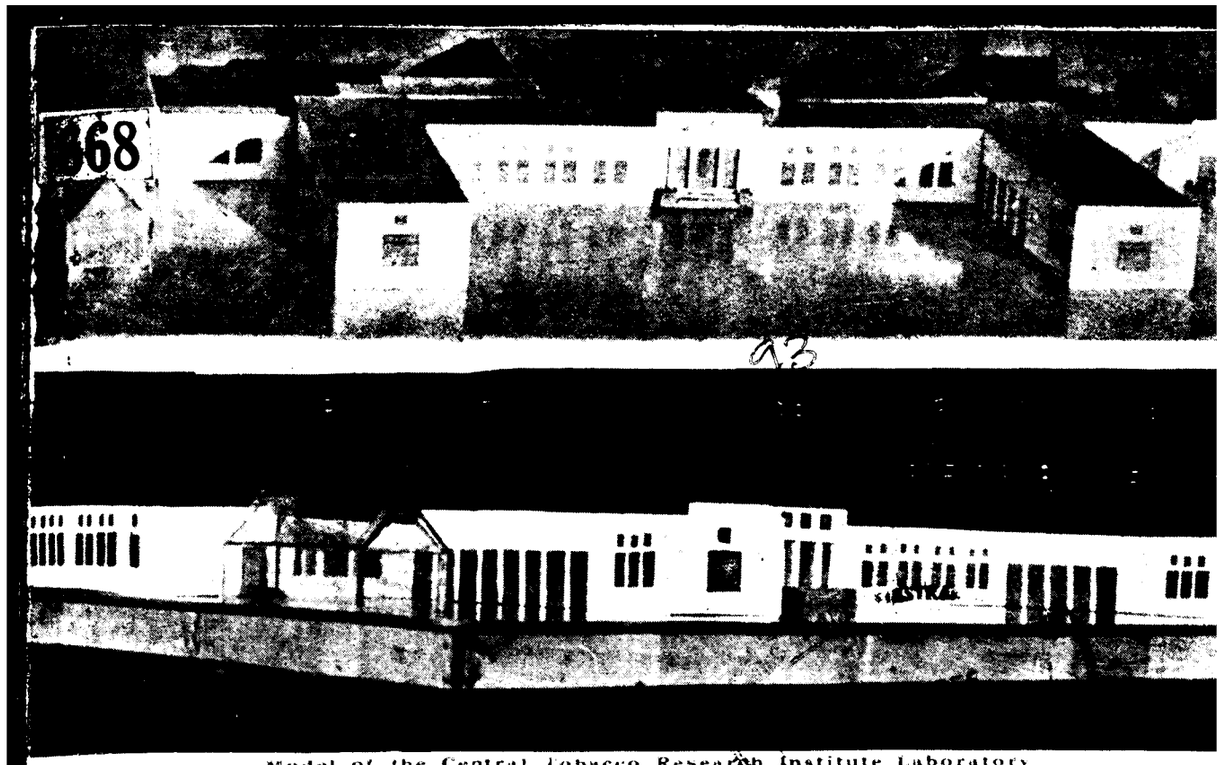
Indian Tobacco

Jan - Mar. 1955



Model of the Central Tobacco Research Institute Laboratory

INDIAN TOBACCO

QUARTERLY

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INDIAN CENTRAL TOBACCO COMMITTEE

(MINISTRY OF FOOD AND AGRICULTURE, GOVERNMENT OF INDIA)

MADRAS-8

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2. References to literature which must be restricted to the very few of importance, should be given in the text wherever possible in chronological order—only the names of authors and years of publication in brackets being given. They should be stated in full after the summary, authors' names following in alphabetical order, as under :—

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3. Information of a miscellaneous nature and of interest to the general public, facts, observations, etc. relating to TOBACCO are also received for publication.

4. Manuscript should be neatly typed with double spacing on one side of the paper only and with wide margin. Drawings, diagrams, etc. should be done in Indian ink. Coloured illustrations are not required.

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6. In addition to one copy of the Journal, in which their articles appear, 25 complimentary copies of the reprints of only the original articles will be supplied to their respective authors free of cost on request. If there are more than one author, these 25 copies will be distributed among them. Authors should intimate, while sending their articles for publication, whether they require their reprints. Additional copies of reprints can be supplied on payment at printer's cost price if intimation is given while sending the articles for publication

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Dr. Panjabrao S. Deshmukh Minister for Agriculture, Government of India laid the foundation stone of the C. T. R. I. Laboratory at Rajahmundry.

Laying of the Foundation Stone of the C.T.R.I. Laboratory at Rajahmundry

The foundation stone of the Central Tobacco Research Institute Laboratory was laid by Dr. Panjabrao S. Deshmukh, Minister for Agriculture, Govt. of India on the after-noon of Thursday the 20th January, 1955 in the presence of a large and distinguished gathering. The Laboratory Building* which will consist of nine halls and 41 rooms is estimated to cost about Rs, 5,90,000/-. The site where the building will be constructed measures 2,20,849 sq. ft. and the plinth area including basement works out to 30,000 sq. ft.

After prayer, Sri M. A. Parikh, the Vice-President of the Committee said in his welcome address:—

"On behalf of the Indian Central Tobacco Committee, I have very great pleasure in welcoming you all on this occasion.

"I am particularly happy in welcoming Dr. Panjabrao Deshmukh, the Union Minister for Agriculture, who has kindly agreed to come here to lay the Foundation Stone of the Laboratory buildings sparing a few hours of his very valuable time, in spite of his numerous pre-occupations and pressing engagements. This, he has done, I am sure, out of his keen interest for agriculture of which tobacco growing industry forms an important part. Dr. Deshmukh needs hardly any introduction, as you all know, he is in charge of the portfolio of agriculture which forms the mainstay of our country.

"His dynamic drive has been mainly responsible for increased production of various agricultural commodities by intensive application of scientific methods, an example of which is the Japanese method of paddy cultivation. He has also been instrumental in bringing about a closer contact between the scientific workers and the growers by reorganising the extension machinery.

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"We are indeed fortunate in having Dr. Deshmukh for laying the Foundation Stone of the Central Tobacco Research Institute Laboratory. His association with us on this occasion gives us hope and encouragement in pursuing our activities of the Indian Central Tobacco Committee with vigour and enthusiasm.

Dr. M. S. Patel, the Secretary of the Committee read the messages wishing the function success received from among others, Shri Chandulal Trivedi, Governor of Andhra, Shri Sri Prakasa, the Governor of Madras, Shri D. C: Kothari, the Sheriff of Madras, Shri P. D. Nair, Secretary, Indian Central Cotton Committee, Messrs. Davis and Nicholson of the Imperial Tobacco Company of India Ltd., Shri Kalidas Sawhney, the Agricultural Adviser to Community Project Administration, Shri B. C. Kundu, Director, Jute Agricultural Research Institute and Dr. B. S. Kadam, Director of Agriculture, Saurastra and formerly Director, Tobacco Research.

After this Dr. N. R. Bhat, Director, Tobacco Research presented the following report:—

*Two views of the model Laboratory Building appear on the cover of this issue.

Dr. P. S. Deshmukh (extreme right) being received at Godavary Rly. Station by Dr. M. S. Patel, Secretary, Indian Central Tobacco Committee. Dr. A. B. Nageswara Rao, Municipal Chairman is in the left.

"Economic importance of Tobacco to India needs no repetition as it is well known. The varieties grown are numerous and belong to both the cultivated species, *N. tabacum* and *N. rustica*. *Rustica* which is used for hookah, chewing and snuff is confined to north and north-eastern parts of India while *Tabacum* which is used for bidi, cigarette, chewing, cheroot, hookah and snuff predominates in the rest of the country.

