

95

Indian Tobacco

July - Sep - 1955

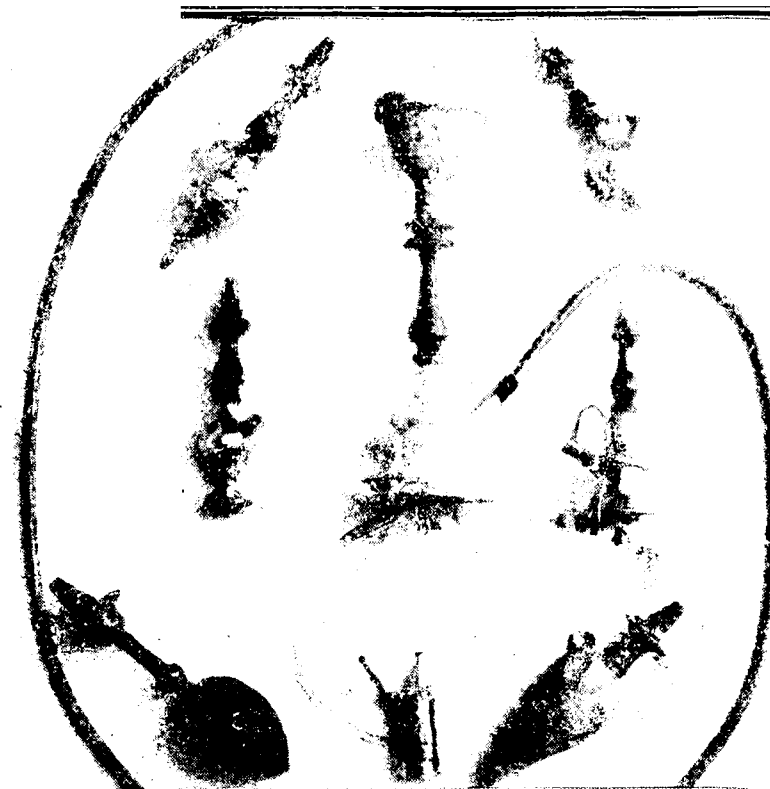


JL
J452m2, NSI .

NSI-5.3
123840

Centre and top
two rows :

* Common types
found in use in
different parts
of India. Made
from metal
with wooden
mouth piece.
For convenience
rubber
pipe is attached



Bottom Row

(L to R)

1. A hookah
with water
container from
coconut shell
2. A very small
& handy type
All metal
3. A cheap hookah
prepared
from clay. For
its cooling ef-
fect people pre-
fer it in scorch-
ing heat.

INDIAN TOBACCO

QUARTERLY

Vol. V, No. 3

JULY-SEP. 1955



PUBLISHED BY

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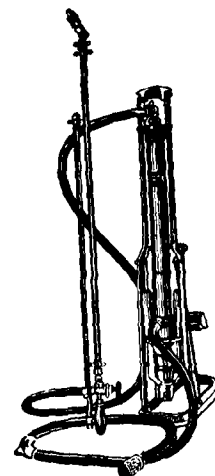
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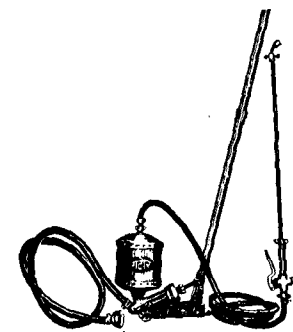
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BY THE
INDIAN CENTRAL TOBACCO COMMITTEE

Vol. V	JULY — SEPTEMBER 1955	No. 3
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Recent Trends in Chemical Research on Tobacco in the United States and Their Applicability to Indian Conditions

By
A. S. SASTRY*

The writer was deputed to study the advanced techniques in tobacco chemical research as practised in U.S.A. under the Point IV program, as U.S.A. is the premier tobacco growing area in the world, with a number of years of research experience behind it.

The observations of the writer while he was in the U.S.A. are recounted in this article under the following heads:—

(1) General agricultural practices in U.S.A. in flue-cured and cigar tobacco culture and the main differences between U.S. and Indian practices;

(2) Chemical problems handled at the various institutions and their applicability to Indian conditions.

The applicability of the methods and findings are described item by item.

(1) General Agricultural Practices in U.S.A. in Flue-cured and Cigar Tobacco Culture and The Main Differences between U.S. and Indian Practices:—

In dealing with this subject it is proposed to deal only with certain striking differences in the conditions of culture, curing

and fermentation of tobacco as practised in U.S.A. and India. For details of the various cultural and curing practices the reader is referred to U.S.D.A. Farmers' Bulletins (1) and (2). The subject matter is presented under the heads flue-cured and cigar tobacco.

Flue-cured tobacco:—This type of tobacco is grown in U.S.A. on light sands and sandy loams with yellow or red sandy loam sub-soils with relatively small amount of clay. In India this is grown on heavy black clayey soils in Godavari, Krishna and Guntur districts in the Andhra State.

The rainfall in the U.S.A. is adequate and well-spaced during the growth period of the tobacco crop. In India the tobacco crop has to depend on the soil moisture for its growth as practically there is no rain during the growth period and irrigation facilities are negligible.

Another difference is in the spacing of plants in the field. In India the plants are spaced 33" × 33". In U.S.A. the rows are 4' apart and the plants in the rows are set 20" to 28" apart. The spacing of 33" × 33" has been adopted in India as it was found convenient from the point of inter-cultivation on both the sides of the

* Chemist, Cigar and Cheroot Tobacco Research Station, Vendasandur, S. India.

plant as manual labour is used for this purpose. The greater distance between rows used in U.S.A. is mainly to facilitate the use of mechanical appliances which are not yet in vogue in our country. An experiment to compare the two systems of planting has been undertaken at the Central Tobacco Research Institute, Rajahmundry, since last year.

The fourth important difference is in the fertilization of tobacco. In U.S.A. 800 to 1200 lbs of a mixture containing 3% nitrogen, 1% available P_2O_5 and 6 to 10% potash is used. In addition, the fertilizer for flue-cured tobacco should contain 2% chlorine, 2% available magnesium and 3% available calcium. In India the farmer uses mostly farmyard manure. The manurial trials conducted at Guntur and Rajahmundry with nitrogen, phosphoric acid and potash have given hardly any indications of response by the tobacco plant to P_2O_5 and K_2O in regard to yield and percentage of bright grades. It is known that potash is required at luxury level to make the tobacco burn well, as potash is a combustion catalyst. It is, therefore, surmised that potash may be required for at least other ingredients of quality, e.g., fire holding capacity. Further experiments using various levels of N, P, K supported by chemical work to determine the nutrient uptake and burning quality have been recently taken up at the Central Tobacco Research Institute, Rajahmundry and at the Cigar & Cheroot Tobacco Research Station, Vadasandur.

