from the axil of a scale-leaf at the node of the trailing branch ; petioles are long, hairy and grooved on the inner side ; stipules are membranous and united with the base of the petiole ; blade is kidney-shaped or somewhat round, usually broader than long with a deep angular sinus at base. The upper surface of the leaf is smooth while the lower is sparsely hairy ; margin is toothed. Flowers are small, sessile, red, usually three, in a simple umbel. The umbels are 2–5 together and axillary on short peduncles. Bracts of the involucre are two and ovate. Calyx is inconspicuous. Corolla is pinkish and it consists of 4–5 small, ovate-acute, imbricate petals. Stamens are as many as the petals and alternating with them. Anthers are pink, 2-celled, on short filaments. Ovary is inferior, 2-celled, each cell with a pendulous ovule, compressed and surmounted by a 2-lobed disk. Styles are two and stigmas are simple. Fruit is small, much compressed, breaking into two bits with 7–9 ridges.

Means of control.—The weed is best attacked in the seedling stage. When water flows in irrigation channels seedlings appear and can be destroyed by pulling or by lifting them with a chisel-hoe. Remove all branches by pulling at each node. Do not leave any nodes in the soil as they soon put forth new shoots.

Economic importance.—Leaves when used as fodder, increase the secretion of milk in cows.

The whole plant is highly medicinal. Root is said to be the most active part of the plant. It is a tonic and blood purifier and improves the memory. Fresh leaves eaten every day are believed to have the property of prolonging life.



OLDENLANDIA UMBELLATA, *Linn.*

PLATE 65.—Figs. 1. Branch. 2 Root system. 3. Flower. 4. Corolla open. 5. Flower without corolla. 6. Fruit. 7. Seed.

Rubiaceae.

THE MADDER FAMILY.

THE COFFEE FAMILY.

Herbs, shrubs or trees. Leaves are simple, opposite or whorled with interpetiolar stipules. Flowers are regular and hermaphrodite. Limb of calyx is lobed or not. Corolla is gamopetalous with 4–5 lobes. Stamens are as many as corolla lobes and epipetalous. Ovary is inferior and 2–10 celled, with one or more ovules in each cell. Fruit is a capsule, berry or drupe, and seeds are endospermous.

Distribution.—Sub-tropical and tropical regions.

The name of the family is from *Ruber* which means red, after a red dye obtained from some species.

Oldenlandia umbellata, *Linn.*

Plate 65.

English: Chay Root; Indian Madder.
Tamil: Saya Vair.
Telugu: Chiri-veru.
Flowering and fruiting time: July–September; October–January.
Habit: Small herb.
Habitat: Dry, sandy and grassy places of the Circars, the Deccan and the Carnatic.
Propagation: By seed.

It is a small, stiff, diffusely branching, biennial or perennial herb with very deep seated, simple or branched, somewhat fleshy or brittle roots which may at times grow to a length of two feet or more. The branches are either prostrate or ascending and woody at the base. The leaves are simple, opposite or sometimes in dense clusters, sessile, linear, acute and hispid. Flowers are small, white, 2–10 in cymose stalked umbels; pedicels are short. Corolla tube is short with four teeth, and hairy inside. Stamens are as many as the lobes of the corolla. Ovary is inferior, 2-celled and many ovuled. Capsule is rounded, convex at the top and surmounted by the four calyx teeth; it dehisces loculicidally at the top. Seeds are very many, minute, angular and indistinctly reticulate.

Means of control.—In cultivated fields destroy the weed by cutting the main root deep into the soil with the help of a chisel-hoe before the seeding time. In pastures the spread of the plant may be prevented by using grass cutting swords and separating the flowering tops.

1. *Oldenlandia corymbosa*, Linn.—An erect or a prostrate, diffusely branched, annual herb with white flowers usually in pairs, on prominent, slender pedicels rising from the top of a peduncle. Leaves are linear or linear-lanceolate. It is a common weed in both dry and moist places, in many districts.

Telugu: Verri Nelavemu.

2. *Oldenlandia herbacea*, Roxb.—An erect herb resembling *Oldenlandia corymbosa*, Linn., from which it differs in having usually solitary peduncles; and the top of capsule is protruding. Common in most districts.

3. *Borreria hispida*, K. Sch.—A perennial, hispid herb with long prostrate or procumbent branches usually dark pink in colour, and axillary clusters of mauve flowers and hard fruits. Seeds look like miniature coffee seeds. It is a weed of cultivated and waste dry, light soils, in all plains districts, and up to 3,000 feet in the hills.

Tamil: Natha Churi.

Malayalam: Konal Churukki.

Telugu: Madana Budama.

4. *Dentella repens*, Forst.—A small, dichotomously branched, prostrate herb with small, pale green leaves, and rooting at nodes. It is common in rice fields, in all plains districts where the soil is moist.

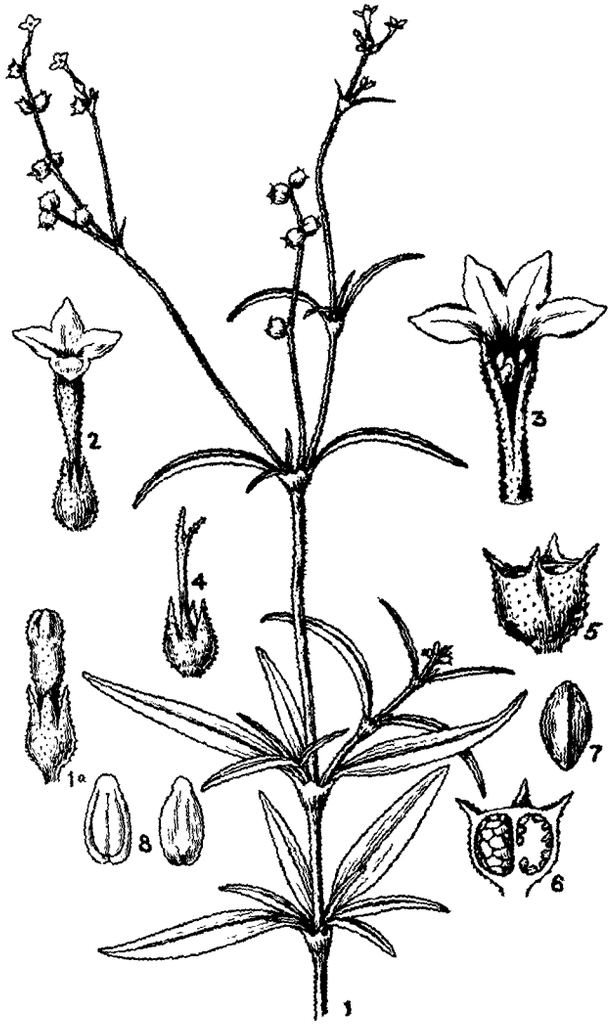
Compositae.

THE COMPOSITE FAMILY.

THE CHRYSANTHEMUM FAMILY.

Herbs, shrubs or trees with simple or compound, alternate or opposite, exstipulate leaves. Flowers are unisexual or bisexual, tubular or ligulate, paleate or not, and collected in a head or heads on the top of the enlarged peduncle, and surrounded by an involucre of bracts. A head may have all tubular or all ligulate or both tubular and ligulate flowers. Calyx is absent or represented by scales or hairs called the pappus. Corolla is tubular or strap-shaped. Stamens are five, epipetalous and anthers are united. Ovary is inferior, 1-celled, with a solitary ovule. Fruit is an achene. Seeds are ex-endospermous.

A large family distributed all over the globe, and its name is derived from the composite inflorescence.



OLDENLANDIA ASPERA, *DC.*

PLATE 66.—Figs. 1. Branch. 1a. Flower bud. 2. Flower. 3. Corolla cut open to show anthers. 4. Pistil. 5. Fruit. 6. Longitudinal section of fruit. 7. Seed. 8. Anthers.

Economic importance.—This species of *Oldenlandia* was once cultivated for the valuable red dye contained in the bark of the root. Leaves are expectorant and are used in asthma and consumption. Root is said to be a specific for snake bite.

Oldenlandia aspera, *DC.*

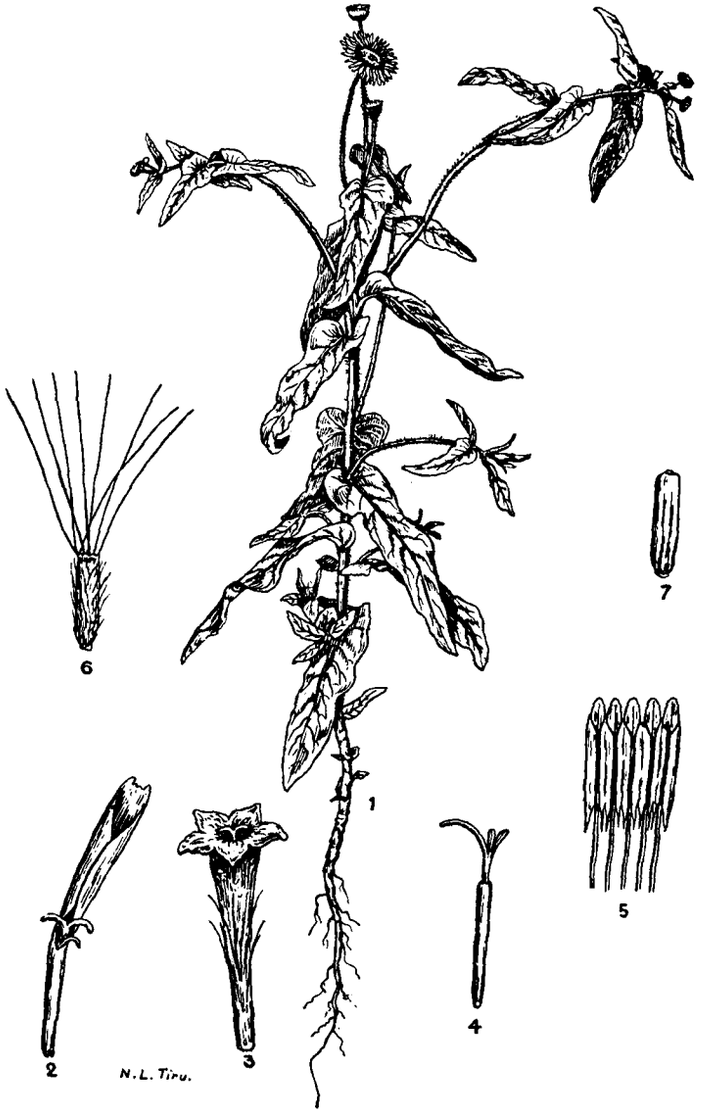
Plate 66.

Flowering and seeding time: September-November.
Habit: A herbaceous annual.
Habitat: In dry loamy soils of Cuddapah, Anantapur, Bellary and Coimbatore.
Propagation: By seed.
Number of seeds: 2,000-5,000.

It is a somewhat slender erect plant about 18" high with narrow pointed leaves. The plant makes its appearance after the setting in of the north-east monsoon when the soil is pretty moist, but it is capable of growing under dry conditions. Ordinarily this is not found in cultivated fields, but in fields lying fallow, it is occasionally met with.

The whole plant excepting the leaves is covered with short scattered scabrid points. Branches arise from the base and are trichotomous. Leaves are simple, opposite and in fascicled whorls, sub-sessile, linear-lanceolate, glabrous with slightly recurved margins. Stipules are interpetiolar, membranous, white with 1-3 bristles of varying length. Flowers are arranged in terminal cymes on a long peduncle. They are small, solitary or in pairs, sessile or shortly stalked. Calyx is small four-toothed and persistent. Corolla tube is slender with four lobes which are light-blue or white in colour. Stamens are four attached to the corolla and they consist of sessile anthers. Ovary is inferior, 2-celled with numerous ovules. Style has two stigmatic branches. Fruit is a broad, 2-lobed capsule surmounted by the four calyx teeth and opening by a loculicidal slit at the top. Seeds are very many, minute, angular and minutely pitted.

Means of control.—The weed appears in the same place year after year. This is largely due to the large number of seeds produced which lie dormant and start the following year's crop of weeds. Handpulling at the time of flowering is the easiest and the best remedy. As all the seeds in the soil do not germinate in the same season, the operation of weeding should be done successively for three or four seasons till no more specimens of the weed are seen.



VICOA INDICA, *DC.*

PLATE 68.—Figs. 1. Entire plant. 2. Female floret (Ray). 3. Bisexual floret. 4. Female floret. 5. Stamens. 6 and 7. Achenes.

Vicoa indica, *DC.*

Plate 68.

Tamil: Mookkutti Poondu.
Flowering and fruiting time: August–February.
Habit: An annual herb.
Habitat: Meadows, cultivated fields and waste places as also in the undergrowth of deciduous forests.
Range: In most districts.
Propagation: By achenes.

An erect branching annual, ½–2 feet high, conspicuous and appearing in numbers in open grassy places. The stem is pinkish, round, striate and puberulous. Leaves are 2–3 inches long, simple, alternate, sessile, oblong-lanceolate and auricled at the base. The upper leaves are smaller and somewhat clasping the stem. Margin is serrate and slightly recurved. Heads are conspicuous, yellow, ¼–¾ inch across, terminal or leaf opposed at the tops of branches on long slender peduncles. Involucre of bracts is in many series, the outer being smaller and linear. Outer ray florets are in 1–2 rows, ligulate and female. The ligule is yellow, oblong and 3-toothed at the apex. Pappus is absent. The numerous inner florets are all tubular and yellow, the corolla being 5-toothed. Ovary is inferior and stigma is bi-fid with oblong obtuse lobes. Pappus consists of a few scanty hairs. Achenes are round and sparsely hairy.

Means of control.—In meadows, chop off flowering tops and prevent the spread of the weed.

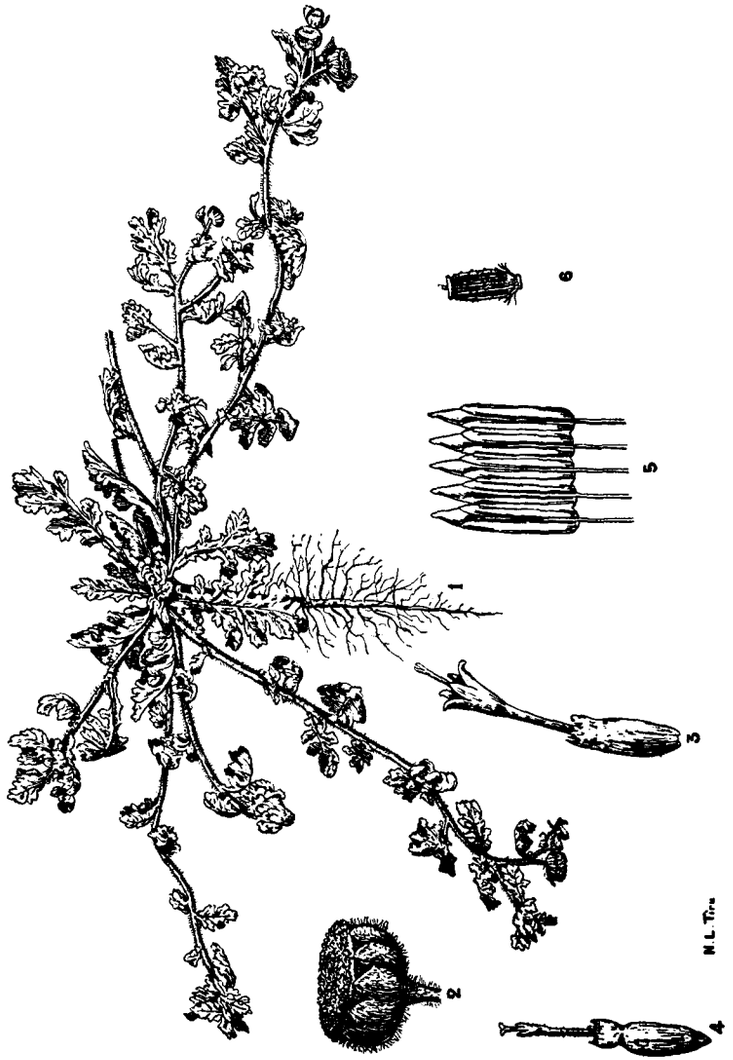


PLATE 67.—Figs. 1. Entire plant. 2. Head. 3. Bisexual floret. 4. Female floret. 5. Stamens. 6. Achene.
GRANGEA MADERASPATANA, *Poir.*

Grangea maderaspatana, *Poir.*

Plate 67.

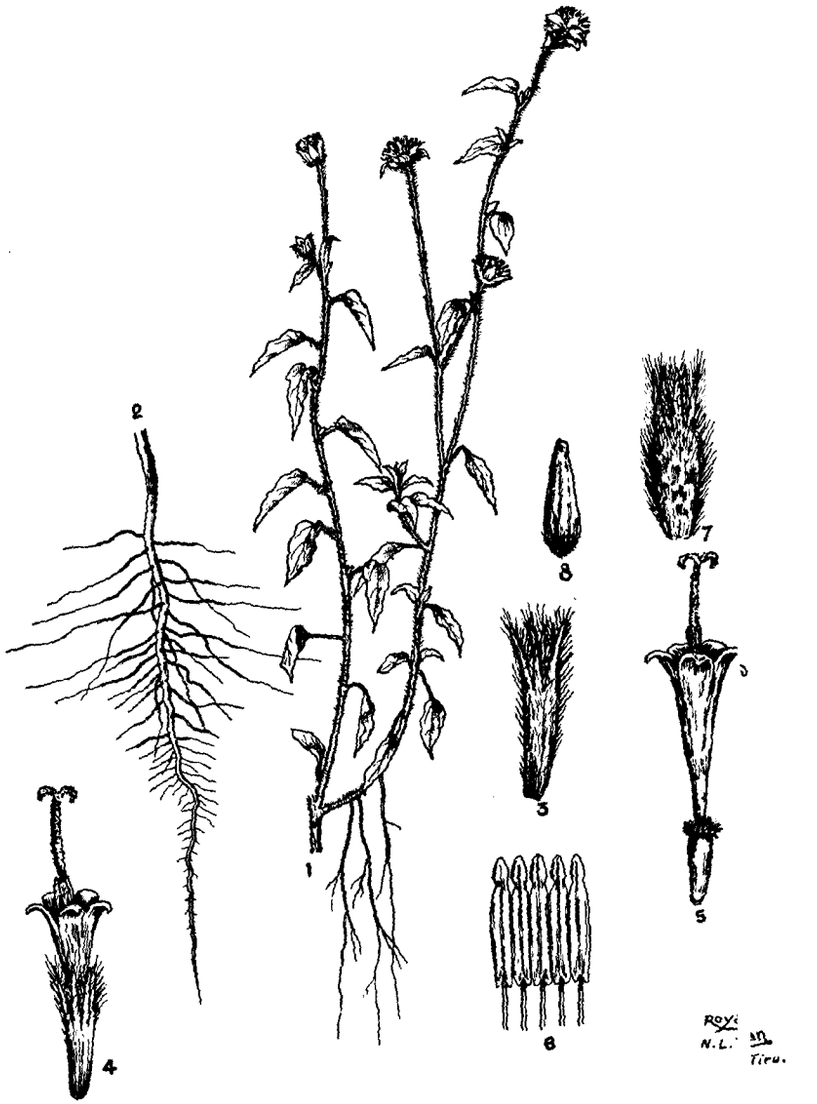
Tamil: Masipatri.
Malayalam: Nilampala.
Telugu: Masipatri; Mustaru.
Flowering and fruiting time: March-June.
Habit: An annual herb.
Habitat: Rice fields and river beds.
Range: All plains districts.
Propagation: By seed-like achenes.

A sub-erect or a prostrate, small, villous, branched herb commonly found in large numbers in rice fields after harvest of paddy.

Branches are 6–10 inches long and densely hairy. Leaves are simple, alternate, sessile and pinnately divided; lobes of the leaf are opposite and softly hairy on both sides. Flowers are small, yellow, collected in dense sub-globose heads, ¼–⅓ inch in diameter; they are either terminal or leaf opposed. Involucre of bracts is 2–3 seriate. Receptacle of the head is convex. Outer female florets are in 1–6 series and they have 2–4-toothed, slender tubular corollas. The inner florets are bi-sexual with a dilated corolla tube which is 5-toothed. Fruit is a flat glandular achene with a cup-like pappus.

Means of control.—The weed is not very common in a standing crop of paddy. Smothering crops do not seem to affect it much. Pull out seedlings and prevent seeding.

Economic importance.—Leaves are medicinal being used in hysteria to prevent spasms. It is good for irregular menses.



LAGASCA MOLLIS, *Cav*

PLATE 70.—Figs. 1. Branch. 2. Root system. 3. Flower bud enclosed by involu bracts. 4. Flower with involucre. 5. Flower. 6. Stamens. 7. Fruit en icre of by involucre. 8. Achene. closed

Lagasca mollis, *Cav.*

Plate 70.

Flowering and fruiting time: May-December.
Habit: A herb.
Habitat: Waste places.
Range: The Ceded Districts, Chittoor, Salem and Coimbatore districts.
Propagation: By the seed-like achenes (fruits).
Number of seeds: Ten thousand or more.

The plant is a native of Central America. It has been introduced into South India and is now so naturalized that it is growing wild in many pastures and waste lands.

It is an erect, gregarious, annual herb growing to a height of 2½ feet, with many spreading branches. The root system is shallow and it consists of a tap-root about 10 inches long with many lateral roots that are chiefly confined to just a few inches below the surface of the soil. The stem is round and densely clothed with short hairs. Leaves are simple, opposite below and alternate above. Petiole is 1–1½ inches long and hairy; the lamina is ovate acute, up to 2½ × 1½ inches. Both the surfaces of the leaf are softly hairy and the base is tapering. There are 3 branching nerves which are prominent on the lower surface. The flowers are white, arranged in terminal compound heads ½–¾ inch across, on stalks 3–5 inches long. Bracts of involucre below the cluster are 7 and leaf-like. They are sessile, oblong-ovate, acute and densely silky villous. Each individual flower is surrounded at its base by an involucre of 5 hairy connate bracts which resemble the calyx of an ordinary flower. Corolla is white, tubular, constricted below, dilated and 5-toothed above. It is hairy and sometimes pinkish outside. Stamens are 5, the free filaments are attached to the corolla while the anthers are black and united into a tube. Ovary is inferior, the two lobes of the stigma are hairy and recurved. Fruit is an elongate cuneate achene surmounted by a hairy short cup-like pappus.

Like most of our introduced weeds this has been spreading very rapidly and has already established itself in many districts of the Presidency. In Bombay it has become one of the most troublesome weeds seriously interfering with the growth of grass in pasture lands. In the course of a few years it is very likely that it will earn an equally bad name in South India. It is advisable that immediate remedial measures should be adopted to eradicate this new comer.

Means of control.—The rapidity with which the weed has been spreading is chiefly due to the numerous seeds the plant is

XANTHIUM STRUMARIUM, *Linn.*

PLATE 69.—Figs. 1. Branch. 2. Head of male florets. 3. Male floret with palea. 4. Male floret with corolla cut open. 5. Monadelphous stamens. 6. Utricle with two female florets. 6*a*. Hooked spine on utricle. 7. Cross section of utricle. 8. Female floret. 9. Achene.

Xanthium strumarium, *Linn.*

Plate 69.

English: Bur-weed.
Tamil: Marul Oomathan.
Telugu: Marula Mathangi.
Flowering and fruiting time: October–April.
Habit: A herb.
Habitat: Waste places and rubbish heaps.
Range: Most plains districts.
Propagation: By the hooked fruit.

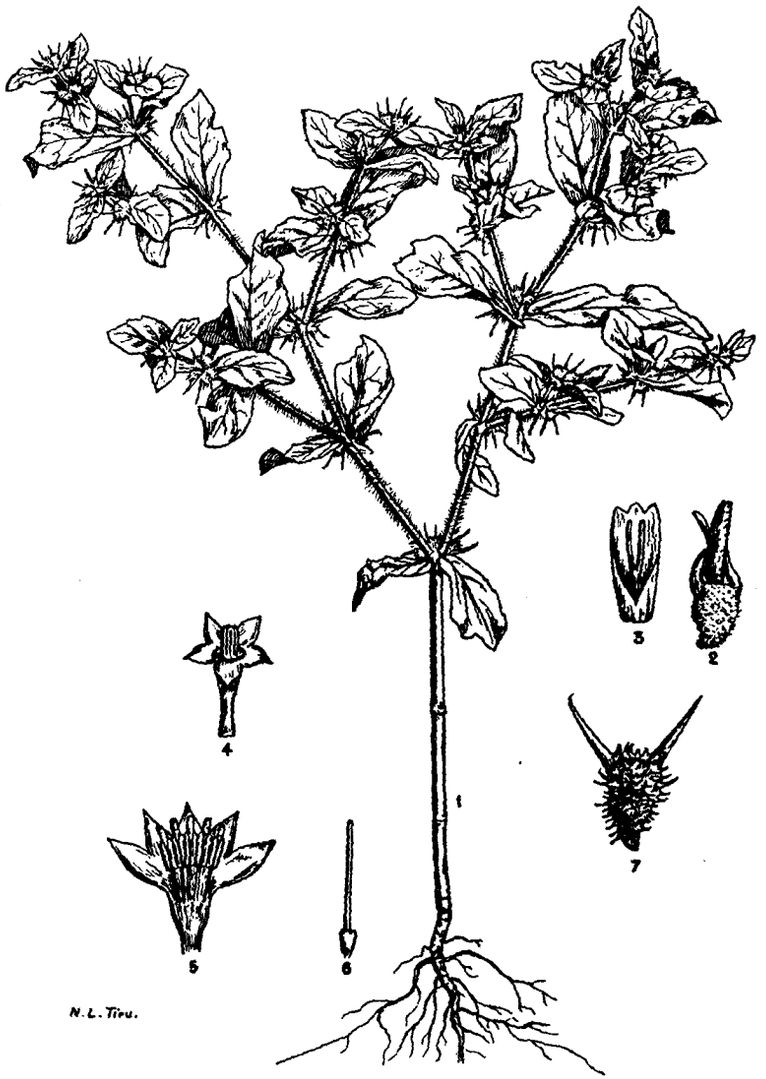
A coarse annual herb, 1–2½ feet high, often met with in large numbers in dry rice fields and tank beds.

Stem is rather stout and rough with scabrid hairs. Leaves are simple, alternate and ex-stipulate. Petiole is 1–3 inches long; blade is broadly triangular ovate up to 3 inches long, somewhat 3-lobed and irregularly toothed; leaf-base is somewhat cordate and tapering. Flowers are monœcious. Male florets are many in globose heads at the top of the inflorescence. Involucre is short with a few bracts; receptacle is cylindric and paleae are hyaline enclosing the florets. Corolla is tubular and 5-lobed. Anthers are five and distinct with inflexed tips; filaments are united into a tube. Female florets are in the axils of upper leaves and at the tops of branches; usually two of them are together enclosed in a two-horned utricle formed by the union of bracts and covered with hooked spine-like structures. Corolla is absent; style arms are two and long. Achenes are two, somewhat flattened, enclosed in the hard 2-beaked utricle. Pappus is absent.

The weed can be easily distinguished by means of the ovoid hooked fruits beaked at the top and the globose heads of male flowers.

Means of control.—Prevent production of fruit. Seedlings and plants in flower should be destroyed by pulling or cutting. Spraying with 10 per cent copper sulphate solution is said to be a good remedy.

Economic importance.—Seeds yield an oil used in medicine. The plant is very useful in urinary diseases when given as infusion. In America and Australia the plant is said to be poisonous to cattle and pigs.



ACANTHOSPERMUM HISPIDUM, *DC.*

PLATE 71.—Figs. 1. Entire plant. 2. Female floret. 3. Tip of corolla of female floret and stigma. 4. Corolla of disk floret. 5. Corolla of disk floret cut open. 6. Pistillode of disk floret. 7. Achene.

capable of producing. It must be pulled out before the flowering time. When the plants are found growing in very large numbers, a good ploughing and subsequent working with the spring-tyned harrow to collect them will be found effective. Where this is not practicable cut off the flowering tops by means of grass-cutting-swords.

Acanthospermum hispidum, *DC.*

Plate 71.

Tamil : Mul Thulasi.
Malayalam : Kattu Nerinjil.
Flowering and fruiting time : July–December.
Habit : Annual herb.
Habitat : Waste places.
Range : Salem, Coimbatore and South Kanara districts.
Propagation : By achenes.
Number of seeds : About 300.

The plant is one of the recently introduced weeds and like most of our bad weeds it hails from South America. About a dozen years ago it was first noticed round about Tiruppattur Railway Station in the Salem District. In November 1917, it made its appearance at Nileshwar in South Kanara. Since then, the plant has been found to be rapidly spreading around those places. Just three years ago it suddenly made its appearance at Coimbatore in an out-of-the-way place. The plants are so very gregarious and numerous that the large number of spinous achenes produced are a constant source of annoyance to barefooted pedestrians. The spines are stiff enough to puncture cycle tyres.

From its first appearance near a railway station it may be guessed that a few seeds of the plant must have been carried along with the packing material of some imported goods.

It will be of interest to note that the weed appeared in Transvaal and Natal (South Africa) at about the same time as it did in this Presidency. There it has already proved aggressive, and it is popularly called the "Star Burr." The name is suggestive of the spiny nature of the achenes which are radiating and present a star-like appearance.

The plant is an erect, diffusely branched, herbaceous annual, 1-2 feet high. It thrives best in light soils. The root system is rather shallow and surface feeding. The stem is round, striate and rough with a dense clothing of spreading white hairs. Leaves

are simple, $1\frac{1}{2}'' \times 3\frac{1}{2}''$, opposite, obovate-lanceolate and sessile. The margin is serrate from the middle upwards and it tapers towards the base; petioles are absent. Both the surfaces of the leaf are softly hairy. Heads of flowers are about $\frac{1}{8}''$ in diameter when young, spreading to $\frac{1}{2}''$, when mature. They are placed at the base of the forking branches and consist of two kinds of florets; the outer florets are female and rayed while the inner are tubular and male. Peduncle is very short and hairy. Bracts in the involucre are 5, oblong-lanceolate and pubescent on the back with long white hairs, and their margins are ciliate. The female florets are 7–8 in each head. Corolla is ligulate, small, yellow, oblong-elliptic with 3 teeth at the tip. Ovary is inferior, 1-celled, 1-ovuled, softly spiny and covered with gland-tipped hairs. Style is short and stigma is deeply divided into two lobes which are linear-oblong, obtuse and recurved. Pappus is absent. Fruit is an achene, clothed with short hooked spines; it has also two long prickles at the top, the upper one is straight and the lower hooked. Disk florets are 6–7, in the middle of the head and each of them has a membranous bract (palea) which is obovate, truncate and slightly keeled on the back. Corolla is small, tubular, yellow and has 5 acute lobes. Stamens are 5 with united anthers and free filaments. Ovary is inferior, small and infertile. Style is erect and the two stigmatic branches are almost fused.

The name of the plant is suggestive of its characters. The generic name *Acanthospermum* (Acanthon = a spine or a prickle, spermum = seed) indicates the spiny nature of the achenes, and the specific name *hispidum* is appropriate, showing the hispid or rough nature of the hairs. The weed can be easily recognized by these two characters and also by the forking branches bearing opposite leaves. The plant is capable of spreading rapidly as the achenes are easily dispersed by the agency of animals and human beings. In the course of a few years it is likely it will become a pernicious weed in this Presidency. If it finds its way into cultivated areas, it will surely become very harmful to crops on account of its surface feeding nature and gregarious habit. In wool-growing areas the spiny fruits will be very troublesome as experienced in other countries, for they easily get entangled in the wool of sheep.

Means of control.—Seedlings appear after the rains and hand-pulling is most effective in the initial stages, when there are only a few plants. But if it happens to be in large numbers grubbing the surface of soil is essential. On no account should the weed be allowed to mature its fruit and all control measures

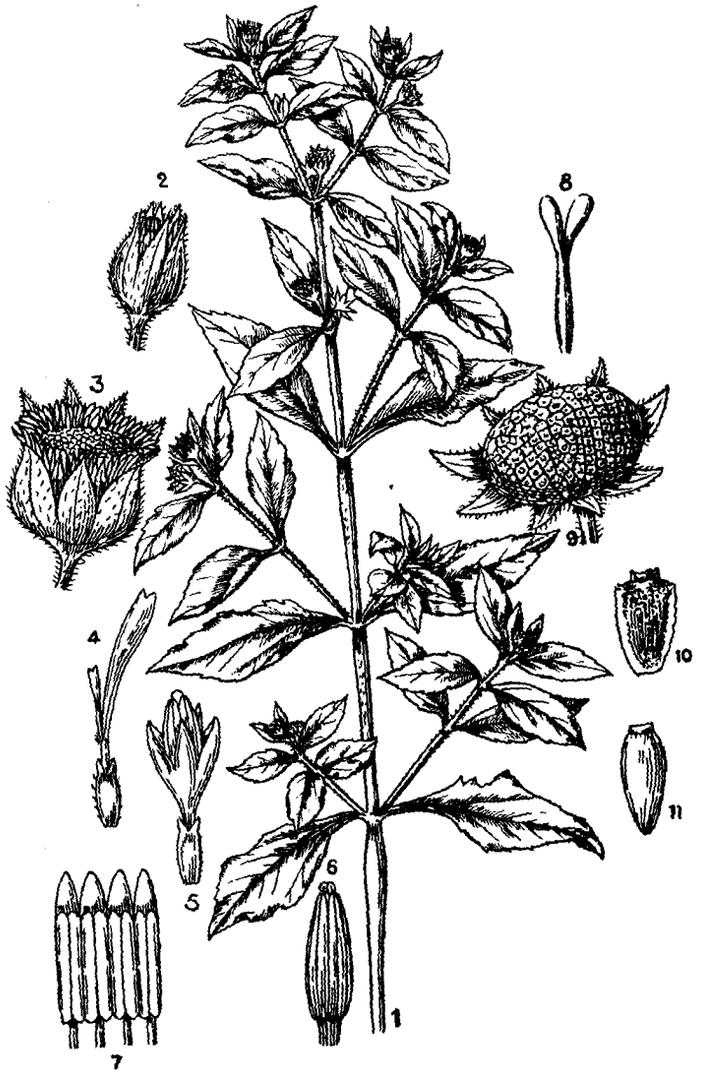
have to be adopted before the flowering time. Old plants should be cut and burnt *in situ*. Attempts should not be made to collect and remove them to another place for the fruits are easily shed and get dispersed. When once control measures are adopted it is advisable to watch for the weed for the following three or four seasons and to repeat the same methods of eradication whenever it appears.

are simple, 1½″ × 3½″, opposite, obovate-lanceolate and sessile. The margin is serrate from the middle upwards and it tapers towards the base; petioles are absent. Both the surfaces of the leaf are softly hairy. Heads of flowers are about ⅛″ in diameter when young, spreading to ½″, when mature. They are placed at the base of the forking branches and consist of two kinds of florets; the outer florets are female and rayed while the inner are tubular and male. Peduncle is very short and hairy. Bracts in the involucre are 5, oblong-lanceolate and pubescent on the back with long white hairs, and their margins are ciliate. The female florets are 7–8 in each head. Corolla is ligulate, small, yellow, oblong-elliptic with 3 teeth at the tip. Ovary is inferior, 1-celled, 1-ovuled, softly spiny and covered with gland-tipped hairs. Style is short and stigma is deeply divided into two lobes which are linear-oblong, obtuse and recurved. Pappus is absent. Fruit is an achene, clothed with short hooked spines; it has also two long prickles at the top, the upper one is straight and the lower hooked. Disk florets are 6–7, in the middle of the head and each of them has a membranous bract (palea) which is obovate, truncate and slightly keeled on the back. Corolla is small, tubular, yellow and has 5 acute lobes. Stamens are 5 with united anthers and free filaments. Ovary is inferior, small and infertile. Style is erect and the two stigmatic branches are almost fused.

The name of the plant is suggestive of its characters. The generic name *Acanthospermum* (Acanthon = a spine or a prickle, spermum = seed) indicates the spiny nature of the achenes, and the specific name *hispidum* is appropriate, showing the hispid or rough nature of the hairs. The weed can be easily recognized by these two characters and also by the forking branches bearing opposite leaves. The plant is capable of spreading rapidly as the achenes are easily dispersed by the agency of animals and human beings. In the course of a few years it is likely it will become a pernicious weed in this Presidency. If it finds its way into cultivated areas, it will surely become very harmful to crops on account of its surface feeding nature and gregarious habit. In wool-growing areas the spiny fruits will be very troublesome as experienced in other countries, for they easily get entangled in the wool of sheep.

Means of control.—Seedlings appear after the rains and hand-pulling is most effective in the initial stages, when there are only a few plants. But if it happens to be in large numbers grubbing the surface of soil is essential. On no account should the weed be allowed to mature its fruit and all control measures

have to be adopted before the flowering time. Old plants should be cut and burnt *in situ*. Attempts should not be made to collect and remove them to another place for the fruits are easily shed and get dispersed. When once control measures are adopted it is advisable to watch for the weed for the following three or four seasons and to repeat the same methods of eradication whenever it appears.



ECLIPTA ALBA, *Hassk.*

PLATE 72.—Figs. 1, Branch. 2. Young head. 3. Head with open flowers. 4. Ray floret. 5. Disc floret. 6. Syngenesious anthers. 7. Anthers. 8. Stylar arms. 9. Mature head of achenes. 10. Achene. 11. Seed.

Eclipta alba, *Hassk.*

Plate 72.

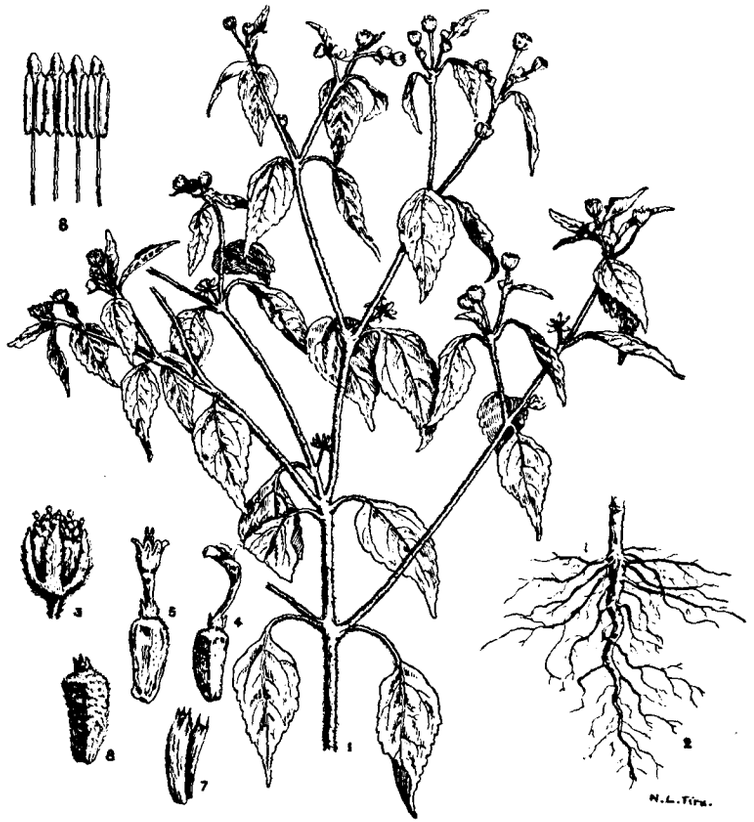
Tamil: Karasaranganni.
Malayalam: Kyonni.
Telugu: Guntakalavaraku; Guntagalijeru.
Flowering and fruiting time: Throughout the year.
Habit: A herb
Habitat: Moist places and roadsides.
Range: All plains districts and also in the hills.
Propagation: By seed-like achenes.
Number of seeds: Even up to 5,000.

The plant is a very common weed of waste lands and cultivated places and is usually found thriving best in moist situations as rice fields, bunds of irrigation channels and tank beds.

It is a prostrate or erect annual varying much in form; branches are many and root at the basal nodes. The stem is round, somewhat fleshy with strigose hairs. Leaves are 1–3 inches long, opposite, sub-sessile, oblong-lanceolate or elliptic-lanceolate, varying much in size. Both the surfaces are clothed with rough adpressed hairs. Heads are ¼ inch in diameter, somewhat bell-shaped, axillary, solitary or in pairs on short peduncles. Involucre of bracts is two-seriate. The bracts are ovate, acute, the outer five alternating with the inner five narrower ones. Ray florets are female, in two series and they are ligulate; the ligule is white, oblong, spreading with 2 or 3 short lobes at the tip. Ovary is inferior, trigonous; stigma is bi-fid. Fruit is a three-sided achene, truncate at the top, tapering at the base and covered with warty excrescences. Disk florets are bi-sexual, with white tubular corollas which are constricted below and dilated above into four teeth. Stamens are 5. The achenes of these florets are more compressed than those of the outer ray florets.

Means of control.—Handpulling is quite easy and effective; it is best done before flowering time, or before the seed is set.

Economic importance.—The plant is highly prized in Hindu medicine being used in asthma, rheumatism and other diseases. Leaf is a good remedy for scorpion sting.



BLAINVILLEA RHOMBOIDEA, *Cass.*

PLATE 73.—Figs. 1. Branch. 2. Root system. 3. Head. 4. Female flower 5. Bi-sexual flower. 6. Stamens. 7. Palea. 8. Achene.

Blainvillea rhomboidea, *Cass.*

Plate 73.

Flowering and fruiting time: September–December.
Habit: A robust erect herb.
Habitat: Waste and cultivated places in all districts, up to 5,000 feet.
Propagation: By achenes.

The plant is a rigid, scabrous, annual herb 2–3 feet high with many diffusely spreading branches at the top. Though the plant is rather big the root system is shallow.

The stem is round, striate and is covered with white rough scattered hairs. Leaves are large up to 4 inches by 2 inches or more, opposite below and sub-opposite or alternate above, ex-stipulate, petiolate, ovate or ovate-lanceolate with crenate-serrate margins. There are three prominent nerves at the base of the blade which is roughly hairy on both sides. Flowers are collected in heads ¼–½ inch in diameter and are arranged in terminal cymes. Peduncle is ½–1 inch long. The bracts of the involucre are ovate or oblong, and the inner ones gradually merge into palea and are persistent. There are two kinds of florets—the outer one whorl is of inconspicuously rayed female florets and all the inner ones are tubular and hermaphrodite. The corolla is whitish or light yellow. Stamens are five, attached to the corolla, the anthers cohering in a ring and the filaments being free. Achenes are enclosed by the persistent palea and they are of two kinds—those of the ray florets are three sided, dorsally compressed and slightly bent, while those of the disc or tubular florets are three or four sided, laterally compressed and not bent. Pappus consists of a few irregular short scales.

Means of control.—This weed is very profuse in seed production and as many as 10,000 seeds from a single plant have been recorded. Clean cultivation and a frequent use of the hoe will ordinarily check the spread of the weed. Prevent seeding.

TRIDAX PROCUMBENS, *Linn.*

PLATE 74.—Figs. 1. Plant. 2. Ray floret. 3. Disc floret. 4. Palea. 5. Corolla cut open showing stamens. 6. Achene.

Tridax procumbens, *Linn.*

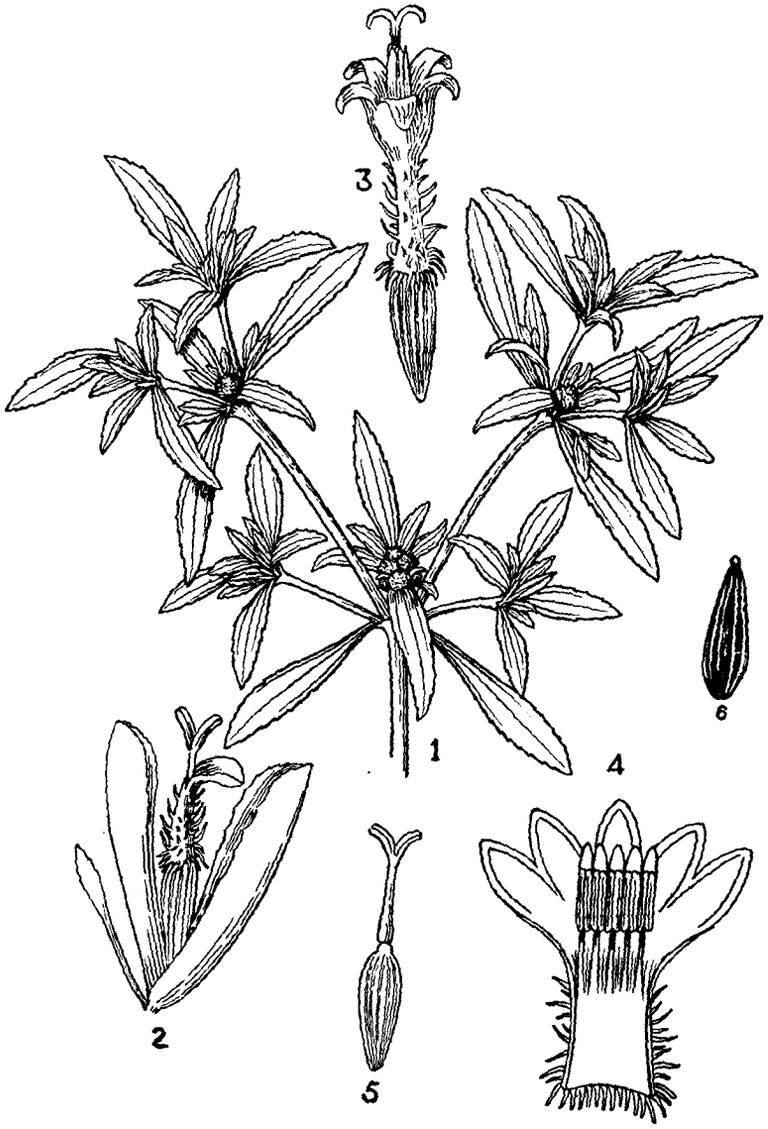
Plate 74.

Flowering and fruiting time: Almost throughout the year.
Habit: A perennial herb.
Habitat: Roadsides and waste places in all dry districts.
Propagation: By achenes.
Number of seeds: 500–1,500.

This is another example of an introduced weed that has become naturalized in the Presidency and it is now a part of the Flora. Though common in the plains it has already worked its way up the hills to an elevation of about 2,000 feet or more and is now found thriving on all the low hills of South India.

The plant is a procumbent, hispid perennial herb, 1–2 feet or more high with a few branches spreading on all sides. Often large colonies of this weed are met with in waste places and along edges of cultivated fields. Stem is round and covered with sparsely distributed hispid hairs. Leaves are mostly confined to the base of the plant. They are simple, opposite, shortly stalked and without stipules. Blade is 1½ by ¾ inch, rather thick, elliptic with an irregularly toothed margin; both the sides of the leaf are covered with rough hairs. Flower heads are solitary, about 1/3 inch in diameter on long terminal stalks or peduncles which go up to a length of 10 inches or more. The outer involucre of bracts is green and hairy while the inner ones are membranous. Florets are yellow and are of two kinds. The outer female ones are ligulate with three-lobed limbs. The many inner disc florets are paleate, tubular with narrowly five-toothed corollas, the paleae are membranous and keeled. Achenes are grey, densely covered with short hairs and surmounted by a ring of pappus consisting of feathery bristles.

Means of control.—The ease with which the plant spreads itself is greatly due to the large number of achenes produced which are capable of being dispersed over extensive areas on account of the pappus of the achenes which enable them to be carried by wind. Hedges and neglected places which are the sources of continuous supply of the seeds should be frequently cleaned. On no account should the plants be allowed to mature their seed. The grass-cutting sword ought to be frequently used to remove the flowering tops in waste places. Destroy seedlings whenever they appear; repeat the operation successively for a few seasons.



FLAVERIA AUSTRALASICA, *Hook.*

PLATE 75.—Figs. 1. Branch. 2. Small head with one female flower. 3. Disc fl
4. Corolla of disc floret cut open to show stamens. 5. Pistil of tubular fl
6. Achene.

Flaveria australasica, *Hook.*

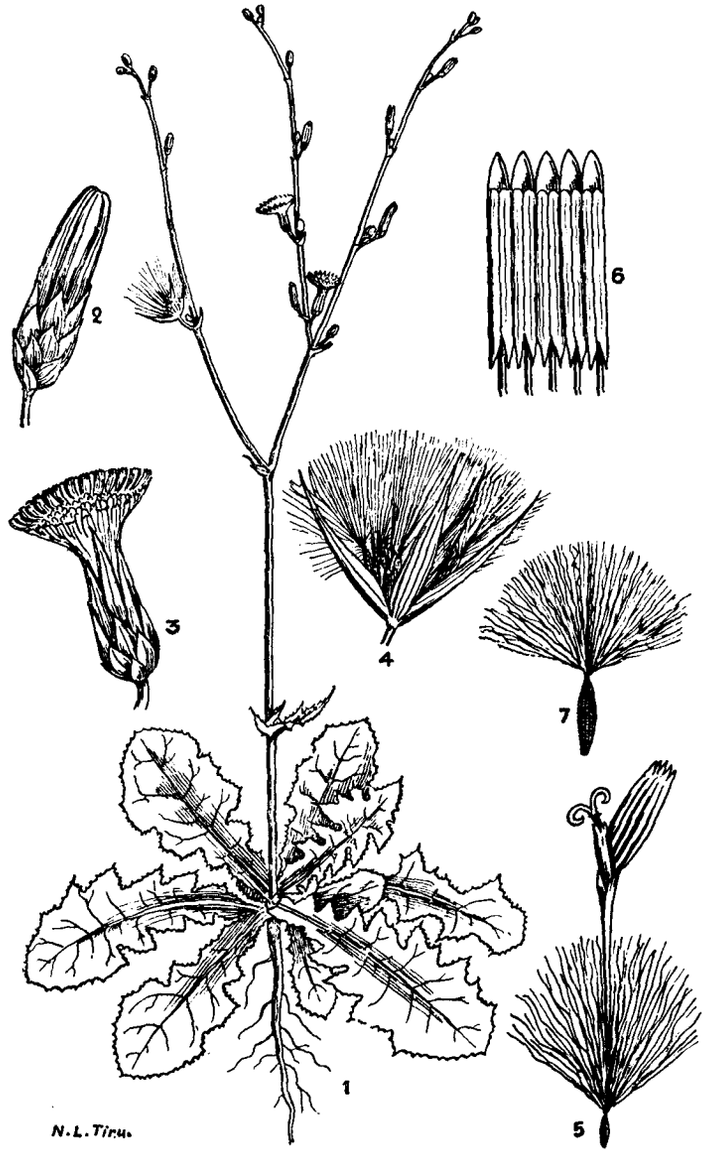
Plate 75.