"The areas of concentration of different types of tobacco are coastal Andhra with an area of 2,75,000 acres under Virginia and country tobaccos; North Gujerat and Nipani tracts in Bombay State growing bidi tobacco in about 1¼ and 1 lakh acres respectively; North Bengal and North Bihar each with areas of 40,000 acres under hookah and chewing tobaccos; Coimbatore in Madras growing mainly chewing and some cheroot tobaccos in about 30,000 acres. These regions form a variety of soil-climate complexes. There are numerous quality requirements such as colour, texture, body, flavour, hygroscopicity, aroma, strength, taste, burning capacity, colour of ash, etc. in the different types of tobaccos mentioned above, the development of which depends in turn on various factors such as soil, rainfall, temperature, humidity and day length, methods of curing, etc. and tremendously influence the quality of the final products. Such being the case, quality in tobacco is very elusive and, naturally therefore, the work of improvement of tobacco is very intricate and difficult. In fact, there is hardly an economic crop, whose problems approach those of tobacco in variety and complexity. The importance of research in this crop should, therefore, be evident.

"A short history of the research work done on tobacco in India may not be out of place here. A start in this direction was made first by the Indian Council of Agricultural Research at Pusa and two strains of cheroot tobacco and two of cigarette tobacco were evolved and recommended for large scale cultivation. Some experiments were conducted also in finding out the manurial requirements and in the eradication of Orobanche. The work done at Burirhat in Bengal resulted in the introduction of Rangpur Sumatra type of filler and wrapper tobaccos. The tobacco breeding work done in Charotar tract of the Bombay State resulted in higher yielding strains which have become very popular with growers.

"The most important development of tobacco cultivation since its introduction centuries back into this country was the introduction of Virginia tobacco in the Guntur district of Madras State (now in Andhra State), in the twenties, by the Indian Leaf Tobacco Development Co. Ltd., This company has done pioneer service to the development of this crop by their efficient organisation, business acumen, and help and advice to the growers. Great credit is due to them for making India an established producer and exporter of Virginia tobacco in the world market. The Department of Agriculture, Madras, followed up with research work, on "damping off" and trials of virginia varieties on several of the State farms.

"The establishment of the Indian Central Tobacco Committee towards the end of 1945 was a land mark in the development of tobacco research in this country. The Government of India constituted this Committee and set apart a non-lapsable grant of 10 lakhs of rupees for the improvement of the tobacco crop in the country. In pursuance of its objects the committee established the following research institutions,—

The Central Tobacco Research Institute, Rajahmundry — for economic research on Cigarette tobacco and Lanka tobacco, and for fundamental research on all tobaccos.

The Cigarette Tobacco Research Sub-Station, Guntur—for Cigarette and Natu tobaccos.

The Cigar and Cheroot Tobacco Research Station, Vedasandur — for chewing and cheroot tobaccos.

The Hookah and Chewing Tobacco Research Station, Pusa—for chewing and hookah tobaccos.

The Wrapper and Hookah Tobacco Research Station, Dinhata—for wrapper and hookah tobaccos.

Besides, the following schemes are working under subventions of the Committee:—

The Bidi Tobacco Research Sub-Station, Nipani—for bidi tobacco.

The Bidi Tobacco Research Scheme, Anand—for bidi tobacco.

The Hookah Tobacco Research Sub-Station, Ferozepore—for hookah tobacco.

"The important achievements of the Central Institute during the short span of its life are (1) the introduction of a better flue-cured variety, Chatham, to replace Harrison Special that supports the industry at present, (2) fixing the optimum requirement of nitrogen as 20 lbs per acre—for flue-cured tobacco in this area, (3) recommendation of judicious topping and irrigation of the crop to increase yield without deterioration of quality, the popular belief being that these practices are always injurious, (4) application of oil to suppress suckers, (5) evolution of a schedule of spraying Perenox or Bordeaux mixture to control 'damping off' in nurseries, (6) a better schedule of curing, which reduces the consumption of coal while increasing the percentage of bright grades; and a number of other minor recommendations on time of transplanting, spacing control of ground beetle and Orobanche, (8) a number of demonstrations on the improved method of flue-curing and the profit accruing therefrom has been given for three seasons at Guntur. A practical finding of this station is that *natu* tobacco could be topped with 18 to 20 leaves instead of 14 to 16 as done by cultivators—to increase yield without any effect on quality. Eight popular leaflets on the economic findings of the Institute have been issued for the use of farmers. During the last two years, the Institute has issued more than 1200 lbs. of pure seed to the growers and helped them with expert advice on a variety of subjects.

"The Institute has also initiated work in the fundamental sciences of Genetics, Cytology, Physiology, Entomology, Plant

Sri Mohanlal A. Parikh, the Vice-President, Indian Central Tobacco Committee welcoming Dr. Deshmukh and others.

Dr. Deshmukh addressing the meeting

Pathology, Soil Science and Agronomy. Over thirty scientific and technical papers have been published by the research workers on a variety of applied and fundamental subjects connected with tobacco. Nevertheless, the fundamental work has not gathered enough momentum for want of satisfactory laboratory facilities. As is well-known it is as futile to expect achievements in fundamental research without a well equipped laboratory as to expect dainty dishes to arrive at the table without a well furnished kitchen. In full recognition of this fact, the Indian Central Tobacco Committee provided for a full-fledged laboratory at the Institute and the buildings were designed by the Central Public Works Department as per expert advice of a committee of scientists as far back as in 1948. The construction of the buildings has remained to be undertaken to this day due to a variety of reasons, the chief of which was the financial difficulties of the Committee soon after the plans were finalised. However, it is a matter of great pleasure to us all that, after all, the day has dawned on which the foundation stone of the laboratory is being laid at the auspicious hands of Hon'ble Dr. Panjabrao S. Deshmukh, Minister for Agriculture in the Government of India.

"Today will indeed go as a red letter day in the history of the Institute and of tobacco research in India. I conclude with the hope that the laboratory be destined to attain a very speedy completion and begin functioning as a first class laboratory for solving both practical and theoretical problems in tobacco".

The Vice-President of the Committee Sri M. A. Parikh then garlanded Dr. Deshmukh who was requested by the Secretary Dr. M. S. Patel to lay the Foundation Stone. After laying the stone the Minister spoke. The following is the text of his speech :—

"Shri Parikh, Dr. Patel, Dr. Bhat, Ladies and Gentlemen,

"It gives me great pleasure to be here today on the occasion of laying the foundation stone of the Central Tobacco Research Institute Laboratory in this very ancient city of Rajahmundry, situated on the banks of the holy Godavari. The city has been the centre of Andhra culture for many generations, and it is in the fitness of things that it should also be the centre of research of the principal cash crop of the State.

"It is now recognized even by the man in the street that the progress of a country depends greatly on sound system of scientific investigations in the solution of the problems confronting it. This is particularly true in agriculture.

"India is primarily an agricultural country and one of the principal tobacco producing countries in the world, being third after the U.S.A. and China. Tobacco is a cash crop of very great importance to the Government from the point of view of revenue and to the trader and cultivator as a good source of income. In some parts it is the cultivators' leading cash crop and their mainstay.

It earned about 123 million rupees in foreign currencies in 1953-54 for the

nation forming the ninth important item of India's export merchandise and contributed 327 million rupees as excise revenue, besides those from cess, import duty and sales tax. It also provides employment for hundreds of thousands of workers in its industry.