The fifth difference appears to be in the use of mineral oil as a fuel for flue-curing.

The recent trends in U.S.A. are to use oil burners controlled by a thermostat in the flue-curing barns. This has been found to result in more uniform temperature conditions in the barn which undoubtedly will result in better grades. By placing the oil burners inside the barn and putting a shade over the burners to prevent the bottom most leaf from being scorched the use of flue pipes can be avoided. Trial of burners in an experimental way has already been planned to be carried out next year at the Central Tobacco Research Institute, Rajahmundry.

The sixth difference is in the grading of tobacco. The U.S. tobacco is divided into six classes and they in their turn are subdivided into types and grades. Class I of flue-cured tobacco, for example, is divided into types, e.g., 11A, 11B, 12, 13, 14 depending on the regions where it is grown. The types are sub-divided into grades and in making grades four factors are recognized. They are (1) groups like wrappers, leaf, smoking leaf, cutters, lugs, primings, non-descript and scrap; (2) factors of quality like choice, fine, good, fair, low and common; (3) colours like lemon, orange, red, dark-red, green, mahogany, varigated and mixed; and (4) special factors. The groups are according to the position of the leaves on the plant.

In India, regional differences are taken into consideration, only indirectly but the leaf of flue-cured tobacco is graded primarily on the basis of colour, and to some extent on texture and body but not on leaf position on the plant. The bright lemon yellow leaf fetches the highest price,

regardless of its being slightly deficient in body and texture.

Investigations to determine whether leaf position on the plant should be taken into consideration in our grading procedures have been recently taken up at the Central Tobacco Research Institute, Rajahmundry.

Cigar tobacco.—Cigar tobacco is grown on very fine sandy loams in U.S.A. It is grown on gravelly sandy loams in India.

The rainfall during the growth period is well distributed in U.S.A. In India there is not enough rainfall during the growth period. The moisture requirements of the crop are supplied by frequent irrigation in Dindigul and surrounding areas.

The fertilizer applied to the cigar tobacco crop in the U.S.A. is 2000 to 2500 lb per acre of 8—4—8 mixture. At the Cigar & Cheroot Tobacco Research Station, Vadasandur it has been found that 10 tons of farmyard manure supplemented by 100 lbs of nitrogen half as ammonium sulphate and half as groundnut cake is required.

The main difference is in the curing and fermentation of this type of tobacco. In the U.S. the filler, binder and wrapper type of tobacco is cured in specially constructed barns which are equipped with ventilators and sometimes even with oil burners. After the leaf and stem are cured the tobacco is allowed to come to condition on a humid day by opening the ventilators and then the leaf is stripped. The stripped leaf is fermented either in

bulks or in cases depending on the type of tobacco. In India this type of tobacco is cured by hanging it on racks in the sun and when the leaf is dried, the stem being still green, the whole plants, with leaves attached, are kept in bulks for fermentation. After fermenting the whole plants in bulks for 15 to 20 days with occasional turning, the leaf is stripped from the stalk and again fermented in bulks. Differences in changes that take place during the curing and fermentation processes as adopted in the U.S. and India have to be investigated. For this purpose, a small experimental barn on the lines of the barns in U.S. has to be constructed. This will be taken up as soon as possible.

(2) Chemical Problems handled at the various Institutions and their Applicability to Indian Conditions:—

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The various institutions visited and the work carried out there is summarised below:—

A. *North Carolina State College of Agriculture and Engineering*.—This institution concentrates on tobacco research with particular reference to flue-cured tobacco. The chemical work that is being carried out in these laboratories is summarised below:—

(i) Studies on the suitability of methods of analysis for various tobacco constituents.

(ii) Studies in the chemistry of tobacco under different conditions of curing like varying temperature, humidity, light, atmosphere, partial pre-drying of tobacco

before yellowing etc. A batch of specially designed curing cabinets located at the experimental station at Oxford is used in these studies. These cabinets are about 4' x 3' x 3', and take about 300 leaves. Air conditioned to suitable temperature and humidity is blown into these cabinets thus keeping them at the required temperature and humidity. The temperature of the leaf is recorded by thermocouples attached to a thermograph. Treating one of these cabinets as control and varying the conditions in the other cabinets the behaviour of the leaves under different curing conditions can be studied. Efforts are being made to have such cabinets built at the Central Tobacco Research Institute, Rajahmundry.

(iii) Inheritance of alkaloids in inter-specific hybrids:—The trend in cigarette trade is to have tobaccos of lower and lower nicotine content. Interspecific hybridization has been resorted to to achieve this purpose. But new alkaloids, e.g., nor-nicotine and anabasine get introduced into the hybrid and the derived tobacco cultures from the non-commercial parent. Work is being done at this institution to determine the chemical constituents in the synthetic types derived from the cross between *N. tabacum* and *N. sylvestris*. Such work has also been initiated at the Central Tobacco Research Institute, Rajahmundry.

(iv) Use of radio active phosphorus for studies in root development:—The technique of using P 32 has been described in great detail by Hall and co-workers (3). By injecting radio active phosphorus in suitable concentrations into the soil at

various depths and distances from the plant, and analysing suitable plant parts for radio activity at weekly intervals, the distances and depths to which the roots have reached can be determined, without actually removing the plant from the soil. Certain very interesting conclusions have been arrived at as a result of this study. Briefly they are as follow:—

(a) It has been found that the growth of the roots precedes growth of the shoots during the first six weeks and nutrient uptake precedes the period of rapid growth.

(b) In the nor-folk sandy loams which have been used in these studies flue-cured tobacco shows itself to be a deep rooted plant, the roots going down to a depth of 24".

(c) It has been found that only very small quantities of nutrients are taken up by the plant more than 8" away from the plant. This finding may not be of practical significance as overcrowding will result in less photo-synthetic activity yielding poor quality tobacco.

(d) The activity of the roots shifts from the top 6" of soil to a layer between 10" to 12" in as little as four weeks after transplanting. Later on even soil layers as deep as 14" to 18" contributed to total nutrient uptake. There are great difficulties at present in initiating such studies in our country for want of staff trained in high technicalities warranted by the work.