Flowering and fruiting time : April–December.
Habit : Herb.
Habitat : Most plains districts.
Propagation : By achenes.
Number of seeds in one plant : Up to a lakh in a well-developed specimen.

The weed hails from Australia. In recent years it has estab-ished itself in various parts of the Presidency. It is said to ave been introduced by horse-dealers. Bits of flower heads were rried in hoofs of horses imported from Australia and were drop-ed at landing places. Hence the first appearance of this plant in rts like Madras. It is fast spreading in other localities that have t been affected so far. The plant is an erect rigid perfectly abrous annual with numerous forked branches and dense clusters yellow flowers. It is frequently found in loamy soils.

The stem is round and striate, pale green or slightly tinged with rple. Leaves are simple, opposite, ex-stipulate and clasping e stem. The leaves at the base of the plant have short stalks hile those above are sessile. Blade is ½–2 inches long, elliptic lanceolate with toothed or entire margins and three prominent ins running the whole length of the blade. The clusters of llow flowers in the forks of branches consist of numerous small ads each containing either 1–4 tubular bisexual florets with five-thed corollas or one female flower with a yellow short ray. The volucre has 2–5 folded bracts and a few linear ones. The achenes e very small and black with ten distinct ribs and without any ppus.

Means of control.—Destroy all seedlings by means of a harrow a hoe and prevent formation of seed. Burn all old plants in it.



LACTUCA RUNCINATA, *DC.*

PLATE 77.—Figs. 1. Entire plant. 2. Young flower head. 3. Head with open flowers, 4. Old head with mature achenes. 5. Flower. 6. Syngenesious anthers. 7. Achene.

Lactuca runcinata, *DC.*

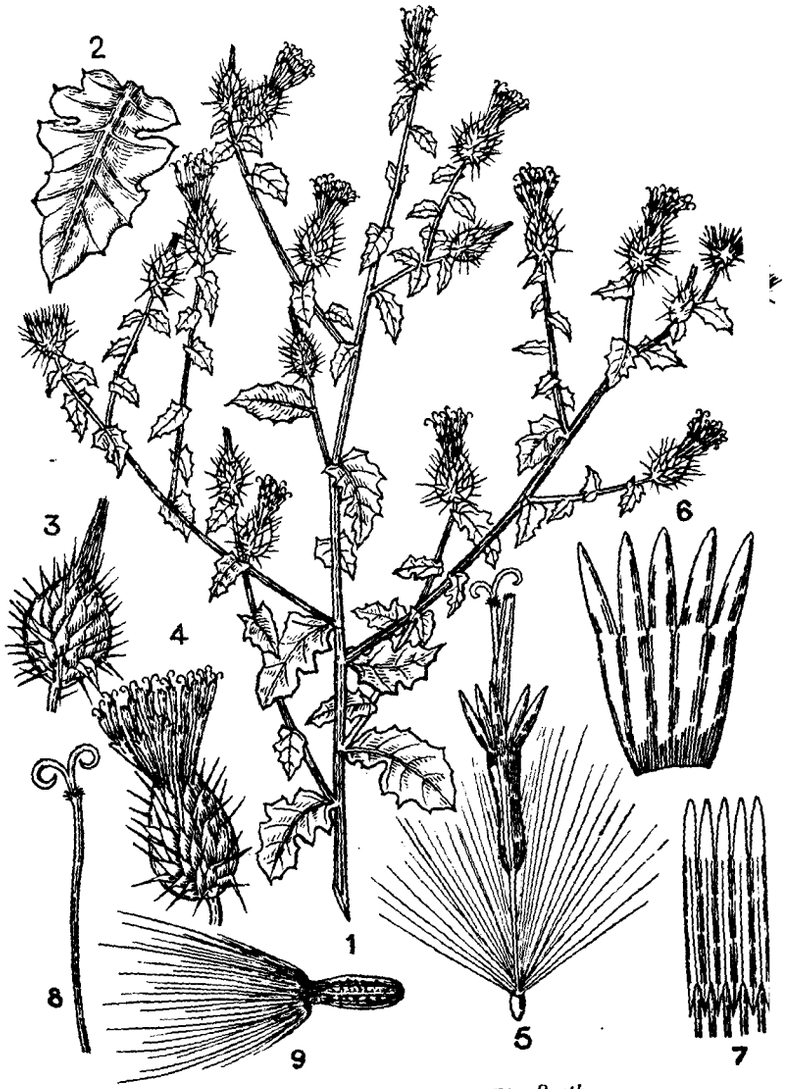
Plate 77.

Flowering and fruiting time : September–March.
Habit : An annual or a biennial herb.
Habitat : Fields, hedges and waste places.
Range : Most plains districts.
Propagation : By achenes.

A tall glabrous milky herb, 2-5 feet high with a rosette of leaves lying prostrate on the ground and many naked branches bearing heads of flowers. Stem is erect, cylindric, glabrous, hollow and full of milky juice. Leaves are mostly on the ground, 4–13 inches long, sessile, oblong, obtuse or acute, narrowed at base and pinnately lobed; margins are slightly toothed and ciliate with soft spines. Leaves on the stem are small, few, narrow and distantly arranged and are auricled and semi-amplexicaul. Heads of flowers are many, cylindric, ½ inch long, narrow, shortly stalked and remotely arranged on long, lax leafless branches in small clusters. Involucre of bracts is in a few series; the outer bracts are small, ovate acute and the inner are narrowly oblong with membranous margins. Flowers are yellow, bisexual, ligulate, the ligule being five-toothed at the apex. Achenes are black, narrow, compressed, ribbed and muriculate with a beak bearing a disc beneath the copious white silky pappus.

Means of control.—The weed is best attacked in the seedling stage when it is conspicuous with the few radical leaves. Work a guntaka in cultivated fields or a chisel-hoe in waste places and destroy seedlings. Old plants should be cut before the heads open. When the plants are very numerous the grass-cutting-sword should be freely used. Prevent seed production. Pulling is of no use as branches are very brittle and easily break.

The plant is sometimes mistaken for a species of *Sonchus* from which it differs in having few or no cauline leaves and a few narrow heads and beaked achenes.



VOLUTARELLA DIVARICATA, *Benth.*

PLATE 76.—Figs. 1. Branch. 2. Leaf. 3. Young head. 4. Head with open involucre. 5. Disc floret. 6. Corolla of disc floret (dilated part). 7. Syngenesious stamens. 8. Style with stylar arms. 9. Achene.

Volutarella divaricata, *Benth.*

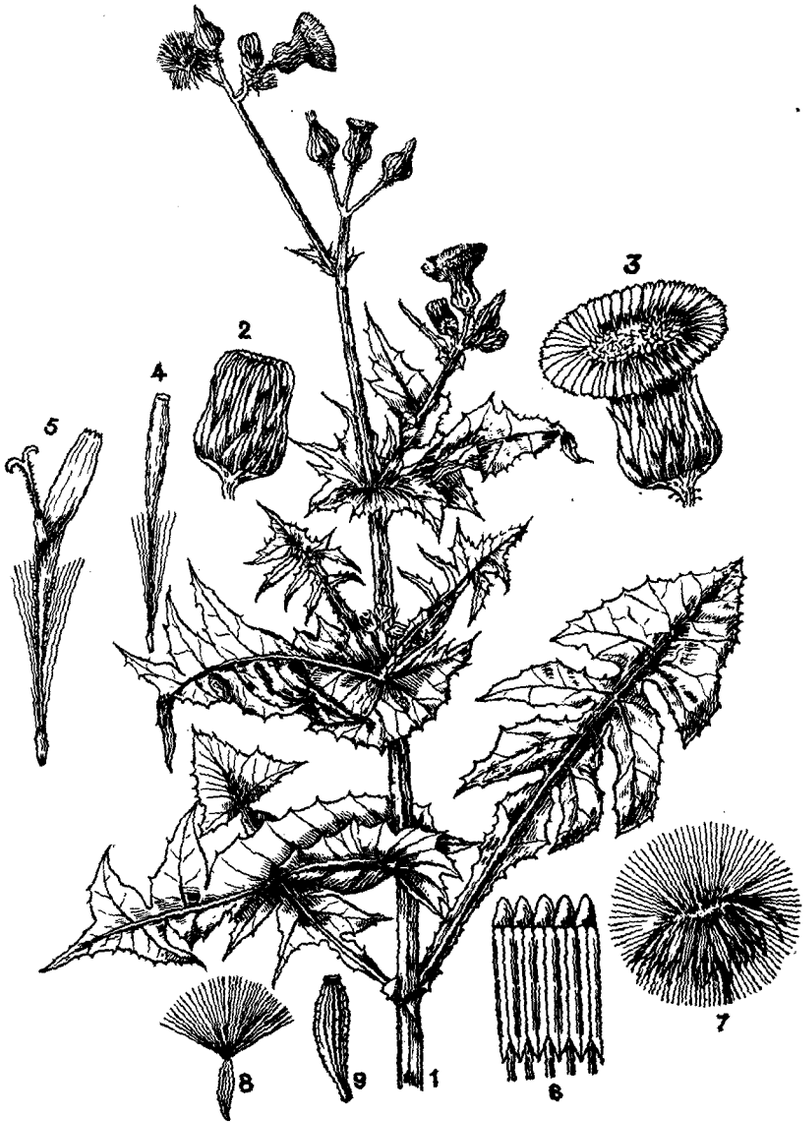
Plate 76.

Flowering and fruiting time: July–February.
Habit: A stiff herb.
Habitat: Dry waste places and sandy river banks.
Range: The Circars, the Deccan and Carnatic, Coimbatore, up to 2,000 feet.
Propagation: By achenes.
Number of seeds: 2,000.

The plant is an erect, much-branched stiff annual, 1–2 feet high. The stem is grooved and somewhat rough to the touch. Leaves are 1–2 inches long, nearly glabrous, alternate, sessile, oblong-lanceolate or oblong-ovate. They are also sometimes lobed, each lobe ending in a short point. Flower heads are long, ovoid and terminal. Involucre of bracts is many seriate, the innermost bracts being longest and becoming gradually shorter outwards. They are spinescent at the tip which is spreading. The outermost row consists of sterile florets and all the inner florets are tubular and bisexual. Corolla tube is long and purplish; it is deeply five-toothed at the apex. Stamens are five within the corolla tube. Ovary is inferior and the style is dilated at the base. Pappus at the top of the achene is in many series and consists of unequal bristles; the innermost ones are the largest and are dilated at the base. Achenes are angled and surmounted by the pappus.

Means of control.—Deep cutting.

Economic importance.—The plant is used as a tonic. It is believed that it has the property of driving away reptiles when it is kept in a house.



SONCHUS OLERACEUS, *Linn.*

PLATE 78.—Figs. 1. Branch. 2. Young head. 3. Head with open flowers. 4. Young floret. 5. Open floret. 6. Anthers. 7. Old head. 8. Achene with pappus. 9. Achene without pappus magnified.

Sonchus oleraceus, *Linn.*

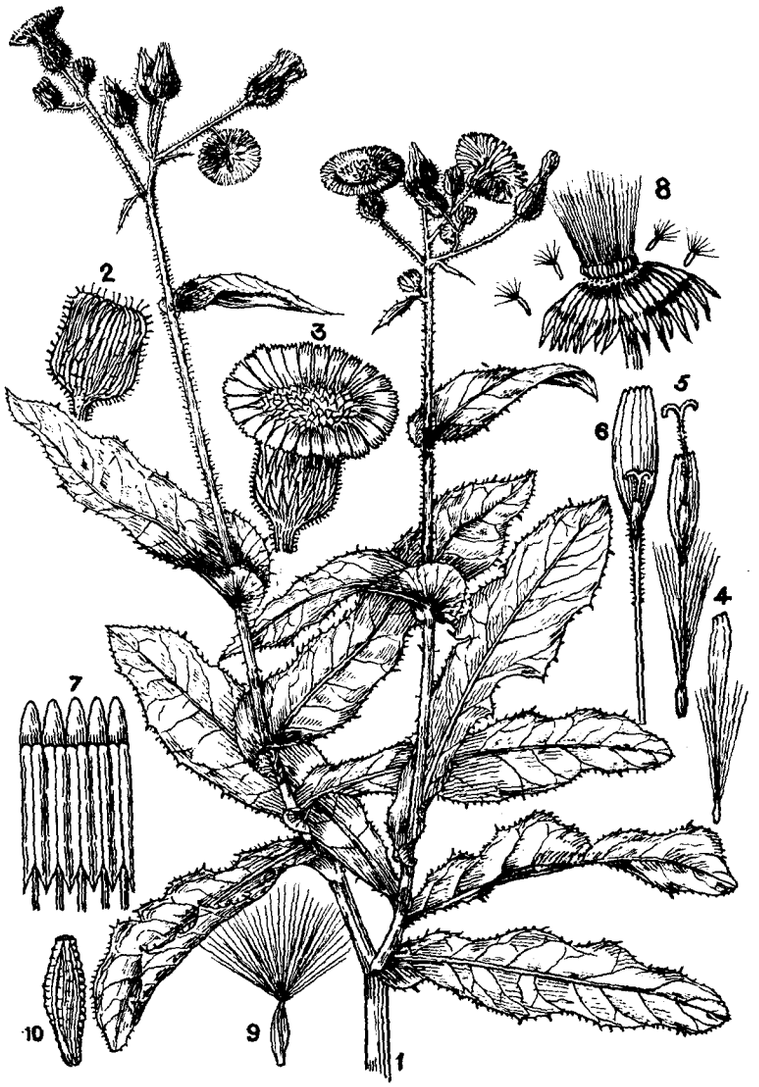
Plate 78.

English : Common Sow Thistle; Milk Thistle.
Telugu : Ratrinta.
Flowering and fruiting time : June–December.
Habit : An annual herb.
Habitat : Cultivated fields, waste places and roadsides.
Range : Most plains districts and up to 8,000 feet in the hills.
Propagation : By seed-like achenes.
Number of seeds : 30,000 or more.

The plant is an erect, somewhat fleshy, robust, milky herb, growing to a height of 2–3½ feet or more. It is not only common in the plains but also appears to be abundant in the hills. The stem is glabrous, erect, angular, striate, and sparingly branched above; it is hollow between the nodes and is full of milky juice. The ground leaves are large up to 1 foot long and form a rosette, while those on the stem are sessile and partly clasping it at their bases. They are oblong and variously pinnately lobed; the lobes are acute or acuminate, toothed and softly spinescent and the basal auricles are round and spreading, at the same time, they elongate into a process which is drawn into a long point. The leaves at the top are narrower than those below. Heads are an inch across, many flowered and rayed; they are in umbellate panicles at the tops of branches. Bracts are narrow in many series, the outer being smaller, with or without a few gland-tipped bristles. Flowers are light yellow; the corolla is strap-shaped and truncate with 5 teeth at the tip. Stamens are five, attached within the corolla with united anthers and free anther-stalks. Ovary is inferior, 1-celled, and 1-ovuled and style arms are very narrow. Fruit is a brown, slender, ob-ovoid achene with longitudinal ribs which are transversely muriculate; it is crowned with a pappus of numerous white, silky hairs.

Means of control.—On account of the large number of achenes produced and the ease with which they can float in the air and get dispersed, the plant can spread itself in areas that are free from it.

Prevent the development of the seed by destroying seedlings or cutting old plants with the help of a hoe. A light surface cultivation to stimulate the germination of dormant seeds and subsequent destruction of seedlings are necessary. Waste places and roadsides in the vicinity of cultivated fields should be got rid of this weed so as to prevent the achenes from contaminating the fields. If it is not possible to uproot the plants bodily, the flowering tops at least should be chopped off, when they are young.



SONCHUS ARVENSIS, *Linn.*

PLATE 79.—Figs. 1. Branch. 2. Young head. 3. Head with open flowers. 4. Young floret. 5 and 6. Open florets. 7. Anthers. 8. Old head. 9. Achene with pappus. 10. Achene without pappus magnified.

Economic importance.—In Europe the plant is said to be used as a pot-herb. It can also be employed as fodder for cattle. Leaves and roots have tonic properties and they are also used in the diseases of liver and in chronic indigestion.

Sonchus arvensis, *Linn.*

Plate 79.

English : Corn Sow Thistle.
Telugu : Jangli Tamaku.
Flowering and fruiting time : October-January.
Habit : A perennial herb.
Habitat : In cultivated fields and bunds of paddy lands.
Range : Circars, North Arcot, Coimbatore, West Coast and in most of the hilly tracts.
Propagation : By seed-like fruits.

Though an introduced plant it is so thoroughly established in the places noted above that it has become an important weed to contend with. In other countries as England and the United States of America it is treated as one of the most noxious weeds of cultivation. In South India though it has not yet become very aggressive it must be always kept under check, for, it may, at any time prove to be as troublesome as in other countries.

The plant very much resembles *S. oleraceus*, Linn., but can be distinguished by the cauline leaves being more entire with round appressed lobes at the base, the teeth being provided with somewhat stiff spines. The flowers are deep yellow and the bracts are very often covered with gland-tipped bristles. The achenes are oblong-elliptic but not ob-ovate and have longitudinal ribs which are transversely rugose.

Means of control.—The eradication of the weed is extremely troublesome on account of the underground perennial roots which are capable of producing shoots. The most important thing to be done in the eradication is to completely prevent the aerial shoots from developing and feeding the underground roots. Deep cultivation simply multiplies the weed by spreading the broken bits of roots which easily sprout. The shoot must be cut deep from time to time so as to starve the root. Short rotations with crops that are of a smothering nature or that require frequent hoeing and surface cultivation may be tried with advantage.

Economic importance.—The root is said to be given in jaundice. The plant makes good fodder.

1. *Vernonia cinerea*, Less.—A very variable plant growing from a height of a few inches to a few feet. It is an erect, branched, herbaceous annual with the leaves usually bigger at base and

becoming smaller above. Flower heads are rather small, pink many, in diffusely, branched, terminal inflorescence. Pappus of' achenes is white and silky. The plant is one of the most common weeds of cultivated and waste places, in all plains districts and low hills.

English : Ash-coloured Fleabane.
Tamil : Neichitti Chedi.
Telugu : Gariti Kamma.

2. *Erigeron asteroides*, Roxb.—A coarse looking, herbaceous annual clothed, all over, with white spreading heirs. Leaves are toothed and somewhat clasping the stem. Heads of flowers are terminal, on long peduncles. Ray florets have light blue ligules. A weed of cultivated and waste places, in almost all districts in the plains.

3. *Blumea Wightiana*, DC.—An erect, branched, aromatic, robust herb, hairy all over. Leaves are coarsely toothed and bigger towards the base. The small heads of pink flowers are crowded at the ends of branches. Pappus of achenes, consists of a few hairs. The plant is common in rice fields, in all districts, and up to 4,000 feet in the hills.

4. *Blumea lacera*, DC. var. *glandulosa*, Hook. f.—An erect, much branched, strong smelling herb, glandular hairy all over. Leaves are rather large and coarsely toothed. Flower heads are many and yellow. It is a common weed in moist places as rice fields, in most districts.

Tamil : Kattu Mullangi.
Telugu : Adavi Mullangi ; Karu-pogaku.

5. *Sphaeranthus indicus*, Linn.—A branched, strong smelling, low herb, glandular hairy all over. Leaves are alternate, oblong, coarsely toothed and decurrent on the stems. Flowers are pink and collected in dense, globose, compound heads, either terminal or leaf-opposed, on long peduncles. The plant is abundant in rice fields and wet places, all over the plains.

Tamil: Kottai-karanthai.
Malayalam : Adakka Maniyan.
Telugu : Boda-saram.

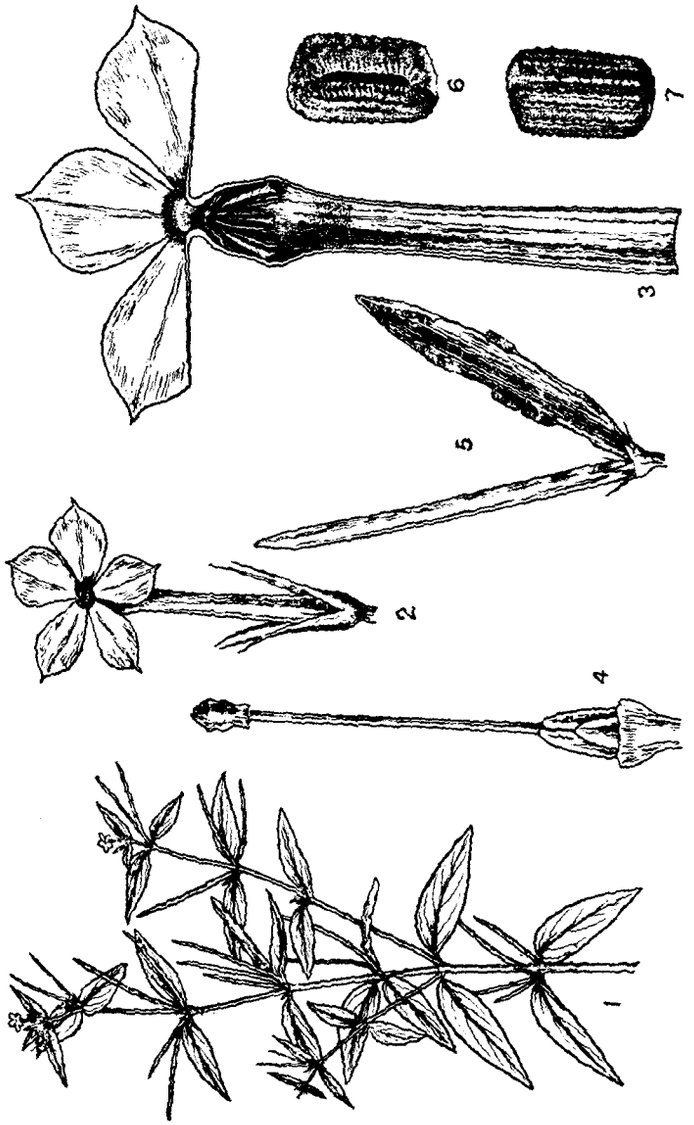
6. *Bidens pilosa*, Linn.—An erect herb with usually pinnately 3–5 foliolate leaves. Leaflets are often ovate, acute, with serrate margins. Heads of flowers have long stalks and pale yellow or white rays. The black achenes have 3–4 awns with retrorse barbs that help them in getting dispersed by sticking to the skin of animals. The weed occurs in cultivated or waste places and hedges, in all districts.

Apocynaceae.

THE PERIWINKLE FAMILY.

Herbs, shrubs or trees with simple, alternate, or usually opposite or whorled, exstipulate leaves and milky juice. Flowers are often showy and regular. Calyx-lobes are five and corolla is gamopetalous, with 4–5 lobes. Stamens are usually five and attached to the corolla tube, on very short filaments. Ovary is superior, one or two-celled and the carpels are united or free. Fruit is a drupe or a berry or it may consist of follicles; seeds have, sometimes, tufts of hairs at one or both ends.

Chiefly a tropical family.



LOCHNERA PUSILLA, *K. Schum.*

PLATE 80.—Figs. 1. Branch. 2. Flower. 3 Longitudinal section of corolla. 4. Pistil. 5. Fruit with one follicle open and the other unopen. 6 and 7. Seeds.

Lochnera pusilla, *K. Schum.*

Plate 80.

Tamil: Milagai Poondu.
Flowering time: June–July; September–October.
Fruiting time: July–August; November–December.
Habit: An annual herb.
Habitat: Cultivated fields and pastures.
Range: Most plains districts up to 2,000 feet, not common on the West Coast.
Propagation: By means of seeds.
Number of seeds: 1,000 to 15,000.

The plant is an erect, sparingly or freely branched, annual herb growing to a height of 1–2 feet. Though it is commonly met with in loamy soils, it is not rare in black cotton areas.

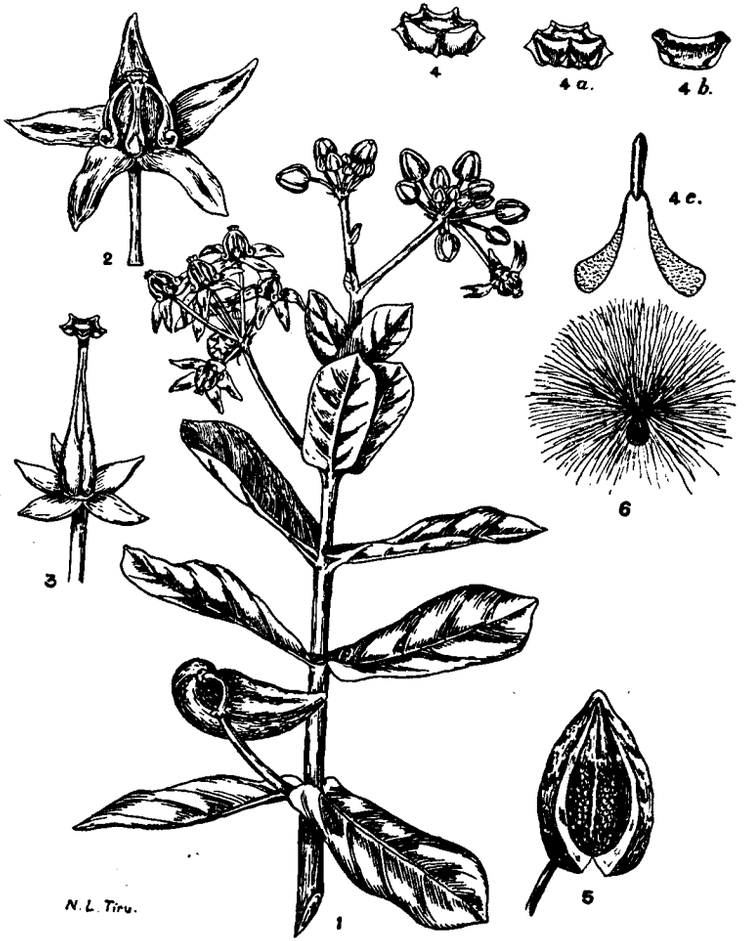
The stem is four-sided and glabrous. Leaves are simple opposite and shortly stalked. The blade is ovate, lanceolate, with entire margins, 1½–3 inches by 1/3–1 inch. Flowers are white, small, axillary, solitary or in pairs. Calyx is deeply 5-partite and persistent and the lobes are narrow. Corolla is tubular, 1/3 inch long, salver-shaped, with 5 small white lobes twisted in bud. Stamens are 5 attached to the corolla and are almost stalkless. Fruit consists of two slender striate follicles 1½ inches long. Seeds are black, with many ribs, and rounded ends.

The weed can be easily distinguished by its opposite leaves, small white flowers and narrow fruits in pairs.

Means of control.—The plant has been reported to be poisonous to cattle; no pains should be spared to eradicate the weed, wherever it is found. The seeds have a hard seed-coat which enable them to keep alive for a considerable time. Even in places where every care is taken to destroy the weed fresh plants are found to spring up, season after season. This is due to the dormant seeds germinating when conditions are favourable.

After the setting in of the monsoons, seedlings appear and they can easily be destroyed by working a harrow like the guntaka. Then the field may be given a light ploughing so as to bring the dormant seeds to the surface layer of the soil where they germinate and can easily be killed. In cases where weeding implements cannot be worked, recourse may be had to handpulling. Old plants in fruit should be burnt *in situ* if possible. In grazing areas the plant is more easily accessible to cattle than it is in cultivated fields. So special attention should be paid to eradicate it from pastures. The trouble taken to get rid of the weed can never be a waste considering the harm it does to cattle.

Economic importance.—It is applied as an external stimulant in lumbago.



CALOTROPIS GIGANTEA, *R. Br.*

PLATE 81.—Figs. 1. Branch. 2. Flower. 3. Pistil with calyx. 4 and 4*a*. Stigma with anthers. 4*b*. Anther. 4*c*. Pollinium. 5. Open fruit. 6. Seed.

Asclepiadaceae.

THE MILKWEED FAMILY.

Herbs or shrubs, often twining, and with milky juice. Leaves are usually opposite, ex-stipulate or absent. Flowers are regular, bisexual and in umbellate clusters. Calyx is deeply 5-lobed Corolla is gamopetalous, with or without outgrowths. Stamens are five and filaments are united. Staminal corona is usually present. Pollen grains are in sacks or pollinia and anthers are united with the sides of the stigma. Ovary is superior and 2-carpelled and the carpels are free, with many ovules. Fruit consists of two follicles. Seeds are endospermous and comose.

Distribution.—Chiefly tropical and sub-tropical regions.

Calotropis gigantea, *R.Br.*

Plate 81.

English: Gigantic Swallow-wort; Madar.
Tamil: Erukkam ; Yerukku.
Malayalam: Erukku.
Telugu: Jilledu.
Flowering and fruiting time: Almost throughout the year.
Habit : A large shrub.
Habitat: Waste places and roadsides.
Range : All plains districts.
Propagation: By seed.

A large much-branched milky shrub, 3–6 feet high and covered all over with very soft cottony tomentum. Stem is erect, stout and round. Leaves are up to 6″ × 4″, simple, opposite, sub-sessile, somewhat oblong and obtuse; base is narrowed and cordate; the lower surface is covered with a thick coat of tomentum. Flowers are white or purplish, about ¾ inch across on long peduncled, umbellate cymes at the tops of branches. Pedicels are longer than the flower. Calyx is small, deeply 5-fid to the base and the lobes are ovate and glandular within. Corolla is somewhat wheel-shaped; the lobes are deeply cut, valvate in bud and spreading and reflexed in flower. Stamens are 5, arising from the base of the corolla tube. Filaments are united into a tube, on the back of the tube is the outgrowth consisting of 5 lobes which are spurred at the base, rounded above, with two small auricles. Anthers are broad and attached to the sides of the stigma with membranous appendages bent over the style apex. Anther cells are pouch-like each containing a yellow mass of pollen grains, which is flat opaque and pendulous attached to a carrier by means of a short

LEPTADENIA RETICULATA, *W. & A.*

PLATE 82.—Figs. A. Branch. 1. Flower bud. 2. Open flower. 3. Calyx. 4. Longitudinal section of corolla. 5. Pollinium. 6. Stigma with anthers. 7. Fruit. 8. Seed.

stalk. For every pair of two pollen masses of adjacent anthers there is only one carrier. Ovary is superior and consists of two distinct free cells; styles are 2. The ovary and the styles are enclosed by the staminal tube. Stigma is 5-sided. Fruits are large and fleshy, solitary or in pairs on stout stalks. They break open on one side by only one long slit and liberate numerous ovate-flat seeds which have tufts of long slender silky white hairs at the narrow ends These hairs being light easily float in the air carrying the seed with them and help its dispersal.

Means of control.—Prevent the fruit from maturing. Cut it while green and bury it. Destroy flowering tops. Dig and cut away the plant with as much of root as possible.

Economic importance.—The stem yields a strong fibre. The silky hairs of seeds are good for stuffing pillows. The plant is largely used as green leaf manure.

Root bark and juice have tonic properties. The juice contains an active principle called *Mudarine*, and it is a purgative. Root is an antidote to poison. Leaves with pepper are used in snake-bite.

Leptadenia reticulata, *W. & A.*

Plate 82.

Tamil: Palai Kodi.
Telugu: Mukku-tummudu; Pala-tige.
Flowering and fruiting time: September-March and May-July.
Habit: A climbing shrub.
Habitat: Among hedges.
Range: Northern Circars, the Deccan and Carnatic, and westward to eastern slopes of Western Ghats up to 3,000 feet.
Propagation: By seed.

This is one of the most common climbing plants found among hedges. It often encroaches into cultivated fields and spreads on the ground with the branches twining round one another or a support.

Stem is round, slightly hairy and contains pale yellow, watery juice. Leaves are up to $3\frac{1}{2} \times 2\frac{1}{2}$ inches, simple, opposite, ovate, acute and entire; base is rounded or somewhat cordate; upper surface is sparsely hairy and the lower is puberulus. Petioles are up to one inch long. Flowers are many, greenish yellow, in lateral stalked umbellate cymes which are solitary or sometimes in pairs. Flower stalks are ¼ inch long. Calyx consists of 5, ovate-oblong, acute lobes divided to below the middle. Corolla is yellowish, deeply 5-lobed with a short tube; lobes are narrow, valvate in bud

HELIOTROPIUM OVALIFOLIUM, *Forsk.*

PLATE 83.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4. Corolla cut open. 5. Pistil. 6. Fruit with persistent calyx. 7. Nutlets.

hairy with small processes inside; margins are recurved. There is an outgrowth on the corolla, which consists of 5 fleshy structures at the sinuses alternating with the lobes. Stamens also have an outgrowth of fleshy, 5-lobed ring below the pollen masses which are ovate, erect and attached to dark brown pollen carriers by elastic stalks. Staminal tube is very short. Ovary consists of two free cells; stigma is conical with the anther appendages bent on it. Fruit is somewhat woody, up to 3½ inches long and beaked; seeds are flat, ovate-acute with tufts of fine silky hairs at the tips.

Means of control.—Cut off branches and fruits while green and bury them, thereby preventing dispersal of seed.

Economic importance.—Leaves and tender shoots are said to be used as a vegetable during times of scarcity.

Pentatropis microphylla, W. & A.—A slender herb, creeping among grass and sometimes rooting at the nodes, or climbing among hedges. Leaves are small, rather thick, ovate, round and mucronate. Follicles are pointed and smooth. The plant occurs in many districts.

Tamil: Oopilan-kodi.

Telugu: Chekurti-tivva.

Boraginaceae.

THE BORAGE FAMILY.

Herbs, shrubs or trees usually with alternate, ex-stipulate leaves. Flowers are regular. Calyx is five or more lobed and persistent. Corolla is gamopetalous and 5-lobed. Stamens are five, attached to the corolla tube within. Ovary is superior, 2–4 celled, with four ovules. Fruit is either a drupe or it breaks into 2 4 nutlets.

Distribution.—Tropical and temperate regions of the world.

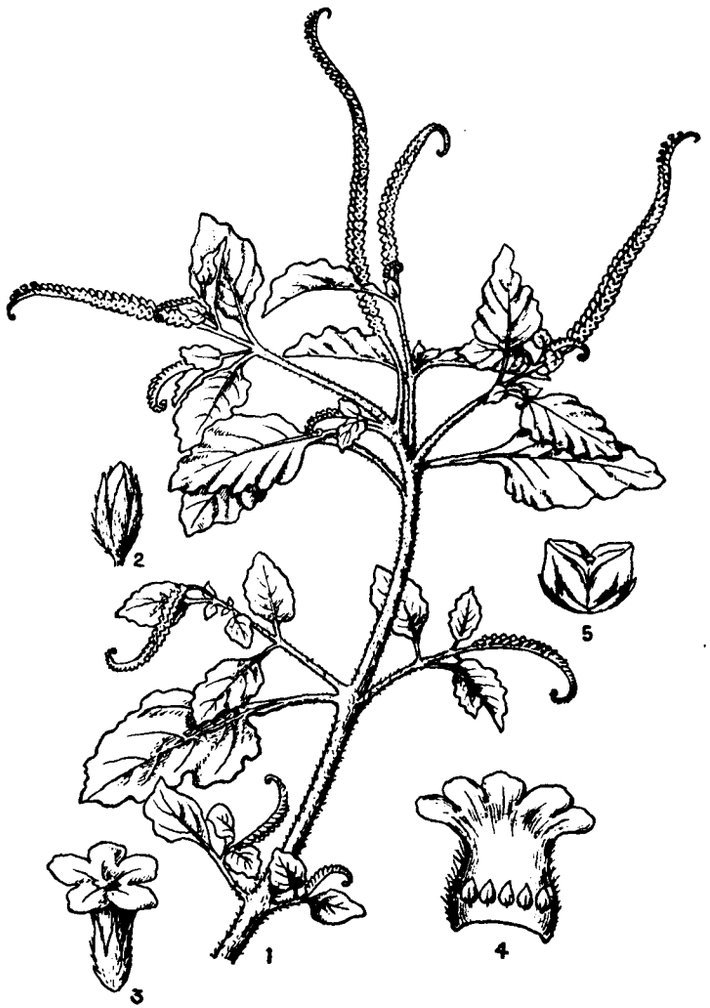
The name of the family is from *Borago* in reference to the roughness of the leaves: Latin *Burra*—rough hair.

Heliotropium ovalifolium, *Forsk.*

Plate 83.

Flowering and fruiting time: February-June; September-October.
Habit: A herb.
Habitat: All plains districts.
Propagation: By nutlets.
Number of seeds: Up to 10,000.

Of the many species of *Heliotropium* occurring in this Presidency, *H. ovalifolium* is the one which is most commonly met with everywhere.



HELIOTROPIUM INDICUM, *Linn.*

PLATE 84.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4. Corolla cut open to show stamens. 5. Fruit.

The plant is an erect or a decumbent annual herb with many diffusely spreading or prostrate branches. Stem and branches are densely covered with soft appressed white hairs. The tap-root is rather stout with a few lateral roots and it goes deep into the soil The weed is very abundant in the wet lands and it is in such moist situations that it attains its maximum size. Plants growing to a height of even 3 or 4 feet have been observed. In black cotton soils specimens are very much stunted in growth and attain a height of a few inches, and in red soils they are rather scarce. Leaves are simple, alternate and shortly stalked; the blade is elliptic or elliptic-ovate, ¼–¾ inch long and hairy on both surfaces. Flowers are small, white in colour and are arranged in two rows on one side of a flattened axis which is curled at the tip. The flower-bearing axis is either terminal or leaf opposed and it may be simple or forked. Calyx is divided into five unequal segments and is persistent. Corolla is very small, about ⅛ inch long and tubular. Fruit breaks into four small one-seeded nutlets which are densely hairy and convex at the back.

Means of control.—The hardy nutlets retain their vitality for a considerable time and as such their formation ought to be prevented. Flowering tops may be destroyed by the use of a grasscutting-sword.

Heliotropium indicum, *Linn.*

Plate 84.

Tamil : Thel-kodukku.
Malayalam : Thekkada ; Ven-pacha.
Flowering and fruiting time : February–May.
Habit : Annual herb.
Habitat : Moist places in most districts in the plains.
Propagation : By nutlets.
Number of seeds : Up to 10,000.

This is the largest of the species of *Heliotropium* found in South India. It is an erect, robust, coarse, annual with few or many succulent branches. The plant grows to a height of 1–2 feet and is commonly met with in moist waste places and in paddy fields that are lying fallow. Sandy places as river-beds and salt swamps are not without this plant.

The stem is erect, deeply grooved and sparsely roughly hairy. Leaves are simple, alternate and sub-opposite; leaf-stalk is 1–1¾ inches long and winged. The blade is broadly ovate, or oblong with an entire, wavy margin and its base is cuneate and unequal

HELIOTROPIUM SCABRUM, *Retz.*

PLATE 85.—Figs. A. Branch. 1. Leaf. 2. Flower bud. 3. Flower. 4. Corolla cut open to show stamens. 5. Pistil. 6. Fruit. 7. Bit of fruit.

The upper surface is hispidly hairy and the lower one is densely pubescent. The flower-bearing axis is either simple or forked opposite the leaf, and varies in length from 1–12 inches. Flowers are small, white or violet in colour and they are arranged in two rows one on each side of a flattened axis which is curled at the tip. Calyx consists of five unequal segments which are hairy without. Corolla is small, tubular and the limb is 5-lobed. The season of flowering is so long that ripe fruits fall away from the base of the inflorescence before the buds cease to unfold at the summit. The fruit is deeply 2-lobed and the lobes are compressed and beaked at the top. There are in each lobe, two hard 1-seeded pyrenes.

Means of control.—The weed is neither gregarious nor found in large numbers except in tank-beds. Handpulling seems to be the best remedy.

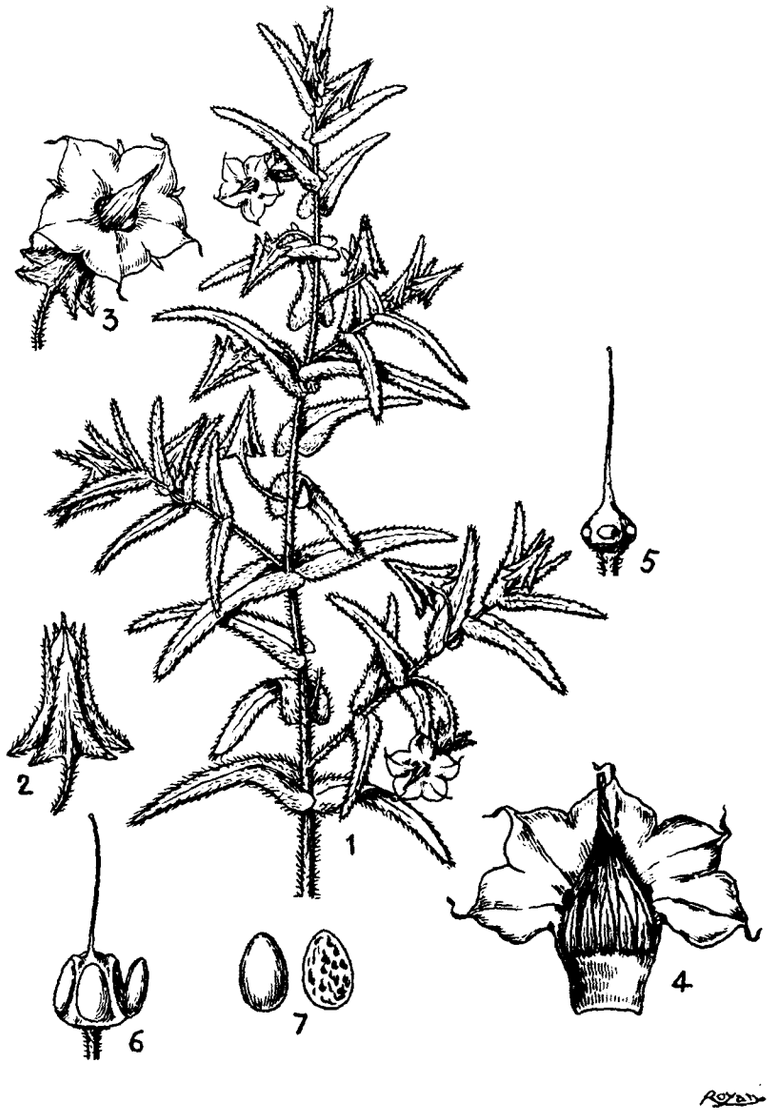
Economic importance.—Juice of leaves is said to be applied as a remedy for scorpion sting. The plant is used in the treatment of hydrophobia. Decoction of fruit is given in asthma, leprosy and other diseases.

Heliotropium scabrum, *Retz.*

Plate 85.

Flowering and fruiting time : September–January.
Habit : A woody herb.
Habitat : Sandy soils, waste places and road-sides, also in black cotton soils.
Range : All plains districts.
Propagation : By bits of fruit.

A much-branched woody herb growing in tufts and the branches are 1–5 inches long and prostrate on the ground; they are rarely ascending. The whole plant is densely clothed with hispid appressed hairs. Leaves are simple, ½–1 inch long, alternate or subopposite, narrowly elliptic on short petioles. Sometimes leaves look very much congested on account of the internodes being very short. Flowers are small, white and crowded among the upper leaves or sometimes in short spikes, an inch long. Calyx is deeply divided into five narrow lobes hairy without. Corolla tube is short, the mouth with a 5-lobed expanded limb. Stamens are five, included in the corolla tube, on short filaments and connected by their tips. Ovary is superior, 4-celled and raised on a disc. Style is short erect, bearing a conical stigma at the tip. Fruit is somewhat



TRICHODESMA INDICUM, *R. Br.*

PLATE 86.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4. Corolla cut open to show anthers. 5. Pistil. 6. Fruit. 7. Nutlets.

globose and is partly enveloped by the persistent calyx and it separates on maturity into four nutlets which are glabrous or pubescent and rounded on the back.

Means of control.—Remove plants by cutting the woody main root as deep into the soil as possible with the help of a chisel-hoe.

Trichodesma indicum, *R. Br.*

Plate 86.

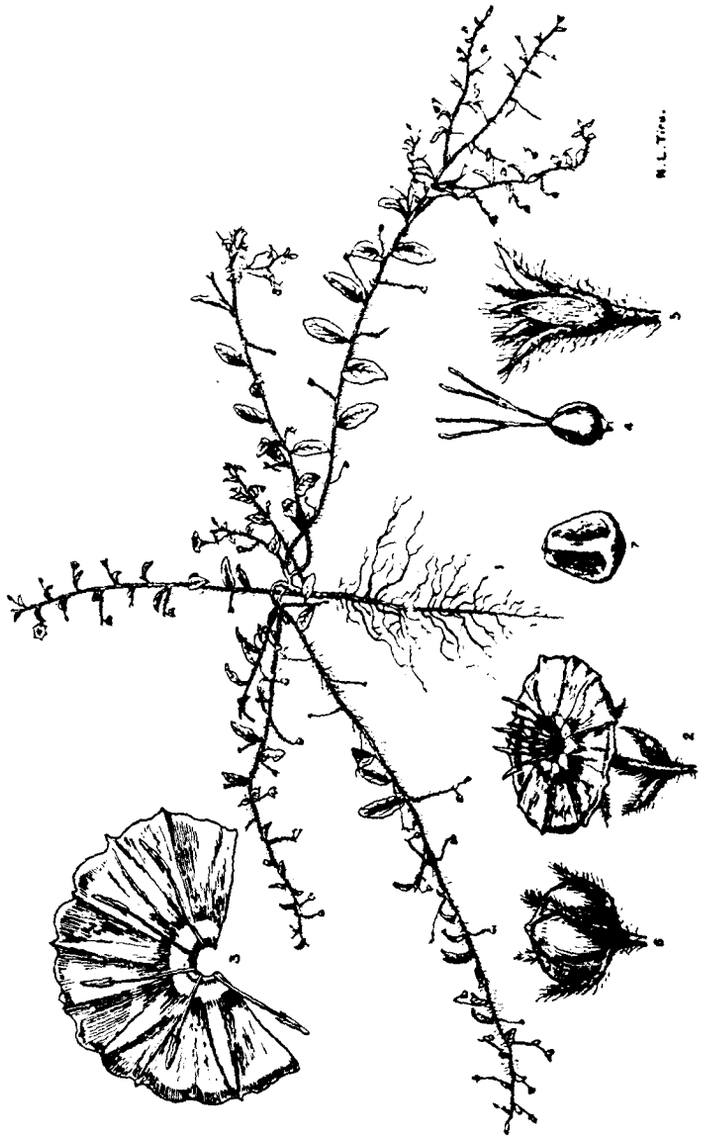
Tamil: Kazhuthai Thumbai ; Kavizh Thumbai.
Flowering and fruiting time: September–December.
Habit: A herb.
Habitat: Waste places and fields of all plains districts.
Propagation: By nutlets.
Number of seeds: About 3,000.

This weed is found growing in waste places and cultivated dry and irrigated fields. It is very common in black cotton soils. The plant is hardy and can withstand drought to some extent.

It is an erect diffusely branching hispid annual becoming perennial under favourable conditions. It attains a height of even 2 feet and has a thick taproot. The stem is round and is covered with simple and tubercle-based hairs. Leaves are simple, opposite below and alternate above, ex-stipulate, sessile, oblong-lanceolate and auricled at the base. The margin of the leaf is entire and reflexed and both its surfaces are hairy. Flowers are solitary, axillary or leaf opposed on bent flower stalks. Calyx is hairy and deeply divided into five lobes which are hastate at the base. Corolla is white or light blue, tubular below, the throat having reddish brown patches at the bases of the five triangular lobes which end in fine-twisted processes. Stamens are five, attached to the corolla ; filaments are very short ; anthers cohere to form a cone. The back of anthers, and connectives are prolonged into finely pointed and twisted appendages. Fruit consists of a central 4-winged axis bearing 4 single-seeded nutlets which are polished grey with or without brown spots on the back. The inner surfaces of the nutlets are rough with cavities and ridges.

Means of control.—Where seedlings of the weed are found in large numbers grub the surface of the soil by means of a cultivator and work the triangular harrow to collect the plants. Old plants, however, are rather woody at the base and require to be cut deep into the soil.

Coldenia procumbens, Linn.—A prostrate herb with many trailing branches radiating from the crown of the tap-root. Leaves are



EVOLVULUS ALSINOIDES, *Linn.*

PLATE 87.—Figs. 1. Entire plant. 2. Flower. 3. Corolla cut open showing attachment of stamens. 4. Pistil. 5. Calyx. 6. Fruit with calyx persisting. 7. Seed.

somewhat oblong and toothed, with prominently impressed nerves, and white, haggy, silky hairs. The plant is frequently found in dry rice fields, dry tank-beds and ponds, in all plains districts.