"With the successful functioning of the Indian Central Cotton Committee and the invaluable benefits derived therefrom in the development of the cotton industry in India, the establishment of similar all-India Commodity Committees for the production and improvement of particular crops was recommended. The Govt. of India has, therefore since constituted Commodity Committees for Lac, Jute, Sugarcane, Coconut, Tobacco, Oilseeds, and Arecanut.

"With the imposition of a Central excise duty on tobacco in 1943, the Government of India set apart a sum of rupees ten lakhs per annum for the improvement in the production, development and marketing of this important cash crop. Pending formation of the Indian Central Tobacco Committee in November, 1945, this amount was placed at the disposal of the Indian Council of Agricultural Research, which administered it till then. The Committee draws up plans for comprehensive tobacco research, development and marketing on all India basis. It is a body representative of all the interests concerned with tobacco, viz., the grower, the trader, the co-operator, the nominees of the State Departments of Agriculture and concerned Central Ministries, which ensures the requisite co-ordination in the Committee's work. Further to give an effective voice to the grower, who matters most in the field of agricultural research and marketing, the Government of India are increasing representation to the growers on the Committee. The active association on a common forum, of all such important interests with the development of the Commodity has amply justified the creation of such Committees for each commodity.

"The main functions of the Commodity Committees comprise in the advancement in (*a*) agricultural, (*b*) technological and (*c*) economical development of the Commodity concerned. The advantages of a Commodity Committee lie in the fact that the Committee can devote its whole-hearted attention to the different agricultural and industrial problems of the commodity concerning the growers, traders, industrialists and the consumers in the country.

"Of the various States producing tobacco, Andhra occupies the pride of place since it accounts for almost the entire production of Virginia tobacco in India, which largely enters international markets. This State produced in 1953-54, 217 million lbs. out of 571 million lbs. of total Indian production. It is, therefore, in the fitness of things that this State should have the Central Tobacco Research Institute located within its borders at Rajahmundry and a Research station at Guntur. The headquarters of the Tobacco Grading Inspectorate is also located in Andhra. Science has helped man in almost all his undertakings. The part played by it in modern agriculture is now too well known to merit any special mention.

"In the Second Five-year Plan, it is proposed to strengthen and equip all the

Tobacco Research Stations, particularly this Institute, so that they could also serve as extension and training centres in tobacco production. It will be no exaggeration to mention here that this Central Research Institute will be one of the biggest research centres on tobacco in Asia. The laboratory buildings for the Institute when completed and equipped will provide additional opportunity to the research worker to further concentrate on various problems facing the tobacco grower. I would suggest, therefore, that those who are connected with tobacco research work will make full use of the opportunities now given to them to produce practical results of lasting benefit to the primary producer.

"It is my fervent hope that from the laboratory of which, I have great pleasure in laying the foundation stone, will flow results of research which will enable the cultivator to produce tobacco of high quality with higher yields and thereby obtain a better margin of return for his produce to give him a higher standard of living, the country to earn more revenue and foreign exchange and the trade to find easy markets for tobacco thus benefitting our great nation".

In the end, Dr. Deshmukh expressed his thanks for the excellent arrangements made for the function. He particularly thanked Sri Parikh for taking active interest as Vice-President of the Committee in the development of Committee's activities and wished the Institute and the Indian Central Tobacco Committee godspeed in its activities.

After vote of thanks by Shri A. Aka, Member, Indian Central Tobacco Committee, the function terminated with the singing of the National Anthem.

At the pot experiments

At the entomological plots

Earlier, Dr, Deshmukh went round the Institute farm and the exhibition held on the occasion. He expressed satisfaction at the work and emphasized the importance of carrying the results of research to the doors of the growers through effective demonstration and propaganda. He visualised the possibilities of developing cottage industry of extracting oil from tobacco seed as the oil was suitable as a drying oil for varnishes and paints and was also edible and the cake was a nutritious food for cattle.

Chemical Aspects of Leaf Burn in Cigar Tobacco*

K. G. Tejwani †

The quality factors in cigar tobacco are size, shape, soundness, colour, body, texture, burning quality etc. of the leaf. The burning quality of the leaf is of prime importance; hence, considerable research has been and is being done to investigate the factors which influence it.

Burning quality is usually defined as the length of time for which a tobacco leaf will continue to burn or glow without a free flame and coaling and retain fire after it has been ignited at at emperature just sufficient to start combustion in a small area. The burning quality of the leaf has profound influence on such important quality factors as fire-holding capacity, the rate, evenness and completeness of the burn, aroma, and flavour of the cigar and the colour and character of the resulting ash. A manufacturer usually tests the burning quality of the leaf on the spot by igniting the leaf with a match or the burning tip of a cigarette or a cigar. The apparatus used for the test in the laboratory has been devised with a view to maintain a uniform temperature and area of ignition.

In the ultimate analysis it is the inherent chemical composition and physical properties of the leaf as influenced by the soil, climate and cultural practices which determine the burning quality of the leaf. It is therefore essential to know the role played by various plant constituents and nutrients in promoting or retarding the burn of the leaf and also the factors which contribute to their variation.

Chemical composition of the leaf :

The chemical constituents of the cigar leaf are both inorganic and organic. The inorganic constituents comprise calcium, magnesium, potassium, sodium, nitrogen, phosphorus, sulphur, chlorine, silicon and trace elements e.g., boron, iron, manganese, copper, zinc, barium, lithium, iodine, etc.

Role of inorganic constituents :

Of the various mineral elements found in tobacco leaf, potassium is reported to be more important for promoting the burn of the leaf than any other element.

* Numerous enquiries are received by the Central Tobacco Research Institute and its stations regarding the factors influencing and the methods of improving the burning quality of cigarette and cigar tobaccos. This short review has been written to high-light the factors influencing the burn of cigar leaf. Work for improving the burn of cigarette and cigar tobaccos is in progress at the Central Tobacco Research Institute, Rajahmundry and Cigar & Cheroot Tobacco Research Station, Vedasandur, respectively.

‡ Pedologist at the *Central Tobacco Research Institute, Rajahmundry* and formerly Chemist at the Cigar and Cheroot Tobacco Research Station, Vedasandur.

It is now over 90 years since Schloesing (20)* in Germany first reported the favourable influence of potassium on the burn of tobacco leaf. Subsequent investigations of a large number of workers have confirmed this finding. The beneficial effect of potassium on the burning of tobacco leaf can be easily demonstrated. If a cured leaf of good burning quality is leached with water for 24 hours, dried and ignited, it will not hold fire and glow but will burn with a flame like paper. The lost glowing capacity can be restored to the leached leaf by soaking it in 1% solution of potassium carbonate or citrate. In general, it may be said that the larger the potassium content the better will be the burn. It is believed that potassium acts as a mineral catalyst in promoting the burn of tobacco leaf. At the burning the temperature of 700–900°C, the potassium salts give up their oxygen to oxidize the carbon. Since the salts of potassium are distributed throughout the leaf structure the oxygen released internally near the burning carbon is more effective than the atmospheric oxygen. The potassium which has thus been reduced to metallic state is at once burned to oxide which again releases oxygen for further burning of carbon. The potassium acts as oxygen carrier and a catalyst. On the other hand, it is known that all the potassium salts do not exert favourable influence on leaf burn. *Anderson et al.*, (3) by soaking the leached leaves with various concentrations of potassium salts concluded that all salts of potassium, at least at certain concentrations, improved the burn of the leaf. They observed that at the lower concentrations of potassium sulphate the burning of the leaf was poor and it improved considerably as the concentrations increased which they suggested was due to the increasing quantity of oxygen being supplied for combustion by increasing concentration of sulphate radical. However, under natural conditions, they were of the opinion, that such concentration of potassium sulphate would never occur. Most of the workers consider sulphate as harmful for the burning quality of the leaf. Phosphates of potassium in general are reported to be unfavourable to the leaf burn.