B. Ligget and Meyers Research Laboratory:—These are the laboratories of one

of the biggest cigarette industries in the United States. They concentrate on the analysis of tobacco so as to determine which it is worthwhile for the company to buy. Dr. F. R. Darkis who is the Director of research in these laboratories found that sugars (reducing and total) and a-amino nitrogen provide the best index of quality. The tobacco is also analysed for nicotine, ash, total nitrogen and soluble nitrogen. It is the object of the cigarette manufacturing concerns to keep the chemical composition of the blended cigarette constant from year to year. They seldom allow the nicotine content of these cigarettes to go above 2%.

According to Dr. Darkis with whom the writer had discussions, the Indian flue-cured tobacco is harvested a little on the immature side, and that it is cured too fast. According to him the full potentialities of leaf to develop sugars, which are responsible for the quality of this type of tobacco to a great extent, are not being developed in the field or in the flue-curing barn. Experiments, therefore, to determine the most appropriate time for harvest and suitable curing schedules have to be conducted to investigate this aspect.

C. General Cigar Company Research Laboratory:—These laboratories are under the direction of Dr. W. G. Frankenburg who is a well known authority on catalysis. The techniques of ultraviolet spectroscopy and chromatography are extensively used in these laboratories to reveal alkaloid decomposition products which may be formed during fermentation of tobacco and for studies of individual amino acids during curing and fermentation of tobacco.

Dr. Frankenburg developed a system of stepwise analysis of tobacco whereby the alkaloid decomposition products are investigated. The details are given in (4 and (5).

According to Dr. Frankenburg a thorough investigation of the products formed during curing and fermentation of tobacco which involves isolation and identification of the various organic compounds using the latest techniques of chromatography and ultraviolet spectroscopy may suggest methods of bringing about these changes more thoroughly by the use of enzymes or catalysts and this is the reason why such searching investigations are carried out at the General Cigar Company Research Laboratories. The following important findings have been made as a result of these studies:—

(a) Tobacco produced during a dry year does not ferment properly probably because it has not absorbed from the soil certain metals which act as catalysts. By treating the tobacco with suitable metallic solutions it is possible to ferment this tobacco properly. Work on these lines is proposed to be taken up at Veda sandur.

(b) The nicotine in the tobacco leaf itself acts as an inhibitor for the desirable changes during fermentation.

D. Connecticut Agricultural Experiment Station, New Haven:—The chemical work in these laboratories is done under the direction of Dr. H. B. Vickery. He made extensive studies on the chemical changes that take place during curing and

fermentation of Connecticut shade-grown tobacco, the influence of culture in various nutrient solutions, and of light and darkness on the metabolism of tobacco leaf and also the effect of various acids on the metabolism of Connecticut tobacco. By using a synthetic resin as packing material in column chromatography, he has developed a method for determining organic acids in tobacco.

E. Tobacco Research Sub-station, Windsor:—The chemical work in these laboratories is being done by Dr. A. B. Pack. By using curing cabinets where the temperature and humidity are carefully controlled by blowing conditioned air, the behaviour of leaf subjected to different curing conditions is being investigated. Also some work on the control of suckers by chemicals and their effect on chemical composition are being carried out. It had been found that Maleic hydrazide causes higher protein, ammonia and less nitrate in cured Pennsylvania cigar filler tobacco.

Experiments using chemicals for control of suckers will be taken up shortly, at the Tobacco Research Station, Vendasandur.

F. University of Maryland:—Chemical work is being done in the laboratories of University of Maryland under the direction of Dr. O.E. Street on the following lines:—

(i) Studies on the effect of various cover crops on growth, quality and nitrogen nutrition of Maryland tobacco.

(ii) The relationship between rates of phosphorus for Maryland tobacco and nitrogen constituents of the plant.

(iii) Studies on the effect of irrigation on chemical composition and smoking quality of Maryland tobacco.

G. Bureau of Plant Industry, Beltsville:—This is a federal organization of the United States Government devoted to agricultural research. Research work on tobacco is carried out in the tobacco section. The main problem in the United States is evolution of disease resistant strains. For this purpose interspecific hybridization is extensively used and this in its turn is introducing unusual alkaloids like nor-nicotine and anabasine into the new strains. The tobacco trade is suspicious of these alkaloids because their effect on human health is not known. Dr. R. N. Jeffery who is in charge of chemical work in these laboratories is engaged in screening such tobaccos for their alkaloids. Paper chromatography is used in identifying and roughly estimating the amount of the alkaloids present in the breeding material. Also some fundamental work on the identification of alkaloid like substances in the various types of tobacco is being conducted by Dr. Tso and Dr. Jeffery (6). By adopting the solvent extraction procedure of Dr. Frankenburg and co-workers (5) and combining this with paper chromatography they have isolated 24 unknown substances from a sample of Robinson's medium broad leaf type of Maryland tobacco.

Work on the screening of new strains for their alkaloids will be conducted when our work develops sufficiently to warrant it.

H. Agricultural Marketing Administration: Tobacco Standards Division:—

In the chemical laboratories under the direction of Dr. Max Philips the various grades of different types of tobacco are analysed for organic constituents to see if there is any chemical basis for the grading procedure. His work shows that various chemical ratios like Schmuck's No., Kovalenko's No., Pyriky's No. correlate with quality in the various groups of flue cured tobacco (7). The polyphenol ratio does not fit well with quality index.

From the foregoing it is clear that in tobacco chemical research in the United

States the techniques of ultraviolet spectroscopy, chromatography and radio active tracers are being extensively used to unravel new constituents and factors which may suggest ways of improving curing, fermentation and quality of tobacco.

Acknowledgement

The writer desires to express his grateful thanks to Dr. N. R. Bhat, Director Tobacco Research, Rajahmundry for revising the article.