Tamil: Seruppadi.

Telugu: Hamsa-padaku.

Convolvulaceae.

THE MORNING-GLORY FAMILY.

THE BIND WEED FAMILY.

Mostly twining herbs or shrubs, with milky or pale juice. Leaves are simple or alternate or absent. Flowers are showy, regular and bisexual. Calyx consists of five sepals. Corolla is gamopetalous and conduplicate, contorted. Stamens are five attached at the base of the corolla tube. Ovary is superior, raised on a disc and 1–4 celled. Fruit is a berry or a capsule having 2–4 seeds with little or no endosperm.

Though chiefly, a tropical family, it has members all over the world. It gets its name from Latin *convolvo* = to twine.

Evolvulus alsinoides, *Linn.*

Plate 87.

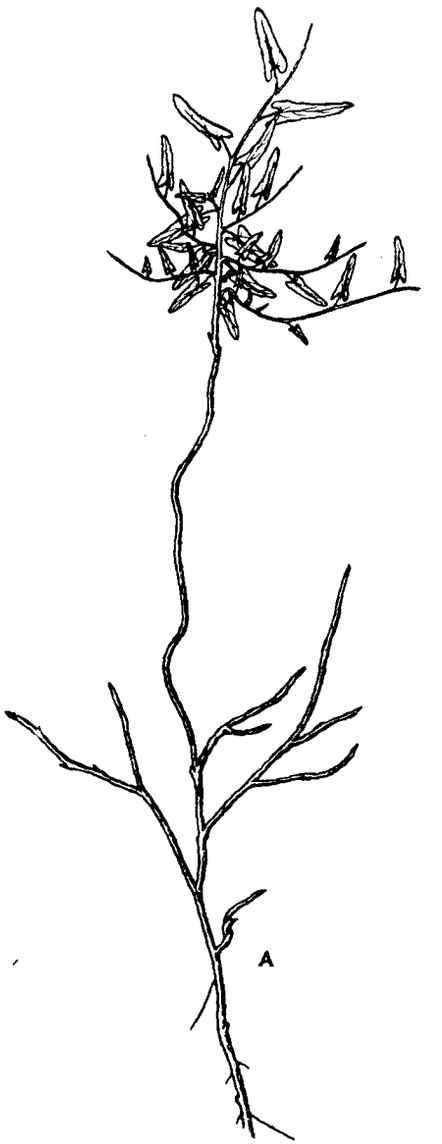
Tamil: Vishnukirandi.
Malayalam: Vistnaclandi.
Telugu: Vishnukranthi.
Flowering and fruiting time: Throughout the year except in the dry months of April and May.
Habit: A perennial herb.
Habitat: Open grassy places.
Range: All plains di tricts.
Propagation: By seed.
Number of seeds: 5,000-10,000 or more in fully developed specimens.

The plant is a low perennial herb with numerous spreading branches which are completely prostrate or somewhat ascending above the grass among which it grows. The branches are slender and wiry and are at times as long as 2 feet. These start at the crown of the woody tap-root and radiate on all sides. The stem is round and densely clothed with white appressed and long spreading hairs. Leaves are simple, alternate, very shortly stalked often elliptic-oblong and obtuse. Both the surfaces of the leaf are appressedly hairy. Flowers are small, pretty and blue. After the rains the flowers open in large numbers and are very prominent.

They are axillary solitary, or in pairs on long peduncles. Bracts are small and lanceolate. Sepals are five lanceolate and densely villous on the back. Corolla is blue or rarely white and it is somewhat wheel-shaped with a short tube. Stamens are five and they are attached to the corolla. Ovary is superior, 2-celled and 4-ovuled. Styles are two and slightly united at the base, and each style is again deeply divided into two. Fruit is a thin globose 4-valved capsule. Seeds are dark brown and smooth.

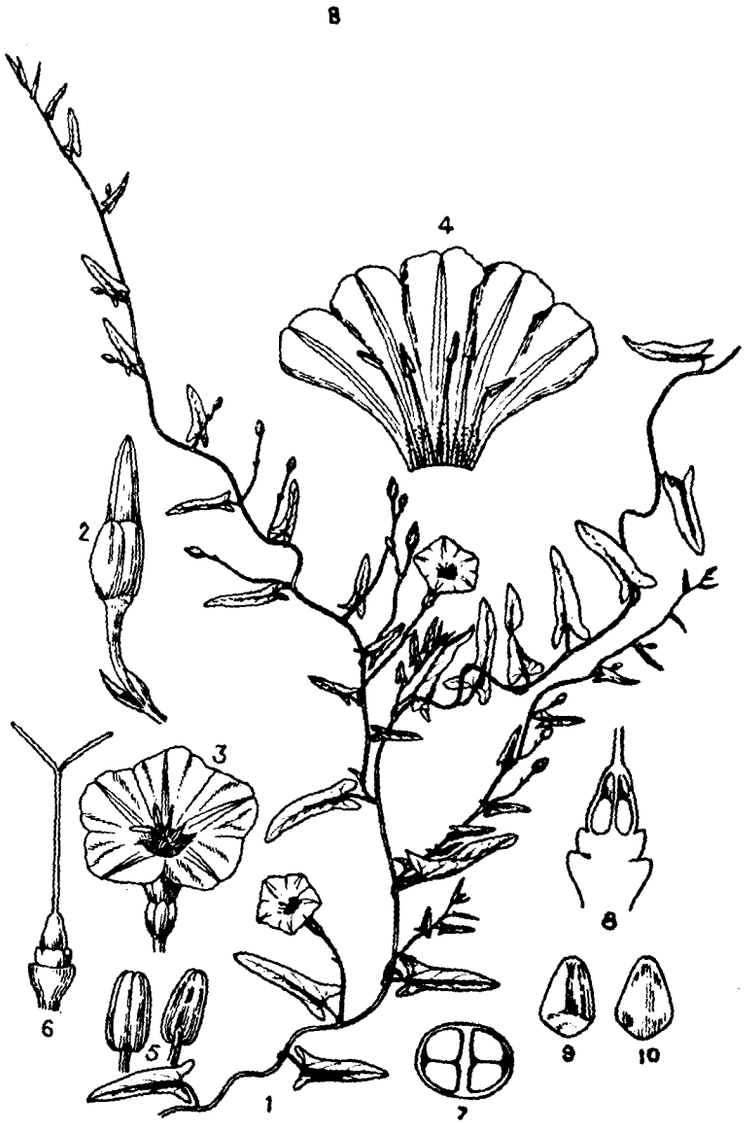
Means of control.—Plants can be lifted by means of a chisel-hoe and destroyed. If such an operation is not practicable a weighted Guntaka may be worked in April so as to scrape the surface of the soil and remove the branches. After the rains the grass comes up and may choke the tender branches of the weed.

Economic importance.—The plant is a bitter tonic. It is useful as a remedy for rheumatism. When taken internally, it is said to promote conception.



CONVOLVULUS ARVENSIS, *Linn.*

PLATE 88.—Fig. A. Small plant showing underground stems.



CONVOLVULUS ARVENSIS, *Linn.*

PLATE 88-A.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4. Corolla cut open showing stamens. 5. Anthers. 6. Pistil. 7. Cross section of ovary. 8. Longitudinal section of ovary, disc and top of pedicel. 9 and 10. Seeds.

Convolvulus arvensis, *Linn.*

Plates 88 *and* 88-A.

English: The Field-bind Weed.
The Small-bind Weed.
The Lesser-bind Weed.
Tamil: Bhoomi Chakra Poondu.
Flowering and fruiting time: August, September-December.
Habit: A twining perennial herb.
Habitat: Cultivated and waste places.
Range: Throughout the Presidency.
Propagation: By seeds and underground stems.
Number of seeds: 200 to 400 or more.

Convolvulus arvensis is one of the handsome weeds of arable lands. It is very widely distributed throughout the temperate regions of the world and is also common in Tropical Africa. In black cotton and irrigated or dry soils of the Deccan, it is frequently met with.

The name *Convolvulus* seems to be given to the Genus on account of the twining habit of its members. The Tamil name is very suggestive of the habit of the plant and indicates the nature of the deep lying underground stems which go round and round in a sort of spiral.

The plant is a very obnoxious weed possessing a deep lying tap-root from the top of which perennial cord-like, sub-soil stalks develop and spread over a considerable area. These stalks come up to the surface of the soil and from every one of them several aerial branches varying in length from 1–3 feet, arise. They twine round a support or trail along the ground in the absence of a support, The stems are much twisted, angular and glabrous. Leaves are simple, alternate, ovate or oblong, hastate or auricled at the base. The blade is 1–2½ inches long and the petiole is ¼–¾ inch. Flowers are showy, shortly stalked, light pink or white in colour, 1–3 together on axillary solitary peduncles which are 1–2 inches long. Sepals are 5, unequal, thick, broadly elliptic, acute and sub-glabrous. Corolla is about an inch across and broadly funnel shaped. Stamens are 5, epipetalous, unequal with hairy bases. Ovary is seated on a yellow, annular disc, two-celled, each cell with two ovules. Stigmas are two and linear. Seeds are 2–4 in each fruit; they are dark brown, about ⅛ inch long, ovoid, somewhat trigonous and glabrous. Often, the flowers do not set fruit.

Means of control.—Since the propagation is by means of both seeds and undergound stems it is safe to prevent their development It is not enough if the aerial branches alone are removed, for the

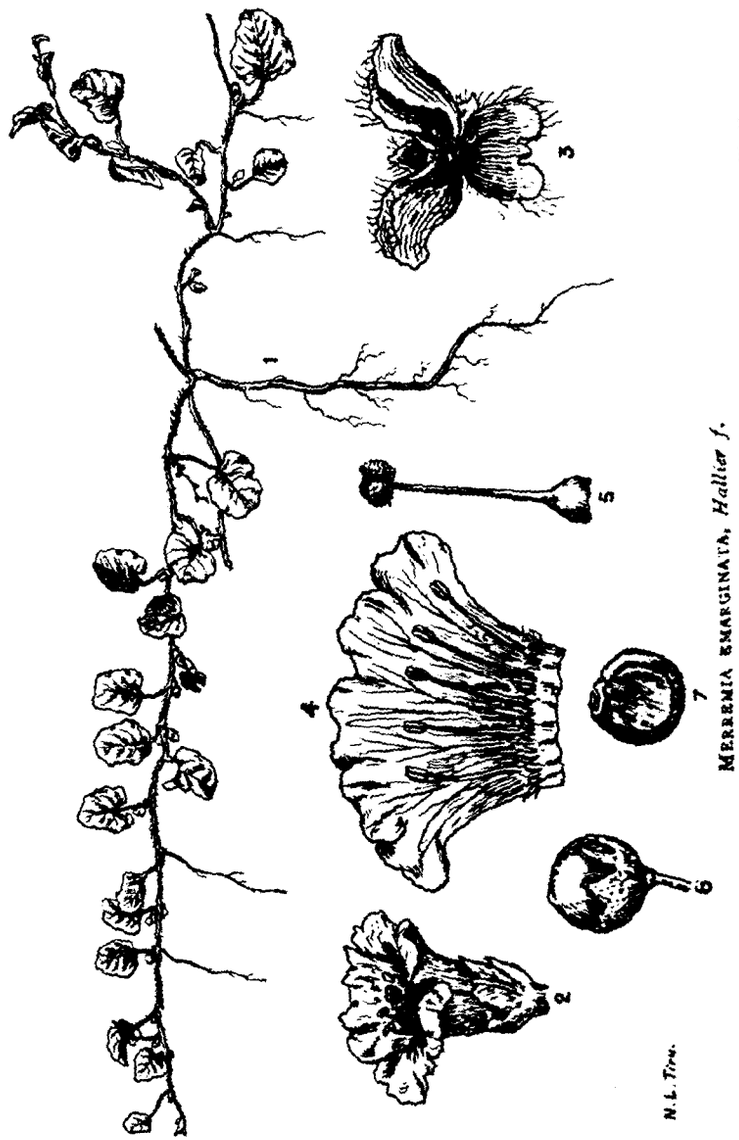


PLATE 89.—Figs. 1. Plant. 2. Flower. 3. Calyx. 4. Corolla cut open to show stamens. 5. Pistil. 6. Fruit with persisting calyx. 7. Seed.

MERREMIA EMARGINATA, *Hallier f.*

N. L. Iyer.

underground stems put forth fresh shoots in no time. Careless digging or ploughing is likely to break the brittle subterranean branches into small bits and spread them over the field; each broken piece is capable of growth as it possesses buds. So instead of being exterminated the weed is likely to get widely dispersed. Therefore it is advisable to collect carefully all broken bits when such operations are done in the field, and burn them. Wherever practicable trace out all the underground stems by careful digging and destroy them. Recourse should also be had to deep hoeing or raising of root crops which necessitate hoeing. When deep cultivation cannot be done the underground stems may be made to starve and finally die by persistently removing the aerial shoots or by short rotations of smothering crops through a number of seasons.

When fields infested with the pest are in fallow, it is advisable to turn in sheep or goats or cattle which consume the green parts. Clean cultivation and sowing of pure seed greatly minimise the spread of the weed. Lucerne smothers the plant and it should be cultivated wherever possible and cuttings of it should be taken at close intervals. This will put down the leafy growth. Dry fodder and straw may be stacked over patches of land which are very foul with the weed.

Economic importance.—The root is a purgative.

Merremia emarginata, *Hallier f.*

Plate 89.

Tamil: Elikathu Keerai.
Telugu: Elika-jemudu.
Flowering and fruiting time: October–March.
Habit: A creeping herb.
Habitat: Black cotton soils and also in damp places.
Range: Northern Circars, the Deccan and Carnatic, and Coimbatore, up to 3,000 feet in the hills.
Propagation: By seeds and bits of branches.

A very troublesome weed seriously interfering with ploughing especially when the soil is dry. It is a much branched annual or a biennial. The branches are prostrate, slender and hairy; they densely cover the ground and root at nodes. Young shoots grow erect a few inches and are pinkish in colour. Leaves are small, about 1–1½ inches across, simple, alternate, usually kidney-shaped or ovate-cordate and broader than long on petioles 1–1½ inches long which are often bent at base and longer than the blade. Flowers are small, yellow, ¼–⅓ inch long, axillary, solitary or in

clusters of 2-3, usually on short and rarely on a long peduncle. Bracts are small, ovate acute and hairy. Calyx consists of five sepals, the outer two being shorter than the three oblong inner ones. Corolla is yellow and glabrous, the limb being five-lobed. Stamens are five, sub-equal, attached to the base of the corolla and filaments are flat. Ovary is superior with four ovules; style is erect and stigma is bi-globose. Fruit is a small somewhat globose, smooth capsule about 1/6 inch in diameter and surrounded by the persistent calyx. Seeds are two, one in each cell, glabrous, round on the back and flat on the inner face and dark grey in colour.

Means of control.—Pulling is of no use as the branches are firmly fixed to the ground by the roots at the nodes. In dry soils work a weighted Guntaka and remove the branches before the flowering time. Do not leave bits of branches in the field.

Economic importance.—The plant is diuretic. Its juice is given in rat bite.

1. *Ipomaea hispida*, Roem. & Sch.—A slender, twining annual with hairy stems and alternate, narrowly oblong or ovate-cordate leaves and hairy capsules. Flowers are small, pink, in somewhat dense, axillary, sub-sessile clusters. The plant is met with in dry fields, particularly in a crop of horse-gram, in all plains districts.

2. *Ipomaea reptans*, Poir.—An aquatic herb with hollow stems sometimes swollen and provided with spongy, white floats. Leaves vary from narrowly oblong to broadly ovate. Flowers are pretty, large and pink. The plant is either free floating in ponds or creeping in moist places and irrigation channels of all districts in the plains.

Tamil: Vellai Keerai.
Telugu: Tooti Koora.

3. *Ipomaea sepiaria*, Koen.—A twining perennial, climbing among hedges or creeping in grassy waste places in almost all plains districts. Stem is densely hairy or glabrous. Leaves vary much in shape from narrow and hastate to broadly ovate. Flowers are about 1 inch across, white or pinkish in axillary peduncled cymes. Pedicels are dilated below the calyx. Fruit is a small sub-globose capsule.

Leaves may be used as fodder for cattle.

Tamil: Thali Keerai.
Malayalam: Tiru-tali.
Telugu: Metta-tooti.

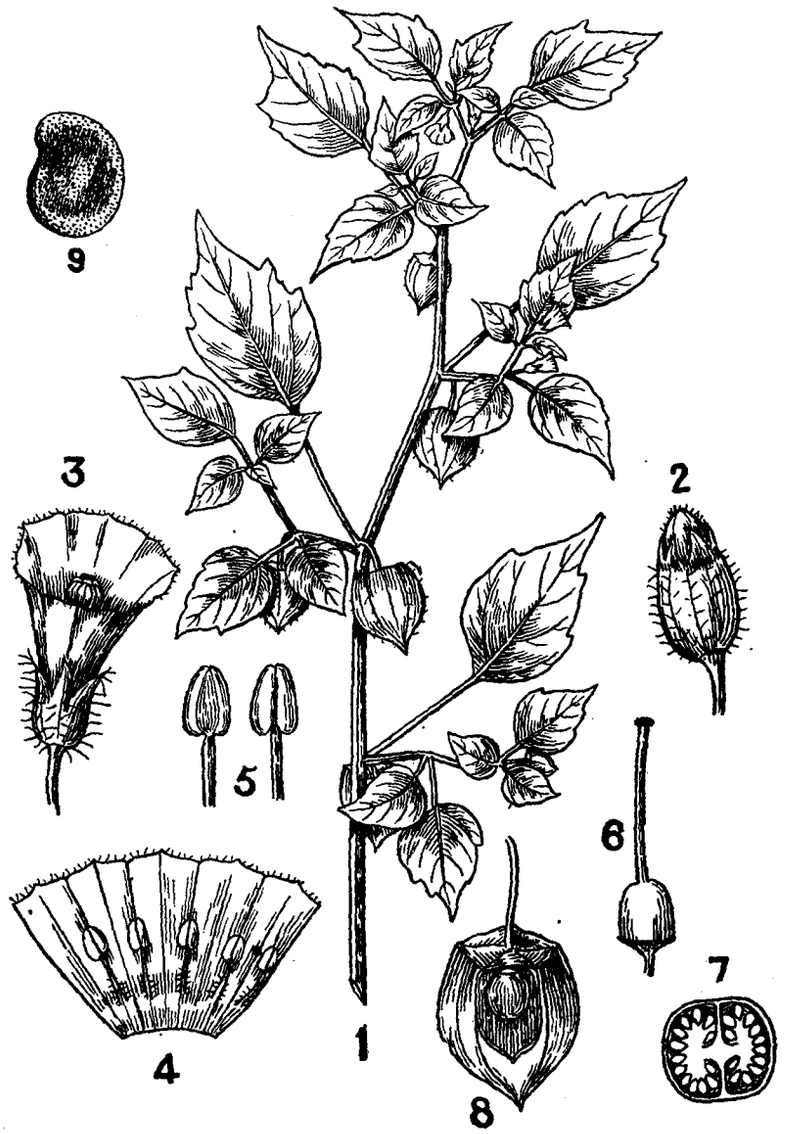
Solanaceae.

THE NIGHT-SHADE FAMILY.

THE BRINJAL FAMILY.

Herbs or erect or climbing shrubs and small trees. Leaves are simple, alternate and often carried up by the growing axillary branches. Flowers are regular and usally bisexual. Calyx is 5-lobed, as also the limb of the corolla. Stamens are five, attached to the corolla tube. Ovary is superior, often two-celled with many ovules. Fruit is a berry or a capsule and seeds are many and endospermous.

Distribution.—All warm regions.



PHYSALIS MINIMA, *Linn.*

PLATE 91.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4. Corolla cut open to show stamens. 5. Anthers. 6. Pistil. 7. Cross-section of ovary. 8. Fruit with inflated calyx. 9. Seed.

Physalis minima, *Linn.*

Plate 91.

Tamil: Thakkali.
Malayalam: Njodi-njotta.
Telugu: Kupanti.
Flowering and fruiting time: June-October.
Habit: A herb.
Habitat: Waste places and cultivated fields.
Range: Throughout the Presidency up to 3,000 feet.
Propagation: By seed.
Number of seeds: About 15,000.

The plant is an annual herb with forking branches, growing to a height of 1½ feet. It is commonly found in irrigated fields and occasionally on the bunds of paddy lands. The root system though shallow is well developed. The plant is able to withstand water logging to some extent though it does not thrive in very wet situations.

The stem is smooth or sparsely hairy and somewhat angled. Leaves are simple and alternate; they are carried up by their axillary branches. Stipules are absent. Petioles are 1–1¾ inches long; the lamina is ovate, acute, up to 2½ inches long and sparsely hairy on both the surfaces, while the base is unequal and the margin is sinuate-dentate. Flowers are yellow and solitary. They are placed at the bases of the forking branches; the pedicel is at first short in flower and then elongates and becomes pendulous in fruit. Calyx is cup-shaped with five triangular teeth, persistent and becoming bigger and bigger as the fruit grows. Corolla is bell-shaped and about ¼ inch across. Stamens are five attached to the corolla and the bi-lobed anthers break open lengthwise. Ovary is superior, ovoid, raised on a disc, two-celled and many ovuled. Stigma is indistinctly bi-fid. Fruit is a berry, about ½ inch in diameter and it is completely enclosed by the much enlarged inflated and ten-ribbed calyx. Seeds are small, compressed and discoid.

Means of control.—The weed is easily killed by handpulling which however should be done early in the season to prevent the ripening of the fruit.

Economic importance.—The plant is a tonic. When applied to breasts in the form of paste with rice water, it stimulates increased secretion of milk.

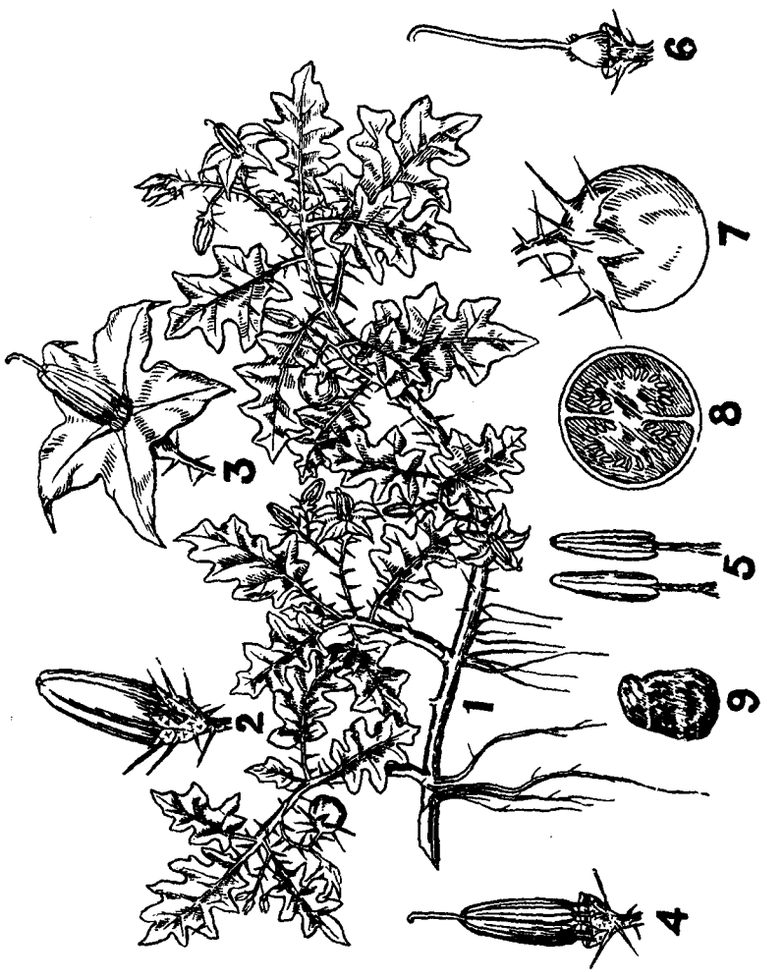


PLATE 90.—SOLANUM XANTHOCARPUM, *Schrad. & Wendl.*
Figs. 1 Branch. 2. Flower bud. 3. Flower. 4. Stamens surrounding pistil with calyx below. 5. Stamens. 6. Pistil. 7. Fruit. 8. Cross-section of fruit. 9. Seed.

Solanum xanthocarpum, *Schrad. & Wendl.*

Plate 90.

Tamil: Kandan-kattiri.
Malayalam: Kandankathiri.
Telugu: Nelavakudu; Nelamulaka; Jidduvusti.
Flowering and fruiting time: May-August.
Habit: A perennial herb.
Habitat: Roadsides and waste places.
Range: All plains districts and low hills.
Propagation: By seed.

The plant is a very conspicuous herb common in black cotton soil. It has a very deep-seated, woody root sometimes attaining a length of even three feet. Branches are rather short, spreading and prostrate on the ground; the numerous long yellow spines all over the plant make it very prominent.

The stem is somewhat round and covered with sparsely distributed, star-like hairs. The leaves are simple, alternate, about 4″ × 2″ pinnately lobed on petioles ½-1½ inches long. Flowers are rather showy, purplish blue in colour, wheel-shaped and about ¾ inch across. They are arranged in few-flowered, extra axillary cymes. Pedicels are short. Calyx is five-lobed, prickly and somewhat accrescent and persistent in fruit. Stamens are five, attached inside the base of the corolla tube; anthers are yellow and much longer than the filaments. Ovary is superior, two-celled and many-ovuled; style is short. Fruit is a globose berry about ½ inch in diameter. It is yellow or white with green blotches. Seeds are very many in each fruit, small, smooth and compressed.

Means of control.—First remove the shoot by cutting with a spade and then dig out the crown of the tap-root. By so doing the growth of fresh branches will be arrested. Attack plants before the fruit is ripe.

Economic importance.—The plant is highly medicinal and forms one of the "Dasa mulikas" of Hindu medicine. It is also useful in the treatment of asthma, cough, fever, etc.

Solanum nigrum, Linn.—An erect herb with ovate, lanceolate, usually lobed leaves and clusters of small, round, black or red berries on lateral peduncles. It is a common weed of cultivated and waste places, in all districts.

English: Garden-nightshade.
Tamil: Mana-thakkali.
Malayalam: Mulaku-thakkali.
Telugu: Kamanchi-chettu.

DATURA FASTUOSA, *Linn.*

PLATE 92.—Figs. 1. Entire plant. 2. Corolla cut open to show stamens. 3. Pistil. 4. Fruit with part of calyx persisting below. 5. Seed.

Datura fastuosa, *Linn.*

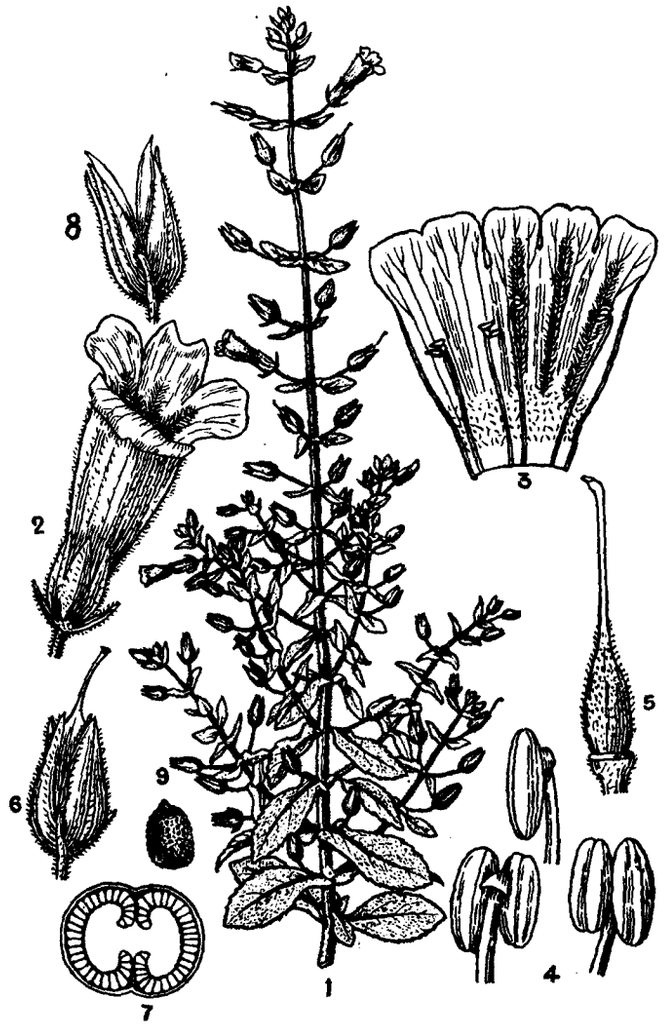
Plate 92.

English : Thorn Apple ; Devil's Trumpet.
Tamil : Ummattam.
Malayalam : Ummattam.
Telugu : Nalla Ummetta.
Flowering and fruiting time : June-December.
Habit : An annual succulent herb.
Habitat : Waste places, fields and gardens.
Range : Almost all districts, especially in the plains.
Propagation : By seed.

The plant is a fetid smelling, robust herb, ½-2 feet high with forking, zig-zag branches. The roots are either surface feeding or deep-seated. The stem is somewhat round, softly hairy or sub-glabrous. The leaves are glaucous green, simple, alternate or sub-opposite ; petioles are 1–2½ inches long. The lamina is up to 6″ × 3″, ovate, acute, entire or with a few lobes and the base is unequal. Flowers are solitary at the bases of the forking branches on short, stout pedicels. Calyx is about three inches long, loose, tubular with five triangular very acute lobes at the top. The base of the calyx is persistent. Corolla is white purple outside, often double, trumpet-shaped, up to 7 inches long and 3–4 inches across at the mouth. Lobes are five, pointed with a short tail in each of the intervening sinuses. Stamens are five, attached to the corolla tube and long. Ovary is superior, softly echinate, 2–4 celled and many-ovuled. Style is long and erect, and stigma is dilated and bi-fid. Fruit is a sub-globose capsule on a stout stalk, and covered all over with short spines. At the base of the fruit is the flat persisting calyx. The mature fruit breaks open irregularly at the top. Seeds are many, compressed and yellowish-brown in colour.

Means of control.—As the weed is poisonous, special care should be taken to destroy it wherever it is found. Large number of seedlings can be destroyed early in the season by handpulling or hoeing. Old plants should be cut close to the ground level and destroyed.

Economic importance.—Seeds are poisonous and contain an alkaloid called *Daturine.* Seeds and leaves are used in medicine for a number of diseases. Leaves and flowers are smoked in asthma. Root ground in " Datura Oil " with lime juice is applied to body in snake bite.



STEMODIA VISCOSA, *Roxb.*

PLATE 93.—Figs. 1. Branch. 2. Flower. 3. Corolla cut open to show stamens. 4. Anthers 5. Pistil. 6. Fruit enclosed in calyx. 7. Cross section of fruit. 8. Dehisced fruit with calyx. 9. Seed.

Datura Fastuosa, Linn, var. *alba*, C. B. Clarke.—This plant is similar to *D. fastuosa*, Linn., and has the same distribution. But the flowers are white and are not often double. The spines on the capsule are sharper.

There is another plant occurring in the same localities and belonging to the same species as *D. fastuosa*, Linn., which has dark stem and foliage, and purple flowers. The seeds of this variety are more poisonous than those of the other two plants.

Withania somnifera, Dun.—A somewhat large undershrub with broad, ovate leaves and clusters of flowers, and small, round, red berries loosely enclosed in the enlarged calyces. Roots are stout and fleshy. The plant is found in waste places and on field bunds, in most dry districts.

English: Winter Cherry.
Tamil: Amukkaran-kilangu.
Telugu: Pilli-vandram; Penneru Chettu.

Scrophulariaceae.

THE FIGWORT FAMILY.

Herbs, sometimes semi-parasitic, or shrubs. Leaves are simple, alternate or opposite and exstipulate. Flowers are bisexual and usually irregular. Calyx is 4-5 lobed and persistent. Corolla is 4-5 lobed and somewhat 2-lipped. Stamens are usually four, epipetalous and didynamous or rarely two or five. Disc is hypogynous. Ovary is superior, 2-celled, with numerous ovules. Fruit is a capsule and seeds are many, with or without endosperm.

Distribution.—Various regions of the world.

The name of the family is derived from the supposed property of some species, of curing scrofula.

Stemodia viscosa, *Roxb.*

Plate 93.

Telugu: Gunta Kaminam.
Habit: An annual herb.
Habitat: Moist situations.
Range: Most plains districts.
Flowering and fruiting time: Almost throughout the year.
Propagation: By means of seeds.
Number of seeds: about 100,000.

This is one of the most common weeds of rice fields, found in large numbers when the fields are in fallow. Outside India this plant is said to occur only in Afghanistan.

It is an aromatic, viscid, pubescent herb, 1-2 feet high, producing many branches from the very base. The basal branches are the longest becoming smaller and smaller towards the top, so that

PLATE 94.—Figs. 1. Branch. 2. Flower. 3. Flower. 4. Corolla. 5. Anthers. 6. Pistil. 7. Fruit with Calyx. 8. Cross-section of fruit. 9. Seeds.

MONIERA CUNEIFOLIA, *Michx.*

the plant presents a sort of pyramidal appearance. The root system is shallow but well developed. The stem is erect, four-angled and densely glandular-hairy. Leaves are simple, opposite, oblong-ovate, 1 inch long and somewhat clasping the stem. Base of the leaf is cordate and its margin is serrate. The basal leaves are the biggest and they become smaller and smaller towards the top, till they merge into the bracts. Both the surfaces of the leaf are glandular hairy. Flowers are violet, whitish or pale blue and are produced in great abundance. In a single plant about 2 feet high as many as 800 flowers and fruits have been recorded. They are axillary, solitary, but towards the ends of branches where the leaves are much reduced, the flowers are arranged in a sort of raceme. There are two small bracteoles at the base of the calyx which is deeply 5-partite. The lobes are linear, lance shaped and hairy. Corolla is tubular, nearly twice as long as the calyx and 2-lipped and 5-lobed. In the throat of the corolla there are 3 rows of hairs and a yellow streak. Stamens are 4, attached to the corolla. Ovary is superior, 2-celled with numerous ovules. Fruit is a capsule, ½ inch long, ovoid, acuminate and enclosed in the persistent calyx. The capsule dehisces by means of 4 valves. Seeds are very numerous, minute, ellipsoidal and dark brown.

Means of control.—Destroy the plants before the fruiting time. Repeat the same operation for a few years consecutively. If practicable, work a harrow or country plough to kill seedlings. Hand-pulling may be resorted to in the case of stray plants, but if they are in fruit they ought to be burnt. In paddy fields where the weed is extremely gregarious and where it often simulates a crop, plough it in when there is enough water in the field, for dry ploughing is considered harmful for paddy lands. Do not plough in mature plants for it only ensures preservation of seed which will start a fresh colony of the weed in the succeeding season.

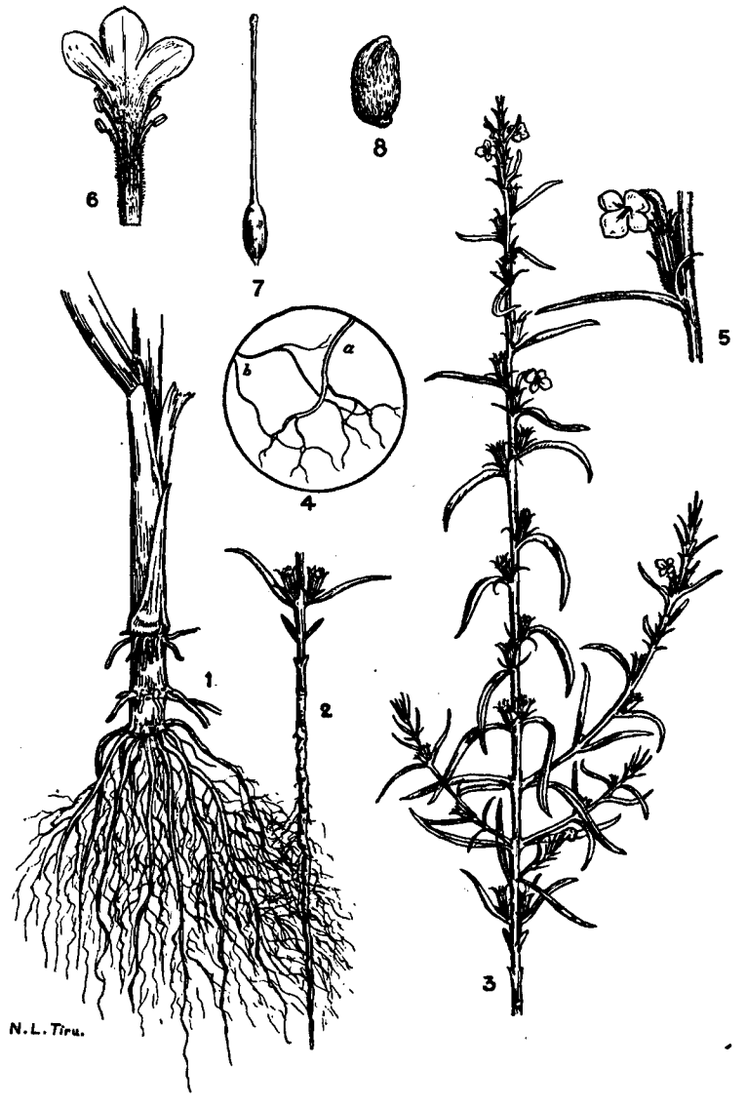
Economic importance.—The plant is used as a demulcent.

Moniera cuneifolia, *Michaux.*

Plate 94.

English : Thyme-leaved gratiola.
Tamil : Neerpirami ; Neerbrahmi.
Malayalam : Neerbrahmi ; Beami.
Telugu : Sambrani Mokka.
Flowering and fruiting time : Almost throughout the year.
Habit : A creeping herbaceous annual.
Habitat : In wet places and sometimes in saltish water, in all plains districts and in the hills up to about 4,000 feet.
Propagation : Chiefly by seed.

The plant is a succulent, glabrous, creeping herb thickly spreading with numerous branches that root at the nodes. Though it is



STRIGA LUTEA, *Lour.*

PLATE 95.—Figs. 1. Root system of *Andropogon Sorghum*, Brot. (cholam). 2. Lower portion of *Striga*. 3. Upper part of *Striga*. 4. *a*. Roots of *Striga* with haustoria. *b*. Roots of cholam. 5. Flower in the axil of leaf. 6. Corolla cut open. 7. Pistil. 8. Seed (much magnified).

commonly met with in rice fields where water stagnates, it can adapt itself to moisture conditions and can get on even if the soil becomes dry.

The stem is round and pinkish. The leaves are opposite, somewhat fleshy, oblong-ovate in shape and longer than the internodes, in the young shoots. Flowers are blue, axillary, solitary on pedicels ¼ inch long. Bracteoles are two and linear. Sepals are five, the three outer are ovate acute and are longer than the inner two which are linear. Corolla tube is about ⅓ inch long and has a five-lobed limb; it is pale blue in colour with a yellow patch and a red ring at the base inside the tube. Stamens are four, epipetalous and didynamous. Anther lobes are bluish purple. Ovary is conical, two-celled, each cell containing many ovules. Style is bent towards one side of the corolla tube and bears a flat green stigma. Fruit is an ovoid capsule about 1/5 inch long. It is narrowed at the tip and breaks by the splitting of the valves and thereby liberates the numerous minute seeds which are pale and striate on the sides.

Means of control.—Though a gregarious plant it may be brought under check by improving the drainage of the soil. Where this cannot be done, persistent hand weeding has to be adopted.

Economic importance.—The whole plant is used as a nervine tonic and in the treatment of insanity and rheumatism.

Striga lutea, *Lour.*

Plate 95.

Tamil: Palli Poondu.
Flowering and fruiting time: June–January.
Habit: A parasitic annual herb.
Habitat: Dry grassy places and among crops especially cholam.
Range: All districts and up to 7,000 feet in the hills.
Propagation: By seed.
Number of seeds: 50,000 or more.

The plant is an erect, branching, stiff herb 6–15 inches high. It is a root parasite attacking various cereals and doing considerable damage. The plant can be easily recognized from the linear rough leaves, white or yellowish tubular flowers with spreading limbs. Root system is shallow and is poorly developed. Stem is slender, 4-sided and densely clothed with rough hairs. Leaves are about ½ inch long, sessile, opposite below, alternate above, very narrow and rough with small prickles having pustules at their bases. Flowers are many, sessile, axillary, solitary or the upper in lax bracteate spikes; bracteoles are 2, linear, pointed and rough to the touch. Calyx is narrowly tubular, dilating a little in fruit, 5-toothed

the teeth being narrow. There are 10 characteristic ribs on the calyx, 5 of them end in the teeth and the other 5 at the sinuses. Corolla is pale yellow, white or rarely reddish; tube is slender, curved at the tip and limb is 2-lipped with round lobes. Stamens are 4, included in the corolla tube, attached to it and didynamous. Ovary is superior, 1-celled with numerous ovules. Fruit is an oblong cylindric capsule, ¼ inch long, dehiscing by two valves and liberating the innumerable seeds which are dark brown in colour, very minute, ovoid and striate.

As the plant is parasitic, it robs its host of its food and causes considerable damage. The roots of the parasite attach themselves to those of the host by means of sucking organs called *haustoria.*

Means of control.—Considering the large number of seeds a single plant is capable of producing, it is absolutely essential that all possible methods should be adopted to prevent the weed from seeding. If this important point is lost sight of, it will be almost impossible to attempt at successful growing of grain crops. The seeds are said to be capable of maintaining their vitality for a period of 40 years or more. Therefore one year's seeding may mean 40 years' weeding.

In places where the parasite usually occurs, have an eye for it and destroy it as soon as it appears. Young plants can be easily pulled out. But old plants in fruit should be collected without shedding the seed and burnt. After harvest of cholam or other cereal crops, instead of ploughing the field, the weed must be collected and destroyed. Then the field must be kept clean of all grasses. If this is not done the parasite will freely seed and the seeds will be buried with the first ploughing and stored in the soil. Subsequent cultural operations will bring the seeds to the surface of the soil, which means fresh trouble to the crop if it happens to be a cereal. If it is suspected that there is already plenty of *Striga* seed in the soil, raise a catch crop of cholam and induce all the seed to germinate. And when the seedlings come up, plough the whole field and destroy both the crop and parasites. Change of rotation of crops, may also be tried; if it is not possible to entirely leave off cereals, they must at least be arranged to come at long intervals. It will be found advantageous in combating the weed, to sow cereals in lines so that intercultivation could be easily done with a view to kill the parasite whenever it appears.

The plant has also been noticed attacking sugarcane, ragi, varagu and paddy.

1. *Striga euphrasioides*, Benth. It is an erect, very variable, annual herb, 4"-1½ feet high very much resembling *S. lutea*, Lour. This also, is a root parasite said to be very destructive to crops like ragi, sugarcane and cholam.

Stem and calyx are very rough being covered with crustaceous pustules bearing short, rough hairs. Flowers are small and white. The plant differs from *S. lutea* in having 15 ribs on the calyx, all the ribs being continued to the apex of the calyx lobes. Seeds are more elongate than those of *S. lutea.*

It is found in most districts in the plains and in the hills to about 4,000 feet.

Means of control.—Same as for *S. lutea.*

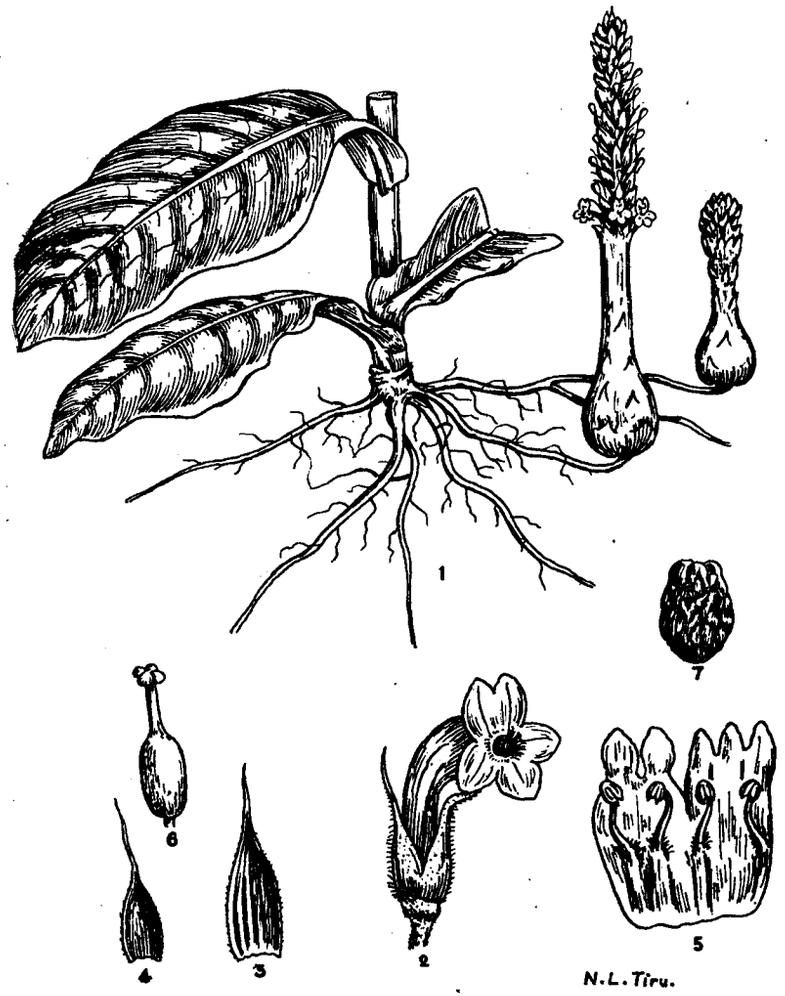
This species was found attacking paddy plants grown under swampy conditions in Nellore District during the month of January 1929.

2. *Dopatrium junceum*, Buch-Ham.—A shallow rooted, erect herb a few inches high and somewhat fleshy at base, becoming slender above. Leaves are opposite, sessile, prominent at base and small, and inconspicuous towards the top. Flowers are pinkish violet. The plant occurs, frequently in wet places as rice fields and ponds, in all districts, and up to 4,000 feet in the hills.

3. *Ilysanthes parviflora*, Benth.—An erect, glabrous, annual herb with opposite leaves which are sessile, three-nerved, usually rather large at base and much smaller above. Flowers are blue or white, solitary on slender pedicels. Fruit is round. It is a common weed of wet places in many districts in the plains.

4. *Ilysanthes veronicæfolia*, Urban.—An annual herb with procumbent branches rooting at the base. Leaves are opposite, obovate or oblong and serrate. Flowers are usually violet, solitary on slender pedicels that elongate and slightly thicken in fruit. Fruit is a narrow, pointed capsule. The plant occurs in wet localities, particularly channels in rice fields, in all districts, and up to 5,000 feet in the hills.

5. *Scoparia dulcis*, Linn.—An erect, simple or much branched undershrub with opposite or whorled leaves which are eliptic or lanceolate, coarsely toothed and tapering towards the base. Flowers are small, white, and solitary on slender pedicels. Fruits are small and globose. The plant is an introduced weed, now abundant on bunds of paddy lands and in fallow moist fields in all plains districts, and up to 3,000 feet in the hills.



OROBANCHE CERNUA, *Loefl., var.* DESERTORUM, *Beck.*

PLATE 96.—Figs. 1. Parasite on root of *Nicotiana tabacum*, Linn. 2. Flower. 3. Bract 4. Calyx lobe. 5. Corolla cut open. 6. Pistil. 7. Seed (magnified).

Orobanchaceae.

THE BROOMRAPE FAMILY.

Brown or yellowish herbs, without green leaves and parasitic on the roots of other plants. Stem is usually simple, with a few scales and often ending in a spike of flowers which are irregular and bi-sexual. Bracts are like the scale-leaves and bracteoles may or may not be present. Calyx is deeply 2-4 lobed. Corolla is gamopetalous, slightly curved, usually two-lipped and five-lobed. Stamens are four, didynamous and epipetalous. Ovary is superior, two or three carpelled, one-celled, with numerous ovules. Fruit is a two or three valved capsule. Seeds are minute and endospermous.

Distribution.—Chiefly in the temperate regions, particularly of the Eastern Hemisphere and also in the tropics.

Orobanchaceæ is from Greek *Orobos* = a vetch and *anchein* = to strangle. Some species of the family are parasites on vetches.