Of all the acid radicals chlorine is considered to be the most injurious for the leaf burn. Chlorine as such is not any more harmful than the sulphate or phosphate radicals but its deleterious effects arise due to the ability of the tobacco plant to absorb and build up large quantities of this element in the tissue if the supplies are available to the plant. Johnson and Ogden (14) reported 5·6% chlorine in the tobacco leaf from a plot receiving 1,000 pounds of 2–10–8 fertiliser annually for 9 years with all the potassium in the form of chloride. It is believed that chlorine content of 1% or more in the leaf is definitely harmful to the leaf burn while Johnson and associates (18) were of the opinion that chlorine content of over 0·5% in the leaf adversely affected the leaf burn of Wisconsin tobaccos. It is well established that the higher the chlorine content of the leaf the poorer is the burn. It has also been shown that the deleterious effects of excess chlorine can be overcome by increasing the potassium content of the leaf, in other words the burn

* Figures in parenthesis refer to the literature cited.

of tobacco leaf depends on the relative potassium and chlorine contents of the leaf. As early as in 1889, Nessler (19) suggested that for successful burning of the leaf the ratio K_2O : Cl should not be less than 5 or 6 : 1. Thus, greater the chlorine content of the leaf greater will be the quantity of potassium required to neutralise its ill effects.

It was first believed that it were the nitrates particularly potassium nitrate which favoured successful burn of the leaf. However, it was shown as early as in 1860 (20) that this was not the case. It is now accepted that nitrate in small quantities promotes burn but when present in large quanties the leaf burn is accompanied by small though audible explosions and spluttering. The combustion is incomplete and the ash is dark (9). Johnson and associates (18) were of the opinion that calcium and magnesium when present in large quantities, particularly in combination with sulphate, phosphate and chloride radicals are harmful to the leaf burn. Since calcium and magnesium form insoluble salts with sulphate and phosphate anions it may be expected that most of calcium and magnesium in the leaf tissue will be in combination with these anions. Therefore excessive quantities of calcium and magnesium in the tobacco leaf are undesirable. One way of keeping the calcium and magnesium content of the leaf low is by increasing the potassium content of the leaf. It is now recognised that potassium, calcium, magnesium and sodium can replace each other to a considerable extent in plants without interfering with the growth. Stewart (22) noted that potassium content of ladino clover could be varied between 2 to 4% without materially affecting the yield while Bear (6) observed that potassium content of alfalfa could be varied between 1 to 3% without affecting the yield and that as the potassium content increased Ca+Mg+Na content decreased. It has been shown in plant chemistry that chemical reactions take place in equivalent proportions, (7, 21, 27) and that under uniform environmental conditions the summation of Ca+Mg+Na+K contents expressed as equivalents tends to be constant. It follows that if the concentration of any one element is increased, all other things being equal, the concentration of other element or elements will decrease. Anderson and associates (3) have reported some data which indicate the same relationship for cigar tobacco (*vide* Table 1. on the next page.)

It may be mentioned that sodium values were not reported and their absence may be responsible for the slight variations observed in Table 1. However the general trend is quite clear namely, as the potassium content of tobacco leaf is increased, there occurs a corresponding, almost equivalent, decrease in Ca+Mg content.

Very little work has been reported with regard to the influence of trace elements on the burning quality of cigar tobacco, Halley and Olson (11) suggest the possibility of iron having something to do with the leaf burn while Swanback (24) noted that an application of 20 lbs of copper sulphate increased the yield and improved the burning quality of the leaf. The exact mechanism of the beneficial effect of copper sulphate application on the burning quality is not understood.

TABLE I

K, Ca and Mg content of cured leaves of tobacco expressed as milli-equivalent per 100 gm (m.e. percent) air dry material.*

K20 applied per acre (in lbs.)	K	M.e. percent Ca	M.e. percent Mg	Total (K + Ca + Mg)	Ca + Mg	Increase in K	Decrease in Ca + Mg
Expt. 1							
40	86.5	292.5	46·5	425·5	339.0	—	—
100	118.0	240.5	30.7	389.2	271.2	31.5	67.8
200	142.2	210.0	34·2	386.4	244.2	24.2	27.0
Expt. 2							
40	126.4	270.5	46·0	442·9	316·5	—	—
100	148.4	241·0	39.1	428·5	280.1	22 0	36·4
200	169·4	223·5	39·6	432.5	263·1	21·0	17·0
300	174·5	215·0	36·6	426·1	251·6	5·1	11·5

% K_2O × 21·22 = m.e. per cent K
% CaO × 35·71 = do. Ca
% MgO × 49·52 = do. Mg

Role of organic constituents :

The organic constituents of tobacco leaf comprise nitrogenous compounds, organic acids, carbohydrates, polyphenols, chlorophyll and other pigments, ethereal oils, resins, wax and enzymes.

Organic nitrogenous compounds comprise proteins and their decomposition products, nicotine and related alkaloids e.g., nornicotine. Very little work has been done to isolate and identify specific proteins though it is generally believed that these forms of nitrogen have an unfavourable influence on the leaf burn (2, 10).

Vickery and Pucher (28) established the presence of malic, citric, fumaric. succinic, oxalic etc., acids in the tobacco leaf, malic acid being present in the largest quantity (about 85%). It has been shown (3) that malate, citrate, acetate, oxalate and carbonate radicals in combination with potassium have beneficial effect on the leaf burn. The work of Halley, Nasset and Olson (12) suggests a positive correlation between the fire holding capacity and the organic acid content. If the catalytic behaviour of potassium referred to earlier is accepted, the beneficial effect of the organic acids can be easily explained. Potassium salts of these acids on combustion will be converted to carbonate and then to potassium oxide which will easily release its oxygen for oxidation of carbon. On the other hand phosphates cannot be reduced easily and chlorides have no oxygen to give off; hence these radicals are injurious to leaf burn.

* Data calculated and reset by the author from the original values reported by Anderson et. al., (3) as percentages of K20, CaO and MgO.

It is believed that soluble carbohydrates probably have unfavourable influence on the burn. Very little information is available about the effect of other organic constituents e.g., polyphenols, ethereal oils, resins, wax, enzymes etc., on the burning qualities of the leaf. Garner (9) considered that the variations in these constituents were too small to influence the leaf burn significantly.

Physical properties of the leaf :

Barth (5) and Behrens (8) suggested that thick, heavy leaves with firm texture due to close cell packing will have poor burn since there will be less air spaces between the cells and consequently poor aeration during the burning of the leaf. Johnson and associates (18) on the other hand noted that, if at all there was any influence of leaf thickness on the leaf burn, the thicker leaves burnt slightly better than thinner leaves. The microscopic study of the leaf structure indicated that the good burning leaf had a loose open structure which was likely to promote burn by better aeration. Thus it would appear that it is the availability of oxygen for combustion as influenced by structure which influences the leaf burn. However, Johnson and associates were of the opinion that the chemical constituents of the leaf rather than the leaf structure are more important for burning quality.

Factors influencing the physical and chemical composition as related to the burning qualities of cigar tobacco :

The physical and chemical composition of the tobacco leaf are affected by soil and climatic factors, leaf position on the plant, cultural practices and methods of curing and fermentation. All these factors are not mutually exclusive in their effects and operate simultaneously. The only factor which can be easily controlled is the nutrient status of the soil.