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Preliminary Trials for Control of Powdery Mildew (Ash Disease) of Tobacco

by
D. I. MATHRANI¹ and N. A. ELIAS²

There have been increasing reports in South India on the incidence of powdery mildew (*Erysiphe cichoracearum* DC.) popularly known as ash disease. The disease reduces both yield and quality of the leaf and in the case of Virginia tobacco makes it unsuitable for curing. The infection starts in small white patches predominantly on the lower three to six leaves. Later, the patches spread, at times, to cover the entire leaf surface (Fig. on the next page). The disease is more prevalent in low lying and waterlogged areas, where Virginia tobacco growers sometimes have to abandon the affected crop as unsuitable for curing. Preliminary investigations for the effective control of the disease are under-way at the Central Tobacco Research Institute, Rajahmundry.

of control on many crops including tobacco. But, as tobacco leaves are likely to retain the residual effect of sulphur their commercial value may be affected. So, dusting of the leaf will be undesirable particularly in the case of Virginia tobacco in which quality is of utmost importance. Sulphur applied to soil at the rate of 40 lbs per acre has been found to check the disease in Rhodesia (2). Our preliminary field trials in 1954-55 also indicated that powdery mildew can be effectively controlled by application of sulphur to the soil at the rate of 40 lbs. per acre 6-7 weeks after planting. The requisite quantity of sulphur was spread in between the rows by hand, taking care that it did not fall on the leaves.

Dusting the mildew affected plants with sulphur is known to be an effective method

The results of the trials were as follows:—

Kind of trial	Tobacco Variety	*Intensity (Mean No. of infected sections) of powdery mildew on application of sulphur to soil at the rate of—lbs per acre.				
		0	40	80	Mean of 40 80	Critical difference**
Replicated	F.C.V. (Chatham)	90.9	24.2	4.4	14.3	63.4
Block	Lanka	557.6	8.2	17.0	—	86.5

* Intensity is measured by assuming each leaf in 8 sections and counting the infected sections.

** C.D. is for fungicide versus no fungicide means.



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*Tobacco Leaf Showing
White Powdery Coating
Due to Ash Disease.*

Late Summer 1955

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Demonstrations in Handling and Flue-Curing Virginia Leaf Result in Extra Returns to Growers

By
S. VISWANADHAM*

Trends are noticeable in recent years that the grower of Virginia tobacco in in Andra State is increasing his area under the crop beyond his capacity for efficient handling and flue-curing of the produce. Many a grower does not know the correct methods of doing the operations and their relative importance in securing high grade leaf. As a result, the quality of the leaf has been on the decline. Alive to this situation and with a view to educate the grower in dealing with his produce and to show him what heavy losses he is suffering on account of his indifferent methods, the Indian Central Tobacco Committee launched in 1950-51 a scheme for village demonstrations of improved methods of handling and curing Virginia tobacco. The items of demonstration consisted of harvesting properly ripened leaf, careful handling so as not to bruise the leaf, stringing limited number of leaves per stick, loading the barn within its capacity, admitting a little air inside through ventilators while starting the barn so as to reduce the risk of sponging, giving ventilation at proper time to suit the condition of the leaf and maintaining steady temperatures. A little moistening of coal before feeding it to the furnace was also advocated to help efficient burning and to reduce cinder formation.

Demonstrations were undertaken on the above lines by the Cigarette Tobacco Research Sub-Station, Guntur and have been continued till the last season. During the five year period from 1950-51 to

1954-55, the demonstrations were given in eight villages situated in different localities. To carry convictions to the farmer about the value of the improved methods, the demonstrations were arranged in the following manner :—

The field of the farmer on whose crop the demonstration was proposed to be given was divided before harvest into two parts one of which was left to him to harvest and cure in his own way and the other was attended to entirely by the demonstration staff. Harvesting, stringing, loading and curing of the produce from the two parts of the field were done almost simultaneously, but independently. After curing, the leaf produced by the two methods was graded on one and the same basis. Comparative results produced by the two methods are presented in the appendix.

The results speak for themselves and show clearly that there is scope for improving the quality of leaf produced by the Virginia tobacco growers by better method of handling and curing. The average increase in the percentage of higher grades is as much as about 6 per cent. The coal consumption as well as the time taken for curing is less and the average enhancement of net profit per candy (500 lbs) of cured leaf which will be approximately the outturn per acre is about Rs. 62/—. The benefit is substantial and growers will do well to adopt the improved methods advocated in the demonstrations.

* Plant Breeder, Cigarette Tobacco Research Sub-Station, Guntur.

APPENDIX.
COMPARATIVE RESULTS OF FLUE-CURING DEMONSTRATIONS CONDUCTED FROM
1950--51 TO 1954--55

Year & villages	Farmer's Method				Improved Method				Profit for 500 lbs cured leaf by adoption of improved method of handling & curing Rs.				
	Weight of cured leaf per barn (lbs.)	Coal used per barn (lbs.)	Total time taken for curing (hrs.)	Percentage grades		Weight of cured leaf per barn (lbs.)	Coal used per barn (lbs.)	Total time taken for curing (hrs.)					
				"Gairu" (yellows & light greens)	Value realised per 500 lb cured leaf Rs.								
1950-51													
Ongole	1131	2777	146	63.2	37.0	309- 3-9	1026	2170	138	70.7	29.4	351- 9-11	42- 6-2
Tadikonda	715	1825	136	80.2	19.9	366- 6-9	742	1700	133	88.4	11.6	451- 7- 9	85- 1-0
1951-52													
Koppole	735	2600	126	84.1	15.9	369-14-5	740	1980	125	93.1	6.9	493- 1- 7	123- 3-2
Budampadu	728	2252	158	93.9	6.1	510- 4-9	717	2096	154	94.8	5.3	530- 8- 4	20- 3-7
1952-53													
Padakakani	779	2574	162	55.9	44.1	399-14-0	746	2110	147	66.5	33.4	456-12- 0	56-14-0
1953-54													
Parchoor	945	2915	132	89.0	11.0	371- 2-0	924	2399	119	86.1	13.8	451- 0- 0	79-14-0
Gollapudi	763	2243	141	85.2	14.7	465-10-0	741	1961	133	93.8	6.1	521- 3- 0	55 -9-0
1954-55													
Narukulla-padu	621	2780	157	71.3	28.8	707- 3-0	611	2540	147	79.7	20.3	745-14- 0	38-11-0
Average	802	2471	146	77.9	22.2	437- 7-4	781	2120	137	84.1	15.9	500- 3- 1	62-11-9

Photoperiodic Response in *Nicotiana Rustica*

By

ATAM SINGH and BAL MUKAND BATRA

Hookah Tobacco Research Sub-Station, Ferozepur (Punjab).