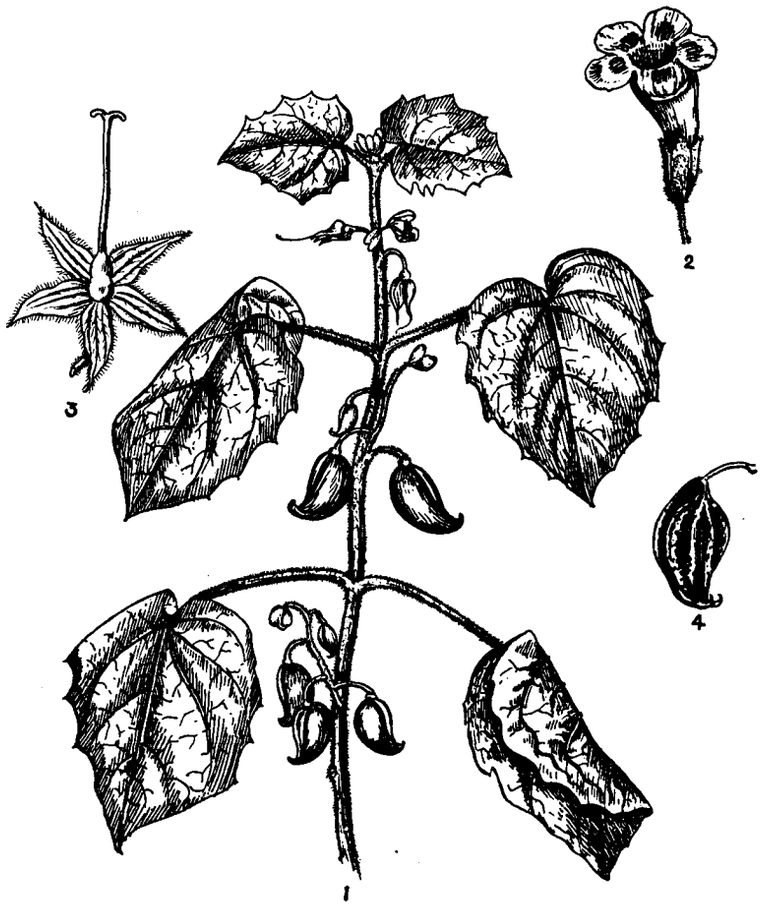
Orobanche cernua, *Loefl., var.* desertorum, *Beck.*

Plate 96.

Tamil: Pokayilai-kalan.
Telugu: Bodu.
Flowering and fruiting time: December-February.
Habit: A fleshy herb.
Habitat: Chiefly cultivated places.
Range: Northern Circars, the Deccan, Tinnevelly, Coimbatore and Travancore.
Propagation: By seed.
Number of seeds: Innumerable.

A fleshy annual parasitic on roots of tobacco and *Withania somnifera*, Dunal., of the Brinjal family. In some districts the plant is a serious menace to tobacco cultivation. Tobacco plants when attacked by the parasite become very stunted in growth and finally die away.

It is an erect herb, 6-12 inches high. Stem is often solitary very much thickened at base and covered with a few acute scale-leaves; it is round, pale brown in colour and ends in a spike bearing number of violet flowers about ½ inch long. Bract is ovate-lanceolate, acute and veined. Calyx is deeply divided into two narrowly lanceolate and long acuminate lobes which may be mistaken for bracteoles. Corolla is 2-lipped; tube is white and lobes are bluish or violet. Stamens are 4 and attached to the corolla. Anthers are 2-lobed and pointed at base. Ovary is superior, 1-celled with numerous ovules. Stigma is rather big and distinctly 4-lobed. Fruit is a 2-valved capsule enclosed by the dried corolla and calyx. Seeds are very many, very minute, ovoid and reticulate.



MARTYNIA ANNUA, *Linn.*

PLATE 97.—Figs. 1. Branch. 2. Flower. 3. Pistil with calyx. 4. Fruit without epicarp.

The innumerable seeds get dispersed all over the field by various agencies. They germinate only in the presence of the roots of either tobacco or *Withania somnifera*, Dunal., and get fixed on to the roots and entirely depend upon their hosts for their growth.

Means of control.—The plant appears only when fields get dry and can easily be recognized from its habit and appearance. Search for the parasite around each tobacco plant and pull the pest away by using a chisel-hoe, as soon as possible, after it makes its appearance. Otherwise it will run to seed and contaminate the field. Goats and sheep that are suspected of having been fed on the plant should not be penned in fields that are likely to be grown with tobacco. If the parasite happens to be in large numbers and the field is badly contaminated, change rotation of crops and avoid tobacco for a few years. At the same time destroy all plants of *Withania somnifera* that may be found in the field or in its vicinity.

Pedaliaceae.

THE PEDALIUM FAMILY.

THE GINGELLY FAMILY.

Herbs or undershrubs with opposite and alternate, ex-stipulate leaves. Flowers are regular, bi-sexual, usually solitary and axillary. Calyx is 4–5 lobed. Corolla is tubular with a five-lobed, obscurely two-lipped limb. Stamens are four, didynamous or two and epipetalous. Ovary is superior, two or one-celled and raised on a fleshy disc. Fruit is indehiscent, or a capsule. Seeds are ex-endospermous.

Distribution.—Warm regions of the world, especially in Africa.

Martynia annua, *Linn.*

Plate 97.

English: Tiger Claw; Devil's Claw.
Tamil: Puli-nagam.
Malayalam: Puli-nakham.
Telugu: Garuda Mukku; Telu-kondi-chettu.
Flowering and fruiting time: May–January.
Habit: An annual robust herb.
Habitat: Cool and open waste places.
Range: Most plains districts.
Propagation: By means of the beaked fruits.
Number of fruits: About 50.

An introduced weed, native of Mexico. It is an erect, branched annual, 1–3 feet high, densely glandular, hairy all over. The root system is rather shallow, the tap-root being short and very stout

with many lateral roots. The stem is round, hollow inside and densely clothed with glandular hairs. Leaves are up to 9″ × 12″, simple, opposite, ex-stipulate on stout, glandular petioles which sometimes attain a length of even 7 inches. Lamina is broadly ovate, obtuse, shallowly lobed, cordate at base and densely covered with the hairs on both the sides. Flowers are conspicuous, ill-smelling, about a dozen in a terminal raceme 4 inches long. Bract is one, ovate, long clawed and pinkish. Bracteoles are two, smaller, ovate-elliptic and sessile. Sepals are five, unequal, elliptic to linear-oblong and greenish white. Corolla is somewhat bell-shaped, about 1½ inches long and an inch across, drooping down and constricted at the base; the mouth has five round, unequal lobes, each with a dark purple velvety spot at the base. Stamens are five, two of which are perfect and the other three undeveloped and epipetalous. Each perfect stamen has two anther lobes which are spreading and are slightly connate with those of the other. Ovary is superior, raised on a glandular disk and four-celled and four-ovuled. Style is erect and stigma is bi-fid, the lobes being unequal. Fruit is about an inch long, hard, woody and black, very curious looking with two prominent hooks and variously furrowed surface.

The plant is a very conspicuous one and can be easily identified from the viscid glandular nature, the tubular showy flowers and the curious fruit.

Means of control.—Plants can be easily destroyed by hand pulling. Prevent the formation of the fruit which on account of its woody nature can remain buried in the soil for a long time. Collect and burn the fruit.

Economic importance.—The fruit is rubbed over a stone with water, and the paste is applied to parts stung by scorpion. But it is very likely that such a property is only imaginary and is perhaps guessed from the vernacular names (Telugu and other North Indian) which refer to the hooks of the fruit that are like the sting of a scorpion.

What is called Phyllody occurs in the flower of this plant, i.e., the various parts of the flower are modified into leaf-like structures which are pink.

Pedalium Murex, Linn.—A somewhat fleshy herb, with the branches either erect or spreading and ascending. Leaves are opposite, ovate, oblong, somewhat coarsely lobed or toothed with long petioles. Flowers are yellow, somewhat big, about ¾ inch across, on short stalks. Fruit is abruptly narrowed at the base and four-sided, each angle having a sharp horizontal spine. The plant is common on sandy soils of most districts in the East Coast and also in Coimbatore.

Tamil: Anai-nerinji.

Telugu: Enugu Palleru.

Acanthaceae.

THE ACANTHUS FAMILY.

Herbs or shrubs. Leaves are opposite, ex-stipulate, usually with many narrow raphides. Flowers are bi-sexual and irregular. Calyx is 4-5 partite. Corolla is two lipped and five lobed. Stamens are four or two and epipetalous. Anthers are two or one-celled. Ovary is superior, two-celled and raised on a disc, with one or more ovules in each cell. Fruit is a capsule, breaking open loculicidally by the valves separating elastically; seeds have little or no endosperm; they are usually compressed and often clothed with hygroscopic hairs.

Distribution.—Tropical and sub-tropical regions.

The name of the family is from Greek *Acantha* which means a thorn. Some of the species are spiny.

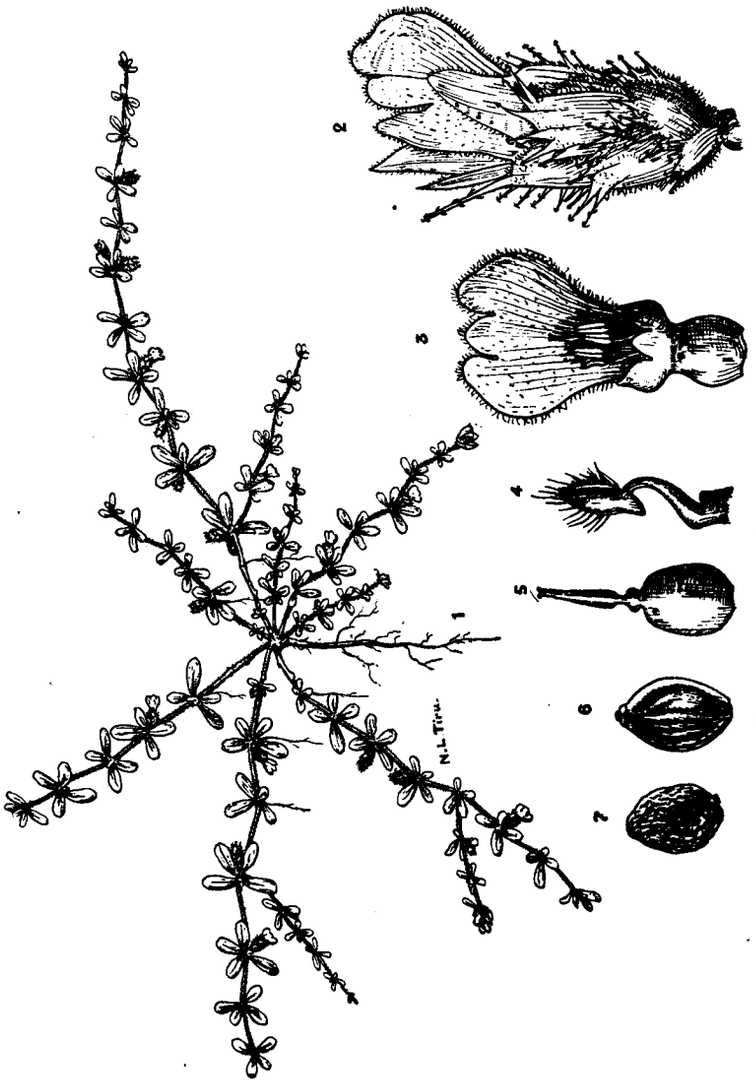


PLATE 98.—Figs. 1. Entire plant. 2. Flower. 3. Corolla. 4. Stamen. 5. Pistil. 6. Fruit. 7. Seed. BLEPHARIS MOLLUGINIFOLIA, *Pers.*

Blepharis molluginifolia, *Pers.*

Plate 98.

Flowering and fruiting time : September–January.
Habit : A prostrate undershrub.
Habitat : Dry sandy places or grass lands.
Range : Northern Circars, the Deccan and Carnatic, as also in Salem and Coimbatore districts.
Propagation : By seed.

The plant is a very prostrate, much branched hispid annual or biennial; the branches are 6–12 inches long, wiry and clothed with hispid hairs. Leaves are small, less than an inch long, in whorls of four, unequal and sub-sessile; they are somewhat fleshy, usually obovate or oblong, obtuse and hairy on both sides; the lower surface is also minutely pitted. Flowers are sessile, solitary and axillary; there are 10 bracts for each flower; the innermost ones are the longest and the rest become shorter outwards; they are oblong, spathulate or obovate, three-nerved with the tips set with hairy bristles barbate at the ends. Calyx is deeply four-partite with two opposite pairs of narrowly oblong acute segments which have membranous margins. Corolla is blue, the lower lip is hairy and three-toothed while the upper lip is almost absent or inconspicuous. The tube of the corolla is very short and horny. Stamens are four and didynamous; the lower pair has two processes; anthers are one-lobed and bearded on the margins. Ovary is superior, two celled and 2–4 ovuled and raised on a disk. Style is glandular at base and stigma is bi-fid. Fruit is a small, oblong-ellipsoid, glabrous capsule with two round seeds which are clothed with white hairs that become elongated and spread out when moistened. The capsule is enclosed by the persistent calyx and by the bracts which help its dispersal by means of their barbate bristles.

Means of control.—Chisel-hoeing and hand-pulling.

ASTERACANTHA LONGIFOLIA, *Nees.*

PLATE 99.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4. Corolla cut open. 5. Pistil. 6. Fruit. 7. Seed.

Asteracantha longifolia, *Nees.*

Plate 99.

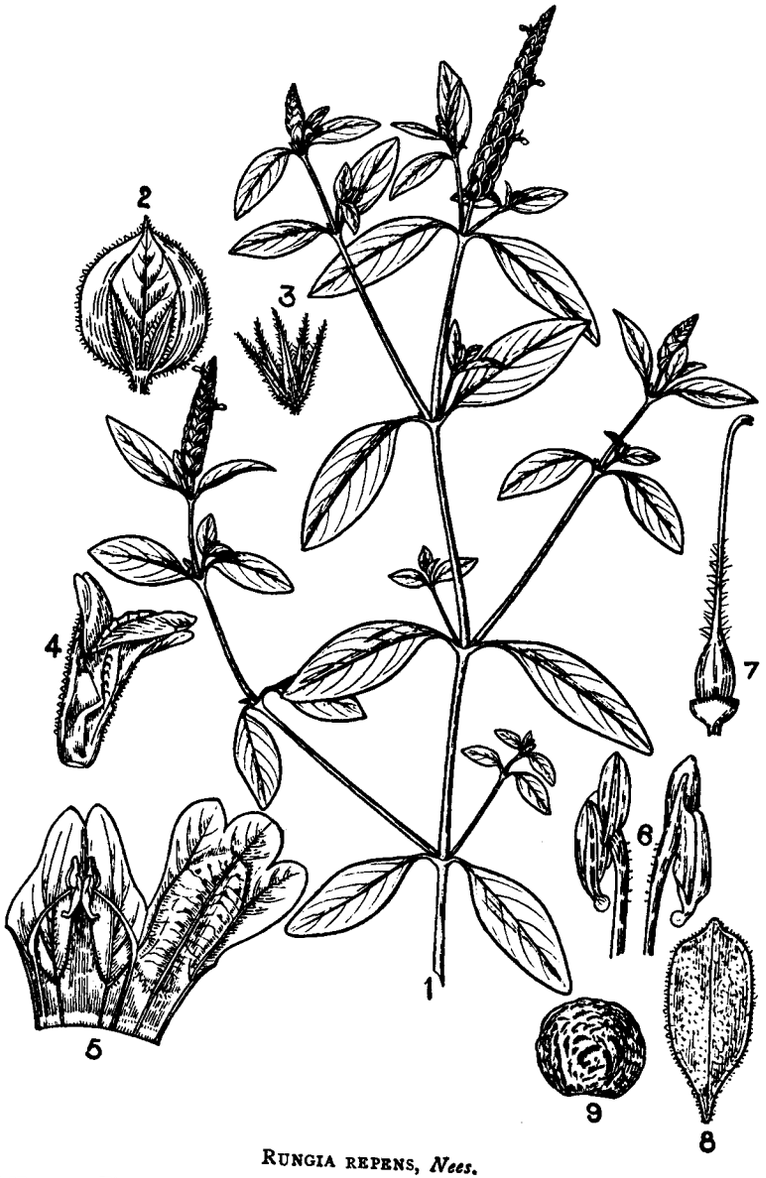
Tamil: Neer-mulli.
Malayalam: Voyal-chullai.
Telugu: Kokilakshi; Neeru-gobbi.
Flowering and fruiting time: August–March.
Habit: A tall herb.
Habitat: Moist places.
Range: All plains districts.
Propagation: By seed.

The plant is often met with in rice fields and margins of tanks. It is very troublesome to people walking on field bunds, and at the time of puddling. It is easily recognized by dense clusters of narrow leaves, long, two-lipped flowers and long woody spines.

Stem is erect, simple or branched, 1–5 feet high, somewhat compressed or round, pinkish and clothed with rough hairs. Leaves are simple, up to 6 inches long, opposite, sessile, narrowly lanceolate and tapering at base; margin is wavy; both the surfaces are sparsely covered with rough hairs. In the axils of the leaves are many narrow shorter leaves and prominent spines which are an inch long. Flowers are pink, 1¼ inch long, in dense axillary leafy clusters. Bracts and bracteoles are narrowly lance-shaped with ciliate margins and tubercle-based hairs. Calyx is deeply four-partite; the upper sepal is larger than the other three and all are densely hairy on the back and ciliate on the membranous margins. Corolla is purple-blue or sometimes white, narrowly tubular with two lips; the upper lip is two-lobed and the lower is three-lobed and ventricose within, with two orange streaks. Stamens are four, attached to the corolla and in two unequal pairs; anthers are two-celled, the cells being parallel, sub-equal and hairy at tips. Ovary is superior, two-celled with four ovules in each cell. Style is elongate, hairy and stigma is simple. Capsule is about 1/3 inch long, glabrous and pointed. Seeds are much compressed and covered with brown hygroscopic hairs.

Means of control.—Cut the plants as frequently as possible and prevent seeding.

Economic importance.—Root is a bitter tonic. It is also employed in rheumatism and in diseases of urino-genital organs. Seeds also are medicinal.



RUNGIA REPENS, *Nees.*

PLATE 100.—Figs. 1. Branch. 2. Bract and two bracteoles. 3. Calyx. 4. Corolla. 5. Corolla cut open. 6. Anthers. 7. Pistil. 8. Fruit. 9. Seed.

Rungia repens, *Nees.*

Plate 100.

Tamil: Kodaga Saleh.
Habit: An annual herb.
Habitat: Water-courses and other moist situations.
Range: Most districts in the plains.
Flowering and fruiting time: July–December.
Propagation: By means of seeds.
Number of seeds: 300–600.

The plant is a diffuse, herbaceous annual growing abundantly in moist situations as ditches, sides of water channels and bunds of paddy fields. It is rarely met with in cultivated fields and as such it is not a very bad weed. But it often interrupts the flow of water in irrigation channels.

The plant can be easily made out from the opposite entire leaves and terminal spikes with four ranked bracts having white membranous margins.

The stem is round or four-sided and sparsely hairy. Branches are spreading and they vary in length from 10–16 inches. Roots are produced at such of the basal nodes that touch the ground. The root system is shallow and consists of a tap-root with numerous lateral roots. Leaves are simple, opposite, ex-stipulate, shortly stalked, and the blade is oblong-lanceolate or elliptic with an entire margin and glabrous sides. Flowers are in terminal spikes; bracts are persistent, four-ranked, oblong-orbicular, glabrous and pointed at the tips. The margins of the bracts are characteristic, being membranous, white and ciliate. Only two rows of bracts bear flowers and the other two are without flowers. Bracteoles are two, membranous, hairy, linear-lanceolate and are half as long as the bract. Calyx is deeply cut to the base into five linear hairy segments. Corolla is two-lipped, light pink, with darker spots on the corrugated three-lobed lip. Stamens are two. Ovary is superior and glabrous. Fruit is a two-celled, capsule compressed. Seeds are four, brown, orbicular, compressed with concentric furrows.

Means of control.—Frequent cleaning of bunds and water-courses will ordinarily keep the weed under check.

Economic importance.—Powder of dry plants is given as a vermifuge in fevers. Fresh leaves bruised and mixed with castor oil is applied in *Tinea capitis* (a scaly fungoid disease on the head of human beings especially children).

1. *Cardanthera uliginosa*, Buch-Ham.—A shallow rooted, erect or decumbent, branched herb 1–2 feet high, and pyramidal in

shape. Leaves are oblong; flowers are light purple, in terminal, bracteate spikes. The plant is a common weed, sometimes gregarious in fallow rice fields, in most coastal districts.

Telugu: Pedda-pichakada.

2. *Ruellia prostrata*, Poir.—A diffuse undershrub with prostrate or ascending branches that root at the nodes below. Flowers are somewhat bell-shaped, purplish and rather conspicuous; they are solitary in the axils of ovate, acute leaves. Capsules are slightly hairy, and 16 or more seeded. The species is frequently met with among bushy places near hedges and in grass lands, in most dry districts.

Tamil: Potta-kanchi.

3. *Ruellia patula*, Jacq.—This plant is very much allied to *Ruellia prostrata*, Poir., but is more erect with obtuse leaves, and has smooth capsules. It occurs in waste places of most districts.

Tamil: Silandi-nayagam.

4. *Dyschoriste depressa*, Nees.—A glabrous, trailing or straggling herb with obovate or elliptic leaves. The small, light violet flowers are axillary, either solitary or 2-4 together. It is common in dry channels, and among hedges, in the Circars, Madras, Salem and Coimbatore districts.

5. *Andrographis echioides*, Nees.—An erect, hairy herb, simple or slightly branched with oblong, obtuse leaves. The pink flowers and hairy capsules are erect, in one-sided, lax, axillary spikes or racemes which are usually shorter than the leaves. It is common in all the dry districts of the Presidency.

6. *Barleria mysorensis*, Roth.—A diffusely branched, villous, thorny shrub with round, mucronate leaves, narrow axillary spines and solitary bluish or white prominent flowers. The outer calyx lobes are ovate or oblong, spine-tipped, toothed, scarious and prominently reticulately nerved. The plant is abundant among hedges, dry tank bunds and waste places, in Coimbatore and Malabar districts.

Tamil: Chulli Mulli.

7. *Asystasia gangetica*, T. And.—A straggling, perennial herb with long inter-nodes, ovate leaves and terminal 1-sided, lax racemes of pretty, conspicuous flowers, often blue or purple and sometimes white or yellow in colour. A prominent plant among hedges in most districts.

Tamil: Medday Keerai.

Malayalam: Upputhalai.

8. *Justicia prostrata*, Gamble n. comb.—A small, much-branched herb, woody at base, rooting at the nodes below, and occurring in patches. The branches are prostrate and somewhat ascending and terminating in short, erect spikes of pinkish flowers. Leaves are small, round or ovate. Bracts and bracteoles are much shorter than the calyx. It occurs along roadsides, grassy places and field bunds in all districts of the East Coast and also in Trichinopoly, Salem and Coimbatore.

Telugu: Chinna Nakka-putha Chettu.

9. *Peristrophe bicalyculata*, Nees.—A diffusely much-branched herb, 1-3 feet or more high, with angular stems rough with hairs. Leaves are usually small and ovate. The small, pink flowers are in very lax, trichotomously spreading panicles. It is often found in large numbers along roadsides, waste places and hedges, in all districts.

Telugu: Che-beera.

Verbenaceae.

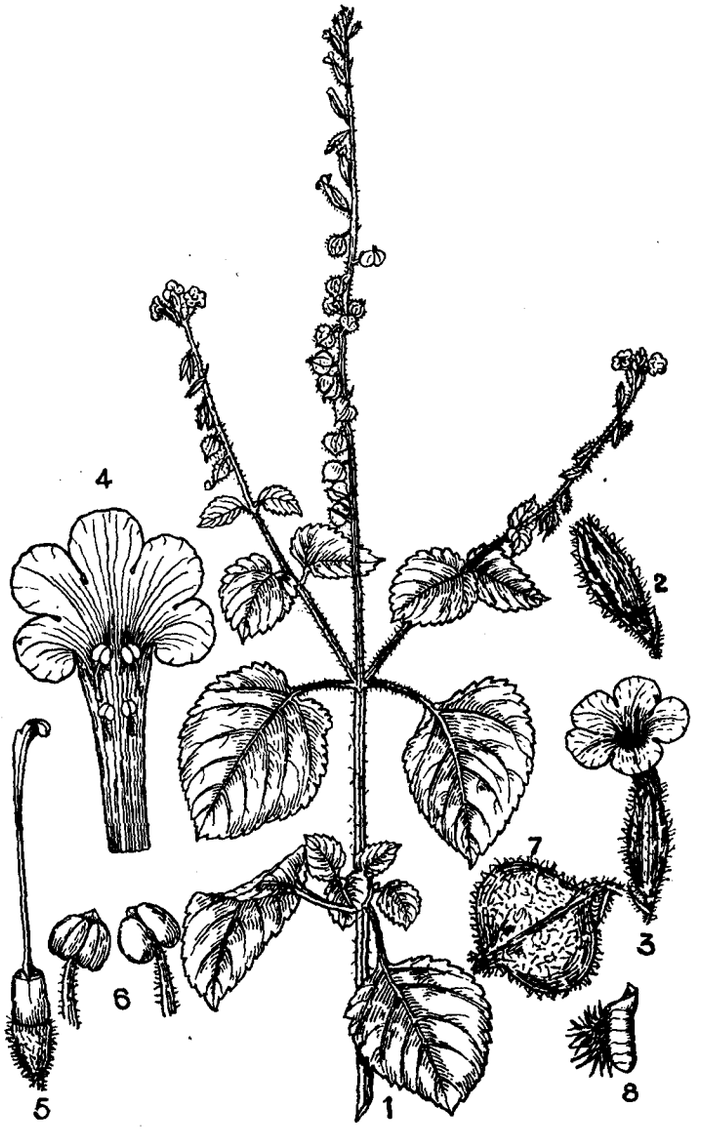
THE VERBENA FAMILY.

THE LANTANA FAMILY.

Herbs, shrubs or trees with usually simple, opposite or whorled, exstipulate leaves. Flowers are bi-sexual and irregular. Calyx is 4-5 or more lobed and sometimes coloured. Corolla tube has a 2-lipped or 4-5 lobed limb. Stamens are 4 and didynamous, or 2, attached to the corolla tube. Fruit is a drupe or a capsule with ex-endospermous seeds.

Distribution.—Tropical and sub-tropical regions.

The name of the family is derived from *Verbena*, an old Latin name for the common European species—*Verbena officinalis*, Linn.



PRIVA LEPTOSTACHYA, *Juss.*

PLATE 101.—Figs. 1. Branch. 2. Flower bud. 3. Flower. 4. Corolla cut open. 5. Pistil. 6. Anthers. 7. Fruit enclosed in calyx. 8. Pyrene.

Priva leptostachya, *Juss.*

Plate 101.

Flowering and fruiting time: June-December.
Habit: An annual or a biennial herb.
Habitat: Shady waste places or bunds of fields.
Range: North Arcot, Madura and Coimbatore, also in the Nilgiris and Anamalais.
Propagation: By bits of fruit.
Number of seeds: 1,500.

The plant is an erect branched herb, 2-4 feet high growing in pretty large numbers in cool situations. The tap-root is somewhat woody and deep-seated.

The stem is rather thick, striate, four-sided, hollow and densely clothed with short hooked hairs. The leaves are simple, opposite and ex-stipulate; petioles are up to 2 inches long; the lamina is 3" × 2½", ovate, obtuse, toothed on the margin, pubescent on the upper surface and covered with characteristic sticky hooked hairs below. Flowers are white and are arranged distantly in a very long terminal spike-like raceme which is ½-2 feet or more in length. Bract is small and linear-lanceolate. Pedicel is short. Calyx is cylindric in flower with five small teeth at the mouth, persistent and becoming globose and inflated in fruit; it is also densely beset with hooked hairs. Corolla is pure white; the tube is as long as calyx and twisted; the limb is five-lobed and the lobes are round. Stamens are four didynamous and included in the corolla tube. Ovary is superior, two-celled, each cell having two ovules. One of the two lobes of the stigma is much suppressed. Fruit is enclosed by the persistent calyx which helps its dispersal by means of the hooked hairs which stick on to the clothing of man and the bodies of various animals. It breaks into two two-seeded bits which are excavate on the faces and bluntly echinate on the back.

Means of control.—Prevent seed production by deep spade cutting soon after the setting in of the monsoons.

1. *Lantana aculeata*, Linn.—A very aromatic, straggling shrub with prickly stems. Leaves are somewhat thick, toothed on the margins, and nerves are much impressed on the upper surface which is very rough. Flowers are arranged in short, sub-capitate spikes on thickened axes; peduncles are long. The flowers occur in various shades of colour, from white to red.

The plant was introduced from Tropical America. It is now run wild and very troublesome in Coorg, the Wynaad, West Coast, Travancore, Cochin, Tinnevelly, Yercaud, parts of Coimbatore and up to 5,000 feet in the Nilgiris.

English: The Lantana; the Wild Sage.
Malayalam: Arippu Chedi.

2. *Lippia nodiflora*, Mich.—A much-branched, prostrate and creeping herb with ascending stems, rooting at the nodes below, and rather small, obovate toothed leaves. Flowers are small and pinkish arranged in short, dense, bracteate spikes on long peduncles. The weed is very common in all moist places as bunds of irrigation channels, tank beds, etc., in all the plains districts.

Tamil: Poduthalai.

Telugu: Gajapippala-kada.

Malayalam: Kattu-thippali.

3. *Stachytarpheta indica*, Vahl, var. *Jamaicensis*, Trimen.—A tall, erect, glabrous herb with rather large, ovate or oblong, coarsely toothed leaves and long, slender, terminal spikes having small, blue, tubular flowers in the excavations of the axes. A very common plant in moist places as fallow rice fields, irrigation channels and coconut gardens, in all the districts in the plains.

English: Aaron's Rod.

Malayalam: Kadaladi.

4. *Clerodendron Phlomidis*, Linn. f.—A shrub sometimes attaining a large size, with white stems and ovate, toothed, rather brittle leaves which have a characteristic, disagreeable odour about them. Flowers are tubular, white or pink, axillary, and either solitary or in clusters of cymes at the ends of branches. Fruit consists of 4 black pyrenes enclosed by the enlarged calyx. This is one of the most pernicious weeds, becoming extremely troublesome in cultivated fields on account of the numerous root suckers produced. The plant occurs in many districts of the Presidency, especially in the dry ones.

Tamil: Thalanji; Thazhudalai.

Telugu: Telaki; Chiri Nellikura.

Labiatae.

THE MINT FAMILY.

THE OCIMUM FAMILY.

Aromatic herbs or undershrubs with four-sided stems and opposite, exstipulate leaves. Flowers are bisexual, bi-laterally symmetrical, in cymose clusters or verticillasters. Calyx is tubular, 4–5 or more toothed and sometimes two-lipped. Corolla also is tubular, with a two-lipped and 4–5 lobed limb. Stamens are four and didynamous or two, attached to the corolla tube. Ovary is superior, raised on a prominent disc and four-lobed, each lobe containing a solitary ovule. Fruit consists of usually four dry, single seeded nutlets. Seeds have a little or no endosperm.

OCIMUM CANUM, *Sims.*

PLATE 102.--Fig A. Entire plant.

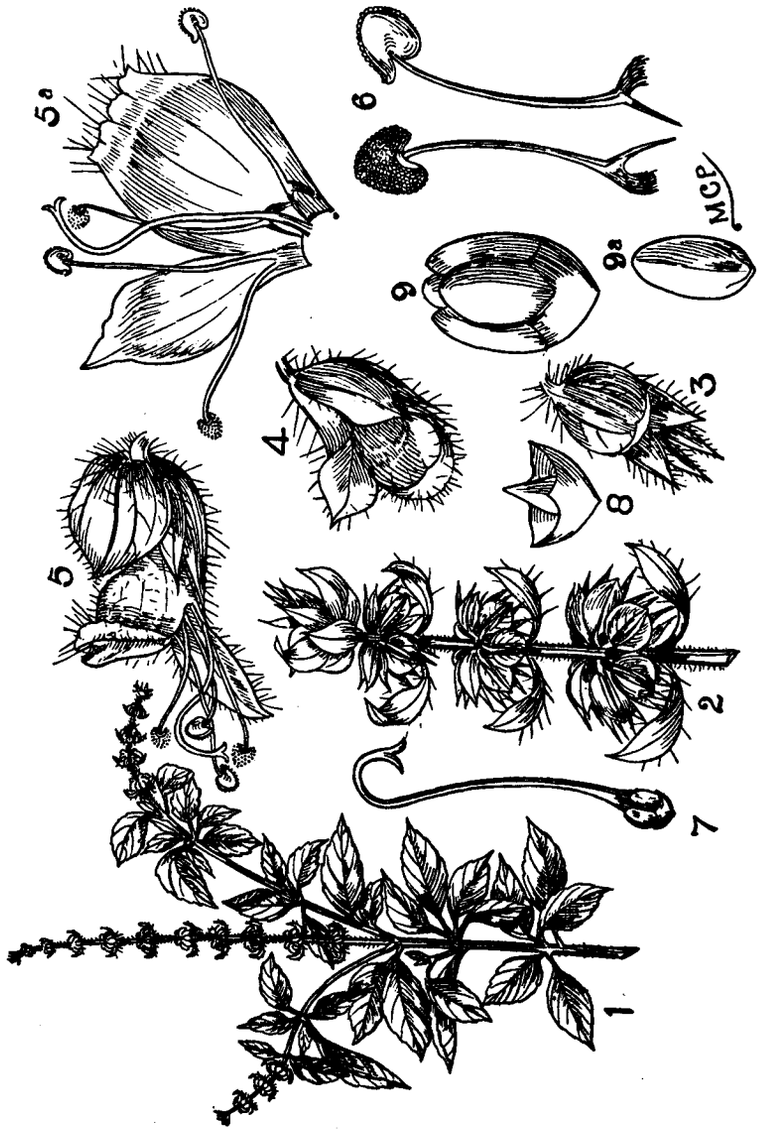


PLATE 102-A.—Figs. 1. Branch. 2. Inflorescence 3. Calyx. 4. Flower bud. 5. Flower. 5a. Corolla cut open. 6. Stamens. 7. Pistil. 8. Disc of ovary. 9. Nutlets on disc. 9a. Nutlet.

OCIMUM CANUM, *Sims*.

A rather large family distributed all over the world and particularly in the Mediterranean and sub-tropical regions. The family is named after the form of the corolla which is usually bilabiate; Latin *Labium* = lip.

Ocimum canum, *Sims*.

Plates 102 and 102-A.

English: The Hoary Basil.
Tamil: Nai Thulasi.
Telugu: Kukka Thulasi.
Malayalam: Kattu Thulasi.
Flowering and fruiting time: August–November.
Habit: A herb.
Habitat: Dry fields and waste places.
Range: Most districts in the plains and also in the Nilgiris.
Propagation: By seed-like nutlets.
Number of seeds: 1,000—14,000.

The plant is an erect herbaceous annual, with a characteristic aroma about it. It freely branches from the very base and attains a height of 1–2 feet. It is one of the most familiar weeds of dry cultivated fields, especially in loamy soils where it flourishes in abundance. The stem is four-angled, grooved, hairy when young becoming glabrous with age. Leaves are simple, opposite and ex-stipulate with long slender petioles. Blade is ½–1 inch long, elliptic and lance-shaped, distantly and inconspicuously serrate and gland dotted. The upper surface of the leaf is glabrous while the lower one is sparsely hairy on the veins. Flowers are small white with short recurved pedicels; and they are arranged in whorls of six on a terminal axis 3–8 inches long. Bracts are small and shortly stalked, ovate-lanceolate with ciliate margins. The upper lip of calyx is broadly ovate while the lower one has four lobes. Corolla is two-lipped, white or yellowish white. Stamens are four, much exserted and attached to the corolla. Ovary is superior, four-lobed and surrounded by a disc at the base. The style is long springing from the middle of the lobes of the ovary and it bears a bi-fid stigma. Fruit consists of four black ellipsoidal nutlets that become mucilaginous when wetted.

Means of control.—On account of profuse seed production the plant is found in large numbers and it becomes very aggressive and troublesome if neglected. A harrowing with *Guntaka* before sowing a crop and frequent cultivation with *Dantulu* or any other cultivator in standing crops will ordinarily check the growth of the weed.

Economic importance.—The plant is medicinal being useful in the treatment of fevers. Decoction of seeds is given to remove phlegm from the throat in epilepsy.

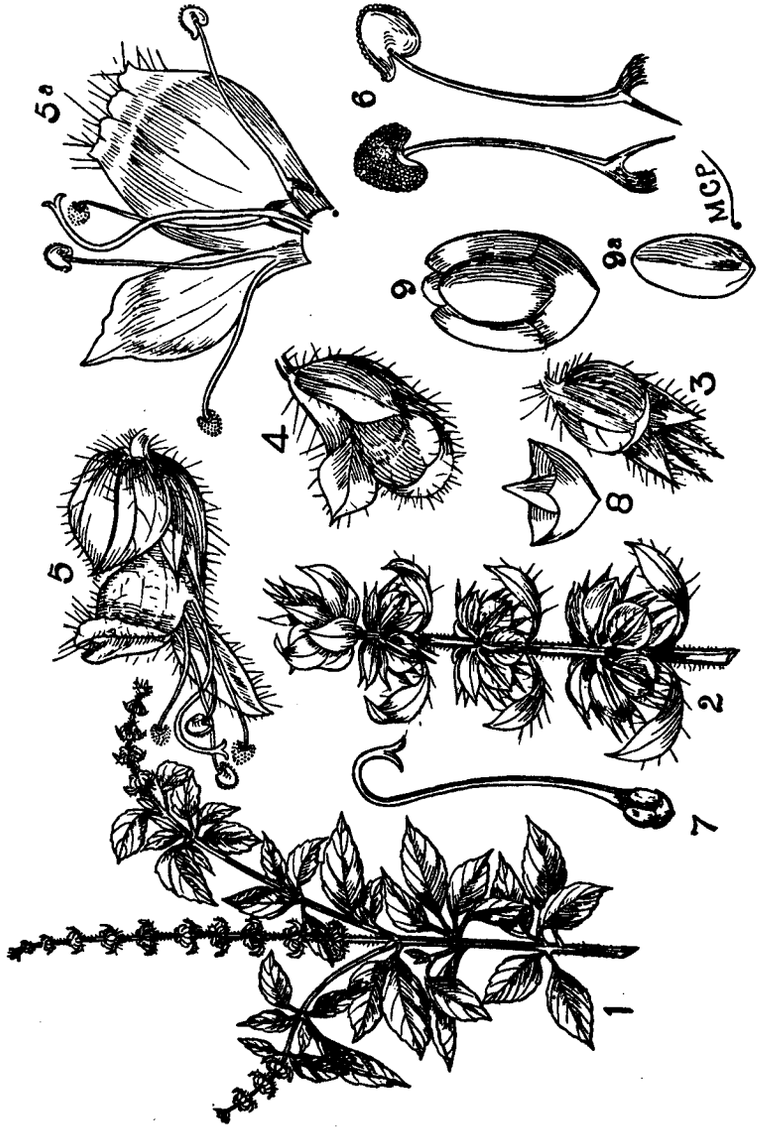


PLATE 102-A.—Figs. 1. Branch. 2. Inflorescence. 3. Calyx. 4. Flower bud. 5. Flower. 5a. Corolla cut open. 6. Stamens. 7. Pistil. 8. Disc of ovary. 9. Nutlets on disc. 9a. Nutlet.

OCIMUM CANUM, *Sims*.

A rather large family distributed all over the world and particularly in the Mediterranean and sub-tropical regions. The family is named after the form of the corolla which is usually bilabiate; Latin *Labium* = lip.

Ocimum canum, *Sims.*

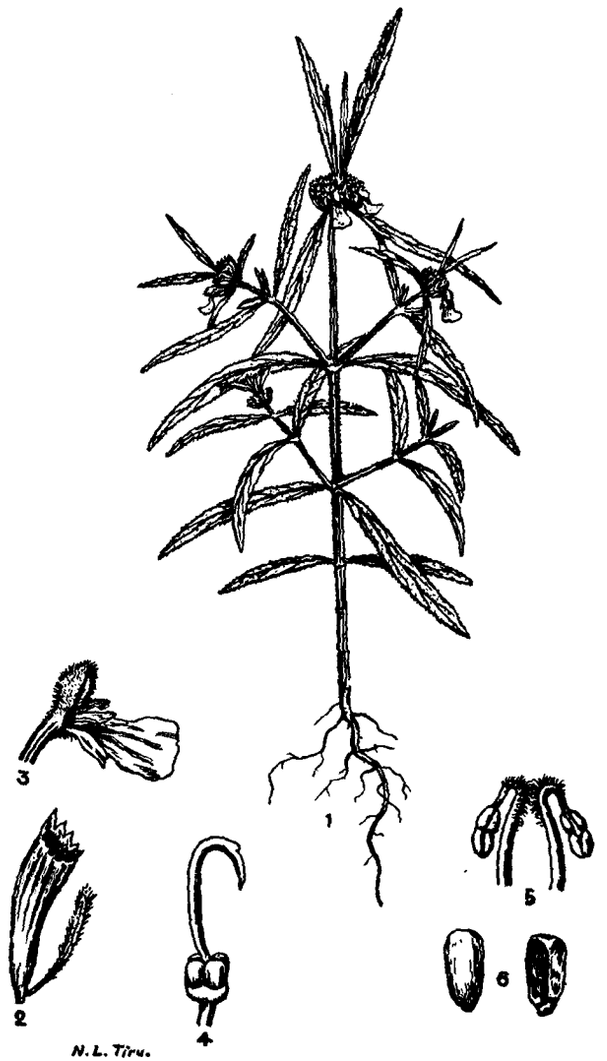
Plates 102 and 102-A.

English: The Hoary Basil.
Tamil: Nai Thulasi.
Telugu: Kukka Thulasi.
Malayalam: Kattu Thulasi.
Flowering and fruiting time: August–November.
Habit: A herb.
Habitat: Dry fields and waste places.
Range: Most districts in the plains and also in the Nilgiris.
Propagation: By seed-like nutlets.
Number of seeds: 1,000—14,000.

The plant is an erect herbaceous annual, with a characteristic aroma about it. It freely branches from the very base and attains a height of 1–2 feet. It is one of the most familiar weeds of dry cultivated fields, especially in loamy soils where it flourishes in abundance. The stem is four-angled, grooved, hairy when young becoming glabrous with age. Leaves are simple, opposite and ex-stipulate with long slender petioles. Blade is ½–1 inch long, elliptic and lance-shaped, distantly and inconspicuously serrate and gland dotted. The upper surface of the leaf is glabrous while the lower one is sparsely hairy on the veins. Flowers are small white with short recurved pedicels; and they are arranged in whorls of six on a terminal axis 3–8 inches long. Bracts are small and shortly stalked, ovate-lanceolate with ciliate margins. The upper lip of calyx is broadly ovate while the lower one has four lobes. Corolla is two-lipped, white or yellowish white. Stamens are four, much exserted and attached to the corolla. Ovary is superior, four-lobed and surrounded by a disc at the base. The style is long springing from the middle of the lobes of the ovary and it bears a bi-fid stigma. Fruit consists of four black ellipsoidal nutlets that become mucilaginous when wetted.

Means of control.—On account of profuse seed production the plant is found in large numbers and it becomes very aggressive and troublesome if neglected. A harrowing with *Guntaka* before sowing a crop and frequent cultivation with *Dantulu* or any other cultivator in standing crops will ordinarily check the growth of the weed.

Economic importance.—The plant is medicinal being useful in the treatment of fevers. Decoction of seeds is given to remove phlegm from the throat in epilepsy.



LEUCAS ASPERA, *Spreng.*

PLATE 103.—Figs. 1. Entire plant. 2. Calyx with bract. 3. Corolla. 4. Pistil. 5. Stamens. 6. Nutlets.

Ocimum adscendens, *Willd.*

Habit: An annual or a biennial herb.
Habitat: Sandy or loamy soils.
Range: Northern Circars, the Deccan and Carnatic up to 3,000 feet in the hills.
Flowering and fruiting time: Dry months of the year.
Propagation: By seed-like nutlets.

It is an erect herb often met with in sandy or waste places and very much resembles *O. canum* with regard to the inflorescence and leaves; but it can be easily distinguished from its relatives by means of the shorter floral axes and lanceolate caducous bracts bearing glands at the bases and by the absence of any characteristic odour.

Sometimes this species is mistaken for *Orthosiphon pallidus* Royle., which, however, has a woody base, somewhat fleshy leaves and entire stigma.

The weed occurs in rather large numbers in certain localities and means of control should be adopted rather early in the season lest it should become woody and its eradication troublesome.

Ocimum sanctum, *Linn.*

English: The Holy Basil.
Tamil: Thulasi.
Malayalam: Thulasi.
Telugu: Thulasi.

Of the few common species of *Ocimum* occurring in the Presidency, *O. sanctum* is the most familiar one, being the sacred Thulasi plant of the Hindus. It is very often cultivated though sometimes it occurs in large numbers in waste places.

Economic importance.—Infusion of leaves is given in malaria. Leaves are used in the treatment of skin diseases. The plant is said to be used as a protection against mosquitoes.

Leucas aspera, *Spreng.*

Plate 103.

Tamil: Thumbai.
Telugu: Tummi.
Malayalam: Thumba.
Flowering and fruiting time: September–November.
Habit: A herb.
Habitat: Cultivated and waste places.
Range: Most districts in the plains.
Propagation: By nutlets.
Number of seeds: About 5,000.

Of the various species of *Leucas* occurring in the plains, *L. aspera* is the one most commonly met with. It is found in almost

LEUCAS URTICAEFOLIA, *R. Br.*

PLATE 104.—Figs. 1. Branch. 2. Flower with bract. 3. Corolla cut open. 4. Pistil. 5. Stamens. 6. Nutlet.

all kinds of situations except in very moist places. Ordinarily it thrives best in well-drained loamy soils. The weed springs up in large numbers after the rains and it can be easily recognized by its narrow, opposite leaves and the globose clusters of flowers at the tops of branches.

The plant is a diffusely branched herbaceous annual growing up to a height of 18 inches The stem is square, grooved on all sides and covered with coarse hairs. Leaves are simple, opposite, ex-stipulate, shortly-stalked. The blade is linear, lance-shaped, 1–3 inches long with entire or distantly toothed margin. Flowers are white, sessile, crowded in dense axillary or terminal clusters. Bracts are ¼ inch long, linear, ciliate on the margins, and each tipped with a bristle. They usually occur in three or four rows. Calyx is tubular and the tube which is bent, is membranous and glabrous below and ribbed above. The mouth of the calyx tube is oblique with triangular teeth. The corolla is two-lipped and white; the upper lip is narrow, hooded and densely hairy without. It encloses four stamens which are attached to the corolla. The lower lip is flat and three-lobed. The ovary is four-partite and is raised on a four-lobed disc which surrounds it at the base. Fruit consists of four, brown, smooth, oblong nutlets which are truncate at the top, dorsally rounded and angled inside.

Means of control.—Harrowing or hoeing early after the rains will ordinarily check the growth of the weed. By so doing numerous seedlings can be easily destroyed as they are very shallow-rooted and can be easily lifted.

Economic importance.—The plant is used as an antidote for snake-bite. Decoction of root is useful in the treatment of rheumatism and asthma. Flowers pounded and applied to the head, mitigate the bad effects of excessive heat.

Leucas urticaefolia, *Br.*

Plate 104.

Tamil: Perun-thumbai.
Habit: A soft annual.
Habitat: Dry waste places.
Range: The Deccan and Carnatic especially in Coimbatore and Anantapur districts.
Flowering and fruiting time: September–February.
Propagation: By the seed-like nutlets.

The plant is an erect, herbaceous annual growing to a height of ¾-2 feet. It comes up in large numbers in waste places and

sometimes, in cultivated fields after the rains. Though a shade-loving plant it thrives well in open areas and has a liking for well-drained soils.

Stem is bluntly four-sided and finely tomentose. The leaves are opposite, shortly stalked, ovate-acute, toothed and membranous. They are finely pubescent and attain a size of 2½ inches by 1½ inches or more. Flowers are white, many, in dense, distant axillary, globose clusters each of which is an inch across. Below each cluster of flowers, there are many linear-lanceolate, ciliate bracts which are nearly as long as the calyx which is membranous and hairy. It is ten-toothed, the lower three teeth being much produced and spinescent while the upper ones are minute. Corolla is white and bilabiate. Fruit breaks into four, dark brown, oblong trigonous nutlets.

Means of control.—Destroy seedlings. In fields without a standing crop work a *Guntaka* after the monsoon rains.

1. *Orthosiphon pallidus*, Royle.—A deep-rooted, low undershrub with a woody base and short, erect or spreading branches and rather small, thick leaves which are somewhat toothed towards the tips. Flowers are white and arranged in whorls on short terminal axes. The weed occurs in small clumps in both moist and dry fields and waste places of Gōdāvari, Kistna, Chingleput, Salem and Coimbatore districts, and up to 4,000 feet in the Nilgiris.

2. *Moschosma polystachyum*, Benth.—A much branched, erect, annual herb with ovate, toothed and long acuminate leaves and rather small, pinkish flowers arranged in whorls, in short, axillary and terminal, slender racemes. A very common wet-land weed in almost all plains districts.

Tamil: Sanakki-poondu.

3. *Anisomeles indica*, O. Kze.—A strongly aromatic, shrubby plant, sometimes attaining a height of even six feet or more. The long petioled, ovate leaves are covered with soft, white tomentum. The clusters of purple flowers are axillary at the ends of branches and in terminal, bracteate, spike-like inflorescenses which are sometimes branched. The plant occurs along bunds of channels, hedges and waste places in all districts.

Tamil: Erumuttai Pinari.