Climatic factors :

Amongst the climatic factors rainfall is perhaps the most important factor influencing the leaf burn. Inadequacy of soil moisture caused by low rainfall is reported (1, 3, 18) to influence leaf burn adversely while heavy rainfall tends to be favourable. This may be due to the fact that the potassium content of the leaf during seasons of heavy rainfall is higher than that during seasons of low rainfall (2, 12) while the reverse is the case with chlorine (15) and nitrogen (4) contents. It has also been shown that high temperature and low humidity during the active growing period are injurious to leaf burn (18).

Soil properties :

It is well known that in the tobacco growing areas certain gardens are noted for producing consistently tobacco of high quality while others which are situated nearby do not enjoy equally good reputation. These differences can generally be attributed to differences in soil properties but how they exert their influence on the quality of tobacco is not clear.

Generally, light soils are preferred to heavy clay soils for production of cigar tobacco. Johnson & Ogden (15) reported

that the Northern Wisconsin soils which have lower clay content than the Southern Wisconsin Soils produce better quality tobacco. It is not the clay as such which is harmful to the leaf but probably it is the nature and quantity of the clay mineral or minerals in the soil which determine the burning quality of the leaf. Montmorillonite and illite clay minerals fix potassium and make it unavailable to the plants while the same is not true of kaolinite. It is therefore obvious that if the soils contain montmorillonitic and illitic clays in large quantities the tobacco plant will not obtain enough potassium necessary for a successful burn. Johnson and Ogden (15) also considered that the greater the clay content the greater is the chlorine content of the soil. They were of the opinion that if the soil contains 20 lbs or more of chlorine per acre the leaf burn will be adversely affected.

Moderate quantity of organic matter will make potassium easily available to the crop but in large quantity it may supply excess nitrogen to the crop which may be detrimental to the leaf burn.

Good quality tobacco is obtained from soils which have medium to strong acidic reaction. Soils as acid as pH 5.0 are not known to be harmful to tobacco. The beneficial effects of low pH value may be due to two reasons. Firstly, acidic soils fix less potassium and secondly calcium and magnesium will be present in comparatively small quantities. On the other hand in the alkaline and calcareous soils potassium is usually available with difficulty while calcium and magnesium are absorbed in such large quantities (23) as to be harmful to the leaf burn (17, 18).

Manures & Fertilisers :

Cigar tobacco is almost invariably fertilised with one or the other potassic fertilisers since it is a potassium hungry crop and removes large quantities of potassium (150-200 pounds K_2O per acre) from the soil. It has been established beyond doubt that, even though the potassium supplying power of potassium chloride (muriate of potash) is the same as that of potassium sulphate, the former is definitely injurious to the leaf burn since it enables the crop to absorb and build up large quantities of chlorine in the leaf (14, 16, 17). The adverse effects of potassium chloride application on leaf burn have been in evidence even three years after its application (17). Anderson et al. (3) observed that sulphate, carbonate and nitrate of potash and tobacco stems were equally effective in improving the leaf burn. There were indications that potassium carbonate was slightly superior to the rest while potassium sulphate tended to slightly impair the burn. They further noted that the plants receiving potassium sulphate contained more inorganic sulphur (sulphate) than the plants receiving potassium carbonate and concluded that the excess inorganic sulphur in the leaf tissue was harmful to the leaf burn. It is however fortunate that the capacity of the tobacco plant to absorb sulphur (unlike that for absorbing chlorine) is very limited. As it is found that commercial potassium sulphate contains about 2% chlorine it should be

obvious that even this fertiliser should be used judiciously.

Cigar tobacco also receives considerably large applications of nitrogenous fertilisers. Organic cakes of various types alone or in combination with inorganics are considered desirable for successful tobacco culture. Swanback (26) has reported that on Connecticut soils sulphate of ammonia was injurious to leaf burn. Among the animal manures farm yard manure and poultry manure (25) are quite rich in chlorine. In order to obtain successful leaf burn, they should be used carefully, preferably in combination with inorganic nitrogenous fertilisers.

Cigar tobacco does not need phosporous in large quantities (it removes about 15 pounds of phosphoric acid per acre). Superphosphate is the usual source of this element. It is desirable not to apply too large quantities of this fertiliser material since it contains large quantities of calcium and sulphate which are likely to injure the leaf burn (15).

Leaf position on the plant :

It has been reported (18) that in general the duration of the burn decreases gradually from the tip of the leaf to the base of the leaf. This behaviour is attributed to the variations in the potassium and chlorine contents of various parts of the leaf since the tip of the leaf is usually richer in potassium while the base of the leaf richer in chlorine than any other part of the leaf.

It has been observed that in general the duration of the burn decreases gradually from the bottom leaves to the top leaves (18). This may be attributed to the variations in the physical properties and chemical composition of the leaves according to their position on the stalk. Bottom leaves are more mature, thinner and drier and contain relatively less total nitrogen, protein, nicotine and ammonia (10, 13) than the top leaves, a trend which will favour better burn of the bottom leaves. On the other hand, the bottom leaves contain less potassium and more calcium and magnesium than the top leaves. This will tend to impair the burn of the former. However, it seems that the chemical composition and physical properties of the bottom leaves are more favourable to the leaf burn than those of the top leaves.

Not much work has been done to determine the influence of varieties, curing conditions, aging etc. on the leaf burn though Johnson and associates (18) from a few observations on Wisconsin tobaccos have indicated that these factors have very little influence on the leaf burn.

Acknowledgements

The author wishes to express his thanks to Dr. N. R. Bhat, Director, Tobacco Research, Central Tobacco Research Institute, Rajahmundry for going through the manuscript and suggesting suitable modifications in the text.

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Germination of Stored Tobacco Seed

By

N. A. PATIL,

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The carrying over of seed from year to year becomes essential for breeding and genetic experiments at research stations, for comparing the performance of parents, F_1 hybrids, selections and cultures under uniform conditions in the same season. For successful comparisons it is necessary that the stored seed should retain satisfactory germinability. Garner (1951) observes that "under proper storage conditions the seed will retain their viability for 10 or 15 years." The remark refers firstly to the flue-cured Virginia tobacco which is grown in the United States of America and secondly to seed which is stored properly, i.e., inferentially, under cool and dry conditions.

With a view to find out the retention of viability of seed stored under ordinary conditions, tests have been carried out in the past at the Tobacco Breeding Station, Nipani. The dried seed was stored in phials which were closed airtight with rubber corks. Seed of two bidi tobacco cultures, viz., 20–2 and 12–5 and two flue-cured Virginia varieties, viz., Harrison Special and Bonanza, were used for the tests. Tests for germination were taken immediately before storing seed and in every successive year. Unfortunately, the time of tests has varied during the period of the experiment. During the first two years the tests were carried out in the months of December-January and in the

Serial No.	Variety	Year	Date of sowing	Germination %	Remarks
1	S20–2	1947–48	9– 1–47	90	
		1948–49	6–12–48	87	
		1949–50	25– 5–49	93	
		1950–51	17– 5–50	37	
		1951–52	21– 4–51	1	
2	S12–5	1947–48	27– 1–47	88	
		1948–49	18–12–48	85	
		1949–50	27– 5–49	91	
		1950–51	31– 5–50	50	
		1951–52	2– 5–51	4	
3	Harrison Special	1947–48	9– 1–47	92	
		1948–49	20–12–48	95	
		1949–50	14– 6–49	83	
		1950–51	18– 5–50	78	
		1951–52	10– 5–51	8	
4	Bonanza	1947–48	19– 2–47	94	
		1948–49	6– 1–49	90	
		1949–50	14– 6–49	85	
		1950–51	19– 5–50	64	
		1951–52	9– 5–51	7	

later three years during May–June which is the normal sowing time for tobacco. In spite of this serious defect in the experiment the data available are useful in giving an idea as to how long the seed could be stored either by the experimental stations or by the farmer, in sealed bottles under the prevalent conditions of temperature and humidity. The seed of each culture or variety was stored in 5 phials and each germination test was made on two lots drawn from each phial. The data are presented in the table on prepage.