During the course of work at Ferozepur on the evolution of high yielding strains of *N. rustica*, it was observed that the late flowering types which were generally heavy yielders, were very shy in seed setting, presumably, on account of high temperature and low humidity during their flowering in the months of April and May. Seed setting is especially poor in years in which the hot season sets in earlier. This fact appears to offer a cogent explanation of the deterioration that has taken place in the yielding capacity of local *rustica* types due to natural selection for earliness having gone unabated for several years past. Inducement of the high yielding late types to flower earlier when the atmospheric temperature and humidity are favourable for seed setting is, therefore, a problem that merits serious consideration in the extension of such types. Since the duration of exposure to light plays an important role in the flowering of most plants, a study of the response of these *N. rustica* types to photo-periodic treatment was undertaken.

The intensive investigations of Garner and Allard, and of Tincker have resulted in the classification of plants into three groups, viz. (a) long day plants, (b) short day plants and (c) day neutral plants, according to their response to length of exposure to light. According to this classification, except for a few 'short day' strains of *N. Tabacum*, like Maryland and Mammoth, the response in the genus,

Nicotiana is believed to be 'day neutral', flowering readily whether days are long or short prior to flowering. Allard (1943), however, has shown that *Nicotiana gossei*, a species confined to Australia can be induced to early flowering by exposure to longer duration of light. The tendency of our high yielding *rustica* types to flower in April and May when, at the latitude of Ferozepur (30.5N°), days begin to get longer, gave an indication that they could, probably, be induced to flower in earlier months through exposure to longer duration of light by illumination during the nights. Accordingly, a small scale experiment was arranged on T. 218, a very high yielding but shy seed setting strain of *N. rustica* to see the effect of nocturnal illumination supplementing the duration of day light the average of which is 10.9, 11.8 and 12.9 hours per day at Ferozepur during the months of February, March and April respectively.

A number of seedlings were transplanted in eight G. I. pots filled with coarse sand. The nutrient solution consisted of 0.30 gms. of double Superphosphate, 0.36 gms. of Magnesium Sulphate, 0.20 gms. of Potassium Sulphate and 0.91 gms. of Potassium Nitrate per litre to which were also added a few drops of stock solution of trace elements containing 1.2 gms. of Ferric Chloride, 1.0 gms. of Copper Sulphate and 0.3 gms. each of Boric acid, Zinc Sulphate and Manganese Sulphate per litre. After the seedlings got established, only



Inducement of earlier flowering in *N. rustica* through illumination at night supplementing day light.

one healthy plant was retained in each pot taking care to see that the seedlings retained were more or less similar to one another in growth. Four of the pots received only day light while remaining four received, in addition to this quantum of day light, illumination from two fluorescent tubes of 40 watts each in an airy cabin (5'x4'x5') throughout the night for about 11 to 13 hours each night.

It was observed that the plants receiving additional light from illumination were more vigorous than the control plants

during the preflowering stage, presumably due to photo-synthetic activity going on even in the low intensity of the artificial light. They also flowered earlier by about 15 days than those receiving only day light as will be seen from the data given in the following table. This finding is of practical importance in seed production of the strain for its extension.

Table showing the response of *N. rustica* (T. 218) to illumination during the night in addition to day light.

Treatment	Plant No.	Date of starting (extra exposure)	Date of flowering (opening of 1st flower)	Days taken from establishment of the seedling to opening of 1st flower
Day light only	A	—	2-4-54	44
do	B	—	2-4-54	44
do	C	—	4-4-54	46
do	D	—	5-4-54	47
			Average	45
Day light supplemented with artificial light during the night.	A	18-2-54	16-3-54	27
do	B	"	19-3-54	30
do	C	"	19-3-54	30
do	D	"	20-3-54	31
			Average	30

SUMMARY

A heavy yielding but late flowering strain, T. 218 of *N. rustica* was induced

to early flowering with artificial light during the night supplementing day light. This finding is likely to be useful in producing seed for the extension of the strain.

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Management of Cheroot and Chewing Tobacco Nurseries

(Cigar & Cheroot Tobacco Research Station, Vedasandur, S. India)

Healthy and strong seedlings ensure good crop with high yield and quality. A plentiful supply of good seedlings at the time of planting is an important requirement in skilled tobacco cultivation. In the cheroot and chewing tobacco areas of Madurai district, failure of nurseries is very common. The chief causes are heavy seed rate of about 10 lbs per acre of nursery, direct flow irrigation of beds after sowing, lack of protection against heavy rains, high winds, hot sun and absence of control measures against 'damping off'. With due precautions however, nurseries can be very successfully raised in the district at economic cost. The methods recommended are briefly described below.

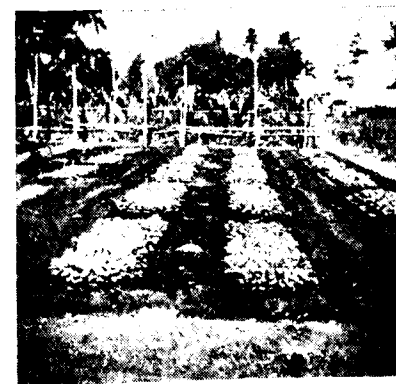


Fig 1.

Preparation of seed bed: The site of the bed should be slightly higher than the surrounding area so that it is well drained and is not liable to be flooded during heavy rains. A loamy soil is preferable. The site should be ploughed three or four times and

all stones and pebbles removed by hand. The land is then laid out into 6' strips with 2' irrigation channels in between. Each strip is divided across into 10' lengths. Within each 6'×10' section a bund 6" wide and then a channel of the same width are made. With the soil removed by digging the channel the remaining central area is raised by 2" to 3". The ultimate area of each bed is 4' by 8'. Fourteen beds of this size will make one cent of nursery and this area will give sufficient seedlings to plant about 2 acres in two pullings. As protection against the vagaries of weather it will be useful to sow a duplicate set of beds of the same area, a week later. A wind break of coconut leaves stuck upright is provided on the wind ward sides of the seed bed area.

Prophylactic treatments: It will be worthwhile to heap trash on seed beds and burn them immediately after the beds are made. This operation will destroy weed seeds and will also serve as a partial sterilization of soil and reduce seed bed diseases. Alternatively the use of fungicides like Bordeaux mixture or Perenox will also be helpful but against diseases only. The strength of Bordeaux mixture applied should be 1 : 1 : 25 i.e., 1 lb of freshly powdered quick lime + one pound of copper sulphate in 25 gallons of water. Concentration of 'Perenox' should be 4 ozs. in 10 gallons of water. Each bed should receive about 5 gallons of either 'Perenox' or Bordeaux mixture.