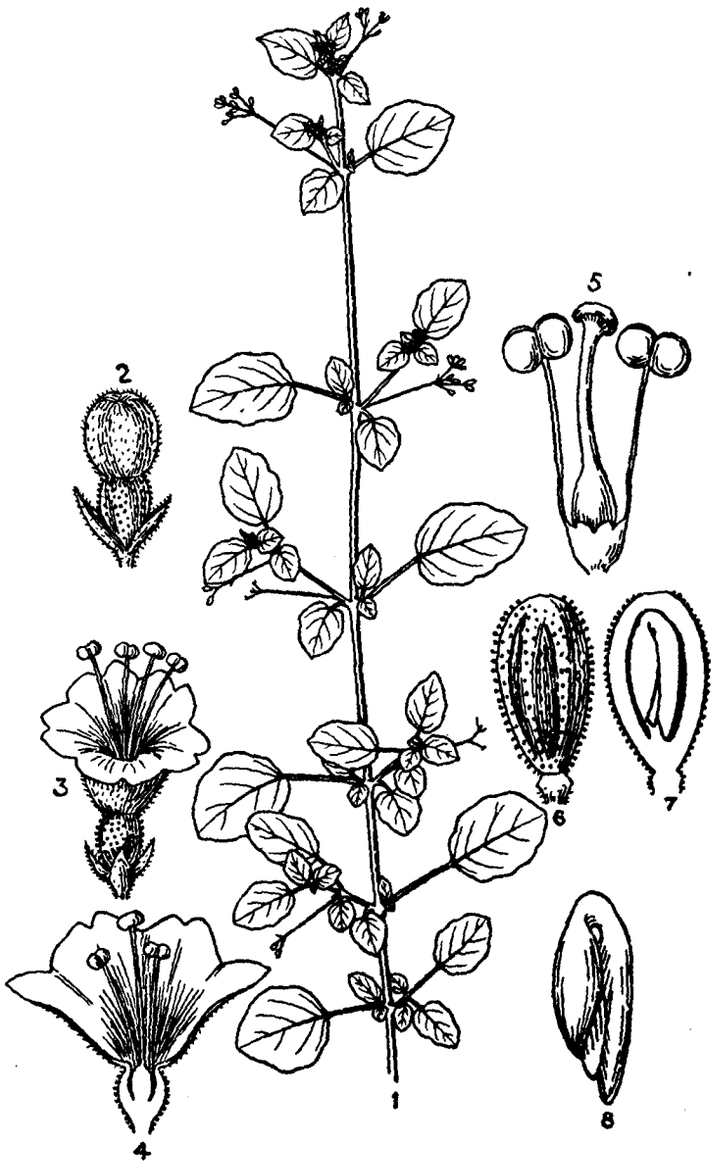
Malayalam: Chedayan.

Nyctaginaceae.

THE FOUR O'CLOCK FAMILY.

Herbs, shrubs or trees with usually opposite, exstipulate leaves. Flowers are often bisexual and regular. The one whorl of perianth is petaloid and funnel or bell-shaped. The base of the perianth tube persists and encloses the fruit. Stamens are 1—30. Ovary is superior, one-celled and one-ovuled. Seeds have floury endosperm.

The family is widely distributed in the warm regions of the world, especially in America. It gets its name from Latin *Nyctos* = night; some species flower at night.



BOERHAAVIA DIFFUSA, *Linn.*

PLATE 105.—Figs. 1. Branch. 2. Flower bud with bracteoles. 3. Flower with bracteoles at base. 4. Longitudinal section of perianth. 5. Pistil with two stamens. 6. Fruit enclosed in base of perianth. 7. Longitudinal section of fruit. 8. Embryo.

Boerhaavia diffusa, *Linn.*

Plate 105.

English: The Spreading Hog-weed.
Tamil: Mukkurattai, Mukkarattai Keerai.
Malayalam: Thamizhama.
Telugu: Atik Mamidi.
Flowering and fruiting time: Almost throughout the year.
Habit: A perennial herb.
Habitat Waste places, grassy lands and also in cultivated fields.
Range: All plains districts.
Propagation: By seed-like fruits.

This is one of the most common weeds of waste lands and grassy places. At times, it is found to occur in large numbers.

The plant is a very diffusely branching perennial with the branches ascending or prostrate and sometimes reaching a length of even five feet. It is very variable and is sometimes very much stunted in growth in poor soils or under unfavourable conditions. The stem is slender, swollen at the nodes, sub-glabrous and often pinkish. The root system is deep and consists of a thick fleshy tap-root containing a large amount of stored food. Leaves are $\frac{1}{2}$–1 inch long, distantly arranged at the nodes, opposite, shortly petioled and in unequal pairs. The lamina is broadly ovate, obtuse and the base is some what cordate; the upper surface is green and the lower is whitish and speckled with glistening dots. Flowers, are very small, red, sub-sessile and are arranged in loose axillary or terminal panicles of subcapitate umbels. Bracts and bracteoles are small. Perianth is tubular and green below, it encloses the ovary at the base, and becomes constricted, funnel-shaped and pinkish above the ovary. Stamens are three, not much exserted. Ovary is superior with a glandular disk at the base; style is long and stigma is peltate. Fruit is small and loosely enclosed by the persisting base of the perianth which is five-ribbed and densely viscid glandular. It easily gets separated from the plant and sticks on to clothes, or bodies of animals and gets dispersed.

Means of control.—Cut the shoot repeatedly so as to starve the fleshy root. For complete eradication dig out individual plants with the root and destroy them. In cultivated fields, if digging is not practicable, continued working of *Guntaka* will be found effective.

Economic importance.—The plant is highly prized in Hindu medicine. Decoction of the root is a remedy for rheumatism and asthma.

CELOSIA ARGENTEA, *Linn.*

PLATE 106.—Figs. 1. Branch. 2. Flower bud. 3. Flower with bract and bracteoles. 4. Bract. 5. Perianth lobe. 6. Stamens, united at base and surrounding pistil. 7. Pistil. 8. Longitudinal section of pistil. 9. Anthers. 10. Fruit dehiscing. 11. Longitudinal section of fruit. 12. Seed.

Boerhaavia repanda, Willd.—A diffusely-branched herb with opposite, ovate, acute, or round, sinuate leaves, long inter-nodes, and umbles of pink flowers on long, axillary or terminal peduncles. It straggles among bushes and hedges, in almost all districts in the plains. The small fruits are glandular and sticky.

Tamil: Chatti Chattaranai.

Amarantaceae.

THE AMARANTH FAMILY.

Most species of the family are herbs with opposite or alternate ex-stipulate leaves. Flowers are unisexual or bisexual, with bracts and bracteoles. Perianth is single consisting of five parts. Stamens are 1–5, free or united, with or without alternating staminodes. Anthers are one or two-celled. Ovary is superior, one-celled with one or more ovules on long funicles. Fruit is usually a utricle. The seed is often round and compressed with a curved embryo and floury endosperm.

Widely distributed in tropical and sub-tropical regions of the world.

The name of the family is from *A-maraino* which is a Greek word meaning *unfading*. The bracts do not wither.

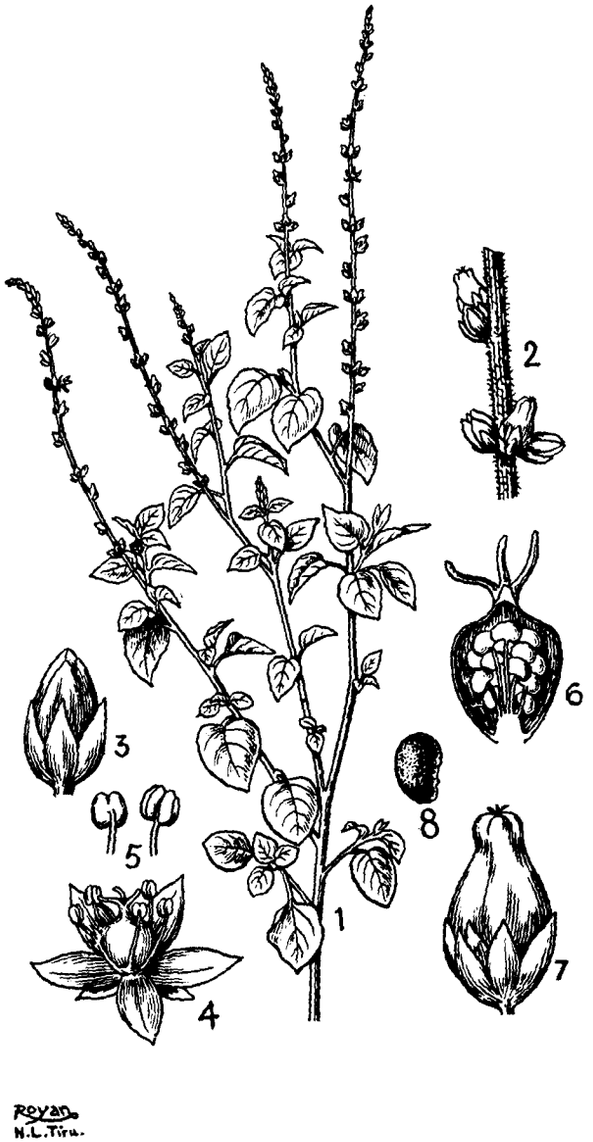
Celosia argentea, *Linn.*

Plate 106.

English: The White Cock's-comb.
Tamil: Pannai Keerai.
Malayalam: Kozhipullu.
Flowering and fruiting time: April-September.
Habit: A herb.
Habitat: Sandy or irrigated clay loams.
Range: All plains districts, particularly in the Northern Circars.
Propagation: By seed.
Number of seeds: 30,000 or more.

The plant is one of the worst weeds of loamy, dry soils where it is sometimes found to be so gregarious that it simulates a crop. Garden lands are not entirely free from it.

It is an erect, glabrous, branched herbaceous annual, 1–3½ feet high with a stout, deep tap-root and numerous lateral roots which are confined to just a few inches below the surface of the soil, and as such they can easily rob the cultivated crops of the available food. The stem is glabrous, somewhat angled and striate. Leaves are simple, alternate, ex-stipulate, linear-lanceolate, up to 5 inches long, either sessile or the bases taper into short petioles.



CELOSIA POLYGONOIDES, *Retz.*

PLATE 107.—Figs. 1. Branch. 2. Part of inflorescence showing clusters of flowers. 3. Flower bud. 4. Flower. 5. Anthers. 6. Longitudinal section of ovary showing attachment of ovules. 7. Fruit with perianth persisting below. 8. Seed.

The flowers are pinkish at first and then become glistening white. They are closely packed in stout cylindrical spikes which are terminal and provided with long stalks. These spikes are characteristic and conspicuous. Bracts and bracteoles are white scarious and ovate-lanceolate. Perianth is of one whorl and consists of five scarious white sepals which are elliptic-oblong and persistent. Stamens are five, pinkish and united at the base into a short cup; anthers are pink and bi-lobed. Fruit is 4-12 seeded and dehisces by the separation of a round cap-like lid. It is enclosed by the persistent perianth. Seeds are smooth, polished-shining black, sub-orbicular and compressed.

Means of control.—Sow clean seed. In fields badly infested with the weed put in crops that will admit of weeding and inter-cultivation. For the same purpose it will be found more advantageous to sow crops in lines as with a drill, than to broadcast them. Cut off the flowering-tops with a grass-cutting-sword whenever they appear. Hand-pulling is certainly effective, but it is not always practicable. Whatever be the methods adopted to destroy the weed, they should be done before the spikes mature and no pains should be spared to prevent seeding. Unless this is done the eradication of the weed is not possible.

Economic importance.—The plant is sometimes used as a pot-herb. The seeds are administered in diarrhœa.

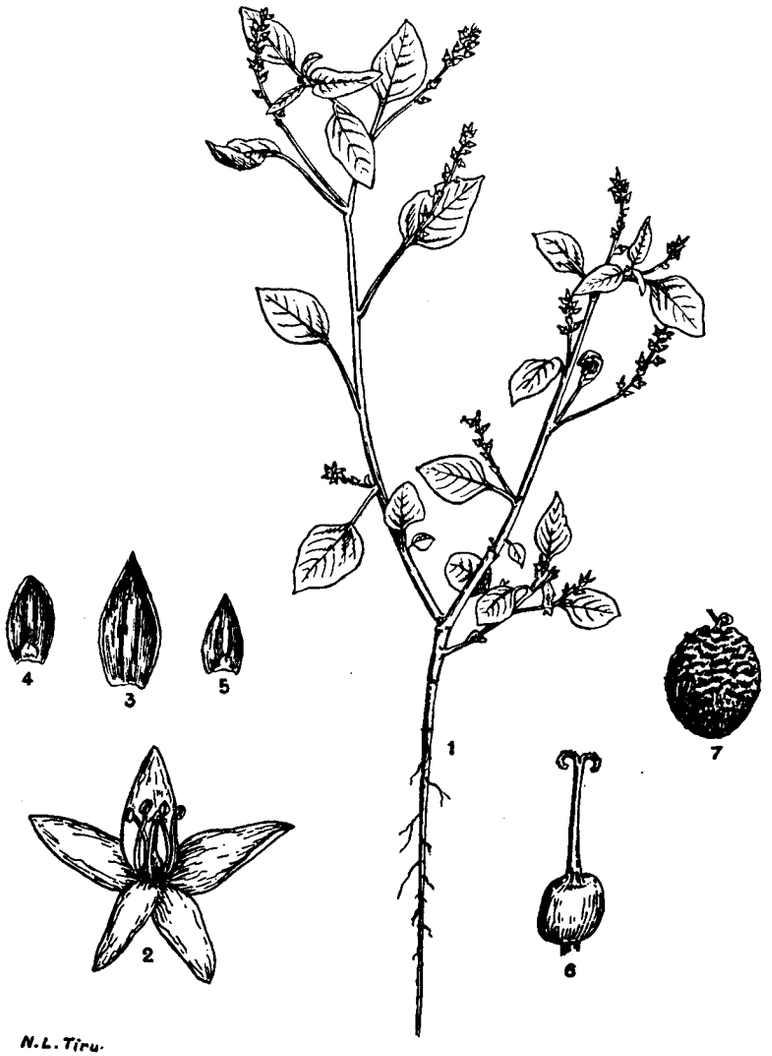
Celosia polygonoides, *Retz.*

Plate 107.

Flowering and fruiting time: July, August, October and November.
Habit: A perennial herb.
Habitat: Grassy places and cool corners.
Range: The Deccan and Carnatic. Not found outside India.
Propagation: By seed.
Number of seeds: 10,000 or more.

It is not a bad weed in cultivated places. The plant is an erect, branched, perennial herb, ½ to 1½ feet high. The base of the stem is stout and woody. This species resembles *Digera arvensis*, Forsk., but can be distinguished by means of the many-seeded fruit which has a stout blunt apex, and by its habit.

The stem is round, hairy, striate and sometimes pinkish. Leaves are simple, broadly ovate, ovate-orbicular, alternate and ex-stipulate. Base of the leaf is either tapering or somewhat heart-shaped. Petiole is ¼-½ inch long. Flowers are small, sessile and pink. They are arranged in distant clusters of 2 or 3 on an elongate, terminal, hairy axis 4-8 inches long. Bracts and



DIGERA ARVENSIS, *Forsk.*

PLATE 108.—Figs. 1. Plant. 2. Flower. 3. Bract. 4 and 5. Bracteoles. 6. Pistil. 7. Fruit.

bracteoles are ovate and scarious. Perianth consists of oblong-lanceolate, scarious sepals with thick green keels. Stamens are five, united into a cup at the base. Ovary is superior and many-ovuled. Styles are three and recurved. The fruit is flask-shaped and breaks open by its thick apex coming off like a lid. Seeds are about 10 in each fruit, very small, black, somewhat round and covered with minute tubercles.

Means of control.—Remove plants by cutting them as far deep into the soil as possible by means of a chisel hoe. Mere chopping at ground level is not of much use as fresh shoots sprout up in no time. Hand-pulling is difficult and is not always practicable.

Digera arvensis, *Forsk.*

Plate 108.

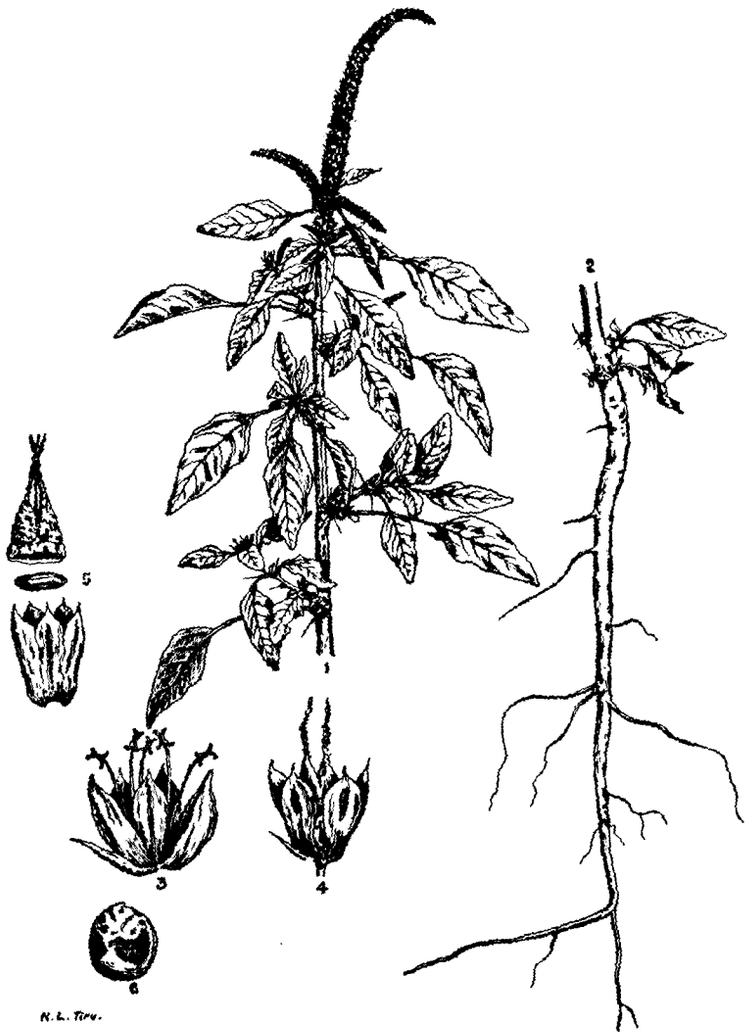
Tamil: Thoyya Keerai.
Telugu: Chenchali Koora.
Flowering and fruiting time: November–February; August–October.
Habit: A herb.
Habitat: Cultivated and waste places.
Range: The Deccan and Carnatic.
Propagation: By means of seeds.
Number of seeds: About 2,500.

This plant is one of the most common weeds found in all kinds of soils. It thrives best in moist loamy soils of the cultivated fields.

The plant is an erect or prostrate annual tending to become perennial under favourable conditions. Branches are many, at first prostrate and then ascending. The stem is round, striate, glabrous or very sparsely hairy. Leaves are simple and alternate. The leaf-stalk is 1–2 inches long and the lamina is thin, ovate or ovate-lanceolate. Flowers are pink and green, sessile, occurring in groups of three and are arranged in lax, axillary spikes 1–6 inches long. The central flower of each group is fertile and the lateral ones are mere scales. Bracts and bracteoles are membranous and persistent. Perianth consists of five oblong lobes which are pink in colour. Stamens are five and the filaments are free while anthers are deep pink. Ovary is one-celled and superior. Fruit is an indehiscent, one-seeded, utricle covered by the persistent perianth, the bracteoles and the undeveloped flowers.

Means of control.—Clean cultivation will ordinarily keep the weed under check. When the hand-hoe is used and the shoots are cut off a part of the stem should not be left on the ground as it produces fresh shoots in a short time. Destroy seedlings after the rains, when they appear in large numbers.

Economic importance.—The plant is eaten as a pot-herb by the poorer classes.



AMARANTUS SPINOSUS, *Linn.*

PLATE 109.—Figs. 1. Branch. 2. Root system. 3. Male flower. 4. Female flower. 5. Fruit open, with lid above and perianth below. 6. Seed.

Amarantus spinosus, *Linn.*

Plate 109.

English : The Thorny Amaranth.
Tamil : Mullu Keerai.
Telugu : Mulla Thota-koora ; Nalla-doggali.
Malayalam : Mullan-cheera.
Flowering and fruiting time : June-September.
Habit : A herb.
Habitat : Chiefly waste places.
Range : Most plains districts.
Propagation : By means of seeds.
Number of seeds : 20,000 or more.

This is another Amaranth widely distributed in the Presidency. It is very commonly found in neglected waste places and occasionally in fields and gardens. The plant seems to thrive pretty well in almost all kinds of soils except in very dry and sandy places. As the specific name indicates the plant is spiny and can be easily made out from the thorns found in the leaf axils and at the base of inflorescence.

It is an erect, glabrous, herbaceous annual, somewhat bushy with many branches growing to a height of 1–2 feet. The stem is round and stout, and green or reddish. Leaves are simple alternate, ex-stipulate with long petioles. Blade is ovate or ovate-oblong, tapering at both ends, with a wavy margin and glabrous sides. Flowers are small, very many, unisexual; they are without stalks in axillary clusters or in continuous or interrupted axillary and terminal panicles. Both male and female flowers are bracteate; the bracts being longer than the sepals. Perianth is of 5 sepals. Stamens are five in the male flowers which are very numerous at the tops of flowering axes. Fruit is thickened at the top and the lower part is membranous and wrinkled. Seeds are round, bi-convex polished black.

Means of control.—Prevent the production of seed by repeated hand-pulling or close hoe-cutting before the flowers develop.

Economic importance.—It is an antidote for snake bite. Decoction of the plant is used for bowel and kidney complaints.

N.L.Tirv.

AMARANTUS VIRIDIS, *Linn.*

PLATE 110.—Figs. 1. Branch. 2. Root system. 3. Male flower. 4. Female flower. 5. Fruit. 6. Seed.

Amarantus viridis, *Linn.*

Plate 110.

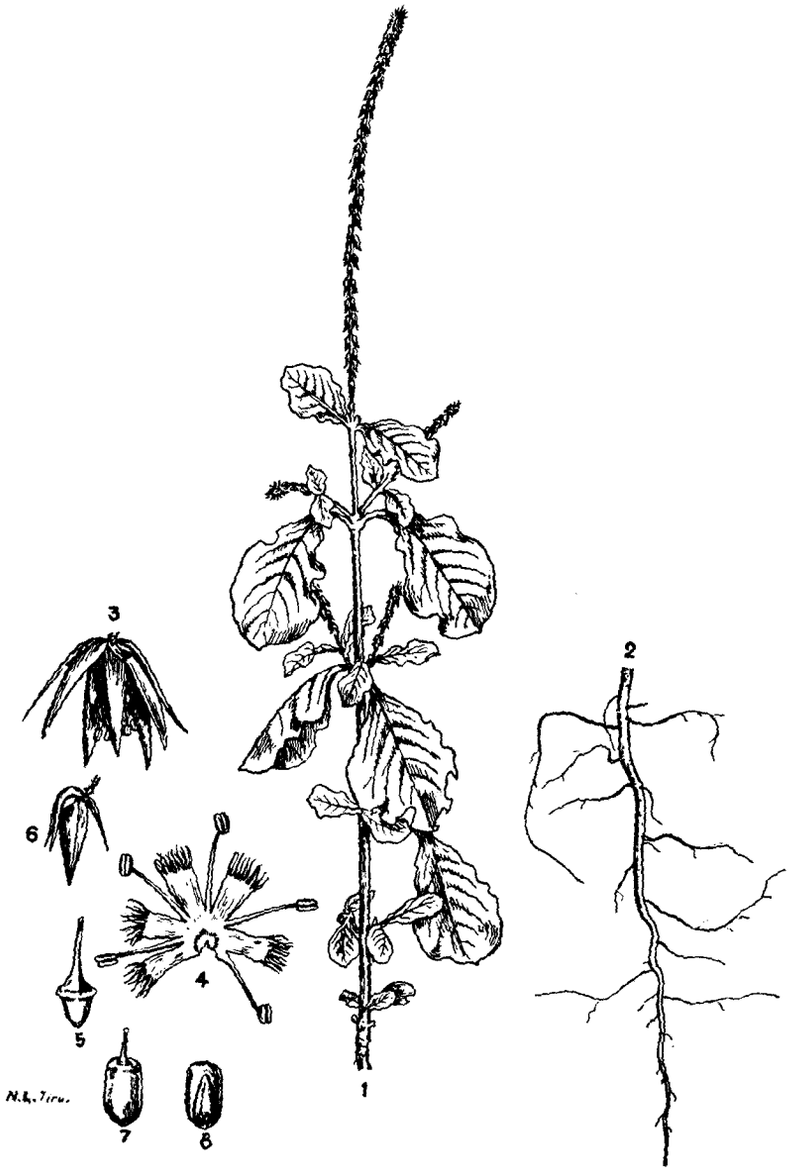
Tamil: Kuppai Keerai.
Telugu: Chilaka Thota-koora.
Flowering and fruiting time: Almost throughout the year.
Habit: A herb.
Habitat: Cultivated and waste places.
Range: Throughout the plains districts.
Number of seeds: 10,000 or more.

The plant is an erect, glabrous, much-branched annual herb growing to a height of 1–2 feet. It is sometimes gregarious and comes up everywhere except in black cotton soils and very damp situations. The weed can be recognized from the long terminal interrupted panicles with numerous minute green flowers.

The stem is round, finely grooved, shining green and often tinged with purple. Leaves are simple, alternate, ex-stipulate with long petioles. Blade is 1–2 inches long, ovate, entire with a wedge-shaped base and a notched tip. Both the surfaces of the leaf are glabrous and occasionally the upper surface is blotched with grey in the middle. Flowers are arranged in terminal or axillary elongate panicles. There are two kinds of flowers, the male and the female, and both of them have bracts which are ovate, oblong and acute. The male flowers have three or rarely five sepals and three stamens while the female flowers have each three sepals and a superior ovary with two or three stylar branches. Fruit is a compressed, indehiscent, wrinkled utricle having one seed which is black, shining, smooth and lens-shaped.

Means of control.—Frequently cut the flowering tops. Grub the surface of soil to destroy seedlings after the rains. Old plants should not be fed to cattle as the seeds pass through the alimentary canal uninjured.

Economic importance.—Leaves are eaten as a vegetable and are also used as emollient poultices.



ACHYRANTHES ASPERA, *Linn.*

PLATE III.—Figs. 1. Shoot. 2. Root system. 3. Flower. 4. Staminal tube cut open to show staminodes alternating with stamens. 5. Pistil. 6. Fruit enclosed by perianth with bract and bracteoles. 7. Fruit. 8. Seed.

Amarantus polygamus, *Linn.*

Tamil: Siru Keerai.
Telugu: Doggali Koora.
Flowering and fruiting time: August-September.
Habit: A herb.
Habitat: Waste places and roadsides.
Range: All plains districts.
Propagation: By means of seeds.

It is a prostrate, much-branched, somewhat hardy annual. Though not very common in cultivated places, the plant is rather troublesome along roadsides.

Leaves are simple, small, obovate or ovate. Flowers are numerous, unisexual, minute in dense axillary clusters. Fruit is an indehiscent or irregularly dehiscent utricle. Seeds are orbicular and compressed.

Means of control.—Remove the plant by cutting the tap root as deep as possible by means of a chisel-hoe. Watch for seedlings after the rains and destroy them.

Economic importance.—Leaves are collected and used as spinach and in bilious disorders.

Achyranthes aspera, *Linn.*

Plate III.

English: Prickly-chaff Flower.
Tamil: Nai Uruvi.
Malayalam: Kadaladi.
Telugu: Uttareni.
Flowering and fruiting time: January-May.
Habit: A herb.
Habitat: Roadsides and waste places.
Range: All plains districts.
Propagation: By means of seeds.
Number of seeds: Up to 1,000.

The weed flourishes mostly in hedges and in sheltered corners and rarely in open situations. This is not a very troublesome weed in cultivated fields, but it can spread far and wide on account of the fruits which are easily dispersed.

The plant is an erect, sparingly branched, biennial or perennial growing to a height of 1-3 feet. The tap-root is rather stout. The stem is round, striate and hairy. Leaves are few, simple, opposite, ex-stipulate and shortly stalked. The blade is round or elliptic and the margin is wavy. At times both the surfaces are covered with red blotches. The inflorescence is an elongate terminal spike attaining a length of even 2 feet. Flowers

are green and purple, erect and crowded when young and becoming deflexed when the fruit is formed. Bract is ovate and spinescent at the tip ; bracteoles are two, similar to the bracts but smaller. Perianth consists of five unequal, oblong, acute, glabrous sepals, which are green in the middle with shining white membranous margins. Stamens are five, alternating with five scalelike staminodes which are fimbriate at the tips. Fruit is single-seeded, oblong-truncate and indehiscent; it is enclosed by the persistent and hardened perianth, the bract and the bracteoles. The bracteoles being spine-tipped, the fruits easily stick on to the skins of animals or the clothing of human beings and get dispersed.

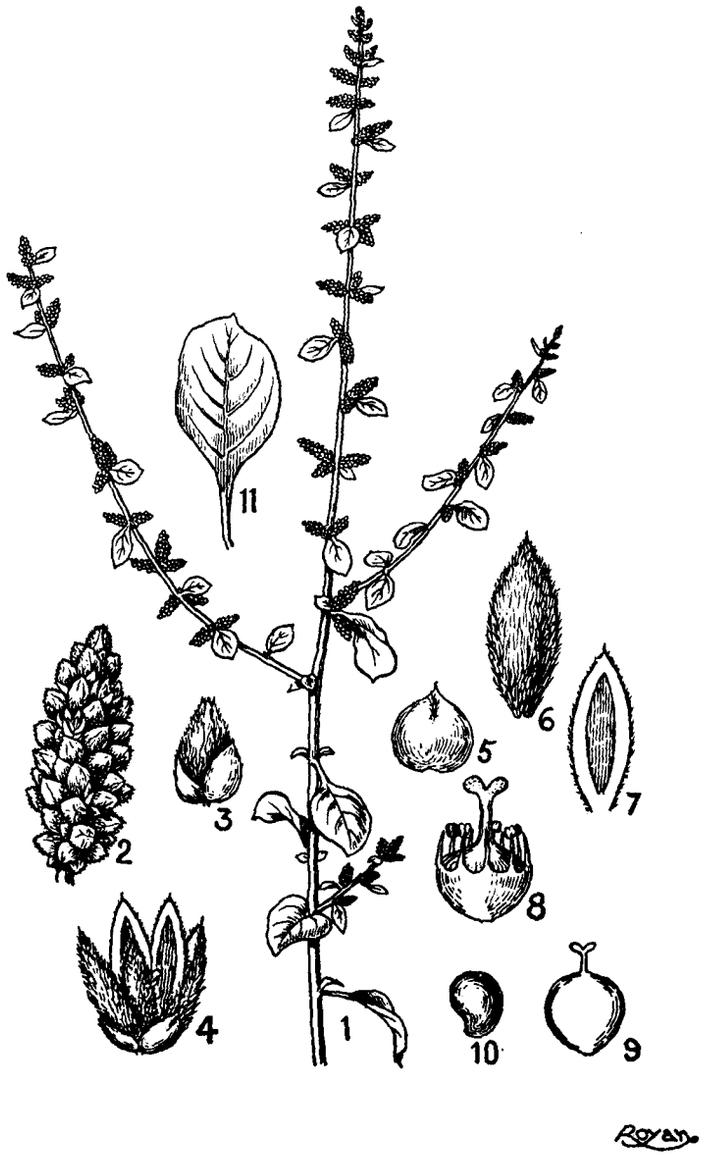
Means of control.—In places where the weed is found in large numbers and hand-pulling is not practicable, the young flowering tops may be chopped off by the use of grass-cutting-swords. General cleaning of the sides of hedges will keep the weed in check.

Economic importance.—The plant is highly medicinal and is employed in the treatment of various diseases. Decoction of the whole plant is good for kidney troubles. In large doses it acts as an egbolic. Pounded leaves, with curd, cure piles if taken internally.

There is an undescribed variety commonly growing among prickly-pear hedges at Coimbatore. It is a tall, robust plant with very elongate spikes and pink flowers.

AERVA TOMENTOSA, *Forsk.*

PLATE 112.—Figs. B. Plant without root. C. Root system.



AERVA LANATA, *Juss.*

PLATE 113.—Figs. 1. Branch. 2. Spike. 3. Flower bud. 4. Flower. 5. Bract. 6 and 7. Perianth lobes. 8. Pistil with filaments surrounding. 9. Pistil. 10. Seeds. 11. Leaf.

Aerva lanata, *Juss.*

Plate 113.

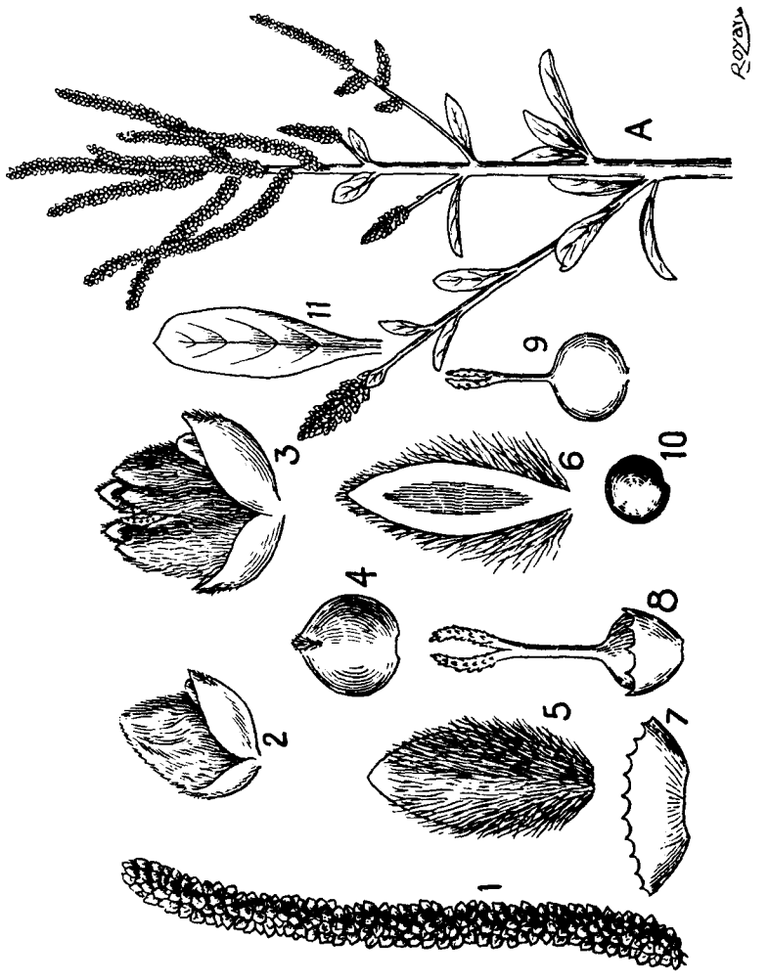
Tamil : Sirukkan Poolai.
Malayalam : Cherupula.
Telugu : Thelagapindi Koora.
Flowering and fruiting time : June–December.
Habit : A perennial herb or an undershrub.
Habitat : Waste places and fallow fields.
Range : All plains districts ascending up to 3,000 feet in the hills.
Propagation : By seed.
Number of seeds : 10,000 or more.

The plant is a perennial with long prostrate or ascending branches and a woody main stem growing to a height of 1–2 feet. The stem is striate, round and softly woolly tomentose. The leaves are simple, alternate, shortly stalked, sub-orbicular or ob-ovate with an obtuse tip. The base is tapering. The upper surface of the leaf is pubescent, while the lower one is densely hairy. The leaves on the side branches are much reduced. Flowers are very small, sessile, greenish white, in dense axillary short spikes, 1/6–¾ inch long, which are solitary or clustered. Bract is one and bracteoles are 2, membranous and apiculate. Perianth consists of 5 free oblong sepals, woolly on the back. Stamens are 5, united at the base into a cup with interposed staminodes. Ovary is superior one-celled, with one pendulous ovule. Fruit is an ovoid bladder-like structure (utricle). Seed is lenticular, smooth and shining black.

Means of control.—Ordinarily the weed is neither gregarious nor troublesome in cultivated fields. Frequent chopping of the stem at the base should kill the plant.

Economic importance.—The flowering tops are sold in druggists' shops. Root boiled with conjee is a tonic for pregnant women. It is also used for kidney disorders.

Branches with neem twigs are used for adorning house-fronts during Pongul days in the month of January.



AERVA TOMENTOSA, *Forsk.*

PLATE 112-A.—Figs. A. Branch. 1. Branch of inflorescence. 2. Flower bud. 3. Flower. 4. Bract. 5 and 6. Perianth lobes. 7. Ring of staminodes. 8. Pistil surrounded by ring of staminodes at base. 9. Pistil. 10. Seed. 11. Leaf.

Aerva tomentosa, *Forsk.*

Plates 112 *and* 112-*A.*

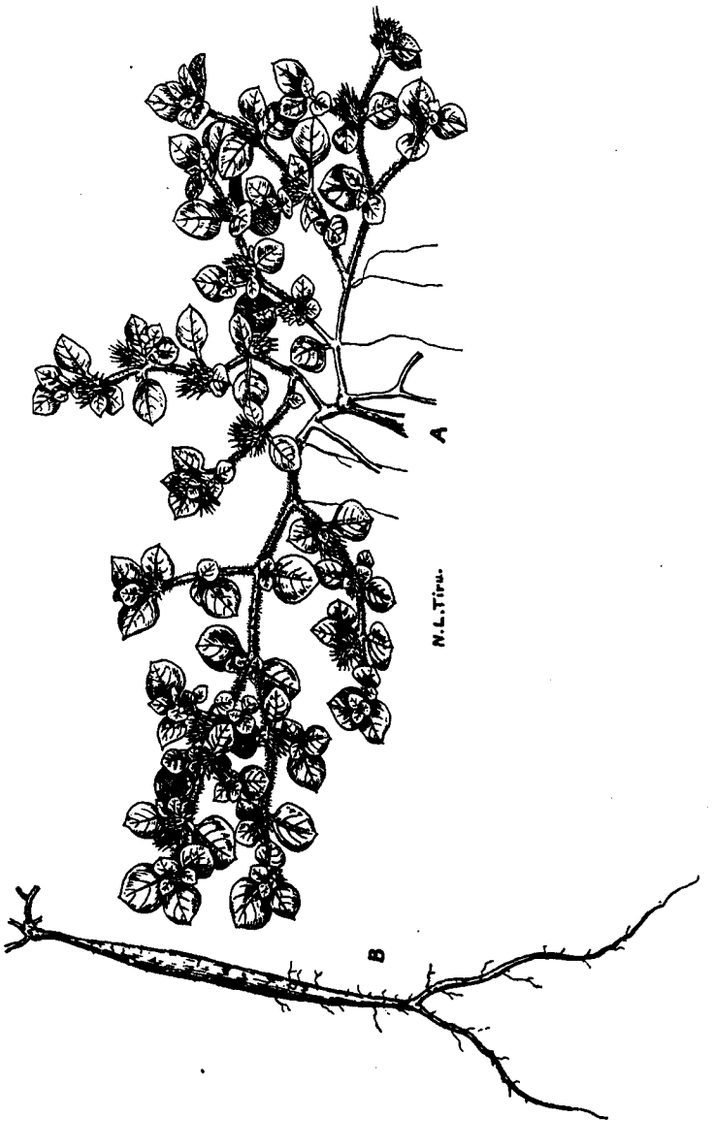
English: Javanese Wool Plant.
Tamil: Poolai Keerai.
Telugu: Peddapindi Konda.
Flowering and fruiting time: June–January.
Habit: An undershrub.
Habitat: Dry waste lands.
Range: The Deccan and Carnatic as also in Coimbatore.
Propagation: By seed.

This plant is very conspicuous on account of its white tomentose nature. It grows to a height of 3½ feet or more and is much-branched. The stem is round, striate and thickly white tomentose Leaves are simple, alternate, sub-sessile, oblong spatulate and obtuse. Both the surfaces of the leaf also are tomentose. Flowers are small, white, woolly and numerous in dense terminal panicles of simple or branched spikes 1–6 inches long. The plant being dicœcious, the male and female flowers occur on different individuals. Female plants are very common and males are extremely rare. Bracts and bracteoles are broadly ovate, membranous and white. Perianth consists of five white sepals. All the sepals are densely woolly at the back. Ovary is superior, 1-celled and 1-ovuled and is surrounded at the base by a small toothed ring of staminodes. Style is short. Fruit is a membranous utricle. Seed is small, round, bi-convex and shining brownish black in colour.

Means of control.—Cut the plants deep or chop off the flowering tops to prevent seed production.

Economic importance.—The flowering tops may be used for stuffing pillows.

Note.—A unique feature of this species is that the seeds develop parthenogenetically.



ALTERNANTHERA ECHINATA, *Smith*.

PLATE 114.—Figs. A. Plant without root. B. Root.

Alternanthera echinata, *Smith*.

Plates 114 *and* 114-*A*.

English: Khaki Weed.
Tamil: Mull Ponnanganny.
Telugu: Mulluponnaganti Koora.
Flowering and fruiting time: Throughout the year.
Habit: A herb.
Habitat: Roadsides, waste places and fields in fallow.
Range: Madras, Hosur, Coimbatore, etc.
Propagation: By Seed.
Number of seeds: 10,000 or more.

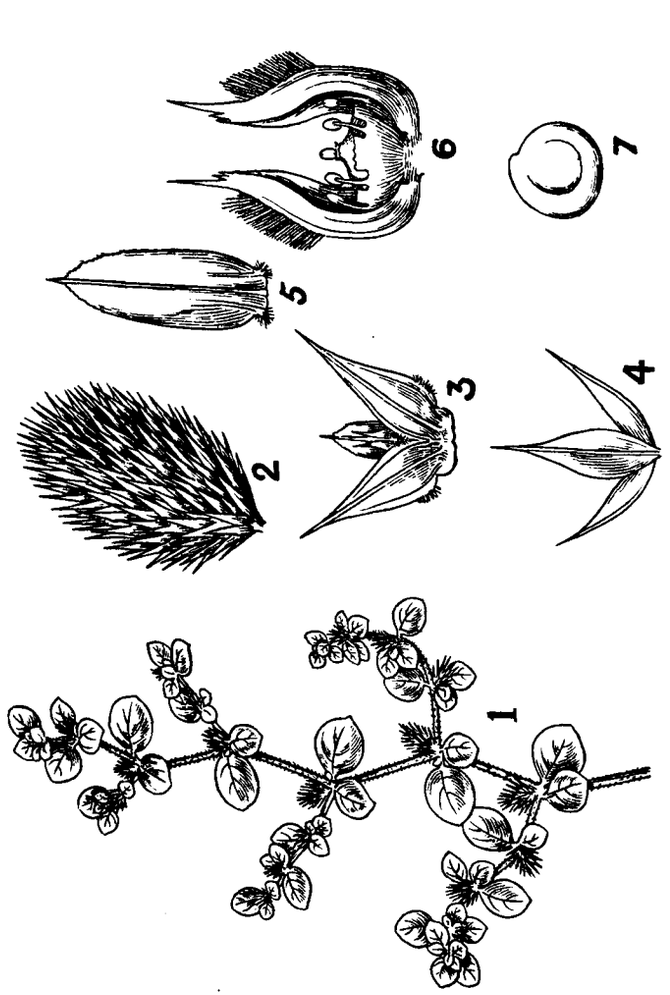
Like some of our worst introduced weeds this plant hails from Tropical America, its native place. In 1913 the weed was collected on the Melagiri hills in Salem District. About 10 years back it first made its appearance in Madras and has since been rapidly spreading into the interior. Some of the small jungles of South India are not free from it.

For the last 5 or 6 years it has been rapidly spreading at Coimbatore and is now found along road-sides and backyards of houses, in plenty. The weed is so gregarious in habit that it completely covers the ground with its foliage suppressing all other kinds of vegetation.

The plant can be distinguished by means of its forking branches which are prostrate and spreading, the round leaves and the short, spiny spikes.

It is a diffusely branching biennial herb, the branches attaining a length of 2 feet or more; they fork and root at the basal nodes. The weed seems to have a liking for sandy or gravelly soils; it is also found thriving in clay-loams. Bad drought or water logging does not seem to affect the plant to any great extent. The root system is shallow and the tap-root is fleshy and sometimes forking; lateral roots are many.

The stem is round, hairy, slightly tinged with pink and somewhat swollen at the nodes. Leaves are simple, opposite, very unequal and ex-stipulate. The leaf-stalk is short and somewhat ensheathing at the base. The lamina is oblong-orbicular or ovate-orbicular and the base abruptly tapers into the petiole. The margin is entire while the tip has a short point. The upper surface of the leaf is hairy. Flowers are small, much compressed and chaffy. They are arranged in dense, axillary, cylindric, spike-like clusters 1/3—½ inch. long. Bracts and bracteoles are lance-shaped, membranous and spine-tipped. The perianth consists of 5 unequal, scarious sepals each of which is tipped with a small spine.



ALTERNANTHERA ECHINATA, *Smith.*

PLATE 114-A.—Figs. 1. Branch. 2. Spike. 3. Flower. 4. Bract and bracteoles. 5. Perianth lobe. 6. Flower with two inner perianth lobes. 7. Seed.

Stamens are 5, very short, united at the base into a cup and alternate with irregularly toothed processes. Ovary is superior, 1-celled and 1-seeded and the stigma is directly seated on the top of the ovary. Fruit is enclosed by the persistent perianth, the bract and the bracteole. The seed is round and brownish.

Means of control.—The ease with which the weed spreads itself is largely due to the numerous fruits produced which being enclosed by the spine-tipped perianth, are readily dispersed through the agency of various animals and human beings. The fruits easily stick on to the soles of boots, tyres of vehicles and are carried over long distances. That is the reason why the weed is very common along roadsides and places much trodden.

It is evident from above that the production of seed has to be checked by all possible means before complete eradication is thought of. Seedlings should be destroyed. In the case of old plants pulling is not effective, as the prostrate branches root at the nodes and the fleshy roots fix the branches to the ground. When the central root system is lifted the lateral branches can manage to live on account of the roots produced at the nodes. It is necessary therefore to entirely remove all plants by means of spade-cutting or by working a heavy blade-harrow, if the weed is not fully grown. No part of a branch should be left in the ground. Old ones with matured spikes should be collected and burnt. After thus killing the weed, it has to be carefully looked for in the succeeding years and similar measures have to be adopted whenever it is noticed.

2. *Pupalia atropurpurea*, Moq.—A somewhat glabrous herb with long inter-nodes and branches. Leaves are opposite, ovate and tapering at both ends. The green flowers are distantly arranged in clusters, in terminal, simple or branched spikes. Fruits are covered with spreading, hooked bristles of undeveloped flowers, which form ready means of dispersal. The plant is common among hedges and waste places, in many districts particularly in the Circars.

Tamil: Adai-otti.

3. *Pupalial appacea*, Moq.—This very much resembles *Pupalia atropurpurea*, Moq., from which it differs in being tomentose. The hooks of fruits are yellow and the clusters of flowers are covered with white wool.

4. *Alternanthera triandra*, Lamk.—A much branched, prostrate herb rooting at the nodes. The leaves are narrowly lanceolate or spatulate, and the numerous white flowers are collected in dense axillary spikes. When submerged under water, the branches ascend over the water-level. This is a common weed found in moist situations as tank beds, rice fields, channels, etc. "It may be found in salt or brackish water." It occurs in all districts, and up to 7,000 feet in the hills.

Tamil: Ponnanganni Keerai.
Telugu: Ponnaganti Koora.
Malayalam: Kozhuppa.

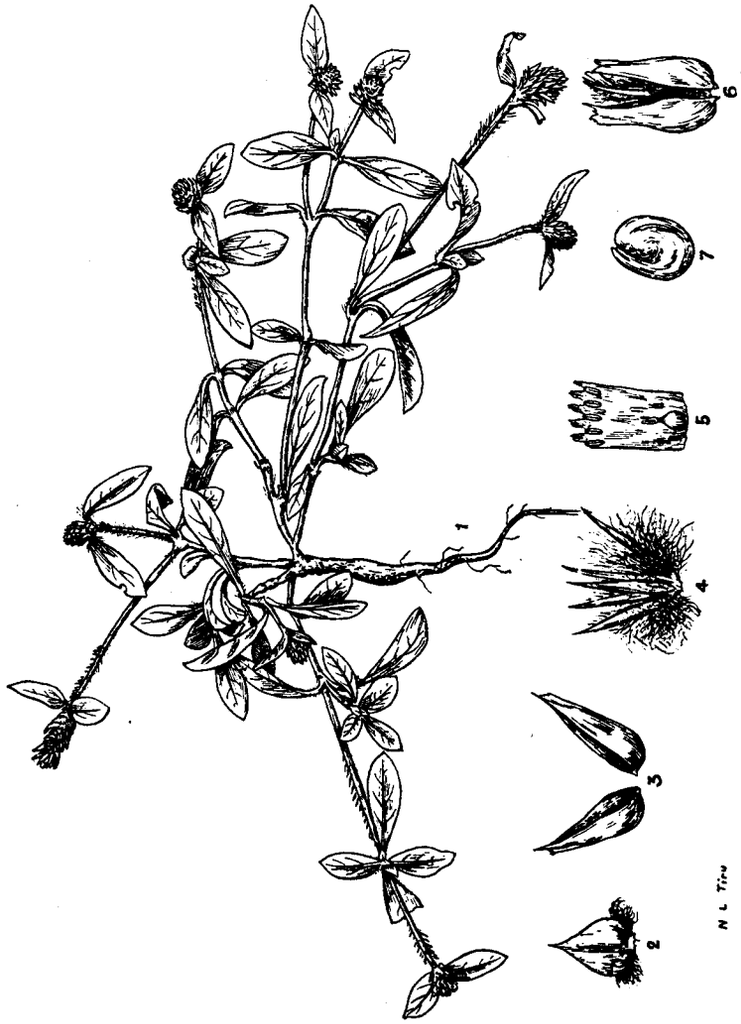
Polygonaceae.