From the data presented, it will be firstly seen that the seed could retain its germinability satisfactorily upto about three years. In the fourth year, there was a heavy reduction in the percentage of germination in the seed of bidi tobacco, and the seed failed to germinate almost entirely in the fifth year. An indication is also available that the seeds of flue-cured Virginia tobacco varieties retain their viability better than the seeds of bidi tobacco varieties during the first four years, though the percentage of their germination is negligible in the fifth year. As should be expected, the germination percentage was less in tests conducted in the winter months of December-January as against the months of May—June which are the months in which tobacco is usually sown.

An observation in all the years was that more than 90 per cent. of the germination was during the 4th and 5th days after sowing.

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WELCOME

The following persons have been recently nominated or renominated as members of the Indian Central Tobacco Committee :

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Control of "Damping off"

(Central Tobacco Research Institute, Rajahmundry)

Every tobacco grower is well aware of the serious havoc caused by "damping off" which is the most important disease of tobacco seedlings.

Fig. 1. Note the blank beds resulting from complete destruction of seedlings by "damping off" where no fungicide was applied.

Symptoms :

The collapse of tiny seedlings after the germination is the characteristic sign of the attack of this disease. (Fig. 2.) The disease may progress very rapidly resulting in very thin stands within two or three days. Dead seedlings show small constriction on the stem just above the soil level. Patches of affected seedlings with yellowish leaves and stunted appearance are not uncommon in seed-beds when the seedlings are in the second pair of leaves. As the seedlings grow to third pair of leaves the disease takes the form of a wet rot, involving the leaves and stems. All the diseased plants may either rot away or dry up depending on weather conditions.

Fig. 2. A "damping off" patch in the centre of healthy seedlings.

Cause :

The disease is caused by certain species of soil inhabiting pathogene known as *Pythium*.

Conditions that promote the disease :

The causal organism lives in the soil where it thrives and spreads very rapidly during periods of warm rainy days. Generally the disease is seen to take severe form if it is warm after rains. In clayey or heavy soils, which are not sufficiently porous, the disease causes much damage. Thickly sown beds with overcrowded stand also help promote the spread of the disease.

Control :

The disease can be prevented satisfactorily by taking sufficient precautionary measures in time. The first task is to prepare seed beds properly. This can be achieved by following the instructions given in the following pages.

1. The soil for tobacco nursery should be sufficiently porous for adequate drainage. Clayey soils can be improved by mixing 50 tons of fine river sand per acre of nursey, on the surface soil. Raised beds, 4 to 6 inches high, also ensure drainage. Channels for drainage should be provided between beds to enable free flow of excess water away from the nursey area. (Fig. 3.) Such drains should not be led into fields intended for transplanting tobacco.

Fig. 3. A well laid-out nursery.

2. Burning seed-beds before sowing is a desirable practice to suppress weeds and to some extent nursery diseases. Any trash that burns slowly is good enough. Burning should be done when the beds are neither too damp nor too dry. The beds should be thoroughly worked before sowing and unburnt trash removed. Sowing should not be delayed too long after burning seed-beds.

3. Changing the site of nursery, wherever possible, every year will reduce seed-bed diseases.

4. Sow good seeds at the rate of 2½ lbs. per acre or 1 tola (one levelled match-box full) per cent of nurey. Heavy seeding produces overcrowding and results in weaker transplants.

5. The seed should be mixed with either sifted sand or ash and spread by hand as evenly as possible for proper distribution. Sowing the beds twice, using half the seed rate for each sowing, will ensure uniform distribution of seeds.

6. Watering is one of the most important operations in raising a successful nursey. Surface desiccation in early stages of the nursery will lead to patched and uneven stand. Rose cans with fine holes are preferable for watering the nursery as pot watering is likely to displace and collect the germinating seeds in patches. Excess watering is also harmful as very damp beds promote "damping off".

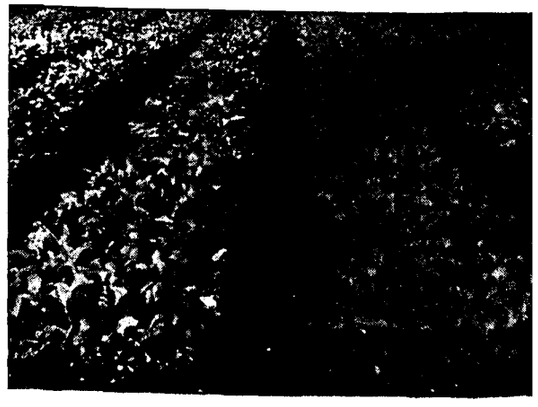

Fig. 4. Seedlings ready for transplanting. Note uniform and vigorous growth of seedlings.

7. In addition to the preparation of seed-beds properly, it is important to use correctly made fungicides to control the disease effectively. At present two fungicides, Bordeaux mixture and Perenox are in general use. However, many farmers prepare Bordeaux mixture in haphazard manner. Use of such mixture is not effective. Follow carefully the suggestions given below:

(a) 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. (Metel 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 to use freshly prepared quick lime. Lime from old stocks will be of poor quality and will result in poor quality Bordeaux mixture.

Pour copper sulphate solution *slowly* into lime solution stirring well all the time with a stick. Constant stirring is essential to prepare good quality Bordeaux mixture*. 25 gallons of Bordeaux mixture are now ready for application.

(b) Perenox:

This is in powder form and is 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.

(c) Spraying Schedule:

(i) The first application should be done three weeks after sowing or earlier if there are signs of the disease.

(ii) The second and third applications should be done at weekly intervals if there are no heavy rains. When there is continuous rain and cloudy weather the intervals should be reduced to five days or even less.

Fig. 5. The fungicides can be applied with a rose can.

(iii) Further applications will be necessary only if the weather continues to be wet and cloudy.

* Dip a clean bright blade of a knife in the mixture for about ½ 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.

(iv) Approximately six gallons of the spray for 100 sq. ft. is sufficient but this will depend upon the nature of the soil and its moisture content at the time of spraying. The spray will be easily absorbed and leached out during rainy days; hence the number of sprayings may have to be increased to once in four days or even to three days.

N.B.:—Both the chemicals have a slight stunting effect on the seedlings specially in the sandy nurseries. Hence concentration of chemicals should not exceed the recommended strength.

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Manuring, Transplanting and Care of Virginia Tobacco

(Central Tobacco Research Institute, Rajahmundry)

Manuring:

The main problem of manuring flue-cured Virginia tobacco in the heavy black soils of Northern Circars is to improve the physical condition of the soil and at the same time to keep low the nitrogen status of the land so that it will produce tobacco of light green leaf.

For improving physical condition of the soil, application of farmyard manure is essential. Apply about 6 cart loads of farmyard manure per acre in the beginning of monsoon and plough it in. But if your lands tend to produce darker green leaf farm-yard manure may be applied in alternate years.

Farmers may try green manuring with maize. Maize should be sown in the beginning of monsoon at the rate of 16 to 20 lbs. per acre. The green crop should be turned in in the beginning of September. This will give nearly 1½ to 2 months for the green matter to get well incorporated in the soil. This way, considerable amount of humus can be added to the soil without much change in the nitrogen status of the soil. Tobacco grown on green-manured maize plots gave about 50 percent of bright grades during 1952–53 when most of the fields produced very dark green leaf and gave as little as 10 to 15 per cent yellow leaf.