Seed bed manuring: Sieved farmyard manure at 400 lbs per cent should be applied and incorporated with the soil. Fertiliser mixture at the rate of 2 pounds sulphate of ammonia + 4 pounds superphosphate and 2 pounds of potassium sulphate per cent of nursery is then applied and mixed with soil. This manuring should be done after burning of trash, if trash burning were done. But, if Bordeaux mixture or Perenox is applied it will be better to manure before spraying.

Sowing: Seed is sown in the nursery 7 to 8 weeks before the transplanting date. One tola of well cleaned seed is enough for one cent of nursery. Seed should be mixed with ash or sieved sand to make up the bulk for uniform distribution. The normal time of sowing is 2nd fortnight of August for cigar tobacco and end of August for chewing tobacco. Sowing should be done evenly. After sowing, seed should be very lightly mixed with the soil with fingers. The bed should then be well



Fig. 2.

pressed with the feet or by rolling a hume pipe or wooden roller about 12" diameter. The bed should then be watered with rose

can. Covering of the beds with paddy straw will be very helpful for uniform germination. But in order to keep off white ants from the straw the beds should be sprayed with D. D. T. Guesarol 550, one ounce in 2½ gallons of water after sowing. Paddy straw should be removed immediately after germination is observed. A



Fig. 3.

thatch of paddy straw resting on 4" high cumbu or cholam stalks will be helpful after germination till the seedlings are a month old. This will prevent caking of the soil due to wind and hot sun and also minimise the beating effect of rain.

After care: For 10 days after sowing 7 or 8 light waterings with rose can will be needed daily. Later on 4 to 5 waterings will be sufficient. After that, when the seedling are one month old the beds can be flow-irrigated once a day. The thatch of paddy straw should be removed every morning so that the seedlings get sufficient sunlight and they should be replaced at noon. Seed beds should be weeded as often as necessary and all diseased and decayed seedlings removed. Seedlings should be thinned wherever they

are crowded and the seedlings removed can be replanted in other beds.



Fig. 4.

To prevent 'damping off' the beds should be sprayed with Bordeaux mixture or Perenox of the strength indicated above when the seedlings are three weeks old. Spraying should be repeated twice at intervals of 10 days. One or two sprayings of D.D.T. of the strength indicated above will reduce the incidence of insect pests. Handpicking of leaf caterpillars may be done, if necessary.

Pulling seedlings: Water should be withheld two or three days before transplanting in order to harden the seedlings. On the evening previous to pulling, the beds should be irrigated copiously. Immediately after pulling the seedlings in the morning, 1 to 2 ozs. of potassium or sodium nitrate in 2 gallons of water per bed will be very useful for improving the quality and the number of seedlings for subsequent pulling. After applying this fertilizer the leaves should be washed by giv-

ing another light irrigation with a rose can.

Bordeaux mixture: Dissolve 1 lb (40 tolas) of well powdered copper sulphate in 20 gallons (5 kerosene tin fulls) of water in an earthen pot. (Metal vessels of any type such as iron, brass, aluminium or tin should not be used). Prepare in another earthen pot lime solution by adding 1 lb. of freshly prepared quick lime to 5 gallons of water and dissolve till a uniform milky mixture is formed. It is essential that the freshly prepared quick lime should be used. Stocks will be of poor quality if made in poor quality Bordeaux mixture.

Pour copper sulphate into lime solution stirring well with a stick. Constant stirring is essential to prepare good quality Bordeaux mixture.* Twentyfive gallons of Bordeaux mixture are now ready for application.

Perenox: This is in powder form sold in packages of various sizes by the Imperial Chemical Industries. First prepare a paste of perenox by mixing half lb. (20 tolas) of the chemical with a small quantity of water. While preparing the paste stir the mixture well. After the paste is thoroughly prepared, add enough water to make up the volume of the fungicide to 20 gallons (5 kerosene tin fulls) for spraying.

Any further information required can be obtained from the Officer-in-charge, Cigar and Cheroot Tobacco Research Station, Vendasandur, District Madurai, S. Rly.

* Dip a clean bright blade of a knife in the mixture for about half a minute. If it appears rusty, add more lime solution to the mixture, and stir well. Repeat the test and continue adding lime until no rusty coating is seen on the blade.

Research Notes

VARIOUS ASPECTS OF TOBACCO VIRUSES

Seminar at the Central Tobacco Research Institute, Rajahmundry

The second seminar at the Institute was held on 16th July 1955 on 'Various aspects of tobacco viruses'. Dr. N. R. Bhat, the Director of the Institute presided. Initiating the seminar, he observed that the subject was of absorbing interest in view of the facts that (i) virus diseases were getting more and more serious in tobacco and satisfactory control measures were not available, (ii) in spite of the short period during which systematic research was being conducted on viruses, the subject has run into different channels, e.g., Physics, Biochemistry, Pathology. Serology, Genetics, etc., and (iii) viruses promised to provide an answer to the question as to what is the discriminant between the living and the non-living. He said that the Institute was vitally interested in their study from the point of diseases they cause to tobacco and control measures which can be devised against them.

Shri D. I. Mathrani, Plant Pathologist at the Institute who was the principal speaker dwelt in detail on the various aspects of tobacco viruses right from the definition of the word 'virus' upto the available methods of control. First, he gave an account of the stages through which the present understanding of the nature of viruses developed. He then gave a list of 22 known viruses on tobacco, 15 of which were typical of tobacco.

Dealing with the transmission and spread, Shri Mathrani stated that 16 of

them were mechanically transmitted. Leaf curl is known to be transmitted by the White Fly; cucumber mosaic by aphids as well as by sap; tomato spotted wilt by thrips and by sap; tobacco mosaic and necrosis through soils as well as sap; but none through tobacco seed.

He stated that the principal virus diseases of tobacco in India were Mosaic and Leaf Curl and described their internal and external symptoms. He also explained at length the properties of some important tobacco viruses in relation to their thermal death point, dilution end-point, particle size, host range and control. Shri Mathrani said that the easiest remedy to control tobacco mosaic was sanitation to prevent its contagious spread. For the control of leaf curl the extermination of the white fly was essential; but in practice this may not be possible. Co-operative removal of alternate hosts of the virus had a promise of reducing the disease. However, the surer remedy in both cases was the evolution of resistant varieties.