THE POLYGONUM FAMILY.

Mostly herbs with alternate leaves. Stipules are often sheathing the stem. Flowers are regular and usually bi-sexual. Perianth is single, with 3-6 segments. Stamens are usually 5-8. Ovary is superior, 1-celled and 1-ovuled; styles are 3 or 2. Fruit is a small, hard, polished, trigonous or bi-convex nut enclosed in the perianth. The seed has floury or ruminate endosperm.

Distribution.—The tropical and temperate regions of the world.

The name of the family is from *Polys=many*; *Gonu=knees*, after the many jointed nature of the stems.



GOMPHRENA DECUMBENS, *Jacq.*?

PLATE 115.—Figs. 1. Entire plant. 2. Bract. 3. Bracteoles. 4. Perianth. 5. Staminal tube cut open, and pistil. 6. Fruit enclosed by perianth and bracteoles. 7. Seed.

Gomphrena decumbens, *Jacq.* ?

Plate 115.

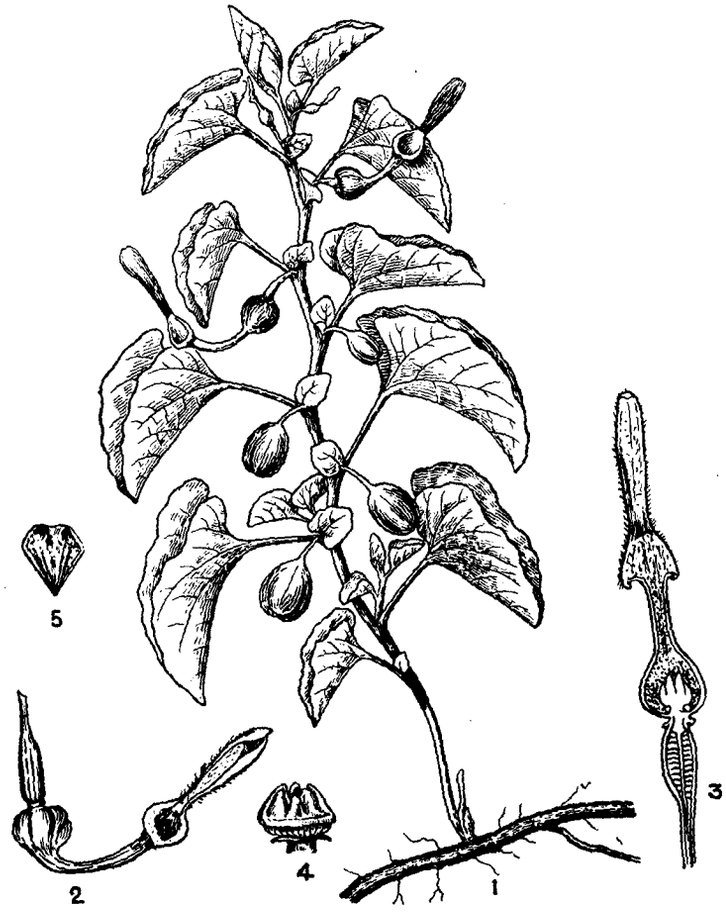
Tamil: Neer-vadamalli ?
Telugu: Neeru-bogadabanti ?
Flowering and fruiting time: November-January.
Habit: A herb.
Habitat: Moist situations and roadsides.
Range: Madras and Coimbatore.
Propagation: By seed.
Number of seeds: 1,000.

A recently introduced weed. It is a native of Central America. The plant was first collected in Madras in December 1915 and has since been rapidly spreading into the interior. It has also been noticed at Coimbatore since 1924.

It is a diffusely much branched annual with a rather stout tap-root. The branches are at first prostrate and then ascending and terminating in a characteristic, stout, white spike. Stem is somewhat round and densely clothed with adpressed or spreading, long white hairs in the young parts. Nodes are much swollen and sometimes densely covered with the hairs. Leaves are rather thick, 1–2 inches long, ob-ovate spatulate with a tapering base which partly clasps the stem. Both surfaces are either glabrous or clothed with the hairs. Flowers are white, compressed, in dense terminal spikes, ½–1½ inches long. At the base of each spike are two small leaves. Each flower is subtended by a bract which is short, membranous, ovate, acute and subulate and persisting on the hairy axis of the spike. Bracteoles are two, as long as the flower, boat-shaped, white, membranous and shortly winged on the back at the top. They fall away with the flower. Perianth consists of five narrow structures, two of which are very densely cottony woolly and much hardened at base. Fruit is enclosed by the hardened perianth. Seed is small, somewhat compressed, shining and orange red in colour. It remains viable for a number of years.

Means of control.—Prevent seed production by chopping off the flowering spikes with a grass-cutting-sword as early as possible after the setting in of the North-East Monsoon.

1. *Allmania nodiflora*, R. Br.—A much branched herb with a rather thick tap root. Leaves are alternate, sessile and vary much from linear-oblong to orbicular. Flowers are pale brown, in leaf-opposed, usually sessile, globose clusters about ½ inch in diameter. Thespecies has many varieties occuring in most districts especially on the East Coast from Ganjām down to Tinnevelly.



ARISTOLOCHIA BRACTEATA *Retz.*

PLATE 117.—Figs. 1. Branch. 2. Flower. 3. Longitudinal section of flower. 4. Stigma with stamens at base. 5. Seed.

Aristolochiaceae.

THE ARISTOLOCHIA FAMILY.

Bad smelling herbs or shrubs sometimes climbing. Leaves are simple, alternate and exstipulate. Flowers are bi-sexual. Perianth is single, tubular and corolla-like. Stamens are 6 or more, united round the style, below the stigma and enclosed by the base of the perianth. Ovary is inferior, 4–6 celled with numerous ovules. Fruit is usually a capsule or a berry with numerous seeds which are endospermous.

Though a small family, its members are distributed all over the world and particularly in the tropics.

Aristolochia bracteata, *Retz.*

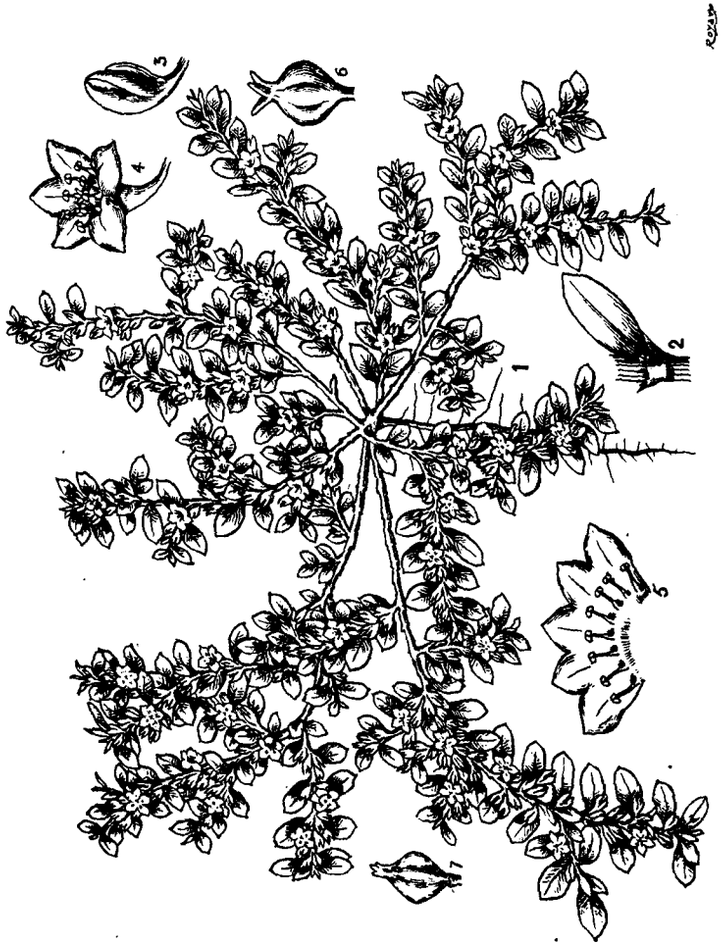
Plate 117.

Tamil : Aduthinnapalai.
Malayalam : Aduthinnapalai.
Telugu : Gaditha-gadapaku.
Flowering and fruiting time : July–October ; January–March.
Habit : A perennial herb.
Habitat : Dry places especially in black-cotton soils.
Range : Circars, the Deccan and Carnatic as also in Salem and Coimbatore and down to Tinnevelly
Propagation : By seed and by underground stems.
Number of seeds : About 1,000 in each aerial branch

The plant is one of the worst weeds of black-cotton soil. It has also been found to occur in dry or irrigated loamy and clayey soils, though not to a great extent.

It is a slender glabrous perennial with weak prostrate or ascending branches, 9–18 inches long. Stem is striate, glabrous and leafy. The underground stems are pale-yellow or white with numerous vegetative buds ; they also arise from the roots and occur at a depth of 8–24 inches or more from the ground level and ramify the soil. It is particularly on account of this habit that the extermination of the weed has become a matter of grave concern.

Leaves are simple, 1–2 inches long, alternate, ex-stipulate, broadly ovate or somewhat kidney-shaped, obtuse at the tip and entire with a broad sinus at base. Both the surfaces are glabrous and glaucous. Petiole is about an inch long with a stipule-like, leafy bract at its base. Flowers are about ¾ inch long, axillary, solitary on short pedicels with the round leaf-like bracts near the bases. Perianth is single with a tube about ½ inch long, dilated and sub-globose at base, at the to which is a cylindric tube which is bent and has a



POLYGONUM PLEBEJUM, *R. Br.*

PLATE 116.—Figs. 1. Entire plant. 2. Node with leaf and tubular stipule. 3. Flower bud. 4. Flower. 5. Perianth cut open. 6. Pistil. 7. Nut.

Polygonum plebejum, *R. Br.*

Plate 116.

Flowering and fruiting time: January-July.
Habit: A prostrate annual or biennial herb.
Habitat: Moist situations as rice fields and tank beds.
Range: All plains districts and up to 5,000 feet in the hills.
Propagation: By seed-like nuts.

When moist places get dry, the weed appears in large numbers. Branches are many, slender, radiating from the top of the woody main root, spreading and prostrate on the ground. Leaves are small, alternate, rather close-set and often less than an inch long and usually oblong or narrow. Stipules are tubular, surrounding the round stem. Flowers are small, pink, shortly stalked, three or more in axillary clusters. Perianth has five segments. Stamens are eight, with filaments dilated at the base. Ovary is superior with three styles. Fruit is a 3-angled nut, beaked at the top and shining brown; it is partly enclosed by the persistent perianth.

Means of control.—The nuts, being hard, can keep alive for a long time even when buried in the ground. So attack plants when they are young. Grub the surface of the soil, collect and burn old plants.

Economic importance.—Root is said to be used for bowel complaints.

The plant is very variable and many forms which are the result of soil and climatic conditions exist. The flowering time also is influenced by the same factors.

Polygonum glabrum, Willd.—A fairly large, erect, glabrous herb with pink stems, long, lanceolate leaves and membranous, sheathing stipules. Flowers are pink, rather small and closely arranged on the branches of a terminal panicle. The plant occurs in moist places as channels and tank-beds, sometimes in enormous numbers, in most districts, and up to 5,000 feet in the hills.

Tamil: Aatalaree.

trumpet-shaped mouth bearing an oblong lip which is dark purple, with revolute margins. The tube is hairy inside with hairs all pointing downwards. Anthers are six, at the top of the ovary and adnate to the column below the stigma. Ovary is inferior, six-celled, with many ovules in each cell. Style is very short and stigma consists of six lobes. Fruit is an oblong ellipsoid capsule glabrous and twelve-ribbed. Seeds are 40–60 in each fruit, triangular and much compressed; they are minutely closely tuberculate and black in colour.

Means of control.—Deep ploughing is more harmful than good as it breaks the underground stems into bits and distributes them in the field or buries them deep, and each bit with a bud is capable of producing a fresh shoot. When the field is in fallow, work a weighted Guntaka as frequently as possible and destory the aerial shoots. Repeat the operation a number of times whenever fresh shoots sprout up. By so doing the subterranean parts will be starved and exhausted; then put in a smothering crop. Repeat the same set of operations continuously for three or four seasons. If it is not possible to grow smothering crops at least crops that can be sown in lines and that require inter-cultivation should be tried. Never allow the pest to mature its seed.

Economic importance.—The plant is bitter in all its parts and is much used by native physicians as a purgative and anthelmintic. It kills maggots when applied to foul ulcers.

Euphorbiaceae.

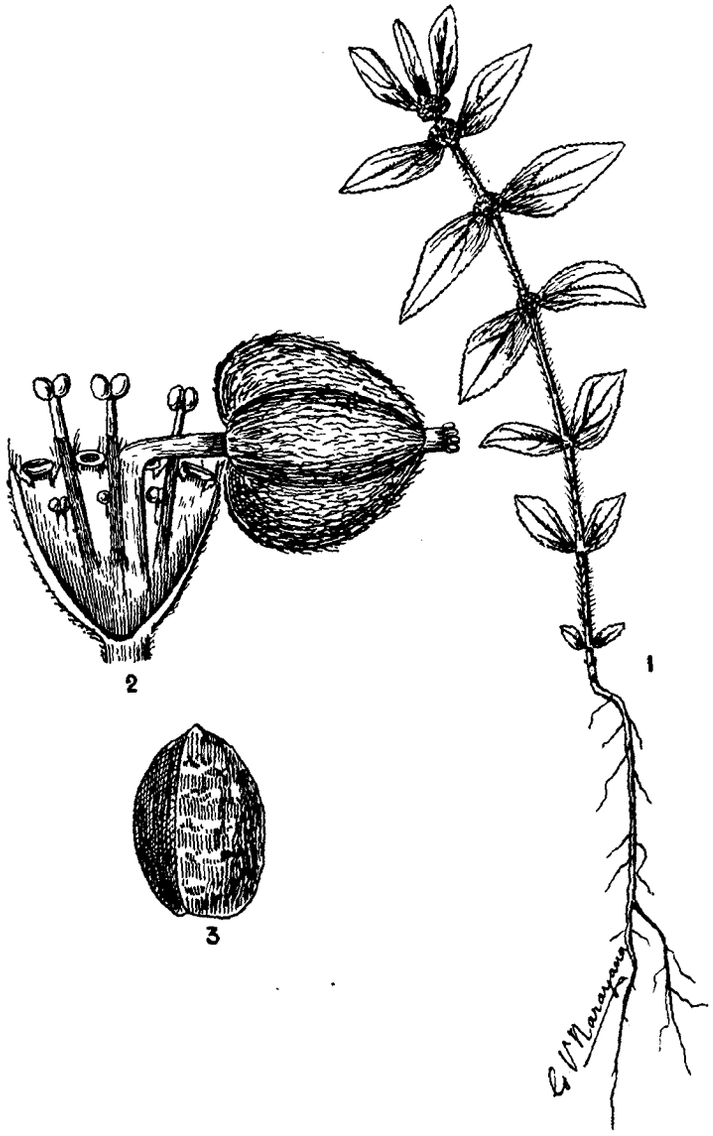
THE SPURGE FAMILY.

THE CASTOR-BEAN FAMILY.

bs, shrubs or trees usually with milky juice. Leaves are te or opposite, often simple and stipulate. Flowers are ual and incomplete. Perianth is usually single. In some , both calyx and coralla are present or both of them are . Petals and sepals are free. Stamens are 1 to many, either united. Disc which is variously shaped, is often present h the sexes. Ovary is superior and usually 3–celled, each ith 1 or 2 ovules. Fruit is a capsule or a drupe. Seeds are r without caruncle. Endosperm is copious.

iefly a tropical family.

ie family is named "after *Euphorbus* a physician to *Juba*, of Mauritania".



EUPHORBIA HIRTA, *Linn.*

PLATE 118.—Figs. 1. Entire plant. 2. Cyathium cut open. 3. Seed.

Euphorbia hirta, *Linn.*

Plate 118.

Tamil: Ammam Paccharisi.
Telugu: Nanabalu.
Flowering and fruiting time: Almost throughout the year.
Habit: A small ascending herb.
Habitat: Cultivated and waste places.
Range: All plains districts.
Propagation: By means of seeds.
Number of seeds: 4,000 or more.

Of the several species of *Euphorbia* occurring in the plains *E. hirta* is the one most widely distributed and commonly met with. It is a hardy, rather deep-rooted annual with plenty of milky juice in all its parts. Branches are few, sub-erect, erect or ascending and attaining a height of even a foot or more. The stem is round and covered with yellow crisp hairs; it is usually solitary and bent backwards at the top in a characteristic way. Leaves are simple, opposite, shortly stalked, with very small linear stipules. The blade is obliquely oblong-lanceolate, acute and the margin is closely serrate. The flowers are unisexual and both the male and the female ones are found in the same involucre which is cup-shaped, and four-toothed at its top, the teeth alternating with minute glands. These involucres are collected in dense axillary or terminal congested cymes. In the centre of each involucre is a solitary female flower consisting of merely a stalked ovary bearing three erect, bi-fid styles. The males are represented only by stalked stamens surrounding the central female. Fruit breaks into three bits, each containing a single reddish or brown seed with shallow furrows.

Means of control.—Hand weeding and clean cultivation are the best remedies.

Economic importance.—Plant is useful in bowel complaints and piles. There is a large demand for this plant in the drugs market.

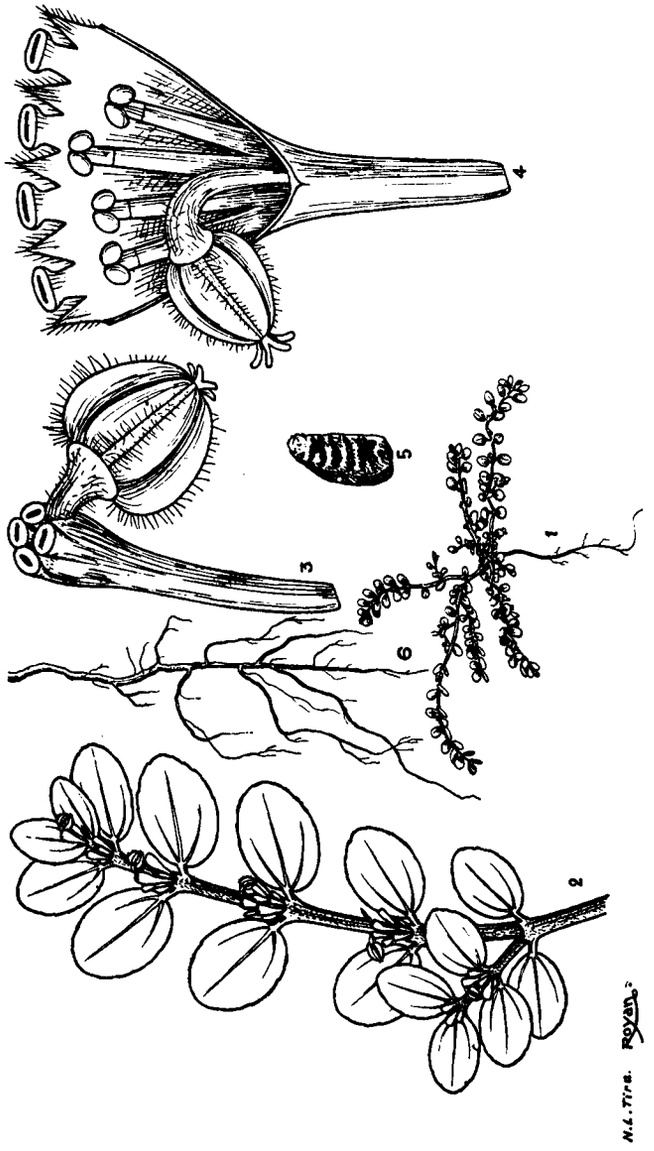


PLATE 119.—Figs. 1. Entire plant. 2. Branch enlarged. 3. Cyathium. 4. Involucre of cyathium cut open. 5. Seed. 6. Root system.

EUPHORBIA PROSTRATA, *Ait.*

Euphorbia prostrata, *Ait.*

Plate 119.

Tamil: Chinna Ammampacharisi.
Flowering and fruiting time: September–April.
Habit: A small prostrate herb.
Habitat: Roads, roadsides, dry open places and also in gardens and gravelly walks.
Range: The Deccan and Carnatic and in Coimbatore.
Progagation: By seed.

A native of West Indies. It is a small, prostrate, annual herb dark bluish green in colour, with spreading branches which are minutely hairy, usually 1–4 inches long and radiate from the top of the main root. Leaves are small ⅓–¼ inch long, opposite, obliquely oblong, obtuse and minutely serrate towards the tip; margins and lower surfaces are purple like the stems. Stipules are small, acute and hairy. Flowers are small, unisexual in involucres as in *E. hirta*. The involucres are small, usually two, in the axil of each leaf; there are 3–4 glands on the top of the involucre. Capsules are small, usually bent and hairy on the keels. Seeds are angled and furrowed, greyish or purplish in colour.

Means of control.—Pull the plants when the soil is moist. Scrape surface of soil, collect and bury the plants. Do not allow them to get dried in the sun lest the capsules should burst and the seeds get dispersed. In gravelly walks and tennis courts spraying with a strong solution of Iron sulphate or Sodium arsenite may be tried.

1. *Euphorbia thymifolia*, Linn.—A much branched herb, spreading flush with the ground in patches. Leaves are green, obliquely oblong, serrulate at the tip, and close-set on the side branchlets. Capsules are hairy all over and the small pink seeds are 4-angled.

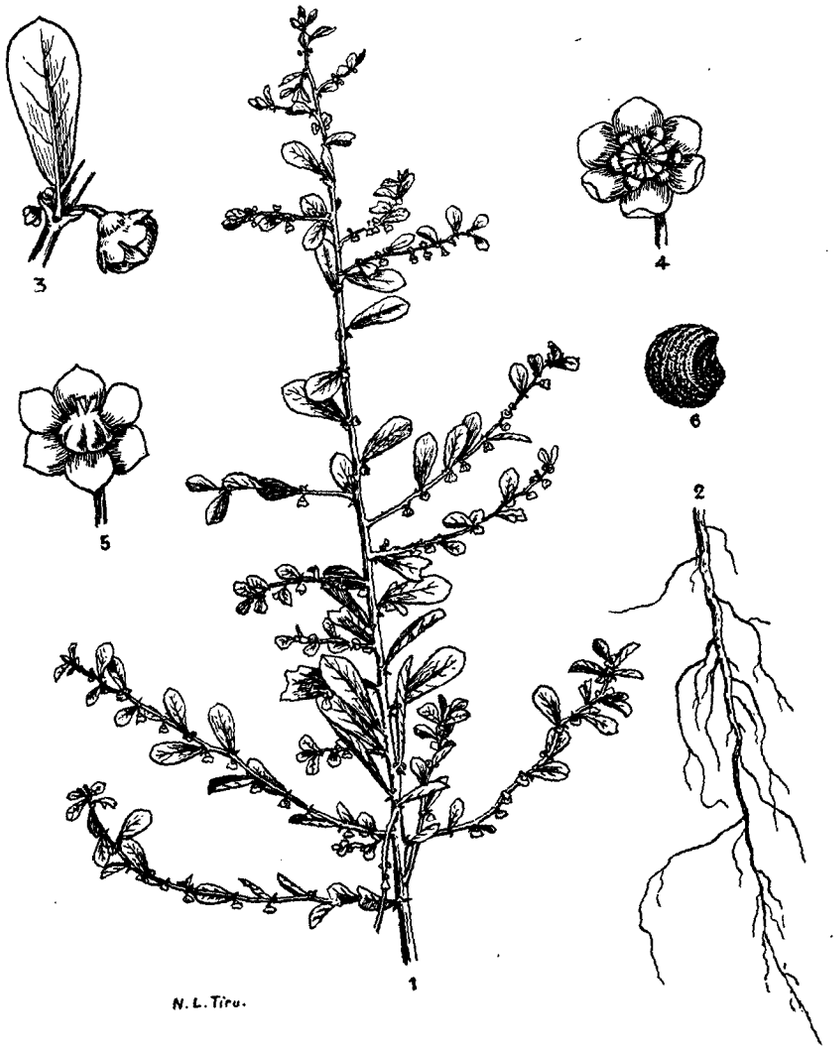
The plant resembles *Euphorbia prostrata*, Ait., the leaves of which are usually dark pink in colour and only the keels of its capsules are hairy. A weed of gardens, roadsides and waste places, in all districts and in the low hills.

Tamil: Chinna Ammampacharisi.

Malayalam: Chitrapala.

2. *Euphorbia dracunculoides*, Lamk.—An erect, glaucous herb, sometimes branching from the very base, with long narrow leaves alternate below and opposite where the top branches spread umbellately and at the base of the involucres. Capsules are smooth and the carunculate seeds are blotched with white. A weed of waste lands and cultivated fields, in many districts on the East Coast and in the Ceded Districts. At times the plant is very gregarious.

Telugu: Tilla-kada.



PHYLLANTHUS MADERASPATENSIS, *Linn.*

PLATE 120.—Figs. 1. Shoot. 2. Root system. 3. Node with leaf and cluster of flowers. 4. Male flower. 5. Female flower. 6. Seed.

Phyllanthus maderaspatensis, *Linn.*

Plate 120.

Tamil: Mela Nelli.
Telugu: Nalla Usirika.
Flowering and fruiting time: July-September; October-January.
Habit: A herb.
Habitat: Cultivated and dry places.
Range: Northern Circars, the Deccan and Carnatic.
Propagation: By seed.
Number of seeds: About 1,000.

Of the few species of *Phyllanthus*, commonly occurring as weeds *P. maderaspatensis* is the one most often met with in almost all kinds of soils. It is very common in black cotton soil. Though it appears to like loamy soils it is found in large numbers along water channels. The plant does not occur in wet lands.

It is an erect, glabrous, annual herb, ½–2 feet high. The branches are somewhat decumbent and sometimes become very woody at the base. Leaves are simple and alternate. Stipules are lanceolate and acute at the tip. Leaf-stalks are short. Blade is ob-ovate and tapers towards the base, while the tip is notched and has a small point. Flowers are small, axillary, pale green, unisexual and both the sexes are found on the same plant. Female flowers are solitary on short pedicels. Its perianth consists of six ovate sepals in two whorls. Ovary is superior, 3-celled and surrounded by six elongate glands at the base. Styles are three and each is bifid at the tip. Male flowers are very minute, crowded in the axils of leaves towards the tops of branches. The perianth consists of six ovate sepals as in the female and the sepals have white margins. Stamens are three, united into a bundle in the centre of the flower, above a disc of glands. Fruit is a small glabrous capsule breaking into three, two-valved bits, each bit or coccus containing two seeds. Seeds are trigonous, rounded on the back, brown in colour and covered with fine concentric, interrupted, raised lines.

Means of control.—The best time for attacking the weed is after the monsoon rains have been received, when it appears in large numbers. Pull the plants or weed them out by means of hand-hoes.

Economic importance.—Infusion of the leaves is used by some people as a remedy for headache.

PHYLLANTHUS NIRURI, *Linn.*

PLATE 121.—Figs. 1. Entire plant. 2. Male flower. 3. Female flower. 4. Fruit with perianth persisting below. 5. Seed.

Phyllanthus Niruri, *Linn.*

Plate 121.

Tamil: Keela Nelli.
Telugu: Nela Usiri.
Malayalam: Kizhanelli.
Flowering and fruiting time: June-October.
Habit: A small herb.
Habitat: Garden and cultivated lands.
Range: All plains districts.
Propagation: By means of seeds.

The plant is a glabrous, annual herb 1-2 feet high. Often it attains a height of only a few inches. Branchlets are slender and spreading. They look very much like compound leaves. It is from this character that the genus derives its name (*Phyllon*=a leaf, *anthos*=flower, flowers appearing on the leaves). Leaves are simple, alternate, oblong and distichous. They are glaucous and have very short petioles. Flowers are small, axillary, yellowish, very many, hanging down below the branchlets. The sepals of the male flower are rounded while those of the female are oblong, subacute with white margins. Stamens are three and anthers are sessile. Styles are minute and two-lobed. Fruit is a capsule, about 1/10 inch in diameter, depressed globose and smooth. Seeds are trigonous, rounded on the back with parallel ribs arranged lengthwise.

Means of control.—Same as for *P. maderaspatensis*.

Economic importance.—Infusion of tender shoots is administered in chronic dysentery. The plant contains a bitter principle called Phyllanthin.

CROTON SPARSIFLORUS, *Morong.*

PLATE 122.—Figs. 1. Branch. 2. Root system 3. Cluster of male flowers. 4. Male flower. 5. Stamen. 6. Female flower. 7. Fruit. 8 and 9. Seeds enlarged.

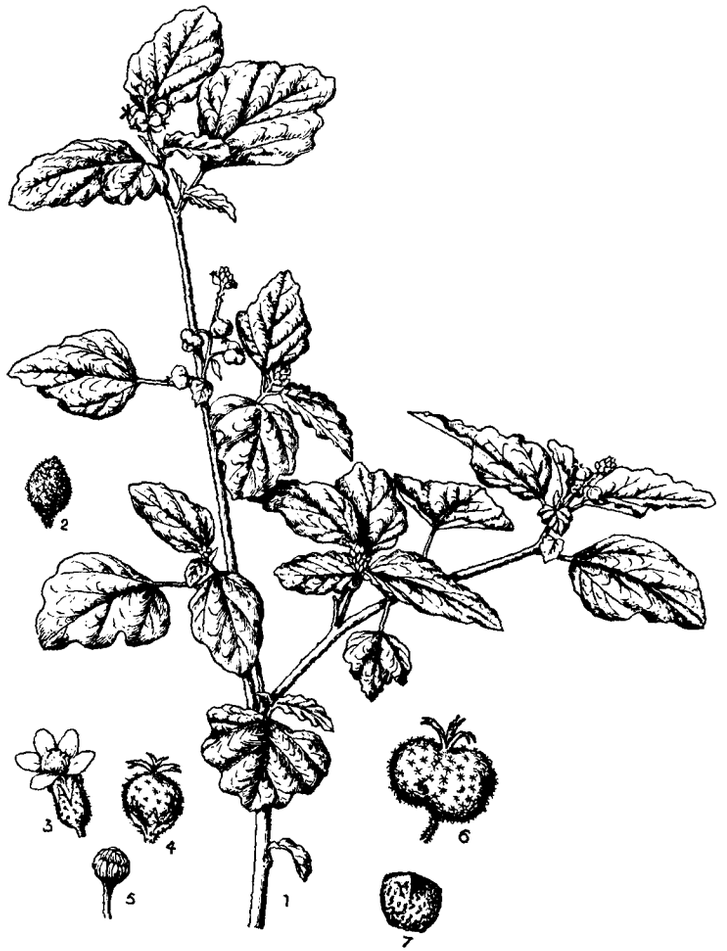
Croton sparsiflorus, *Morong.*

Plate 122.

Tamil: Nai Milakai?
Telugu: Kukka Mirapa; Verri Mirapa.
Flowering and fruiting time: Perhaps throughout the year, especially from September to February.
Habit: A woody herb or an undershrub.
Habitat: Along railway embankments.
Range: East Coast from Ganjam down to Tinnevelly and Travancore.
Propagation: By seed.

An introduced weed, a native of Paraguay in South America. It was supposed that Chittagong was the place where the plant was first introduced in India. In October 1898 specimens of the weed were collected at that place. The immigrant has since been rapidly spreading into various parts of Bengal and Assam, and down to Tinnevelly. In South India the plant was first collected at Tirukkarangudi (Tinnevelly district), 17 miles away from the nearest railway station. It is of interest to note that the species has a special liking for embankments of railway lines and bunds of tanks where it is found in large numbers in isolated patches. In Madura and Ganjam districts the weed is extremely gregarious in fallow rice fields where the soil is light and easily drained. Another peculiar feature of the plant is its fresh look even under very dry conditions and as such it makes great demands on soil moisture which it soon exhausts.

The plant is an erect diffusely much branched annual growing to a height of 1–3 feet, with a faint odour of Chenopodium oil and pale yellow juice. Root system is rather shallow and surface feeding. Main stem is green, rather woody at base and ends in an inflorescence 3–6 inches above the ground becoming sympodial and producing side branches which behave in the same way. This sort of branching is characteristic of the plant. Its various parts are sparsely clothed with small white stellate hairs that make them somewhat rough to the touch. Leaves are simple, alternate, ex-stipulate and crowded towards the tops of branches presenting a sort of whorled appearance below the inflorescence. Leaf-stalks are short, about ⅛ inch long. Lamina is lanceolate, 1–2 inches long, acute, closely serrate and tapering or round at base. Inflorescence is a terminal, erect, androgynous spike, 3–5 inches long with a few female flowers at its base and small somewhat distant few-flowered clusters of male flowers above. Bracts are small and ovate-lanceolate. Male flowers are small on short pedicels. Perianth lobes are 5, ovate-lanceolate and green.



CHROZOPHORA ROTTLERI, *Klotzsch.*

PLATE 123.—Figs. 1. Branch. 2. Flower bud (male). 3. Male flower. 4. Female flower. 5. Staminal column. 6. Fruit. 7. Seed.

Stamens are white, about 15 in number and filaments are longer than the sepals. Anthers are 2-lobed. Female flowers have short flower-stalks at the bases of which there are fleshy glands. Perianth consists of 5 persistent sepals. Ovary is 3-celled, and styles are 3, flat and bi-fid at the tips. Fruit is a 3-lobed capsule dehiscing into 3 bits. Pericarp is crustaceous. Seeds are ¼ inch long, oblong, polished and mottled on the round back. The inner faces taper towards the central column and there is a fleshy outgrowth (caruncle) at the top of each seed.

Means of control.—Destroy seedlings or cut and burn old plants in fruit.

Economic importance.—Young plants are said to be used as green leaf manure; but its efficacy remains doubtful.

Chrozophora Rottleri, *Klotzsch.*

Plate 123.

Telugu: Gurugu; Lingam Miriyalu.
Flowering and fruiting time: April-July.
Habit: A herb.
Habitat: Dry places and tank beds.
Range: Northern Circars, the Deccan, Carnatic and other plains districts.
Propagation: By means of seeds.
Number of seeds: About 2,000.

The plant is an erect herb growing to a height of 2½ feet with many spreading branches rising from the top of the main stem and giving it a sort of bushy appearance in well developed specimens. The tap-root is deep seated and rather thick. The plant is very common in the black cotton tracts of the Presidency, where, sometimes, it is so gregarious that it resembles a crop. When tank beds are dry large numbers of this plant are found occupying the whole area. This weed is a very hardy one and is capable of withstanding extreme drought. The thickly close-set, stellate hairs with which the whole plant is covered, help it in doing so. Though a cosmopolitan species thriving in almost all kinds of soils, it does not seem to like moist situations.

The leaves are simple, alternate and the stipules are small and hairy. Petiole is as long as or shorter than the blade and has two glands at its apex. The lamina is ovate-orbicular, wrinkled while its base is truncate, cuneate or cordate and unequal. The margin is wavy and both the surfaces are densely stellately hairy. Flowers are unisexual and both the sexes are found in the same plant. They occur in terminal racemes. Bracts are small, linear and hairy. Male flowers are 10-12, rather small and arranged

ACALYPHA INDICA, *Linn.*

PLATE 124.—Figs. 1. Branch. 2. Root system. 3. Spike. 4. Female flower with bract. 5. Female flower (at top of spike). 6. Male flower. 7. Seed.

towards the top of the raceme. Sepals are 5 and short; petals are 5 and yellow; stamens are 15 in two whorls and surrounded by a glandular disc at the base. Female flowers are few, often 4-8, at the base of the raceme. Sepals are 5, petals are much shorter. Ovary is 3-celled with one ovule in each cell. Styles are 3 and each is bi-fid and red in colour. Fruit is densely stellately hairy dehiscing into 3 cocci. Seeds are round, and shining black.

Means of control.—Prevent the production of seed by close cutting or hand-pulling. When found in large numbers grub the surface of soil to destroy seedlings.

Economic importance.—The plant yields a dye. Ashes of the root are given to children in cough. Seeds are used as a purgative.

Acalypha indica, *Linn.*

Plate 124.

Tamil: Kuppai-meni.
Malayalam; Kuppai-meni.
Telugu; Muripindaku; Kuppinta Chettu.
Flowering and fruiting time: June-October.
Habit: A herb.
Habitat: Cultivated and waste places.
Range: All plains districts.
Propagation: By seed.
Number of seeds: 10,000.

Of the few species of *Acalypha* occurring as weeds in South India, *A. indica*, Linn., is the one most commonly seen. At times after the rains, the weed is found in enormously large numbers in waste places.

The plant is an erect, herbaceous annual growing to a height of ¾–2 feet or more, with many spreading or ascending branches. The root system is rather shallow and surface feeding. The stem is round or angular and densely shortly pubescent. Leaves are simple, alternate; stipules are 2, short and deciduous. Petiole is up to 1¼ inch long; the lamina is shorter than the petiole, ovate, obtuse and serrate and its base is wedge-shaped. Flowers are minute, green, unisexual and are arranged in an axillary spike which is slightly longer than the petiole. Male flowers are many, very minute, clustered towards the top of the spike. The perianth consists of 4 ovate sepals. Stamens are 8, anther lobes are 2, divaricate and longer than the filaments. Female flowers are solitary or in pairs, 3-12, at the base of the spike; each of these is

three-lobed glabrous capsule, longer than broad and breaking into three, two-valved bits. Seeds are smooth, very much resembling small castor seeds, with a small outgrowth at the top of each.

Means of control.—Attack seedlings. Old plants being thick and stout are not easily destroyed unless the shoot is removed with a part of the stout tap-root. A cotton-puller may be employed for this purpose.

Economic importance.—Boiled leaves are bruised and applied to carbuncles. Paste of tender shoots is a remedy for itches and eczema. The seeds are purgative and poisonous, the antidote for such poisoning being lime-juice. Decoction of bark is said to be given to women to induce menses.

Jatropha glandulifera, *Roxb.*

Tamil: Eli-avanakku ; Adalai Chedi.
Telugu: Dundigapu.
Flowering and fruiting time: September–December.
Habit: A small shrub.
Habitat: Waste places and cultivated fields lying fallow for a long time.
Range: The Deccan and Carnatic and most other districts.
Propagation: By seed.

The plant sometimes occurs in great abundance near the sea coast and is also occasionally raised as a hedge plant from cuttings. It resembles very much *J. gossypifolia*, Linn., and is often mistaken for that species. But it can be easily made out by the green leaves, long branched stipules which are gland-tipped, the serrate and gland-tipped leaves and the yellowish green flowers.

Means of control.—Same as for *J. gossypifolia*, Linn.

Economic importance.—The leaves yield a green dye which is used in colouring cloth. The oil from the seeds is applied in rheumatism and paralysis.

1. *Micrococca Mercurialis*, Benth.—An erect, branched herb with alternate, ovate or lanceolate leaves, crenate on the margin and bluntly acuminate; petioles are long. Flowers are distantly arranged in long spikes. Fruit is a deeply 3-lobed, globose capsule with round, pitted seeds. A weed of waste lands and cultivated places in many districts, in the plains.

Malayalam: Kunuku-thooki.

2. *Tragia involucrata*, Linn.—An erect or a climbing, hispid herb with stinging hairs and ovate or lanceolate, acuminate, petioled leaves, coarsely toothed on the margin. Flowers are in

leaf-opposed racemes. Fruit is a 3-lobed capsule and the persisting perianth lobes are toothed. A weed of cultivated and waste places.

English: Nettle.
Tamil: Poonai Kanjan; Kanjori.
Malayalam: Choriyanam.
Telugu: Pinna-doolagunda; Doolagovila.

3. *Tragia cannabina*, Linn. f.—A hispid, climbing or creeping deep-rooted, perennial herb with stinging hairs and alternate 3-partite leaves, toothed on the margin. Racemes are leaf-opposed and lobes of perianth are toothed. Common among hedges in fallow fields, in many districts of the East Coast, the Ceded Districts, Salem and Coimbatore.

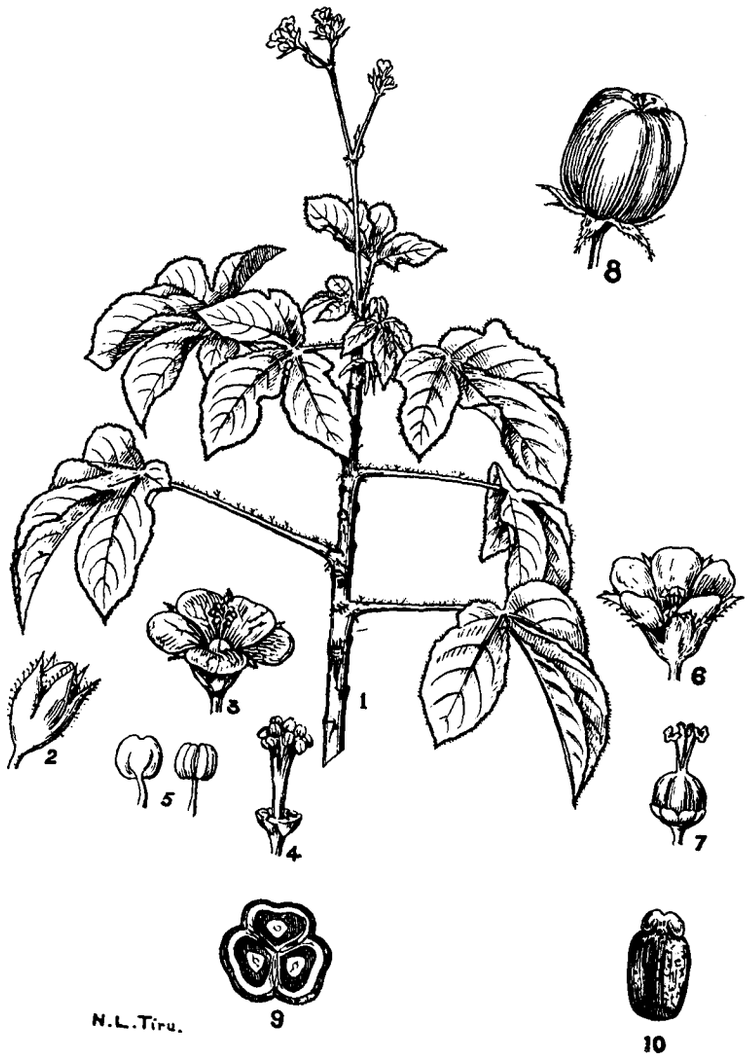
Telugu: Chinna Doolagunda.

Pontederiaceae.

THE WATER HYACINTH FAMILY.

The family consists of erect or floating, fresh water and marsh herbs. Leaves are simple rising from the rootstock or the floating branches, and often variously modified. Flowers are bi-sexual, more or less irregular, usually in a racemose inflorescence from a spathe-like bract. Perianth is usually tubular consisting of six petal-like parts in two whorls. Stamens are six, unequal and attached to the perianth-tube. Ovary is superior, 3-celled with axile, or 1-celled with parietal placentas with many, 2-seriate ovules. Style is one and stigma is lobed or entire. Seeds are many, albuminous.

The members of the family are chiefly distributed in the warm regions of the world.



JATROPHA GOSSYPIFOLIA, *Linn.*

PLATE 125.—Figs. 1. Branch. 2. Flower bud. 3. Male flower. 4. Bundle of stamens. 5. Anthers. 6. Female flower. 7. Pistil with glands at base. 8. Fruit with calyx at base. 9. Cross section of fruit. 10. Seed.

enclosed by a prominent leaf-like and many-nerved bract which is toothed along the margin. The perianth consists of 3 minute sepals united at the base and is inconspicuous below the hispid ovary. Sometimes, above the male flowers, at the very top of the spike, there is a small peculiar appendage with two horns. It is a female flower developing a seed. Above the ovary are three styles which are divided into narrow lobes. Fruit is a small, three-celled capsule enclosed by the persistent bract; it breaks into three, two-valved bits, each containing a small brown seed which is round and smooth.

Means of control.—Clean waste places. In cultivated areas grow crops that require frequent inter-cultivation.

Economic importance.—Leaves have laxative properties. The plant is useful in the treatment of consumption.

Jatropha gossypifolia, *Linn.*

Plate 125.

Tamil: Siria Amanakku; Katamanakku.
Malayalam: Chuvanna-kadalavanakku.
Telugu: Nela Amudam.
Flowering and fruiting time: April-July.
Habit: A shrub.
Habitat: Waste places and roadsides.
Range: All districts in the plains.
Propagation: By seed.

The plant is a native of Brazil and it is now naturalized occurring in all districts. It is an erect robust shrub 3–4 feet high. Though not uncommon in various kinds of soils it seems to thrive best in sandy loams. The stem is round, thick and full of transparent juice. Leaves are simple, alternate, reddish when young becoming green with age. Stipules are short and consist of branched and gland-tipped bristles. Petioles are sometimes as long as 4½ inches, and are covered above with clusters of gland-tipped bristles. The lamina is about 1½–3 inches across somewhat deeply 3–5 lobed. The margin is closely beset with short gland-tipped hairs. Flowers are reddish, in terminal branched cymes and are monœcious. Calyx consists of five lanceolate, ciliate, coloured sepals. Corolla is reddish and has five petals which are slightly united at the base. Stamens are eight, united into a bundle in the middle of the male flower. Ovary is superior, usually three-celled and three-ovuled. It is raised on a disk of five glands. Styles are three, bi-fid above and united below. Fruit is a three-celled,

Perianth tube is short and bent above, with six coloured lobes; the three outer lobes are narrower than the three inner; of these three the upper is the biggest with a prominent yellow patch on it. Stamens are six, attached to the perianth tube; three of them are short and remain within the tube while the other three are long and slightly curved upwards at their tips. Ovary is superior and three-celled with numerous ovules. Style is long and bent at the tip. Fruit is an oblong capsule breaking open in the middle of each cell-wall. Seeds are minute, oblong, pointed and striate and greyish in colour. But often they do not set.

The evils of *Water Hyacinth* are many. Canals and water courses are choked and navigation is made impossible. At times even rivers are infested with the pest, as in the case of St. John's River in Florida. In infested tanks drinking water often becomes contaminated on account of the many old leaves rotting and fish are said to become scarce in such situations. The flowers harbour mosquitoes.

Means of control.—All possible methods that could be suggested by man have been tried to suit different conditions.

Application of superheated steam was tried in the United States of America. The effect of such treatment was only temporary as only leaves were destroyed and the most vital part of the plant, viz., the stem was quite uninjured and it put forth fresh shoots in a short time.

Various chemicals like Arsenite of Soda were used in spraying solutions. But success achieved was only partial and the weed could not be destroyed *in toto*. Moreover, the poisonous substances being injurious to animals and crops could be employed only in limited areas. In small ponds, dropping in big lumps of blue vitriol is said to be effective. The substance gets slowly dissolved in water and being absorbed by the roots, kills the plant.

Saltwater kills the plant and suggestion has been made to collect colonies of water hyacinth and shove them on into the sea. With that object, special dredges were constructed and tried. They were no doubt useful to some extent but the method could be adopted only in places near the sea.

In Bengal, cultivators are said to erect fences round their paddy crops to prevent the pest from entering the fields during times of flood.

In short, no method has so far been quite successful for one reason or other. The best remedy under the circumstances, seems

to be employment of manual labour. Plants should be collected and destroyed by burning or burying them deep. Being fleshy they are not easily burnt unless they are thoroughly dried previously. The problem of eradicating the pest should be taken up seriously by every one concerned and there ought to be a sort of co-operative organization to guide the working of the campaign, and concentrated action.

Various countries have made enactments proscribing the plant and persons having the pest undestroyed in their lands have been fined. But the Acts could not be rigidly applied for many reasons and the good that might have resulted was perhaps very little. In the Madras Presidency there is the Madras Agricultural Pests and Diseases Act of 1919 which has been brought into force in different districts from time to time.

Economic importance.—The plant being found in large numbers, scientists thought of utilizing it for some purpose or other and experimented with it. It is rich in potash and makes a valuable manure when properly decomposed. During the War, potash was actually prepared from it. Attempts at making paper from water hyacinth were also made, but the quality of the paper was extremely inferior. Flowers yield a sort of blue colour and ink prepared from it is very poor in quality.

Commelinaceae.

THE SPIDERWORT FAMILY.

Mostly herbs with simple, alternate leaves having sheathing bases and parallel veins. Flowers are often irregular, bi-sexual or uni-sexual by abortion, and usually arranged in bracteate cymes, often enclosed in spathes. Perianth segments are six in two whorls, the outer three being sepal-like and the inner three petal-like. Stamens are six, two or more of which are sometimes reduced to staminodes, attached to the base of perianth segments. Ovary is superior, three or two celled, each cell with one or two ovules. Fruit is a capsule and seeds have floury endosperm.

A tropical and sub-tropical family named after Kasper and Johann Commelin, two Dutch Botanists.

EICHHORNIA CRASSIPES, *Solms.*

PLATE 126.—Figs. 1. Entire plant. 2. Young plants floating. 3. Stem with a side branch. 4. Bladdered leaf with stipule. 5. Flower. 6. Fruit. 7. Seed magnified.