It is essential that a young growing crop of tobacco should have quickly-available nitrogen during the early period of growth. This can be supplied through sulphate of ammonia at the rate of 20 lbs. of N per acre. Apply in deep furrows about 100 lbs. (one bag) of ammonium sulphate per acre by the end of September or beginning of October. Furrows can be opened either with a country plough or with a ridger after marking the field. After application of the fertilizer, cover the furrows by a levelling plank run across the rows. Do not broadcast the fertilizer.

Experiments conducted for over a long period at Guntur and Rajahmundry have shown that application of phosphates to the tobacco crop by manuring with superphosphate does not result in increased yields or improved quality of the leaf. Hence application of superphosphate to the tobacco crop appears to be wasteful under local conditions.

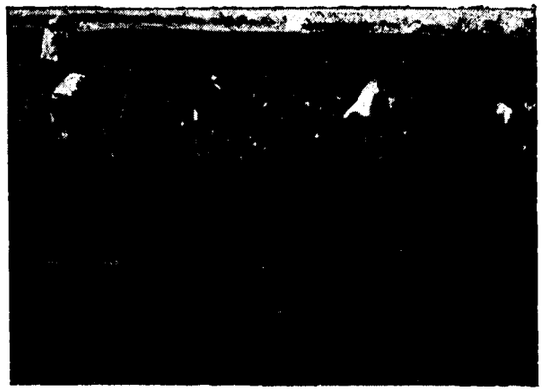
It is also not necessary to apply potash as the black soils already have sufficient quantity of this mineral.

Transplanting:

To give the tobacco crop sufficient time to grow, plant it during the optimum period i.e. between the third week of October and the first week of November.

Do not overcrowd the plants. Plant at 33 inches both ways (see figure) so that there will be sufficient aeration in the field.

Planting at closer spacings does not increase yield much but increases the risk of attack by mildew and spot diseases.



Choose only good healthy seedlings *with good root system* for transplanting. This will reduce gap-filling.

After transplanting if there is not sufficient moisture in the soil 2 or 3 pot waterings at 3 to 4 days interval would greatly help the crop to establish.

Fill up all gaps *within* ten days of transplanting.

Ground Beetles :

Ground Beetle is a small dirty black insect. Immediately after transplanting it damages the young seedlings by by gnawing off the stem at the ground level. Generally the damaged plants die causing gaps in the field. Gap-filling increases the cost of cultivation and reduces the yield and profit. As soon as pot-watering ceases spread a small quantity of the mixture of one part of gammexane and 8 parts of sand around each plant

One application is sufficient to control the beetle and for one acre 10 pounds of gammexane will be required.

Control of "Orobanche"*

(Central Tobacco Research Institute, Rajahmundry)

Orobanche, commonly known as 'Tokra' is a parasite which draws nourishment by attaching itself to the roots of tobacco. Heavy infestation of tobacco fields by Orobanche greatly retards the growth of tobacco plants resultings in lower yields and quality of leaf. (Figs. 1, 2 & 3).

Fig. 1- An 'Orobanche' infested field of Lanka tobacco after harvest.

Fig. 2. Infested with 'Orobanche'.

Fig. 3. Uninfested with 'Orobanche' Note the vigorous growth

No variety of tobacco has been found to be resistant to Orobanche. No chemical and cultivational methods have been found to be cheap and effective. *Removal of Orobanche plants by hand, as they come up, is the cheapest and most effective method of* controlling the parasite.

It is necessary to go round the fields several times to pull out Orobanche plants in case the infestation is heavy. Pulling out of Orobanche plants does not injure the tobacco plant. *Orobanche should be pulled out as and when it appears so that it may not set seed and reinfest the field.*

An Orobanche plant can produce over 1,00,000 seeds in a season. It is, therefore, important not to allow it to set seed.

Even a badly infested field can be completely cleared of Orobanche in 2 or 3 years. Even if your neighbour's fields are not clean, you can keep *yours* completely free of Orobanche as the infestations arising from wind-borne seeds are not heavy and can be kept under check by timely attention.

All the pulled-out Orobanche plants should either be burnt or buried deeply in the soil to prevent dissemination of seeds. They should not be left in the fields.

* Telugu: Bodu or Malle.
Tamil: Kalau.
Hindustani: Tokra.
Gujarati: Vakumba or Makarwa.
Marathi: Bombakhu.

Rapid Drying of Tobacco Improves Quality

By

H. BOGATY

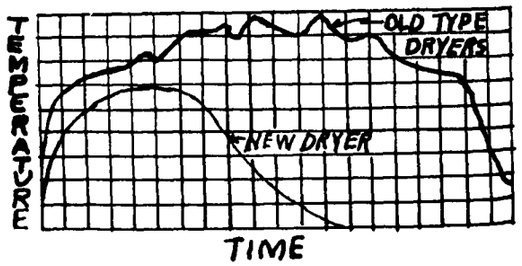
Modern machinery, developed recently has resulted in more rapid drying, which in turn has made for improved quality.

Over the years the old method of drying tobacco by a slow process and at low temperatures gave tobacco men a great deal of difficulty. It was difficult—in fact almost impossible—to obtain the proper moisture content in the dried tobacco. When tobacco in this condition was stored away much of it spoiled and discolored. This was caused by subjecting the tobacco to low temperatures for a prolonged period of time whereby the tobacco reached the temperatures of the air circulated in the machine.

However, in the new method of rapid drying with high temperatures the tobacco does not reach a temperature high enough to discolor the tobacco.

For example, the time required for drying tobacco by the old method was from 60 to 120 minutes when handling tobacco hung on sticks. Tobacco in the from of strips was dried in a period ranging from 35 to 45 minutes. The modern method of drying tobacco is to dry it more rapidly so that the temperature of the tobacco when delivered from the drying compartment is lower than was the case with tobaccos when dried by the old slow method.

The accompanying graph shows the even curve of the temperature in the new dryer as against the irregular curve of the temperature in old type equipment. The end of each of the two solid lines in the curves shows that drying time in the more modern machine is considerably less than in the old, and that the temperature at the end of the drying period is lower than in the old.



'Dotted lines represent time in cooling section'

The temperature in the drying compartment should vary starting from the feed end to the delivery end should follow a parabolic curve towards the delivery end of the drying compartments. The temperature here must be so controlled that when the tobacco enters the cooling compartments it can be easily cooled. Tobacco cannot be reconditioned satisfactorily unless it enters the ordering compartment at not more than 95°F. Arrangement of the atomizors in the conditioning compartment is very important. These atomizors must be so arranged that sufficient vapors are supplied in each compartment so that the tobacco can absorb its moisture in that particular compartment without discoloration or becoming wet.

Farmers' Week at the Institute and Research Stations

At the Central Tobacco Research Institute, Rajahmundry

The Institute celebrated the Farmers' Week from 31st January to 5th February 1955 at the Institute Farm, Katheru, Rajahmundry. The inauguration was done on 31st January afternoon by Shri M. Bapineedu, Community Project Officer, Samalkot. In his inaugural address Shri Bapineedu stressed the need for more and more growers taking interest in the activities of the Institute which is working for their good. He suggested that the Institute also should adopt effective extension methods to reach as many growers as possible. He felt that the farmer was shrewd enough to understand the farm economics and therefore there was great scope for intensifying the cultivation of a cash crop like tobacco in view of the present decline in the prices of food crops.