A discussion took place as to whether low topped crops of tobacco suffered less from mosaic. Shri Mathrani felt it likely because of the fact that younger tissues facilitated the multiplication and movement of viruses. He was in doubt as to how the leaf curl disease, for which the vector was the adult white fly having a life period of only 8 to 10 days, was transmitted to the succeeding crop if alternate host of the virus did not exist in two summer

months as reported. Dr. Philip said that the virus may be multiplying in the body of the white fly and carried forward through succeeding generations. Shri Mathrani stated that as reported the virus was not carried through eggs. Others expressed the possibilities of additional insect vectors and other crops like chillies or potatoes which may be active or silent carriers of infection.

Dr. N. S. Reddy felt that the so-called virus resistant varieties in the U.S.A. did not have satisfactory amount of resistance. Dr. Krishnamurty, the Cytologist, explained how the glutinosa resistance had been introduced into *Tabacum*.

Shri I. V. G. Krishnamurty stated that growers opined that plants affected by virus in early stages could recover in later stages of growth. This view was not generally supported. To a question about the longevity of the mosaic virus, Shri Mathrani informed that it would be persistent and infectious even after the leaf was cured, powdered and stored in bottle for years.

Dr. Bhat explained how it was difficult to be sure about the success in controlling the disease by controlling the vector transmitting virus diseases like the leaf curl.

Reviewing the position of breeding varieties resistant to virus diseases in general, Dr. Bhat informed that the task was rendered very difficult as the resistance to be aimed at, thinking in terms of only the host plant, should affect three fundamental phases, viz. (i) liability of the host plant to infection, (ii) its tolerance to virus multiplication within its body and (iii) its capacity for easy release of the virus to infect other plants. The Ambalema and Glutinosa resistances to tobacco mosaic developed by breeding involved only slight resistance in the first phase, and part or almost complete resistances in the latter two phases. Resistance in the first phase remained yet to be developed. Complete resistance had been found to be cumulative in its nature.

In the case of vector transmitted virus diseases, he said that there were further complications regarding the resistance of the host plant to the vector and the capacity of the virus to multiply in the vector's body and be transmitted to its future generations.

The seminar closed with some discussion on whether viruses could be considered as living organisms. It was generally felt that they were, in view of their containing ribonucleic acid which appeared to be responsible for their multiplication.

[P.T.O.]

ROOT-KNOT OF TOBACCO CAUSED BY MELIOIDOGYNE GOLDI

Root-knot, a disease fairly widespread in all types of tobacco, is so far reported in India to be caused by *Heterodera marioni* (Cornu) Goodey. Chitwood (1949) revised the name of *H. marioni* as *Meloidogyne Goldi* (1887) on the basis of its forms being non cyst formers in which class the female adults laid the eggs outside the cuticle in a sac of jelly-like material which frequently remains attached to the body wall. He further divided

the genus into species mainly by differentiation in perineal patterns of the adult female.

Recent examination by the writer of a few specimens of root-knots of tobacco infected with nematode revealed two species of *Meloidogyne*, *M. incognita acrita* Chitwood and *M. arenaria* Chitwood. The descriptions of the species are in conformity with those given by Taylor *et al* (2).

D. I. MATHRANI
Plant Pathological Laboratory,
Central Tobacco Research Institute,
Rajahmundry.

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Questions and Answers

PERTAINING TO CARE OF SEEDLINGS IN CIGARETTE TOBACCO NURSERY

- Q. We are usually getting heavy attack of 'damping off' in our nurseries of Virginia tobacco. The Institute has recommended Perenox and Bordeaux mixture for the control of the disease. Will you kindly inform me which of the two is better? If Perenox, from where to get it, and if Bordeaux mixture, how to prepare it?
- A. Both Perenox (4 oz.-10 gal.) and Bordeaux mixture (2-2-50) have been found to be equally satisfactory for controlling damping off. Perenox is much simpler to prepare as adequate quantity of Perenox is only to be mixed in water. It should usually be available from the agents of Imperial Chemical Industries (located in every important zone) and Office of any Agricultural Demonstrator of Andhra State Agricultural Department. Bordeaux mixture is a little cheaper. Its method of preparation is as follows: To prepare 25 gallons of Bordeaux mixture (2-2-50) do the following:— Dissolve 1 lb of well-powdered copper sulphate in 20 gallons (5 kerosene tins full) of water in an earthen or cement pot (*metallic vessel should not be used*). In another pot of 25-30 gal. capacity place 1 lb of freshly prepared quick lime. It is very important that the quick lime should be fresh. Add slowly 5 gallons of water to form a milky mixture. To the lime mixture add copper sulphate solution in small quantities and thoroughly stir the liquid till all the 20 gallons are poured. Now the mixture is ready for use.
- Q. When and how often to spray? Is it better to use higher concentration less number of times or vice versa?
- A. Spraying should ordinarily be commenced 3 weeks after sowing and subsequently be given at an interval of one week. In all, 3-4 sprayings should suffice. An additional spraying 2-3 days prior to sowing will be more helpful. In the areas and seasons of more frequent rain, more number of sprayings of less concentration will give good results. For instance at the farm of Central Tobacco Research Institute, Rajahmundry, East Godavari District, where the rainfall and heavy clayey soil are very favourable for the incidence of damping off, the experimental nursery has been successfully grown by giving 8-10 sprayings of Perenox at half the concentration, i. e. 2 oz. per 10 gals. The sprayings were given before, during and after the wet weather and not at any regular intervals.
- Q. Our seed beds are damaged by caterpillars. Sometimes the seedlings are found cut at the collar, and sometimes the leaves are found to be eaten. As a result the loss caused is heavy. Can you suggest any control measures?
- A. The caterpillars can be controlled by spraying D.D.T. 50% W.P. 1 lb of this powder may be mixed with 25 gals. of water and 10 gals. of this spray will be sufficient for 100 sq. yards. One lb costs only Rs. 2-8-0 and can be obtained from any local dealer or from Messrs. Geigy Insecticides, Ballard Estate, Fort, Bombay.