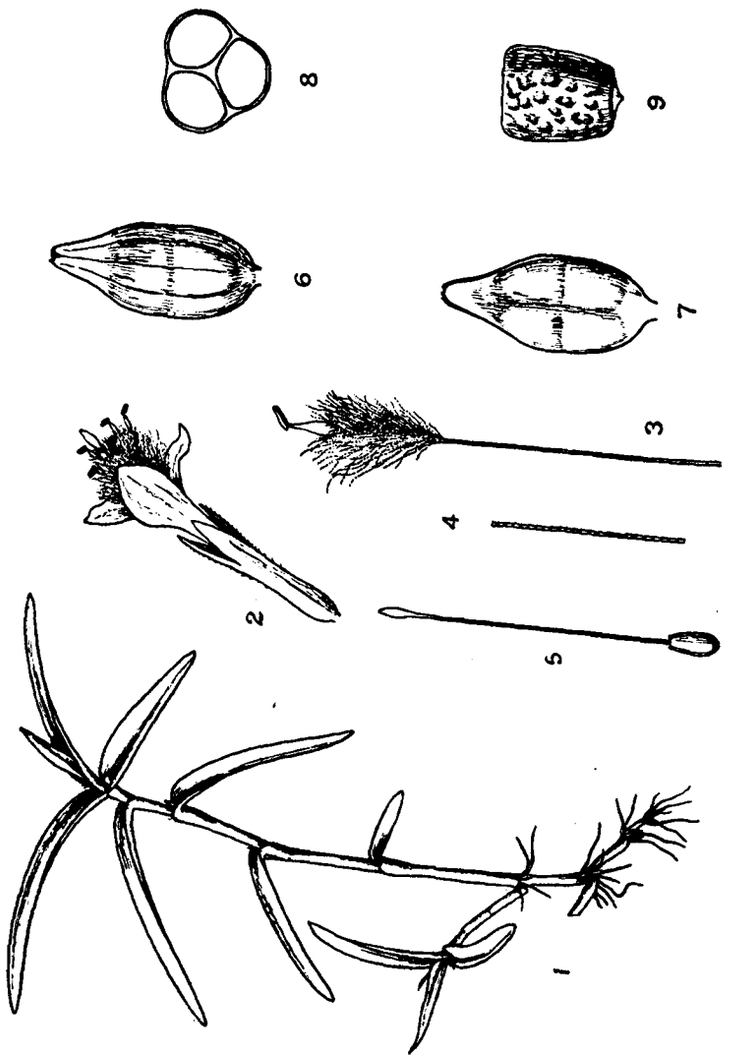
Eichhornia crassipes, *Solms.*

Plate 126 *and frontispiece.*

English: Water Hyacinth, Lilac Devil.
Tamil: Akasa-thamarai, Pisachi-thamarai.
Malayalam: Kola-vazha.
Telugu: Anthara-thamara; Pisachi-thamara.
Flowering and fruiting time: September–December.
Habit: An aquatic herb.
Habitat: Tanks, rivers and other watery places.
Range: Most districts.
Propagation: By suckers and seed.

Perhaps, there is no other weed in any country, that has cost man as much trouble and money as this notorious *Water Hyacinth.* It is a native of Brazil and has been known to Botanists for more than 130 years, as may be guessed from the Generic name which is after a German Minister who lived at the end of the 18th Century. The plant is now very common in the United States of America, Australia, Java, Siam, Burma and India. It is very likely that the pest has been purposely introduced in all these countries as a garden plant for the sake of its pretty flowers and fine foliage. But, if it goes out of bounds and finds favourable conditions for growth, it spreads with extreme rapidity and becomes an awful pest.

The plant is either free floating or partly fixed in mud in shallow waters. It is extremely gregarious in habit and thrives only in fresh water. In the axils of leaves, branches arise and end in a tuft of leaves and roots, when the connexion between the tuft and the parent plant gets broken, the branch becomes a separate plant. Stem is up to 9 inches or more long, rather thick and densely covered all over with bases of leaf-stalks and roots clothed with numerous rootlets having prominent root-caps. Leaves are 1–3 feet long and many. Leaf blade is 2–6 inches broad, varying much in shape from broadly-ovate to elliptic, thick and shining green. Petiole is often long, round, and sometimes much swollen in the middle, assuming the shape of a bladder. Such a structure is common in floating specimens and it helps the plant to keep itself buoyant. In large colonies bladdered petioles are often noticed only in the outermost plants. At the base of the petiole is an oblong stipule-like sheath lobed at its apex. Every young leaf is enclosed in bud by such a structure. The leaf of the outermost stipular sheath is not properly developed. Flowers are about an inch across and two inches long; they are lilac and showy, and arranged in dense spikes on long stalks. Bracts are somewhat leaf like.



CYANOTIS AXILLARIS. *Roem. & Sch.*

PLATE 128.—Figs. 1. Plant. 2. Flower. 3. Stamen. 4. Hair on filament. 5. Pistil. 6. Fruit. 7. Fruit. 8. Cross section of fruit. 9. Seed.

Cyanotis axillaris, *Rœm & Sch.*

Plate 128.

Tamil: Neer-pulli.
Flowering and fruiting time: September–February.
Habit: A succulent herb.
Habitat: Usually in rice fields and Moist situations.
Range: Most districts.
Propagation: By seed and bits of stem.

A branched prostrate or sub-erect, fleshy annual rooting at the nodes. Stem is round, pinkish, growing to a length of 1½ feet or more. Leaves are simple, up to 3 inches long, narrowly oblong, acute, alternate and sheathing at their bases; sheaths are dilated, clasping the stem, and ciliate with long hairs on margins and sides. Flowers are blue, in axillary cymose clusters, partly hidden by the leaf-sheaths. Bracteoles are 2, short, membranous and keeled. Calyx is smooth, 3-lobed in flower and deeply divided to the base in fruit. Petals are 3, long-clawed, the claws being united into a tube; lobes of the limb are ovate. Stamens are 6 and filaments are long and densely bearded with jointed and beaded hairs; anthers are yellow and 2-celled. Ovary is superior and 3-celled; style is erect, and stigma is fusiform and acute. Fruit is a loculicidal capsule, beaked at the top. Seeds are 2 in each cell; they are greyish, truncate at base with a small conical point at the top and pitted.

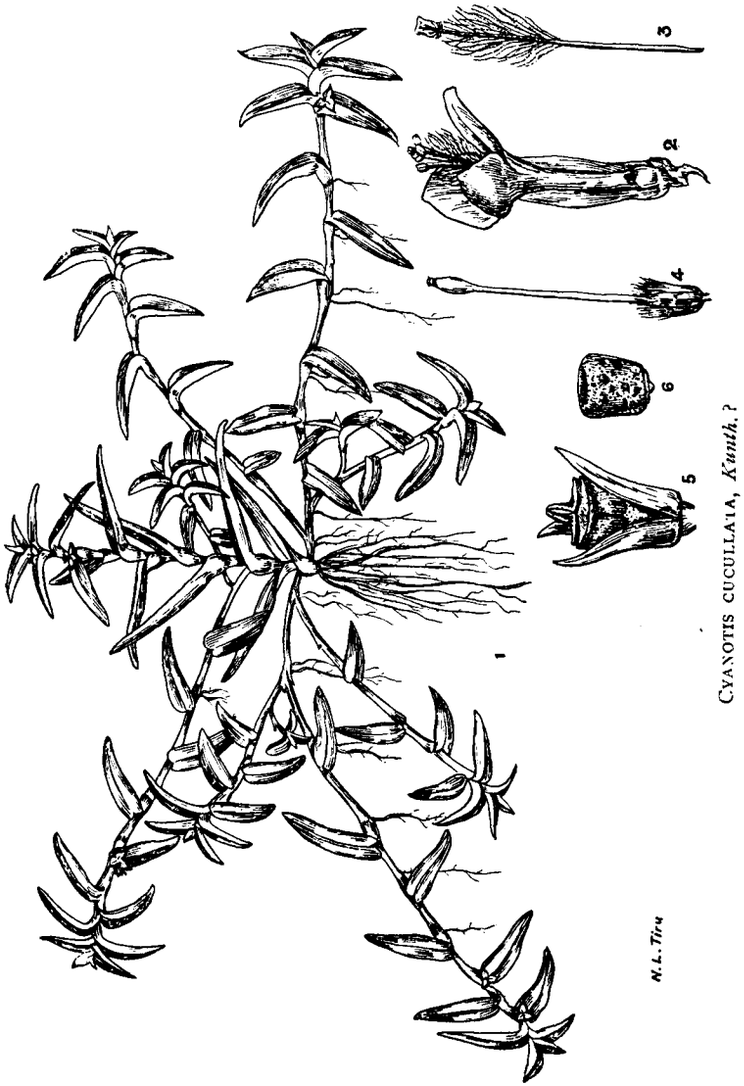
Means of control.—The weed is best attacked in the seedling stage. Uproot plants and bury them. Prevent seeding.

This species closely resembles *C. cucullata*, Kunth.? in spite of the difference in habit; but it can be distinguished by the capsule being beaked; in *C. cucullata*, Kunth.?, the fruit is always 3-horned.

1. *Commelina benghalensis*, Linn.—A somewhat fleshy, branched perennial herb with the forking stems, sometimes spreading to a length of even two feet or more and rooting at the basal nodes which often put forth branchlets that enter the soil and develop pale flowers and fruits. Leaves are rather thick, ovate and obtuse. Flowers are blue, in funnel-shaped, sessile or sub-sessile spathes which are 1–3 together at the ends of branches. A common weed of cultivated and waste places, especially in light soils in all districts.

Tamil: Kanan Keerai.
Telugu: Amrutha-kada.
Malayalam: Vazhaipadathi.

2. *Commelina Jacobi*, Fischer.—This is a very diffusely branched sub-erect or straggling herb usually 1½ feet high and sometimes



CYANOTIS CUCULLATA, *Kunth.?*

PLATE 127.—Figs. 1. Entire plant. 2. Flower. 3. Stamen. 4. Pistil. 5. Fruit enclosed by outer perianth lobes. 6. Seed.

Cyanotis cucullata, *Kunth ?*

Plate 127.

Tamil : Nayini-poondu.
Telugu : Amada-kaya.
Flowering and fruiting time : September–February.
Habit: A fleshy annual herb.
Habitat: Cultivated and waste places.
Range: Most plains districts.
Propagation : By seed and bits of branches.

This is one of the most troublesome weeds of cultivation thriving well in all kinds of soils and under varying conditions of moisture.

The plant is succulent in all its parts. Roots are surface feeding and arise from the few basal nodes of the main stem. The central shoot is only 3–6 inches high and erect, and the many lateral branches which grow to a length of 1½ feet or more, are prostrate or ascending and rooting at the nodes. Stem is round, green or pinkish; it is glabrous except for a longitudinal line of short hairs, and is full of slimy juice. Leaves are 2–5 inches long, sessile, alternate, narrowly oblong, acute and fleshy, and U-shaped in cross section. Base is dilated and clasping round the stem. Flowers are light blue in colour, about ½ inch long, solitary or in cymose clusters and axillary, in the dilated leaf-sheaths. Bracteoles are 2, narrow and long, keeled on the back and sparsely covered with long white hairs. Calyx consists of 3 acute, narrow and keeled sepals which are slightly united below the middle. Corolla is pale white below, in the tubular part, 3-lobed and bluish above; lobes are ovate. Stamens are 6 filaments are long and white, somewhat fusiform and tapering at the tips ; the top portion of each filament is clothed with long, minutely beaded, characteristic hairs. Ovary is superior, 3-celled and 3-lobed and hairy at the apex. Ovules are 2 in each cell. Style is long, white, dilated at the top with a small yellow stigma. Fruit is 3-horned and each horn is grooved and slightly bi-fid at the tip. Seeds are greyish, sub-cylindric, truncate at one side and pointed at the other, and pitted all over.

Means of control.—Seedlings appear in large numbers after the rains. This is the best time for attacking the weed. In large areas work a Guntaka, collect the plants and bury them. It is very difficult to destroy old plants; as they are succulent, they cannot be easily burnt. The only way of disposing them, is to bury them deep. All possible precautions should be taken to prevent seeding, and the dispersal of seed. Stray bits of branches should not be left in the field as they soon root and establish themselves.

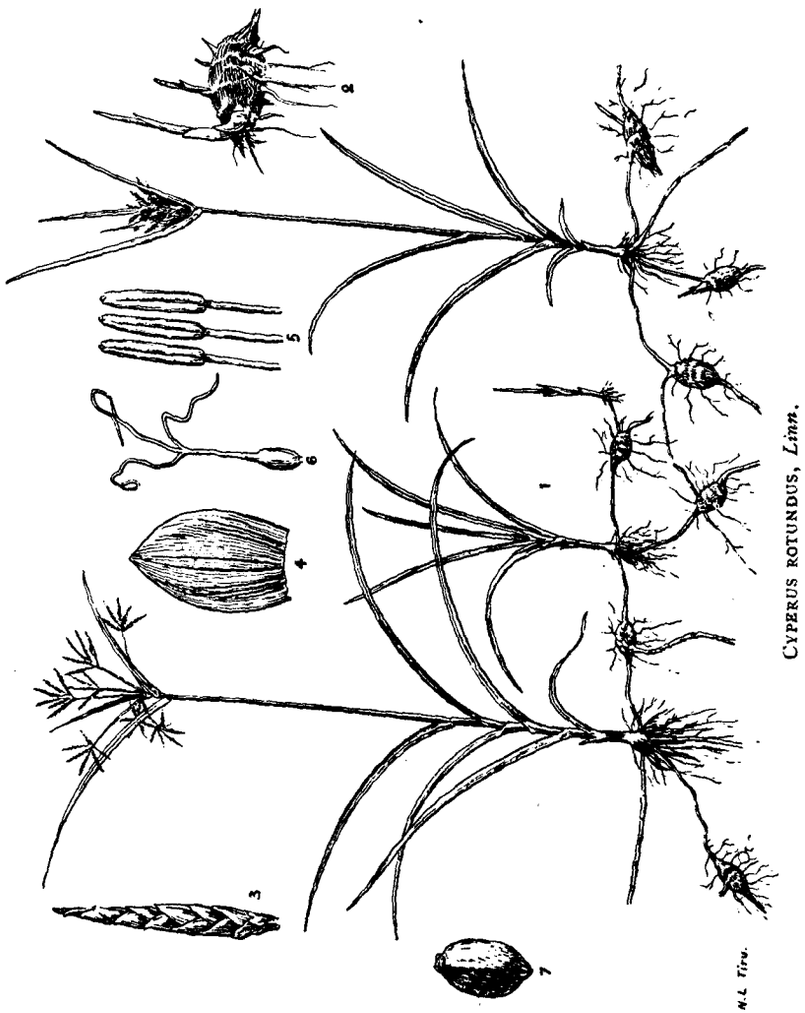


PLATE 130.—Figs. 1. Plant with underground stems. 2. Rhizome germinating. 3. Spikelet. 4. Glume. 5. Stamens. 6. Pistil. 7. Nut.
CYPERUS ROTUNDUS, *Linn.*

The stem is three-sided and rounded at the corners rising from the top of a bulb which is covered with black scales. Short stolons 2–3 inches long radiate from the base of the stem and each ends in a small bulb. Leaves are linear, U-shaped in cross section, and drawn out into a point. They are usually longer than the stem and are placed on it a little above the ground level. Inflorescence is a terminal cluster of spikes. Bracts are 3, unequal and usually longer than the inflorescence. Spikelets are red, compressed, linear-lanceolate and the glumes which are many are oblong and prominently nerved. Flowers are bi-sexual. Stamens are three. The three stylar arms are longer than the style. Fruit is a small, obovoid nut, dark brown or black in colour.

Means of control.—Same as for nut grass. Force the bulbs to germinate by thorough cultivation and when the seedlings come up after the rains, work a weighted Guntaka followed by a harrow or a rake and collect and destroy them. Prevent seeding.

Economic importance.—The bulbs are said to be eaten boiled or roasted, during times of famine.

Cyperus rotundus, *Linn.*

Plate 130.

English : Nut Grass.
Tamil : Korai Kizhangu.
Malayalam : Kora.
Telugu : Saka Tunga Gaddi.
Flowering and fruiting time : July–November.
Habit : A perennial herb.
Habitat : Cultivated fields and waste lands.
Range : Almost throughout the Presidency.
Propagation : By seed-like nuts and underground stems.
Number of seeds : About 3,000 (in each ærial shoot).

The plant is an erect, glabrous herb growing to a height of 3–9 inches with perennial underground stems spreading over an area of even 20 square feet or more. It is cosmopolitan in habit and thrives in almost all kinds of soils even under very varying conditions of moisture and temperature. In wet lands the plant is robust sometimes attaining a height of 3 feet. Roots are fibrous and clothed with bent hairs.

The common English name *Nut Grass* denotes the grass-like habit of the weed and the nut-like underground tubers; however, it must be understood that the plant is neither a grass nor has it real nuts underground. They are only parts of the underground stolons thickened here and there into tubers. The generic name is derived

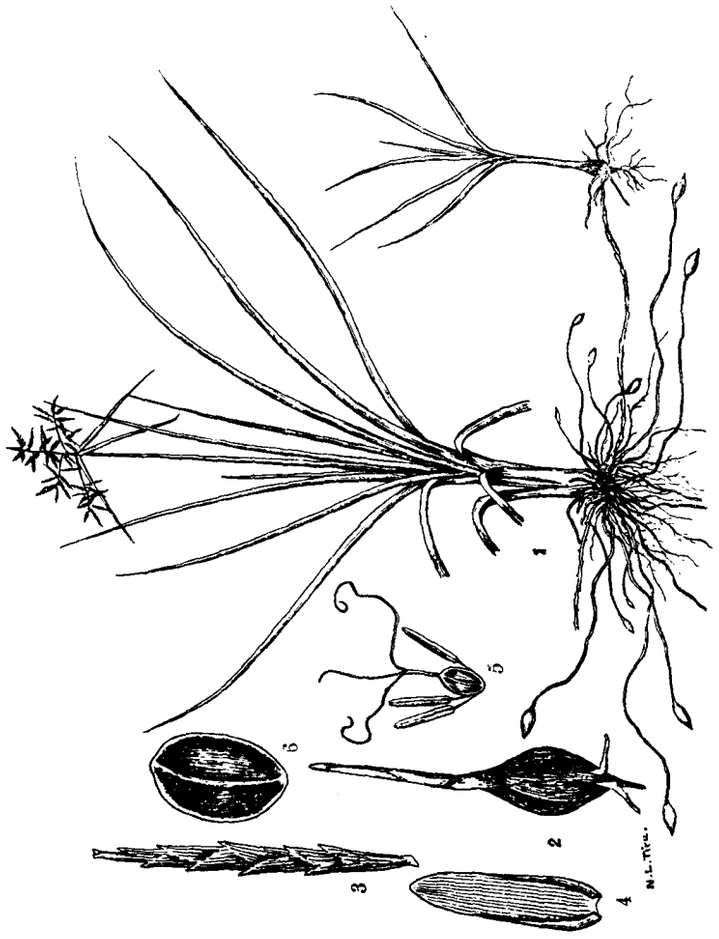


PLATE 129.—Figs. 1. Entire plant. 2. Germinating bulb. 3. Spike. 4. Glume. 5. Pistil and stamens. 6. Nut.
CYPERUS BULBOSUS, *Vahl.*

growing to a height of even six feet when undisturbed, as in hedges.

The plant has been, till recently, mistaken for *C. benghalensis* from which it chiefly differs in having acute or acuminate leaves, long peduncled, ovate, acute spathes, lobed at the base and in the absence of cleistogamous flowers. It is now named as a new species. A common weed of cultivated and grassy places in Nellore, Salem, Coimbatore and probably many other districts.

3. *Aneilema spiratum*, R. Br.—A small, annual herb a few inches to a foot high, with the branches prostrate, rooting and then ascending. Leaves are oblong or linear-lanceolate and clasping the stem. The blue, pedicelled flowers are arranged in terminal panicles of forking, scorpioid cymes. The plant occurs on bunds of rice fields and grassy places, in many districts on the East Coast, and Salem down to Travancore.

Cyperaceae.

THE SEDGE FAMILY.

Usually, perennial, grass-like herbs with simple stems and narrow leaves in three rows at the base of the stem; the closed tube of leaf-sheath encloses the stem. Ligule is very often absent. Flowers are small, bi-sexual or uni-sexual in the axils of glumes which are arranged in spikelets that form the terminal, branched, usually paniculate inflorescence. Perianth is absent or represented by a few hypogynous scales or bristles. Stamens are 1–3. Ovary is superior, 1-celled, with a solitary ovule. Stigmas are 2–3. Fruit is a two or three-sided nut. Seed has floury endosperm.

A rather large family widely distributed all over the world.

Cyperus is an old Greek name for the sedges.

Cyperus bulbosus, *Vahl.*

Plate 129.

English : Bulb Grass.
Tamil : Shilandi.
Telugu : Puragaddi ; Bhadra Musta.
Habit : A herb.
Habitat : Cultivated and waste places especially in light soils.
Range : Many districts in the East Coast down to Travancore and westwards to Coimbatore.
Flowering and fruiting time : September–October.
Propagation : By bulbs and nuts.

An erect herb, 5″–1′ high, growing in small clumps. It is said to be a very bad weed in some localities.

from the original Greek name of the plant *Kuperos*, and the specific name *rotundus* means round in allusion to the somewhat roundish tubers.

It is one of the most noxious weeds of cultivation and its spread is so great and its ravages are so serious that in certain places cultivation of fields has been actually abandoned in despair. In Australia, Africa and America also, the weed has proved itself to be most pernicious.

From the base of a young plant, the first stolen descends into the soil and ends, in a tuber and from this, horizontal cord-like stems radiate and produce new tubers at intervals of 2–10 inches, which give rise to new shoots.

The tubers contain a considerable amount of stored food and are capable of producing new plants even after they are subjected to extremes of temperature as the severe heat of summer and the biting cold of winter. The depth at which the wiry underground stems and tubers can be traced, varies much depending upon the nature of the soil and the conditions of moisture. In moist heavy soils they are only 3–4 inches below ground level and in dry light soils they are usually at a depth of 6–24 inches or more. It is said that "they occurred at a depth of 30 feet below the ground level without their vitality being impaired in any way."

The aerial shoot is often solitary; the growing point is very hard and pointed; being well protected by scale leaves it is not easily damaged and is able to pierce through a layer of 3½ feet of soil. Leaves are dark green, glabrous, 3–12 inches long and are arranged in three rows; they are rather thick, linear and very acute at the tips, grooved on the upper surface, tubular and membranous where they clasp the three-sided stem. Flowers are small, in a terminal, branched umbel on a long, three-sided, glabrous peduncle bearing three, short or long, leaf-like bracts at the top. The umbels are simple or compound, 6–12 branched, each bearing 8–10 spikes which are somewhat clustered. The spike consists of 10–12 spikelets which are somewhat compressed and pointed at the tips and having 10–50 flowers. They are subtended by glumes which are oblong-obtuse, 3–7 nerved, brown, with membranous margins, and closely imbricate. Calyx and corolla are absent and the flower is simply represented by three stamens, a superior ovary with a short style and three elongate stigmas. Fruit is a broadly ob-ovoid, trigonous, seed-like nut, greyish black in colour.

Means of control.—The weed reproduces itself in two ways—by the nuts and by the underground stems.

Ordinarily much attention is not paid to the seeds. It is perhaps due to the fact that the production of the seed can be easily checked. In fact the pest spreads itself more rapidly by the seed than it does by means of the subterranean tubers. Therefore, it is absolutely necessary that the development of the seed should be prevented. Before the flowering time or at the first appearance of the inflorescence, the flower stalks should be chopped off with grass-cutting-swords. If there is no crop in the field during the flowering time, working of a Guntaka is highly recommended to remove the ærial branches along with the flower stalks. In standing crops planted in lines, harrowing with Dantulu will be found quite effective. It looks, as though, moisture hastens the flowering, and therefore, wet places in fields, as irrigation channels and low-lying areas submerged under water, during the rainy season, should be particularly searched for and the flowering stalks destroyed.

If the pest is found for the first time in a patch, it is advisable to carefully dig out and trace the tubers, without leaving any in the ground and burn them. In large areas with an established stand of the pest, prepare the field early by ploughing. Then rake and collect the stolons and destroy them. After a time, when the shoots sprout up, remove them by deep chisel hoeing and put in a dense smothering crop like sweet potato, the object being to starve and finally to kill the underground parts. Introduce into the rotation such crops as require frequent cultivation and digging. At the time of digging, the tubers may be collected and disposed of. Avoid deep ploughing as it only helps to bury the stolons deep which means a great amount of trouble, for if the aerial shoots are destroyed after taking much pains, those buried deep come up and start the trouble afresh.

The weed is extremely troublesome in paddy lands in which puddling cannot be properly done for want of good supply of irrigation water or in lands in which the supply fails after transplanting; because the weed comes up in large numbers when the field begins to get dry, and chokes up the crop. Weeding is impracticable in such conditions as the soil is hard. But if there is plenty of water available, the pest can scarcely do any harm as it can be easily weeded out. At the same time large number of tubers that floats may be collected in baskets and destroyed.

Spraying with poisons like Sodium arsenite have been tried with some success, in the United States of America. But it may not be quite economical under South Indian farming conditions. However, in small areas it may be tried with advantage.

In some localities the application of red earth is said to have put down the growth of the weed.

Economic importance.—Tubers are roasted and eaten by some people. Essential oil is obtained from the tubers and is used in perfumery. The stems and tubers are used in medicine as astringent, stimulant and vermifuge as also in the treatment of bowel and stomach disorders. Applied externally to breasts, they stimulate increased secretion of milk.

1. *Cyperus difformis*, Linn.—An erect, tufted, glabrous annual, ½–1½ feet high with linear, acuminate leaves shorter than the trigonous stems that end in the characteristic, much contracted, head-like spikes forming the umbel. Bracts are three, leaf-like and one of them is much longer than the other two and the inflorescence. Spikelets are rather turgid and nuts are pale brown. A very common weed of rice fields, in all districts, and up to 8,000 feet in the hills.

2. *Cyperus Haspan*, Linn.—A tufted, glabrous, perennial herb ⅓–1½ feet high with or without underground rhizomes. Leaves are few, narrow and acuminate. Of the three bracts, one or two only overtop the inflorescence but are shorter than the stem. Inflorescence is a diffusely branched, compound or decompound, umbellate panicle. Spikelets are narrow. Nut is small and pale brown. Very common in rice fields, in all districts; it flowers even in the first year of its growth when the rhizome is not formed.

Telugu: Chali Thunga.

3. *Cyperus flavidus*, Retz.—A much tufted, slender annual, 4–10 inches high, very much resembling *Cyperus Haspan*, Linn. from which it differs in having usully a bigger inflorescence and bracts which are longer than the stem. Stamen is usually one, and nut is quite white when ripe. The inflorescence often appears to be too big, some of its branches being longer than the main stem itself. The plant lives only for a few months and occurs in plenty, in rice fields in all districts.

4. *Stenophyllus barbata*, Rottb.—A much tufted, slender annual. The very narrow acuminate leaves are shorter than the stems which terminate in a cluster of spikelets. Bracts are usually shorter than the spikelets. Fruit is a 3-angled, straw-coloured, ob-ovoid nut. Common in cultivated and waste places especially in sandy or light soils, in most coastal districts.

5. *Eleocharis atropurpurea*, Kunth.—A very much tufted, leafless annual, 1–7 inches high and glabrous in all its parts. Stems end

in solitary, ovoid spikelets, with spirally arranged glumes. Bristles below the ovary, are 5–7 and hairy. Nut is biconvex, black and smooth. A gregarious weed often found in water-logged places of rice fields, in most districts.

6. *Fimbristylis miliacea*, Vahl.—A leafy, glabrous herb, ½–3 feet high with many tillers. Roots are many in a tuft. Inflorescence is a de-compound umbel with unequal branches. Spikelets are rather small, sub-globose, brown in colour, on very slender stalks. Fruit is a small, ob-ovoid nut, yellow in colour. This plant is perhaps the most common sedge of rice fields sometimes occurring in large numbers.

Gramineae.

THE GRASS FAMILY.

Mostly herbs and rarely shrubs or trees. Stems are hollow or solid between the nodes. Leaves are simple, 2-ranked and parallel veined. Each leaf consists of two parts; the lower one is the sheath enclosing the stem and split on the side opposite the blade which is the upper part of the leaf. At the junction of the sheath and the blade is a short structure close to the stem, called the ligule. Inflorescence is a terminal panicle of spikelets variously arranged. Each spikelet has three to many bracts or glumes arranged on a short axis. The basal two glumes are empty and the rest may contain bisexual or uni-sexual florets which are much reduced and are subtended between the glume and another structure opposite to it, called the palea. Perianth is represented by two minute fleshy bodies the lodicules. Stamens are free, usually three or sometimes six. Ovary is superior, 1-celled and 1-ovuled often with two styles ending in feathery or hairy stigmas. Fruit is a grain, free or enclosed by the flowering glume and its palea, with copious floury endosperm.

The family is the largest among flowering plants and contains very many species of great economic importance. The cereals that supply food to human beings, and fodder grasses belong to this family.

Grasses are widely distributed all over the world and occur in various regions.

The family gets its name from *Gramen* which means a grass.

CYNODON DACTYLON, *Pers.*

PLATE 131.—FIGS. A. Plant with underground stems. 1 and 2. Spikes. 3. Spikelet. 4. First glume. 5. Second glume 6. Third glume. 7. Palea of third glume. 8. Pistil, stamens and lodicules. 9 and 10. Grains (with and without glumes).

Cynodon dactylon, *Pers.*

Plate 131.

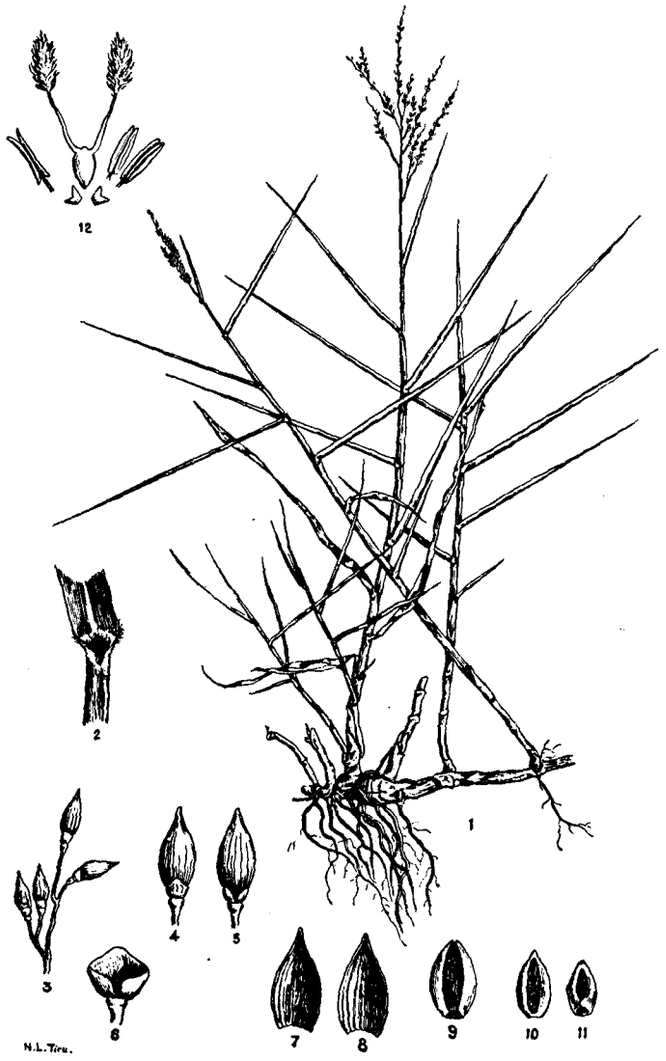
English : Devil's Grass ; Couch Grass ; Dub Grass.
Tamil : Arugam Pullu.
Telugu : Garika.
Malayalam : Karuka-pul.
Flowering and fruiting time : September–December ; May–July.
Habit : A perennial herb.
Habitat : Cultivated fields and waste places.
Range : All districts.
Propagation : By grain and underground stems.

The Hariali Grass. It is one of the best and the worst grasses we have. It is the best for lawns, and as a soil binding plant for bunds, it is excellent, and its fodder is much relished by cattle and horses. But unfortunately it is the most troublesome weed in cultivated places.

It is very hardy, much branched, leafy grass with numerous stems below and above soil. The aerial branches are either ascending or prostrate and rooting at the nodes. They grow to a length of 1-2 feet or more and form thick patches. The underground stems are hard, brittle, thick, pale white in colour and covered with short scale-leaves and occur at varying depths in the soil. Leaves are 1-2 inches or more long in two rows, narrow and pointed. The lower part of the leaf, viz., the sheath is tightly clasping the stem. Ligule is a row of short hairs. Flowers are very minute and inconspicuous; they consist of 3 stamens and an ovary with 2 styles having densely hairy stigmas. Each flower is found in the third glume and its palea, of a short, narrow and compressed spikelet having 3 bracts called the glumes. The spikelets are very many and are arranged on one side of a stalk in two rows. This stalk with the spikelets, which is 1-2 inches long is called a spike and there are 4 or more such spikes arranged in a whorl, like fingers, on the top of a terminal peduncle. Grain is minute, oblong somewhat flattened, rounded on the back and reddish in colour.

Means of control.—The eradication of the weed is extremely difficult on account of the underground stems which are very hardy and are not easy of destruction. Ploughing simply breaks them into bits and distributes them over the field, so that the spread of the weed is increased. Deep ploughing is inadvisable as the bits get buried deep in the soil.

The most common remedy suggested is digging out patches of the grass by means of crow-bars. The stems should be traced, collected and burnt. The operation is no doubt effective but it is



PANICUM REPENS, *Linn.*

PLATE 132.—Figs. 1. Plant. 2. Part of leaf showing ligule. 3. Branch of inflorescence. 4 and 5. Spikelets. 6. First glume. 7. Second glume. 8. Third glume. 9. Palea of third glume. 10. Fourth glume. 11. Palea of fourth glume. 12. Pistil, stamens and lodicules.

very laborious and expensive. When crop is off the field, work a Guntaka or use a hoe as frequently as possible to remove the aerial branches. Then put in smothering crops. The object is to starve the underground parts and finally to kill them.

Economic importance.—Juice is useful in the treatment of dysentery and diarrhœa. Infusion of the plant stops bleeding in piles.

Panicum repens, *Linn.*

Plate 132.

Tamil : Inji Pillu.
Telugu : Karigaddi.
Flowering and fruiting time : Almost throughout the year.
Habit : A perennial grass.
Habitat : Moist situations.
Range : Most districts, not very common on the West Coast.
Propagation : By underground stems and grain.

A stiff erect grass growing in small clusters, to a height of 1–2 feet or more. It is abundant on bunds of paddy fields, water courses and margins of tanks.

Underground stems are thick and hard, very much resembling ginger. Aerial branches are covered with pointed scale-leaves at the base; above, the leaves are in two rows; they are 1–5 inches or more long, often flat and glaucous, narrowly lanceolate and long pointed with hard tips; they are also quite stiff and are either erect or spreading sideways. Leaf-sheath is striate and smooth with ciliate margins. Ligule consists of a short thin membrane hairy at the top. Inflorescence is a much branched, terminal panicle 3–5 inches long. Spikelet is ovoid and pointed, on a short stalk and has 4 bracts or glumes. The lower two glumes are empty and the third contains a male flower of 3 stamens while the fourth subtends a bisexual flower represented by 3 stamens and an ovary with 2 styles. Grain is slightly enclosed by the fourth glume and another structure opposite to it called the palea.

Means of control.—When once the grass is established it is extremely difficult to eradicate it. Fortunately it is never bad in cultivated fields. It can be destroyed only by digging out the underground stems or rhizomes and burning them.

Economic importance.—The plant yields good fodder which is much relished by cattle. It is also a very good soil-binding grass and can be raised from bits of rhizomes, on bunds to prevent their slipping.

rachis. Spikelets are very small, pedicelled and appressed on the lower side of the axis of the spike. The grass occurs in all kinds of soils and in all districts of the Presidency.

11. *Chloris barbata*, Sw.—A common, perennial grass. The 5–15 spikes of the inflorescence are digitately arranged on the top of a long slender peduncle. The spikelets are often purplish, 3-awned and arranged on one side of the spike. The grass occurs in cultivated and waste places in all kinds of soils. Sometimes it is a very bad weed in dry fields.

Tamil: Mayl Kondai Pul.

Telugu: Uppu Gaddi.

12. *Eleusine aegyptiaca*, Desf.—An annual grass with erect or decumbent branches rooting at the nodes below. The short spikes are digitately arranged; spikelets are much compressed, shortly awned and are spreading and densely packed only on one side of the spike. A common weed of cultivated and waste places.

Tamil: Mathangai Pul.

Telugu: Kaval Gaddi.

13. *Dinebra arabica*, Jacq.—A coarse, tufted annual. Spikes are many, very rough when old and arranged in terminal, narrow, raceme-like panicles. Spikelets are closely imbricate and awned. A weed of dry and irrigated fields and also waste places.

14. *Eragrostis interrupta*, Beauv., var. *Koenigii*, Stapf.—A tall erect, elegant looking grass with every variable habit growing from a few inches to a height of a few feet. The inflorescence is a long, terminal, interrupted panicle. The spikelets are rather small and purplish. Common in paddy fields in all districts.

BIBLIOGRAPHY.

ora of British India. *J. D. Hooker.*

ora of the Presidency of Madras. *J. S. Gamble.*

he Flora of the Presidency of Bombay. *T. Cooke.*

anual of Weeds. *Ada Georgia.*

ommon Weeds of the Farm and Garden. *H. C. Long.*

Veeds of Farm Land. *W. E. Brenchley.*

ome Weeds of the Central Farm, Coimbatore. *C. Tadulingam.*

eaflet No. V of 1915, the Water Hyacinth, Department of Agriculture, Madras.

Dictionary of the Economic Products of India. *G. Watt.*

Flowering Plants of Travancore. *M. Rama Rao.*

Elementary Botany for India. *K. Rangachari.*

A Handbook of Some South Indian Grasses. *K. Rangachari* and *C. Tadulingam.*

A list of Natural Orders and Genera of Bombay Plants with Derivation of the Names—*H. M. Chibber.* The Journal of the Bombay Natural History Society, Volume XXIV.

Bulletin No. 71, Imperial Department of Agriculture, Pusa, 1917.

Year Book of the Department of Agriculture, Bengal, 1919.

---

1. *Panicum Isachne*, Roth.—An annual grass growing in tufts with slender branches rooting at the nodes below and then ascending. Leaves are somewhat broad, and linear lanceolate. Spikes are racemosely arranged towards the top of a long peduncle. Spikelets are very small, closely arranged in two rows on one side of the rachis, and densely villous.

Common in all districts, especially in the black cotton soil areas, in fallow fields, and up to 3,000 feet in the Nilgiris.

Telugu: Domakalu Gaddi.

2. *Panicum Crus-galli*, Linn.—An erect, glabrous, tufted annual with the branches rooting at the nodes below and growing to a height of 2–4 feet. Inflorescense is a raceme of closely arranged spikes. Spikelets are somewhat ovoid and awned with a few hairs at the base and are arranged in 3–5 series on one side of the axis. Ligule is absent.

The grass is closely allied to the cultivated "Kudaravali" and comes up well in wet places. It grows along with paddy and is common in rice fields.

3. *Panicum stagninum*, Retz.—This is closely allied to *Panicum Crus-galli*, Linn., and often grows along with it. But the long, stout stems are prostrate and rooting at the nodes. Leaves have often purple cross-bands across the blades and the sheaths. It frequently occurs in channels, ditches and other wet, cultivated and waste places.

Telugu: Bonta-oodara.

4. *Panicum colonum*, Linn.—A glabrous tufted annual with slender stems, allied to *Panicum Crus-galli*, Linn.; but the spikes are shorter and narrower and the spikelets have no awns. A common weed in cultivated lands and rice fields, in all districts up to 6,000 feet. It is not often present in poor soils.

Tamil: Karum-pul.

Telugu: Otha Gaddi.

5. *Tragus racemosus*, Scop.—A leafy, perennial grass, often with many prostrate branches spreading on the ground, in patches. Inflorescence is a terminal spike, and the spikelets have strong, spreading, hooked bristles by the help of which they easily get caught in the clothing of man and the skin or wool of animals. A very common grass easily recognized by its habit and the sticky spikelets. It is found in grassy places, waste lands and dry, cultivated soils, in all districts.

Tamil: Kadai Pul.

6. *Coix Lachryma-Jobi*, Linn.—An erect, glabrous, robust herb 3–5 feet high with rather long, polished inter-nodes and broad leaves. Florets are uni-sexual, in racemes grouped at the ends of branches. Peduncles are long and flattened on one side. At the base of the raceme is a female floret enclosed by a characteristic, hard, polished, ovoid bract which is dark or grey in colour. From the top of the bract, the male portion of the raceme protrudes. Common in rice fields, in standing crop of paddy, in most coastal districts, especially Malabar.

English: Job's Tears.

Tamil: Kattu-kundumani

7. *Imperata arundinacea*, Cyril.—An erect, perennial grass with hard, creeping stolons much spreading in the soil. Leaves in aerial shoots are very close, erect, acuminate and pale green in colour. The terminal, characteristic spikes are densely clothed with long, white, silky hairs. The grass is very gregarious on bunds of rice fields and sides of irrigation channels, usually in heavy soils. It cannot be easily eradicated on account of the under-ground stems.

Tamil: Dharbai-pul.

Telugu: Dharba.

8. *Ischaemum pilosum*, Hack.—An erect, glabrous perennial grass with robust branches growing in thick clumps to a height of even 5 feet. The perennial, under-ground rhizomes have many stolons which are hard and densely covered with scales. They spread and ramify the soil making the eradication of the plant very difficult. The racemose or umbellate, long, hairy spikes are characteristic. The grass is very common in black cotton soils, especially in Guntūr and the Ceded Districts. It is very troublesome after the rains and seriously interferes with the cultivation of the soil.

Telugu: Urranki; Kundara Gaddi.

9. *Aristida Adscensionis*, Linn.—A small, slender annual or a perennial with rather long panicles. The third glume of each spikelet has three spreading arms and the base of the glume is pointed like a lance. The grass occurs in all districts on bunds of fields and waste places. It is rather troublesome on account of the prickly awned glumes.

Tamil: Siru Thudappam Pul.

Telugu: Chinna Cheepiri Gaddi.

10. *Sporobolus coromandelianus*, Link.—A tufted, leafy annual with pyramidal panicles. Spikes are arranged in whorls on the main

GLOSSARY.

A

Accrescent, growing in size with the ovary, as the calyx.
Achene, a dry, 1-celled, 1-seeded, indehiscent fruit.
Acuminate, tapering towards the apex and drawn to a point as the tips of some leaves.
Acute, tapering to an angle, as leaf-tip.
Adnate, united or attached by the whole length.
Adpressed, appressed, pressed to ; lying flat.
Adventitious, rising from unusual places. **Adventitious roots**, roots arising from parts other than the true roots.
Aerial roots, roots that develop above the ground.
Algae, low forms of plant life, with or without green colouring matter and usually found submerged in water.
Alkaloid, an organic substance having basic properties and frequently occuring, naturally, in plants and sometimes having toxic qualities.
Alternate (leaves), rising singly at each node.
Amplexicaul, clasping or embracing the stem.
Androgynous, said of an inflorescence having both male and female flowers.
Annual, of one year's duration.
Anthelmintic, killing worms in the intestines.
Anther, the top portion of a stamen containing pollen grains.
Antidote, a remedy to counteract the effects of poisons.
Apex (plural apices), tip.
Apical, at the tip.
Apiculate, provided with an **apicula** or a short pointed tip.
Apocarpous, having free or distinct carpels.
Appendage, an additional part or an extra process.
Appressed (see adpressed).
Aril, an outgrowth about the hilum of a seed and enclosing it.
Arillate, having aril.
Ascending, rising obliquely and then becoming erect.
Astringent, binding the bowels.
Attenuate, tapering and becoming narrow.
Auricled (leaves), leaves having earlike lobes at base.

Awl-shaped, ending or tapering to a stiff point.
Awn, an appendage like a bristle, usually on the glumes of grasses.
Axil, The angle made by a leaf, with the stem.
Axillary, placed in the axil.
Axis (plural, axes), the stem ; the central line of an organ.

B

Bacterial nodules, nodules or protuberances on the roots of certain Leguminous plants caused by nitrogen fixing bacteria.
Barb, hooked hair.
Barbed, provided with a barb.
Beaked, with an elongated tip.
Bearded, clothed with tufts of hairs.
Berry, a fruit in which the fruit-coat is fleshy throughout.
Bi, twice.
Bi-convex, having rounded surfaces on both sides.
Biennial, a plant which completes its life history in a period of two years.
Bifid, divided into two.
Bilabiate, having two lips.
Bilaterally, on the two opposite sides
Bilocular, two-celled.
Bipinnate, twice pinnate.
Bisexual, having both the sexes, i.e., stamens and pistils.
Blade, the part of a leaf, that is open and expanded.
Blade-harrow, a harrow with a blade, like a Guntaka.
Bract, a modified leaf usually subtending a flower.
Bracteate, having bracts.
Bracteolate, having bracteoles.
Bracteole, a bract-like structure placed on the pedicel and intermediate in position between the bract and calyx.
Bristle, a stiff hair.
Bud, an unopened flower ; the primary state of a stem.
Bulb, a short, modified, underground stem covered with fleshy or scale leaves.

C

Calyx, the outer most whorl of floral structures, above the bracteoles.
Campanulate, bell-shaped.
Capitate, like a head.

Capsule, a dry fruit of more than one capel breaking open to liberate seeds.

Carbohydrate, an organic compound like sugar and starch containing carbon, hydrogen and oxygen.

Carminative, having the property of forcing out wind from the stomach and bowels.

Carpel, a theoretical leaf forming a simple pistil or a part of a compound pistil.

Caruncle, an out-growth at the hilum of a seed.

Carunculate, having a caruncle.

Cathartic, purgative.

Cauline, belonging to the stem.

Cell, cavity as that of an anther or ovary.

Chlorophyll, the green colouring matter found in leaves and other organs of plants, and essential in the syntnesis of certain plant foods like sugars.

Ciliate, provided with a fringe of hairs along the margin.

Clawed, somewhat abruptly narrowed towards the base as in the petals of some species.

Cleistogamous, fertilized without the flower being open.

Coccus (*pl.* cocci), one of the entire bits into which a lobed fruit dehisces.

Comose, having a tuft of hairs.

Compound, having two or more similar structures. A **compound leaf** is composed of 2 or more leaflets.

Compressed, flattened.

Conduplicate, folded lengthwise along a medial line into two halves.

Connate, united, as two or more similar structures.

Contorted, twisted.

Cordate, shaped like an inverted heart.

Corolla, a term given to petals spoken of collectively.

Corolline, belonging to a corolla.

Corona, an out-growth either from the corolla or from the stamens.

Corrugate, wrinkled.

Corymb, a racemose type of inflorescence flat towards the top on account of the lower pedicels being longer than those of the younger ones above.

Corymbose, like a corymb.

Cotyledon, the seed leaf; the leaf-like or fleshy structure of an embryo inside the seed.

Crenate, toothed, the teeth being rounded, as applied to the margin of a leaf.

Cruciform, arranged like a cross.

Crustaceous, having hard and brittle texture.

Cuneate or **cuneiform**, wedge-shaped.

Cylindric, long and round as a stem.

Cyme, a flower cluster in which the axes or growing points end in flowers and subsequent growth is continued by lateral branches which repeat the same thing.

Cymose, like a cyme.

D

Deciduous, falling off after a time, as leaves and petals.

Decompound, divided many times.

Decumbent, prostrate with an ascending top.

Decurrent, running down the stem as a leaf, below the node.

Decussate, said of the arrangement of opposite leaves when the alternating pairs are at right angles.

Definite (stamens) of a number not exceeding twenty (*B. D. Jackson*).

Deflexed, bent outwards.

Dehiscence (*v.* dehisce), the act of breaking open as in fruits and anthers to liberate seeds and pollen grains.

Deltoid, shaped like an equilateral triangle.

Demulcent, a remedy that softens a tissue and reduces irritation.

Dentate, toothed, the teeth being straight.

Depressed, with a depression or a flattened top.

Diadelphous (stamens), united into two bundles.

Dichotomous, forking in pairs.

Didynamous (stamens), in two pairs, one pair being longer than the other.

Diffuse, spreading loosely.

Digitate, said of a leaf in which the lobes or leaflets are arranged like the fingers of a hand.

Dicœcious, with the male and female flowers on two separate plants.

Discoid, like a disc.

Disk or **Disc**, a structure or structures developed from the top of the pedicel and usually surrounding an ovary at the base.

Dissected, divided into many parts.

Dissepiment, partition in an ovary.

Distichous, arranged in two rows.

Distinct, separate.

Diuretic, stimulating the increased excretion of urine.

Divaricate, diverging much.

Divided, deeply lobed.

Dominant, prevailing.

Dormant, not doing the active functions of life.

Dorsal, pertaining to the back.

Drupe, a fleshy fruit with the endocarp or the innermost part of the fruit-coat, being hard.

E

E or **Ex**, a Latin prefix meaning without.

Ecbolic, having the property of contracting the uterus and expelling its contents.

Echinate, having prickles.

Ecological or **Oecological**, pertaining to the relation of plants to their environment.

Eczema, a disease of the skin characterised by redness, itching and watery exudation.

Ellipsoidal, shaped like an ellipsoid, tapering and rounded at both ends.

Elliptic, said of a flat structure shaped like an ellipse tapering at both ends.

Emarginate, having a small notch at the tip.

Embryo, the rudimentary plant in a seed.

Emetic, a medicine which produces vomiting.

Emollient, having the property of softening a tissue.

Endosperm, the reserve food found outside the embryo and close to it in a seed.

Entire, without being toothed or cut in any way.

Epicalyx, whorls of bracteoles placed outside the calyx.