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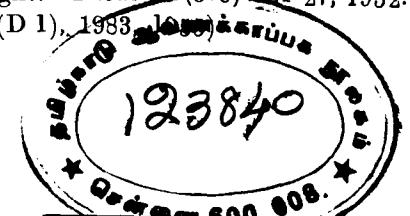
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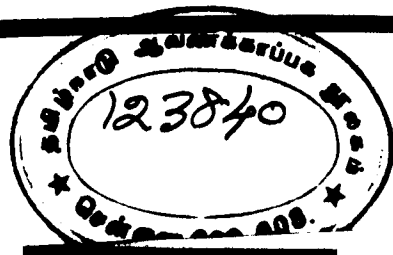
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OBITUARY

We announce with deep regret the passing away of Sri A. RAMASWAMI TEVAR, M.L.A., and a Member of the Indian Central Tobacco Committee, on 10th September, 1955. He represented the Cigar tobacco trade on the Committee from the date the Committee was constituted till 31st March, 1948 and the Cheroot tobacco trade from 1st April, 1955. During his term, he evinced keen interest in the problems of the tobacco trade and in the activities of the Committee.

May his soul rest in peace.



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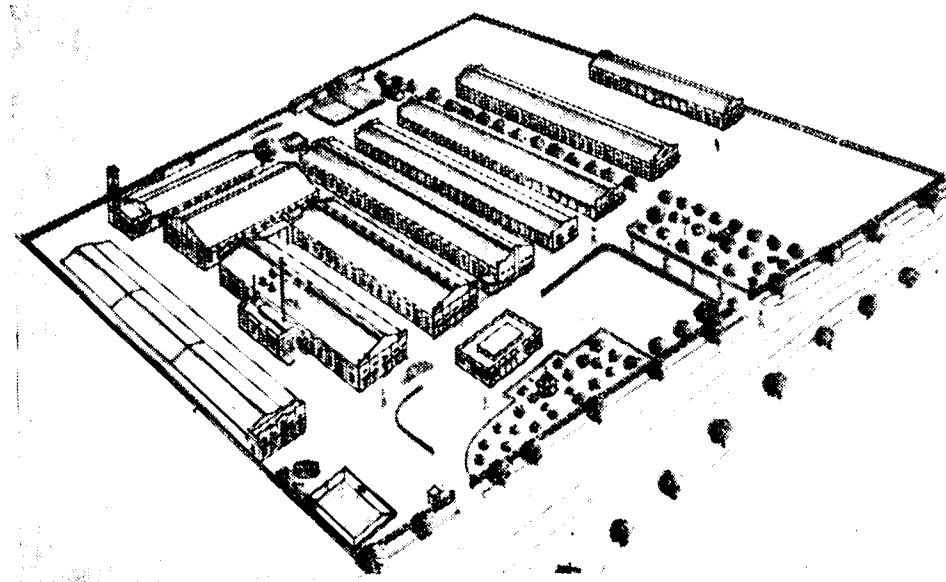
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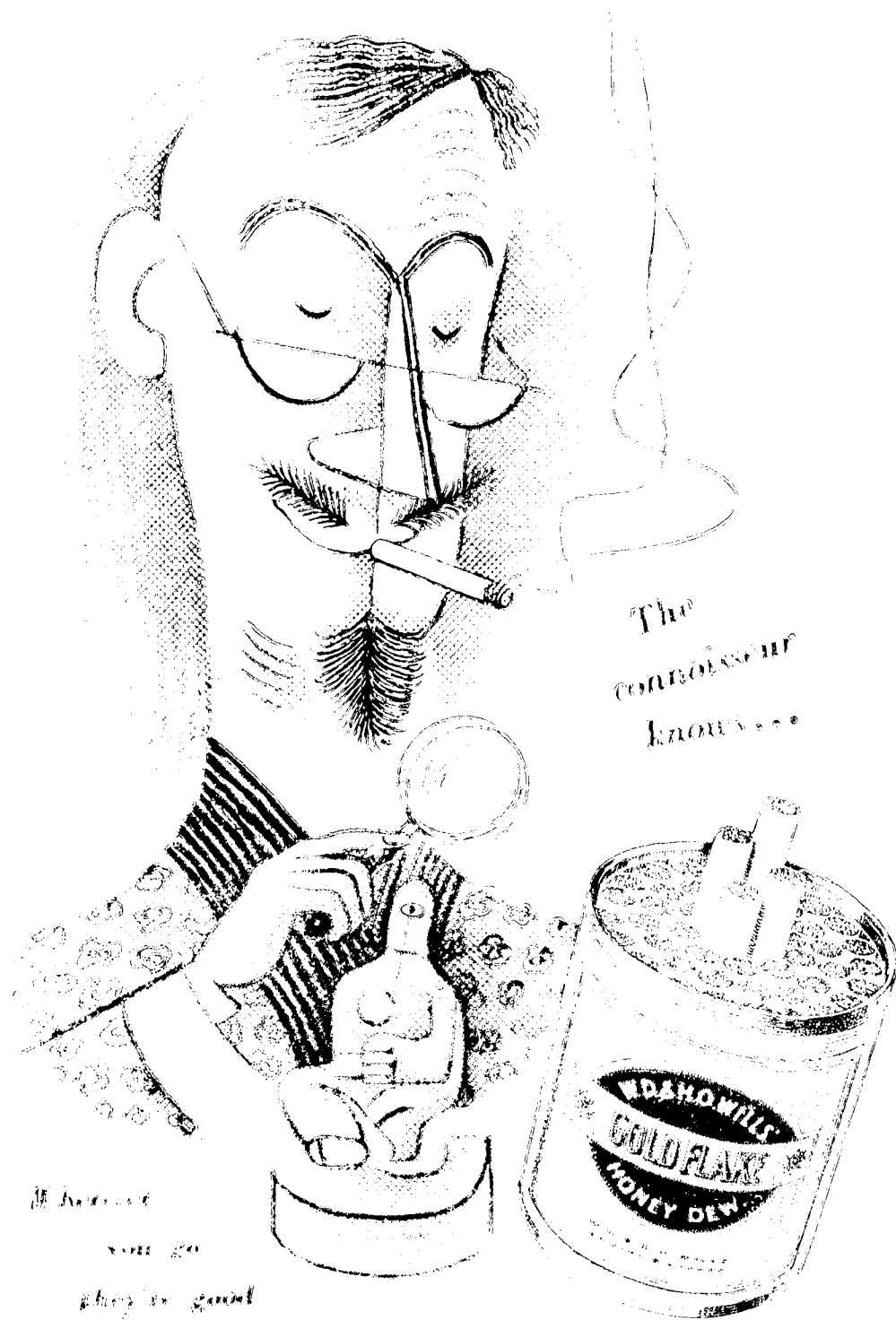
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