Epicarp, the outermost layer of the fruit-coat.

Epigynous, placed above the ovary.

Epipetalous, said of stamens attached to the corolla tube.

Excrescence, protuberance.

Expectorant, having the property of expelling phlegm from the lungs and throat.

Exserted, projecting, as stamens from corolla.

F

Falcate, sickle-shaped.

Fallow, not sown with the seed of regular crops.

Family, a group of plants next bigger than the genus.

Fascicle, cluster of flowers, leaves, etc., closely arranged.

Fertile, capable of growing into fruit, if an ovary; or having normal pollen grains, if an anther.

Fertilization, the act of fusion of the male and female cells to form a new cell which is the beginning of a new individual.

Filament, the stalk of an anther.

Filiform, thread-like.

Fimbriate, fringed.

Floret, a small flower.

Foliate, having leaves.

Foliolate, having leaflets.

Follicle, a mono-carpellary fruit breaking open by the ventral suture only.

Forked, divided into two separate parts.

Free, not united.

Frond, usually applied to leaves of ferns; the plant-body of some minute plants, according to some botanists.

Fruit, a fully developed ovary.

Fungi (s. fungus), a lower order of plants without green-colouring matter like mushrooms, moulds, etc.

Funicle, the stalk by which the ovule or seed is attached to the placenta.

Fusiform, spindle-shaped, *i.e.*, thickened in the middle and tapering at both ends.

G

Gamopetalous (corolla) with united petals.

Gamosepalous (calyx) having sepals united.

Generic, relating to a genus.

Genus (*pl.* genera), a group of plants, containing different species, and smaller than the family.

Glabrous, without hairs.

Gland, a secreting organ.

Glandular, having glands.

Glaucous, covered with bloom.

Glume, the scale-like bract in the spikelets of grasses and sedges.

Gynophore, a somewhat elongated stalk of an ovary.

H

Habit, the general appearance of a plant.

Habitat, the locality in which a plant grows.

Hastate (leaf), with the basal lobes of the blade pointing outwards.

Haustorium (*pl.* haustoria), a sucking organ of a parasitic plant.

Head, a racemose type of inflorescence in which the flowers are sessile and crowded on the receptacle.

Herb, plant without woody shoot system.
Herbaceous, like a herb.
Herbicide, a chemical employed to kill plants.
Hermaphrodite (flower), having both stamens and pistil.
Heterogamous, having two kinds of florets.
Hispid, clothed with rough hairs.
Homogamous, having the same kind of florets.
Host, a plant on which a parasite thrives.
Hyaline, membranous and colourless.
Hydrophobia, rabies.
Hydrophytes, water plants.
Hygroscopic, readily absorbing moisture.
Hypogynous, below the ovary.

I

Imbricate, lying one below the other with the margins overlapping.
Impressed, pressed inward or into.
Incised, deeply cut.
Incomplete, said of flowers, when some of the parts are wanting.
Incurved, curved inward; bent.
Indefinite (stamens, ovules, etc.), numerous.
Indehiscent, not splitting.
Indigenous, native to a region or country.
Inferior (ovary), placed below the other parts of the flower.
Infertile, not fertile.
Inflexed, bent, turned abruptly.
Inflorescence, disposition of flowers on an axis. Also loosely applied to a collection of flowers.
Infusion, liquid extract.
Inserted, attached to.
In situ, in its original place.
Inter, between.
Internode, that part of the stem which is between two successive nodes.
Interpetiolar, between petioles.
Interposed, placed between.
Introduced, brought intentionally or unintentionally from a different region or country.
Involucre, a whorl or whorls of bracts or bracteoles surrounding a cluster of flowers or a single flower.
Irregular, applied to flowers which are not regular in shape.

K

Keel, the lowermost petals of a papilionaceous flower.

L

Labiate, lipped.
Lamina, leaf-blade.
Lanceolate, lance-shaped. Broad at the base and narrowed towards the apex.
Lax, loose.
Laxative, having the property of relieving constipation.
Leaflet, a distinct division of a compound leaf.
Legume, a mono-carpellary fruit dehiscing by both the sutures.
Lenticular, shaped like a double-convex lens.
Ligulate, tongue-shaped; also applied to the ray florets of a head.
Ligule, a small structure found at the top of the sheath and the base of the blade, in grasses.
Limb, the expanded part of a structure as the corolla.
Linear, long and narrow as a grass-leaf.
Lobe, a rounded part of a structure.
Loculicidal, applied to the dehiscence of a capsule when each cavity opens by a separate slit usually in the middle of that part of the pericarp which borders the cavity.
Lodicule, a small structure found in the flowers of grasses and occurring usually in pairs.
Lunate, shaped like a crescent.

M

Membranous, thin and somewhat translucent.
Mericarp, a portion of a fruit which separates as a distinct one and looks like an entire fruit.
Monœcious, having staminate and pistillate flowers in the same plant.
Mucronate, having a sharp point at the apex.
Muriculate, slightly rough with very small tubercular protuberances.

N

Narcotic, a drug which in excessive doses produces stupor and coma.
Naturalised, adapted to grow as if under natural surroundings.
Nerve, a simple, slender vein.
Neuter (flower), neither staminate nor pistillate.

R

Raceme, an inflorescence in which the flowers are arranged on a central axis, so that the old ones are towards the base, and the pedicels are nearly equal.

Rachis, Rhachis, the axis of an inflorescence or a compound leaf.

Radiate, spreading around a central body.

Raphe, the part of the funicle which is adnate to the seed-coat.

Raphid (*pl.* raphides), a cluster of needle-shaped crystals.

Ray, a branch of an umbel. The floret in the outer most whorls in the head of *Compositæ*, is called a *ray* floret, as opposed to the central ones which are known as disc florets.

Receptacle, the enlarged portion of a pedicel or peduncle which bears on it the different parts of a flower or number of flowers as in the head of *Compositæ*.

Recurved, curved backward.

Reflexed, bent downward suddenly.

Refrigerent, a cooling medicine.

Regular, uniform in shape and structure.

Reticulate, like a net work.

Retrorse, pointing downward or backward.

Retuse, applied to the leaf tip when it is rounded and notched.

Revolute, rolled backward as the margins of some leaves.

Rhizome, a rather thick, short underground stem growing horizontally with close internodes and scaly leaves, and also producing aerial leaves, and roots.

Root-cap, a cap-like structure found at the tip of a growing young root.

Root-sucker, a shoot rising from a root.

Rotation (crops), a scheme of cropping so arranged that one particular crop follows another.

Rugose, wrinkled.

Ruminate (endosperm), thrown into folds, due to the seed coat irregularly entering the endosperm.

Runner, a long branch which is prostrate and rooting.

S

Sagittate, applied to a leaf blade shaped like an arrow with two straight lobes pointing downward.

Salver-shaped, applied to a corolla having a slender tube which abruptly expands into a flat limb.

Scabies, itch.

Scabrid, slightly rough.

Scabrous, rough to the touch.

Scale-leaves, much reduced leaves which are sometimes like scales.

Scarious, dry and membranous.

Schizocarp, a dry fruit which splits into separate parts (cocci).

Scorpioid cyme, a cymose inflorescence in which the lateral branches are rather short, developing alternately on one side of the axis, with the tip somewhat coiled.

Semi, half.

Sepal, part of a calyx.

Septicidal, applied to a capsule which opens along the partitions of its cavities.

Septum, partition.

Seriate, arranged in rows.

Serrate (leaf margin), toothed like a saw.

Serrature, the notch between two teeth ; applied to a tooth of a serrate leaf.

Serrulate, minutely toothed.

Sessile, without a stalk.

Sheath, a tube-like structure as the lower part of a grass-leaf.

Shrub, a perennial with woody stem and branches, and smaller than a tree.

Sinuate, with a wavy margin.

Sinus, a bend ; a recess.

Simple, not divided.

Spathe, a large bract enclosing an inflorescence.

Spatulate, shaped like a spatula.

Species, a group of individuals having the same characters and same name.

Specific, pertaining to a species.

Spicate, arranged like a spike.

Spike, a racemose type of inflorescence in which the flowers are sessile and arranged on a long axis.

Spikelet, a diminutive spike as the unit of the inflorescence in grasses.

Spine, a thorn resulting from the modification of a branch or a stipule, etc.

Spinescent, like a spine.

Spinous, provided with spines.

Spur, a sac-like structure or a prolongation in a flower and usually containing nectar.

Spurred, having a spur.

Stamen, the male part of a flower usually consisting of a filament and an anther.

Node, that part of stem or branch which bears leaves.
Nodule, a round structure usually small.
Nut, a hard fruit, 1-celled and 1-seeded.
Nutlet, a small nut; a nut which is part of a fruit.

O

Ob, a Latin prefix meaning inverted.
Oblique, with unequal sides.
Oblong, longer than broad with the sides being almost parallel.
Obovate, inverted ovate.
Obovoid, shaped like an inverted egg.
Obtuse, with blunt or somewhat rounded tip.
Odd-pinnate, pinnate with an odd number of leaflets.
Opposite, said of leaves when there are two at the same node, one being opposite to the other.
Orbicular (leaf), round.
Ovary, the lowest part of the pistil, containing ovules.
Ovate, shaped like an egg, but usually applied to describe a flat structure.
Ovoid, applied to a solid body shaped like an egg.
Ovule, a small body contained in the ovary, which grows into a seed after fertilisation.

P

Palea (*pl.* paleæ), a 2-nerved, scale-like structure which is opposite to usually a flowering glume in grasses. Also applied to the scaly bracteoles on the receptacle of the head in *Compositæ*.
Paleate, having a palea.
Palmate, digitate.
Panicle, an irregularly compound inflorescence often loose and open.
Paniculate, like a panicle.
Papilionaceous (corolla), with a standard uppermost, two lateral wing petals and a keel of two petals which are somewhat united.
Papillose, covered with minute, rather soft protuberances.
Pappus, the whorl or whorls of hairs found on the top of the fruit in many *Compositæ*.
Parasite, a plant living upon another.
Parietal, said of placentation when the ovules are attached to the inner wall of ovary.
Parthenogenesis, development (of the egg) of the ovule without fertilisation.
Partite, divided almost to the base.

Pedicel, the stalk of a flower.
Pedicellate, having a pedicel.
Peduncle, usually applied to the stalk of an inflorescence.
Pedunculate, having a peduncle.
Peltate (leaf), the attachment of the stalk to the blade, being on the lower surface instead of at the margin.
Pendulous, somewhat hanging.
Perennial, living for many years.
Perfect, said of a flower when it bears both stamens and pistil.
Perianth, a term given to calyx and corolla collectively or to calyx alone when the latter is absent.
Pericarp, fruit-coat.
Persistent, remaining for a long time.
Petal, part of a corolla or the whorl of usually brightly coloured structures above the calyx.
Petaloid (sepals), coloured like petals.
Petiole, leaf-stalk.
Phyllody, the transformation of the various parts of a flower into leaf-like structures.
Pinnate, applied to a compound leaf when the leaflets are arranged in two opposite rows, on the same stalk.
Pistil, the central organ of a flower consisting of ovary, style and stigma.
Pistillate (flower), having the pistil only and not the stamens.
Pistillode, undeveloped pistil.
Pitted, having pits.
Placenta, that part of the ovary which bears the ovules.
Pod, a dry, dehiscing fruit.
Pollen, the powdery substance often yellow in colour and produced in the anther.
Pollination, the transference of pollen grains from the anther to the stigma.
Pollinium (*pl.* pollinia), a pollen mass composed of pollen grains.
Polypetalous, having free petals.
Prickle, a small spine.
Principle, a substance which is the chief constituent of a drug.
Procumbent, prostrate on the ground but not rooting, and sometimes ascending towards the top.
Prostrate, lying flat and close to the ground.
Puberulus, slightly hairy, the hairs being short and somewhat distant.
Pubescent, covered with short, soft hairs.
Pyramidal, shaped like a pyramid tapering towards the top.
Pyrene, a part of a drupe.

Staminate, having stamens.
Staminode, a sterile stamen.
Standard, the uppermost petal of a papilionaceous corolla.
Stellate, starlike.
Stem, main axis of a plant.
Sterile, not productive.
Stigma, the top portion of a pistil which receives pollen.
Stigmatic, relating to stigma.
Stipel, a minute stipule at the base of a leaflet.
Stipular, pertaining to stipule.
Stipulate, having stipules.
Stipule, an appendage at the base of a petiole.
Stolon, a runner.
Straggling, said of a plant which does not grow erect but spreads or climbs over other plants.
Striate, having fine longitudinal ridges.
Strigose, hispid.
Strophiolate (seeds), having an outgrowth at the hilum.
Style, that part of the pistil which connects the ovary and stigma.
Stylar, pertaining to the style.
Sub, a Latin prefix meaning somewhat.
Subtend, to give rise to, as a bract or a leaf having in its axil, a bud.
Subulate, awl-shaped.
Succulent, fleshy.
Sui-poisoning, a sort of poisoning of cattle brought about by introducing a paste made out of the seeds of *Abrus precatorius*, Linn., underneath the skin of animals.
Superior, said of an ovary when it is placed above the calyx and corolla and free from them.
Suture, a line along which dehiscence takes place.
Symmetrical, said of a flower which is regular as regards the number of its parts and their disposition.
Sympodial, applied to a stem or a branch which stops growing after a time, and the subsequent growth is continued by lateral branches which behave in the same way.
Syngenesious, having the anthers united into a tube and the filaments free.

T

Tap-root, the main root.
Terete, round in cross section.
Tomentose, densely clothed with soft hairs forming a matting.

Tomentum, hairiness.
Torus, the receptacle of a flower.
Transpiration, the act of transpiring water or exhaling water vapour through the stomata or minute openings found in various parts of plants especially leaves.
Tri, three.
Trichotomous, separating or divided into three.
Trifid, divided into three parts.
Trifoliolate, with three leaflets.
Trigonous, three-angled.
Truncate, ending abruptly as though cut off.
Tuber, underground stem so modified as to be swollen and fleshy.
Tubercle, a small tuber or a protuberance.
Tuberculate, covered with small projections.
Turgid, swollen.
Twiner, a plant which climbs by means of twining round a support.

U

Umbel, an inflorescence in which all the pedicels are nearly of the same length and spring from nearly the same place.
Umbellate, like an umbel.
Undershrub, said of a plant which is partly woody and grows low.
Undulate, wavy.
Unisexual, of only one sex.
Utricle, a fruit with thin and loose pericarp.

V

Valvate, applied to parts of a flower when they simply meet at the edges without overlapping.
Valve, one of the parts into which a capsule separates at the time of dehiscence.
Vein, part of the net work of a leaf.
Ventral, relating to the inner face of a body.
Ventricose, swollen on one side.
Vermifuge, a drug which kills and expels intestinal worms.
Verticillaster, a cluster of flowers, usually spherical and consisting of two opposite cymes.
Vetches, a common name given to the plants of the genus *Vicia* under *Papilionatæ*.

Viable, said of a seed or a pollen grain which can germinate.
Villous, having long and weak hairs.
Viscid, sticky.

W

Warty, covered with small, rather hard excrescences.
Weed, a comparatively useless plant growing without being cultivated, in or about a place where something else is cultivated.
Wheel-shaped, said of a gamopetalous corolla when it has a short tube and broad spreading limb round in outline ; rotate.
Whorl, usually applied to leaves when they are arranged in a circle round the stem.
Wings, applied to the two lateral petals of a corolla of the papilionaceous type.

X

Xerophyte, a plant adapted to live under dry conditions.

Z

Zygomorphic, symmetrical along only one plane.

INDEX TO BOTANICAL NAMES AND FAMILIES, Etc.

(Asterisk denotes plate or figure. Only page numbers are given.)

A

Abrus precatorius, *Linn.*, 18, 31
Abutilon indicum, *G. Don.*, 13, 35*, 86*, 87
Acacia, 19
Acacia arabica, *Willd.*, 4*, 6
Acacia Family, 126
Acalypha indica, *Linn.*, 48*, 51*, 300*, 301
Acanthaceae, 30, 233
Acanthospermum hispidum, *DC.*, 16, 33, 39*, 168*, 169
Acanthus Family, 233
Achyranthes aspera, *Linn*, 7*, 31, 47*, 266, 267
Aerva lanata, *Juss*, 272*, 273
,, tomentosa, *Forsk.*, 47*, 269*, 270*, 271
Agrateum conyzoides, *Linn.*, 38*
Aizoaceae, 141
Albizzia, 19
Allmania nodiflora, *R. Br.*, 279
Alternanthera echinata, *Smith*, 13, 14, 16, 28, 31, 33, 47*, 51*, 274*, 275, 276*
,, triandra, *Lamk.*, 29, 280
Alysicarpus longifolius, *W. & A.*, 119
,, monilifer, *DC.*, 117
,, rugosus, *DC.*, var. styracifolius, *Baker*, 15, 37*, 116*, 117
Amarantaceae, 257
Amaranth Family, 257
Amarantus, 8
Amarantus polygamus, *Linn.*, 267
,, spinosus, *Linn.*, 47*, 262*, 263
,, viridis, *Linn.*, 47*, 264*, 265
Ammannia, 8
Ammannia baccifera, *Linn.*, 81, 130*, 131
,, ,, var. aegyptiaca, *Koehne*, 37*, 131
,, octandra, *Linn. f.*, 131
Andrographis echioides, *Nees.*, 240
Aneilema spiratum, *R. Br.*, 315
Anisomeles indica, *O. Kze.*, 46*, 252
Apocynaceae, 189
Aponogeton monostachyon, *Linn. f.*, 24
Araceae, 25
Argemone mexicana, *Linn.*, 13, 30, 34*, 51*, 53, 62*, 63
Aristida Adscensionis, *Linn.*, 327
Aristolochia bracteata, *Retz.*, 13, 15, 33, 48*, 284*, 285
Aristolochiaceae, 285
Asclepiadaceae, 193
Asteracantha longifolia, *Nees.*, 28, 45*, 236*, 237
Asystasia gangetica, *T. And.*, 29, 240
Azadirachta indica, *A. Juss.*, 4*

B

Barleria mysorensis, *Roth.*, 240
Bergia ammannioides, *Roxb.*, 35*, 80*, 81
,, capensis, *Linn.*, 6, 81
Bidens pilosa, *Linn.*, 40*, 188
Bindweed Family, 205
Blainvillea rhomboidea, *Cass.*, 40*, 174*, 175
Blepharis molluginifolia, *Pers.*, 45*, 234*, 235
Blumea lacera, *DC.*, var. glandulosa, *Hook f.*, 188
Blumea Wightiana, *DC.*, 39*, 188
Boerhaavia diffusa, *Linn.*, 7*, 8, 14, 46*, 254*, 255
,, repanda, *Willd.*, 257
Borage Family, 197
Boraginaceae, 197
Borreria hispida, *K. Sch.*, 38*, 158
Brinjal Family, 4, 213, 229
Broomrape Family, 229

C

Cactaceae, 137
Cactus Family, 137
Caesalpinia Family, 125
Caesalpinioideae, 105, 125
Calotropis gigantea, *R. Br.*, 6, 14, 29, 31, 42*, 192*, 193
Caltrop Family, 103
Caper Family, 67
Capparidaceae, 67
Capsicum annuum, *Linn.*, 10
,, frutescens, *Linn.*, 10
Cardanthera uliginosa, *Buch-Ham.*, 239
Carpetweed Family, 141
Cassia occidentalis, *Linn.*, 37*, 124*, 125
,, Tora, *Linn.*, 126
Cassytha filiformis, *Linn.*, 19, 31
Castor-bean Family, 4, 287

Celosia argentea, *Linn.*, 46*, 256*, 257
,, polygonoides, *Retz.*, 46*, 258*, 259
Centella asiatica, *Urban.*, 38, 152*, 153
Ceratophyllaceae, 22
Ceratophyllum demersum, *Linn.*, 22
Chamaeraphis spinescens, *Poir.*, 25
Characeae, 26
Chara sp., 26, 58
Chloris barbata, *Sw.*, 328
Chrozophora Rottleri, *Klotzsch*, 15, 48*, 298*, 299
Chrysanthemum Family, 159
Citrullus Colocynthis, *Schrad.*, 136
Cladophora, 26
Cleome Chelidonii, *Linn. f.*, 29, 34*, 70
,, monophylla, *Linn.*, 73
,, viscosa, *Linn.*, 34*, 68
Clerodendron Phlomidis, *Linn. f.*, 6, 27, 33, 45*, 244
Clitoria Ternatea, *Linn.*, 29, 30, 37*, 120*, 121
Coccinia indica, *W. & A.*, 9, 134*, 135
Coffee Family, 155
Coix Lachryma-Jobi, *Linn.*, 327
Coldenia procumbens, *Linn.*, 203
Commelinaceae, 309
Commelina benghalensis, *Linn.*, 15, 313, 315
,, Jacobi, *Fischer.*, 313
Compositae, 159
Composite Family, 159
Convolvulaceae, 18, 205
Convolvulus arvensis, *Linn.*, 13, 43*, 207*, 208*, 209
Corchorus capsularis, *Linn.*, 99
Corchorus olitorius, *Linn.*, 36*, 98*, 99
,, trilocularis, *Linn*, 15, 36*, 100*, 101
Coriander Family, 151
Cotton Family, 83
Crinum defixum, *Ker.*, 17
Crotalaria, 8
Crotalaria quinquefolia, *Linn.*, 106
,, retusa, *Linn.*, 7*, 106
,, verrucosa, *Linn.*, 36*, 104*, 105
Croton sparsiflorus, *Morong.*, 16, 31, 33, 49*, 206*. 297
Cruciferae, 65
Cucumis trigonus, *Roxb.*, 136
Cucurbitaceae, 135
Cuscuta, 19
Cuscuta chinensis, *Lamk.*, 18, 43*
Cyanotis axillaris, *Roem & Sch.*, 312*, 313
,, cucullata, *Kunth.*?, 49*, 50*, 310*, 311, 313
Cymbopogon caesius, *Stapf.*, 29
Cynodon dactylon, *Pers.*, 49*, 50*, 322*, 323
Cyperaceae, 25, 315
Cyperus articulatus, *Linn.*, 25
,, bulbosus, *Vahl.*, 314*, 315
,, corymbosus, *Rottb.*, 25
,, difformis, *Linn.*, 49*, 320
,, flavidus, *Retz.*, 320
,, Haspan, *Linn.*, 58, 320
,, Iria, *Linn.*, 25
,, rotundus, *Linn.*, 11, 13, 49*, 50*, 316*, 317
,, tegetiformis, *Roxb.*, 25, 29
,, tegetum, *Roxb.*, 25, 29

D

Datura fastuosa. *Linn.*, 17, 44*, 218*, 219, 221
Datura fastuosa, *Linn.*, var. alba, *C. B. Clarke*, 221
Datura stramonium, *Linn.*, 17
,, Metal, *Linn.*, 17
Dentella repens, *Forst.*, 158
Desmodium triflorum, *DC.*, 6, 125
Digera arvensis, *Forsk.*, 15, 29, 47*, 260*, 261
Dinebra arabica, *Jacq.*, 328
Dopatrium junceum, *Buch-Ham.*, 227
Dyschoriste depressa, *Nees.*, 240

E

Eclipta alba, *Hassk.*, 40*, 172*, 173
Eichhornia crassipes, *Solms.*, 23, 49*, 306*, 307
Elatinaceae, 79
Eleocharis atropurpurea, *Kunth.*, 320
Eleusine aegyptiaca, *Desf.*, 328
Fragrostis interrupta, *Beauv.*, var. Koenigii, *Stapf.*, 328
Erigeron asteroides, *Roxb.*, 188
Euphorbia, 8
Euphorbiaceae, 287
Euphorbia dracunculoides, *Lamk.*, 291
,, hirta, *Linn.*, 288*, 289
,, prostrata, *Ait.*, 14, 48*, 290*, 291
,, thymifolia, *Linn.*, 14, 291
Evening Primrose Family, 133
Evolvulus alsinoides, *Linn.*, 43*, 204*, 205

F

Figwort Family, 221
Fimbristylis miliacea, *Vahl.*, 49*, 321
Flaveria australasica, *Hook.*, 33, 41*, 50*, 178*, 179
Four O'clock Family, 253

G

Gentianaceae, 22
Gingelly Family, 231
Gisekia pharnaceoides, *Linn.*, 150
Gomphrena decumbens, *Jacq.*?, 48*, 278*, 279
Gourd Family, 135
Gramineae, 25, 321
Grangea maderaspatana, *Poir.*, 39*, 160*, 161
Grass Family, 321
Gynandropsis pentaphylla, *DC.*, 6, 14, 34*, 51*, 66*, 67

H

Heliotropium indicum, *Linn.*, 198*, 199
,, ovalifolium, *Forsk.*, 43*, 196*, 197
,, scabrum, *Retz.*, 200*, 201
Henna Family, 129
Hibiscus ficulneus, *Linn.*, 97
,, micranthus, *Linn. f.*, 35*, 92*, 93
,, panduraeformis, *Burm.*, 35, 94*, 95
,, vitifolius, *Linn*, 15, 96*, 97
Hydrilla verticillata, *Royle.*, 22
Hydrocharitaceae, 22, 23
Hygrorhiza aristata, *Nees.*, 25

I

Ilysanthes parviflora, *Benth.*, 227
,, veronicaefolia, *Urban.*, 227
Imperata arundinacea, *Cyril.*, 29, 327
Implements useful in the eradication of weeds, 54*, 55*, 56*
Indigofera enneaphylla, *Linn.*, 14, 36*, 107*, 108*
,, parviflora, *Heyne.*, 111
,, trita, *Linn. f.*, 36*, 111
,, viscosa, *Lamk.*, 36*, 110*, 111
Ionidium suffruticosum, *Ging.*, 34*, 72*, 73
Ipomaea hispida, *Roem. and Sch.*, 212
,, Pescapræ, *Sweet.*, 19
,, reptans, *Poir.*, 22, 212
,, sepiaria, *Koen.*, 212
Ischaemum pilosum, *Hack.*, 27, 49*, 327

J

Jatropha glandulifera, *Roxb.*, 304
,, gossypifolia, *Linn.*, 48*, 302*, 303, 304
Jussiaea repens, *Linn.*, 22, 133
Justicia prostrata, *Gamble n. Comb.*, 241
Jute Family, 99

L

Labiatae, 244
Lactuca runcinata, *DC.*, 41*, 182*, 183,
Lagasca mollis, *Cav.*, 19, 39*, 166*, 167
Lantana aculeata, *Linn.*, 243
Lantana Family., 241
Lauraceae, 19
Leguminosae, 21
Lemnaceae, 24
Lemna paucicostata, *Hegelm.*, 24
Lemna polyrrhiza, *Linn.*, 24
Lentibulariaceae, 22
Leptadenia reticulata, *W. & A.*, 31, 194*, 195
Leucas aspera, *Spreng.*, 15, 248*, 249
,, urticaefolia, *Br.*, 15, 46*, 51*, 250*, 251
Limnanthemum cristatum, *Griseb.*, 22
Linden Family, 99
Lippia nodiflora, *Mich.*, 45*, 244
Lobelia trigona, *Roxb.*, 41*
Lochnera pusilla, *K. Schum.*, 17, 41*, 50*, 190*, 191
Loranthaceae, 19, 20
Loranthus, 27, 31
Loranthus elasticus, *Desv.*, 20
,, longiflorus, *Desv.*, 19
,, ,, ,, var. falcatus, *Kurz.*, 19
Ludwigia parviflora, *Roxb.*, 37*, 132*, 133
Lythraceae, 128

M

Madder Family, 155
Mallow Family, 83
Malvaceae, 83
Malvastrum coromandelianum, *Garcke.*, 35*, 82*, 83
Marsileaceae, 25
Marsilea quadrifoliata, *Linn.*, 25
,, minuta, *Linn.*, 26
Martynia annua, *Linn.*, 45*, 230*, 231
Melia, 6, 19
Merremia emarginata, *Hallier f.*, 27, 43*, 50*
Micrococca Mercurialis, *Benth.*, 304
Milkweed Family, 193

Milkwort Family, 75
Mimosa pudica, *Linn.*, 127
Mimosoideae, 105, 126
Mint Family, 244
Mollugo lotoides, *O. Kze.*, 14, 38*1, 148*, 149
,, oppositifolia, *Linn.*, 15
,, pentaphylla, *Linn.*, 150
Moniera cuneifolia, *Michaux.*, 14, 44*, 222*, 223
Monochoria vaginalis, *Presl.*, 23
Morning-glory Family, 205
Moschosma polystachyum, *Benth.*, 46*, 252
Mustard Family, 65

N

Naiadaceae, 24
Nasturtium indicum, *DC.*, 34*, 64*, 65, 67
,, madagascariense, *DC*, 67
Nelumbium speciosum, *Willd.*, 21
Neptunia oleracea, Lour, 21
Nicotiana, 10
Nightshade Family, 213
Nyctaginaceae, 253
Nymphaea pubescens, *Willd*, 21

O

Ocimum, 8
Ocimum adscendens, *Willd*, 46*, 249
,, canum, *Sims.*, 46*, 245*, 246*, 247, 249
,, Family, 244
,, sanctum, *Linn*, 249
Oldenlandia aspera, *DC*, 156*, 157
,, corymbosa, *Linn*, 158
,, herbacea, *Roxb*, 158
,, umbellata, *Linn*, 15, 38*, 154*, 155
Onagraceae, 133
Opuntia, 14, 31
Opuntia Dillenii, *Haw.*, 38*, 138*, 139
,, elatior, *Mill*, 140
Orobanchaceae, 129
Orobanche, 18, 20, 28, 58
Orobanche cernua, *Loefl.*, var. desertorum, *Beck.*, 10, 44*, 228*, 229
Orthosiphon pallidus, *Royle.*, 249, 252
Oryza sativa, *Linn.*, 10
Oscillatoria, 26
Ottelia alismoides, *Pers.*, 23
Oxalis corniculata, *Linn.*, 26

P

Panicum repens, *Linn.*, 4, 29, 324*, 325
,, colonum, *Linn.*, 29, 326
Panicum Crus-galli, *Linn.*, 49*, 326
,, Isachne, *Roth.*, 326
,, stagninum, *Retz*, 326
Papaveraceae, 63
Papilionatae, 105
Parsley Family, 151
Pavonia Coxii, *Tad. et Jacob.*, 90*, 91
,, procumbens, *Boiss.*, 35*, 88*, 89, 91
,, zeylanica, *Cav.*, 2*, 89
Pedaliaceae, 231
Pedalium Family, 231
Pedalium Murex, *Linn.* 232
Pentatropis microphylla, *W & A*, 197
Peristrophe bicalyculata, *Nees.*, 241
Periwinkle Family, 189
Phaseolus aconitifolius, *Jacq.*, 121
,, trilobus, *Ait.*, 118*, 119, 121
Phyllanthus maderaspatensis, *Linn.*, 48*, 292*, 293, 295
,, Niruri, *Linn*, 48*, 294* 295
Physalis minima, *Linn.*, 44*, 216*, 217
Pistia stratiotes, *Linn.*, 6, 24
Polygalaceae, 75
Polygala chinensis, *Linn*, 74*, 75
,, erioptera, *DC.*, 77
Polygonaceae, 75
Polygonum Family, 281
,, glabrum, *Willd.*, 283
,, plebejum, *R. Br.*, 6, 48*, 282*, 283
Pongamia, 20
Pontederiaceae, 23, 305
Poppy Family, 63
Portulacaceae, 77
Portulaca oleracea, *Linn.*, 29, 34*, 51*, 76*, 77
,, quadrifida, *Linn.*, 34*, 53, 78
Potamageton indicus, *Roxb.*, 24
Prickly-pear Family, 137, 139
Priva leptostachya, *Juss.*, 45*, 242*, 243
Pulses Family, 105
Purslane Family, 77
Pupalia atropurpurea, *Moq*, 28, 31, 47* 280
,, lappacea, *Moq*, 280

R

Rhynchosia minima, *DC.*, 122*, 123
Rotala densiflora, *Koehne*, 37*, 128*, 1
Rothia trifoliata, *Pers.*, 125
Rubiaceae, 155
Ruellia patula, *Jacq.*, 30, 240
,, prostrata, *Poir.*, 240
Rungia repens, *Nees.*, 43*, 238*, 239

S

antalum album, *Linn.*, 18
coparia dulcis, *Linn.*, 227
crophulariaceae, 221
edge Family, 315
eeds of come common weeds, 34*—49*
eedlings of weeds, 50*, 51*
ida acuta, *Burm*, 87
,, cordifolia, *Linn.*, 87
,, glutinosa, *Cav.*, 85
,, spinosa, *Linn*, 35*, 84*, 85
Solanaceae, 10, 213
Solanum, 10
Solanum Melongena, *Linn.*, 10
,, nigrum, *Linn.*, 17, 215
,, tuberosum, *Linn.*, 10
,, xanthocarpum, *Schrad. & Wendl.*, 10, 40*, 214*, 215
Sonchus, 183
Sonchus arvensis, *Linn.*, 41*, 186*, 187
,, oleraceus, *Linn.*, 184*, 185, 187
Sphaeranthus indicus, *Linn.*, 14, 39*, 188
Spiderwort Family, 309
Spirogyra, 26
Sporobolus coromandelianus, *Kunth.*, 327
Spurge Family, 287
Stachytarpheta indica, *Vahl.*, var. Jamaicensis, *Trimen.*, 45*, 244
Stemodia viscosa, *Roxb.*, 13, 44*, 220*, 221
Stenophyllus barbata, *Rottb.*, 15, 320
Striga, 18, 20, 28, 88
,, euphrasioides, *Benth.*, 227
,, lutea, *Lour.*, 44*, 224*, 225, 227
Sunflower family, 9

T

Tamarind family, 125
Tephrosia procumbens, *Ham.*, 14
,, purpurea, *Pers.*, 29, 37*, 112*, 113, 115
,, spinosa, *Pers.*, 37*, 114*, 115
Tiliaceae, 99
Tragia cannabina, *Linn.*, *f.*, 305
,, involucrata, *Linn.*, 304
Tragus racemosus, *Scop*, 14, 32, 326
Trianthema decandra, *Linn.*, 7*, 141, 146*, 147
,, Portulacastrum, *Linn.*, 15, 27, 32, 38*, 51, 53*, 141, 142*, 143, 147
Trianthema triquetra, *Rottl.*, 14, 38*, 141, 144*, 145
Tribulus terrestris, *Linn.*, 7*, 14, 28, 31, 36*, 102*, 103, 109
Trichodesma indicum, *R.Br.*, 43, 202*, 203
Tridax procumbens, *Linn.*, 7*, 40*, 176*, 177
Triumfetta rhomboidea, *Jacq.*, 36
,, rotundifolia, *Lam.*, 28, 32, 101
Typhaceae, 23
Typha angustata, *Bory.*, 23, 29

U

Umbelliferae, 151
Urena lobata, *Linn.*, 97
Utricularia flexuosa, *Vahl.*, 22
,, stellaris, *Linn. f.*, 22

V

Vallisneria spiralis, *Linn.*, 9, 23
Verbenaceae, 241
Verbena Family, 241
Verbena officinalis, *Linn.*, 241
Vernonia cinerea, *Less.*, 51*; 187
Vicoa indica, *DC.*, 29, 39*, 162*, 163
Violaceae, 73
Violet Family, 73
Viscum, 20, 28
Viscum monoicum, *Roxb*, 20
,, orientale, *Willd.*, 20
Volutarella divaricata, *Benth.*, 41*, 180*, 181

W

Water Hyacinth Family, 305
Waterwort Family, 79
Withania somnifera, *Dun.*, 17, 44*, 221, 231
Wolffia arrhiza, *Wimm.*, 24

X

Xanthium strumarium, *Linn.*, 31, 32, 39*, 164*, 165

Z

Zygophyllaceae, 309

INDEX TO ENGLISH NAMES.

A

Aaron's Rod, 244
Algae, 26, 28
Ash-coloured Fleabane, 188

B

Bird's-eye Chillie, 10
Bitter Apple, 136
Bladderwort, 22
Brinjal, 10
Bulb grass, 315
Burweed, 165

C

Cactus, 4
Cashew nut, 20
Caravelle seed, 67
Chay-root, 155
Chillie, 10
Common Sow-thistle, 185
Couch-flower Creeper, 121
Corn Sow-thistle, 187
Cotton, 12
Couch-grass, 323
Country Mallow, 87
Cumbu, 23

D

Devil's-claw, 231
Devil's-grass, 323
Devil's-trumpet, 219
Dub-grass, 323
Duck Weed, 24

F

Fieldgram, 121
Field Bindweed, 4, 209

G

Garden Nightshade, 215
Gigantic Swallowwort, 193
Ginger Rooted Grass, 4
Grass, 8
Ground-bur Nut, 103

H

Hoary Basil, 247
Holy Basil, 249
Humble Plant, 127

I

Indian Madder, 155
Indian Milkwort, 75
Indian Mistletoe, 19
Indian Pennywort, 153
Indian Purslane, 77

J

Javanese Woolplant, 271
Jew's Mallow, 99
Job's Tears, 327

K

Khaki Weed, 275
Kidney Bean, 121

L

Lady's fingers, 97
Lantana, 31, 243
Lesser Bindweed, 209
Lilac Devil, 307
Lucerne, 18, 19, 57

M

Madar, 193
Mango, 20
Mexican Poppy, 63
Milk Thistle, 185

N

Negro Coffee, 125
Nettle, 305
Nutmeg, 20
Nut Grass, 27, 57, 317

O

Orange, 20

P

Paddy, 10, 57, 226
Palms, 9
Palmyra, 9
Pomegranate, 19
Potato, 10
Prickly Chaff-flower, 267
Prickly-pear, 139
Prickly Sida, 85

R

Radish, 4
Ragi, 57, 226, 227
Rice, 11

S

Sacred Lotus, 21
Sandalwood, 18
Sedges, 25
Small Bindweed, 209
Small Caltrops, 103
Spiny Sida, 85
Spreading Hog-weed, 255
Star Burr, 169
Stonewort, 56
Sugarcane, 57, 226, 227
Sunnhemp, 57
Sweet Potato, 4, 57

T

Tape-grass, 23
Tapioca, 57
Thyme-leaved Gratiola, 223
Tiger Claw, 231
Thorn apple, 219
Thorny Amaranth, 263
Touch-me-not, 127

W

Water-firewort, 81
Water-lily, 21
Water Fern, 26
Water Hyacinth, 16, 307
White Cock's-comb, 257
Wild Mustard, 69
Wild Sage, 243
Winter Cherry, 221

INDEX TO TAMIL NAMES.

A

Aatalaree, 283
Adaiotti, 280
Adalai-chedi, 304
Aduthinnapalai, 285
Akasathamarai, 24, 307
Alli, 21
Ammampacharisi, 289
Amukkaran-kizhangu, 221
Anai-nerinji, 232
Arai-keerai, 26
Ariva-mooku-keerai, 87
Arugam-pullu, 323

B

Bendai, 97
Bhoomi-chakra-poondu, 209
Brahmadandu, 63

C

Chatti-chattaranai, 257
Chapathi-kalli, 139
Chinna-ammam-pacharisi, 291
Chitt-avarai, 123
Cholam, 6, 227
Chulli-mulli, 240

D

Dharbai-pul, 327

E

Eli-avanakku, 304
Elikathu-keerai, 211
Erukkam, 193
Erumuttai-pinari, 252

G

Gilugiluppai, 105

I

Inji-pul, 325

K

Kadai-pul, 326
Kakattan, 121
Kalanamappoondu, 119
Kallurivi, 131
Kanan-keerai, 313
Kandan-kathiri, 10, 215
Kanjori, 305
Karasaranganni, 173
Karie-keerai, 77
Karum-pul, 326
Katamanakku, 303
Kattu-kadugu, 65, 67
Kattu-kundumani, 327
Kattu-mullangi, 188
Kanalai-chedi, 111
Kasturi-bendai, 97
Kattu-bendai, 97
Kavizh thumbai, 203
Kazhuthai thumbai, 203
Keela nelli, 295
Kodagasaleh, 239
Kolinji, 113
Korai kizhangu, 317
Kotti kizhangu, 24
Kottai karanthai, 188
Kothan, 19
Kovai, 135
Kundumani, 18
Kuppaimeni, 301
Kuppai keerai, 265
Kuruvi kai, 20
Kuvalai, 121

M

Mana thakkal, 215
Mani-tutte, 97
Manja kadugu, 69
Marul oomatham, 165
Masipatri, 161
Mattangai pul, 328
Mayl kondai pul, 328
Medday keerai, 240
Mela nelli, 293
Milagai-poondu, 191
Mookutti-poondu, 163
Mudappoondu, 101
Mukkaratai keerai, 255
Mul kolinji, 115
Mull ponnanganny, 275
Mull thulasi, 160
Mull keerai, 263

N

Nagadali, 139
Nai kadugu, 69
Nai milakai, 297
Nai thulasi, 247
Nai velai, 67
Namappoondu, 117

Nandukal keerai, 81
Naripayathankai, 119
Nathachuri, 158
Nayuruvi, 267
Nayani-poondu, 311
Neer brahmi, 223
Neer krambu, 135
Neermael neruppu, 131
Neer mulli, 237
Neer pirami, 223
Neer pulli, 313
Neer thamarai, 23
Neer vadamalli, 279
Neichitti chedi, 188
Nerinji, 103
Nilamperanda, 109

O

Oopilan kodi, 197
Oosi thagarai, 126
Orela thamarai, 73
Ottu tutti, 97

P

Palai kodi, 195
Palli-poondu, 225
Pani payir, 119
Pannai keerai, 257
Parpadaka pullu, 150
Paruppu keerai, 77
Pasarai, 77
Perum punnakku-poondu, 99
Perum thumbai, 251
Peechalankai, 106
Pey avarai, 125
Pey kummati, 136
Pisachi thamarai, 307
Podu thalai, 244
Pokayilai kalan, 229
Ponnan-ganni-keerai, 280
Poolai-keerai, 271
Poonai-kanjan, 305
Potta kanchi, 240
Puli-nagam, 231
Pulluruvi, 19
Punnakku-poondu, 101
Purusha-ratnam, 73

S

Sadai, 22
Sanakki-poondu, 252
Saranai, 143
Saya-vair, 155
Seeria-amanakku, 303
Segappu-nerinji, 109
Seruppadi, 205
Shilandi, 315
Shilandi-nayagam, 240
Siru-keerai, 267
Siru-pasarai, 78
Siru-seruppadi, 149
Siru-sharanai, 145
Sirukkan poolai, 273
Siruthudappam-pul, 327
Siruvayal, 149
Sitha-mutti, 89

T

Thagarai, 125
Thakkali, 217
Thalanji, 27, 244
Thali-keerai, 212
Thamarai, 21
Thazhudalai, 244
Thel-kodukku, 199
Thotta-vadi, 127
Thoyya-keerai, 261
Thulasi, 249
Thumbai, 249
Thummatti-kai, 136
Toora, 150
Tulukka-payir, 121
Tutti, 87

U

Umattam, 219

V

Vallarai-kerai, 153
Varagu, 226
Vazhukkai-poondu, 101
Velam-pasi, 22
Vellai-keerai, 212
Vellai-sharanai, 147
Veppam-pasi, 24
Vishnu-kirandi, 205

Y

Yerukku, 193

INDEX TO MALAYALAM NAMES.

A

Adakka-maniyan, 188
Aduthinna-palai, 285
Arippu-chedi, 243

B

Beami, 223

C

Ceruvidukol, 119
Chedayan, 252
Cheruparuva, 87
Cherupula, 273
Chitrapala, 291
Choriyanam, 305
Chuvanna-kada-lavanakku, 303

E

Erukku, 193

I

Ithu-kanni, 19

K

Kadaladi, 244, 267
Kandan-kathiri, 215
Karvela, 67
Karie-cheera, 77
Karuka-pul, 323
Kallar-vanchi, 131
Katta-venthiyam, 85
Kattu-nerinjil, 169
Kattu-thippali, 244
Kattu-tulasi, 247
Kizha-nellai, 295
Kilukilukki, 106
Kodangal, 153
Kola-vazha, 307
Konal-cherukki, 158
Kora, 317
Kova, 135
Kozhinjil, 113
Kozhi-pullu, 257
Kudaka-payil, 24
Kunni-kuru, 18
Kunuku-thooki, 304
Kuppai-meni, 301
Kyonni, 173

M

Mavirithil, 20
Moodilla-thali, 19
Mukkavala, 115
Mulaku-thakkali, 263
Mullan-cheera, 263

N

Nai-kadugu, 69
Naga-mullu, 139
Neela-keera, 78
Neerambala, 21
Neerbrahmi, 223
Nerunjil, 103
Nilampala, 161
Njodi-njotti, 217

O

Orela-thamara, 73

P

Pasali-keera, 143
Poona-veeram, 125
Ponnumattam, 63
Puli-nakham, 231

S

Sanku-pushpi, 121

T

Thamara, 21
Thamizhama, 255
Thekkada, 199
Thiru-tali, 212
Thotta-vadi, 127
Thulasi, 249
Thumba, 249

U

Ummattam, 219
Uppu-thali, 240
Uram, 87
Uran, 97

V

Vayal-chulli, 237
Vazhai-padathi, 313
Velluram, 87
Ven-pacha, 199
Vishnuchandi, 205

INDEX TO TELUGU NAMES.

A

Adavi-benda, 87
Adavi-mullangi, 188
Agnivendrapaku, 131
Amada kaya, 311
Ambitimadu, 143
Amera, 119
Amruta-kada, 313
Antara-tamara, 22, 24, 307
Atika-mamidi, 255
Avideru, 125

B

Babassa, 153
Badanika, 19
Banki-tutturi, 101
Bhadra-musta, 315
Boda-saram, 188
Bokkudu-chettu, 153
Bonta-oodara, 326
Brahma-dandu, 63
Brahma-jemudu, 139
Budama-kaya, 136

C

Chadarasi-koora, 150
Chali-tunga, 149, 320
Che-beera, 241
Chekurti-tivva, 197
Chenchali-koora, 261
Cheragedam, 109
Chilaka-thota-koora, 265
China-muttama, 85
Chinna-cheepiri-gaddi, 327
Chinna doolagunda, 305
Chinna mudda pulagam, 89
Chinna nakka putta chettu, 241
Chiri nellikoora, 244
Chiriveru, 155

D

Dharba, 327
Doggali koora, 267
Domakalu gaddi, 326
Doola govila, 305
Dundigapu, 304

E

Elika jemudu, 211
Enngu palleru, 232

G

Gaditha gadapaku, 285
Gajapippala kada, 244
Galijeru, 143
Garika, 323
Garitikamma, 188
Garuda mukku, 231
Gedi chikkudu, 123
Gorri geddam, 78
Gunta galijeru, 173
Gunta kalavaraku, 173
Gunta kaminam, 221
Gurugu, 299
Guruvinda, 18

H

Hamsapadaku, 205

J

Jammu gaddi, 23
Jangli tamuku, 187
Jiddu vusti, 215
Jilledu, 193

K

Kaidonda, 135
Kaki donda, 135
Kaluva, 21
Kamanchi chettu, 215
Kari gaddi, 325
Karu-patti, 97
Karu pogaku, 188
Karu pucha kaya, 136
Kasivinda, 125
Kaval gaddi, 328
Kokilakshi, 237
Kukka mirapa, 297
Kukka pala koora, 145
Kukka thulasi, 247
Kukka vavinta, 69
Kundara gaddi, 327
Kupanti, 217
Kuppinta chettu, 301

L

Lingam miriyalu, 299

M

Madana budama, 158
Mandooka brahma kooraku, 153
Marula mathangi, 165
Masipatri, 161
Metta tooti, 212
Mitekalu, 121
Mukku tummuiu, 195
Mulla thota koora, 263
Mullu ponna ganti koora, 275
Mullu vempali, 115
Munta mandu, 125
Muripindaku, 301
Mustaru, 161

N

Naga jemudu, 139
Nakkanaru, 111
Nalla benda, 97
Nalla doggali, 263
Nalla gentana, 121
Nalla ummetta, 219
Nalla usirika, 293
Nama gadda, 24
Nanabalu, 289
Neela alumu, 123
Neela gentana, 121
Neeru bogadabanthi, 279
Neeru gobbi, 237
Neeru thalavapu, 22
Neeru veniki, 23
Nela amudam, 303
Nela mulaka, 215
Nela usiri, 295
Nela vakudu, 215
Nityamalli, 93

O

Otha gaddi, 326

P

Pala teega, 195
Palleru, 103
Parpatakam, 150
Paunch teega, 19
Peddabenda, 97
Pedda nidrakanta, 127
Pedda pavila koora, 77
Pedda picha kada, 240
Pedda pindikonda, 271
Penneru chettu, 221
Perinta koora, 99
Pilli pesara, 119
Pilli vendram, 221
Pinna doola gunda, 305
Pisachi-thamara, 307
Ponnaganti-Koora, 286
Potakanchi, 240
Pura gaddi, 315

R

Ratna purusha, 73
Ratrinta, 185

S

Saka thunga gaddi, 317
Sambrani mokka, 223
Saraswati aku, 153

T

Tantipu, 126
Tella antisa, 87
Tella galijeru, 147
Tera nalla benda, 85
Thamara, 21
Thelaga pindi koora, 273
Thelaki, 244
Thelu kondi chettu, 231
Tilla kada, 291
Tooti koora, 212
Tummi, 249
Tutturu benda, 87

U

Uppu gaddi, 328
Urranki, 327
Uttareni, 267

V

Vavinta, 67
Vempali, 113
Verri mirapa, 297
Verri nelavemu, 158
Visha boddi, 87
Vishnu kranti, 205

Y

Yetta palleru, 109