Dr. N. R. Bhat, Director, Tobacco Research, observed that the Institute was doing research on various tobaccos of India, more particularly on cigarette and and lanka tobaccos, which are the money crops of the tract. He narrated the recommendations made to growers on the basis of research findings and requested the growers present to give their experiences about them. He wanted them also to tell if any other problems of importance need to be taken up for investigations.

Shri B. Gangarayudu Sastry, an enterprising tobacco grower, narrated his happy experiences about the work and recommendations of the Institue. He made a special mention of the supply of good quality tobacco seed and the introduction of Chatham variety of flue-cured Virginia tobacco by the Institute. The new variety gave higher yield, more bright grades and possessed good curing qualities. He stressed the need to take up the analysis of soils of the tract to gauge their suitability for tobacco cultivation and for recommending suitable manurial schedules.

Dr. N. S. Reddy of the Indian Leaf Tobacco Development Co., Ltd., remarked that there was ample scope for growers to improve the yield and quality of tobacco by paying more attention to the various operations.

After this, the exhibition was opened by Shri M. Bapineedu, Community Project Officer. The exhibition consisted of histograms, tables and charts showing acreage and production of tobacco in India, its exports, imports and revenue it fetches. Leaf samples and live specimens of different tobaccos grown in India, photographs showing methods of culture of tobacco from nursery to curing stage, and control of suckers with application of coconut oil were put up. Specimens of different insect pests and diseases on tobacco, their photographs showing the nature of damage with short notes on their control were also exhibited. The visitors were taken round the exhibition and the function concluded with a vote of thanks by Dr. N. L. Pal, the Plant Physiologist of the Institute.

At the Cigar & Cheroot Tobacco Research Station, Vedasandur

"Farmers' Day" was celebrated at this Station on the 31st January, 1955.

Sri V. C. Palaniswami Goundar, M.L.A. from Coimbatore, formerly Minister for Prohibition, Government of Madras, and a very prominent agriculturist presided over the celebrations.

In the morning after hoisting the national flag the Exhibition was opened by Sri Goundar. He was taken round the farm and was explained the various research activities that are being carried out in this farm. In the Exhibition, different exhibits pertaining to the cultivation, curing and other aspects of cigar, cheroot and chewing tobacco were displayed. A model nursery showing different phases of seedling growth and culture and a model field with rows, ridges etc. were exhibited.

Through the courtesy of M/s Voltas Limited, there was a tractor demonstration on the farm. M/s Voltas had brought two tractors and showed the various other uses the tractors were put to, like irrigation, pumping water from the well etc.,

There was a very huge gathering of about 4,000 farmers who had come from alround Vedasandur and also from far off places like Karur, Aravakkurichi, Palni, Tiruchirapalli, Dindigul etc, The farmers who were taken round the experimental fields, evinced keen interest in our methods of cultivation and appreciated the general growth of plants. Some of the doubts which they had, were cleared and some of their ideas were noted down for investigation. As an example one farmer was particularly interested to know what exactly would be the loss in yield if orobanche was not removed.

In the after-noon there was an assembly with a very huge crowd. The officer-in charge introducing Sri Gounder to the audience, spoke about the Research Station and the work it was carrying out in the field of tobacco improvement-

At the outset Sri Gounder observed that Government Research Stations are mainly intended to serve the agriculturists' needs and that the money return for the investments on these stations was not the criterion.

He further said that the farmers should make the best use of the recommendations

of the Research Stations and appealed to both the research staff and the cultivators to establish better relationships by having frequent and closer contacts.

He emphasised the need for the use and spread of quality seedlings and exhorted the ryots to take advantage of the advice of the research staff in this regard.

Adverting to the subject of actual research work, the speaker appealed to the cultivators not to be impatient and expect lot of benefits in a very short time and stated that to get best results, people would have to wait for quite a long time.

While answering some of the points raised by the farmers who spoke on the occasion, Sri Gounder said that whatever difficulties the farmers might have, they should seek redress collectively through agricultural associations and expressed a desire that every village should have one such association.

Three farmers viz., Messrs. Jambulingam from Thayampalayam (Dharapuram), Chellappa Gounder from Palni and Raja Goundar from Kasipalayam gave their impressions about the Research Station as very favourable. As enlightened agriculturists they appealed to the farmers to make the best use of the advice of the Research Station.

There was a folk dance performance by the labourers of the farm and the field staff enacted an instructive farce entitled "*Troubles are over.*"

After the concluding remarks by Sri Gounder and vote of thanks, the function terminated with the singing of National Anthem.

At The Cigarette Tobacco Research Sub-Station, Guntur

The Farmers' Week was inaugurated at the Cigarette Tobacco Research Sub-Station Farm on 11-2-1955. The Plant Breeder in charge of the Station welcomed the visitors. Sri V. Rama Rao, Deputy Director of Agriculture, Guntur presided over the function and opened the exhibition staged for the occasion, which consisted of materials of interest to the tobacco industry.

The gathering was then shown round the exhibition and taken round the farm. The various field trials that were conducted and in progress were explained to the visitors. After seeing round the farm, the visitors were given light refreshments. A meeting was then held in a separately erected pandal with Sri V. Rama Rao in the chair.

Sri Rama Rao in the course of his address stressed the importance of tobacco crop in the economy of the country and the need for scientific approach in handling the crop. Sri D. Satyanarayana, Personal Assistant to the District Agricultural Officer, Guntur and Sri P. Sankara Rao, Plant Protection Assistant of the Department of Agriculture, also addressed the gathering and requested the ryots to adopt the scientific methods of cultivation of tobacco.

Tracing the history of the Station, The Plant Breeder gave an account of the activities of the Research Station and appealed to the ryots to visit the station as frequently as possible and to take up the improved methods of tobacco culti-vation.

The function was largely attended by tobacco growers, numbering nearly one hundred from the surrounding villages. Various leaflets on tobacco cultivation were also distributed to the ryots present.

I. C. A. R. Farm News Releases

'Placement' of Fertilizers— Better Results with Crops than Broadcasting

Extensive experiments conducted in many parts of the world with the mode of application of fertilizers to various crops have shown that increased yields are obtained if the fertilizers are 'placed' at proper distance from the seed. The method also will entail a saving in the quantity of fertilizers used. Experiments conducted at the Indian Agricultural Research Institue, New Delhi, confirm the fact that this is true under Indian conditions too.

Readily soluble nitrogenous and potassic fertilizers are best 'placed' at a suitable distance from the seed. On the other hand, phosphatic fertilizers give good results when placed close to the seed. Legumes do not like the fertilizers to be too close to them. For quick-growing, shallow-rooted short duration crops, applying the fertilzer in side bands, and for deep-rooted ones directly below the seed are best. For long duration and deep-rooted crops, however, broadcasting the fertilizers as farmers generally do is found satisfactory.

Placement of fertilizer has been found particularly beneficial in soils of poor fertility.—*No. 11.*

Urine is A Good Manure— Practical Way of Using it in Villages

The country can produce over 15 million tons of extra grain, if all human urine is utilised for manuring crops, according to agricultural scientists. Human urine is a very rich source of nitrogen, but no attempts are being made by farmers to conserve it for the crops.

Special designs of urinals are being recommended to farmers to serve the dual purpose of sanitation and conservation of the urine as manure.

The idea in the design of one of the commonly recommended urinals, is below-surface soaking of urine in a variety of materials. Commonly available absorbing material like soil, sand, ash, charcoal dust, sawdust, dry leaves, paddy husk, spent tea leaves, chopped straw, dry dung and waste paper are used. Bad smell is reduced to the minimum. A drum type urinal can be easily put up. The drum is filled with any of these materials. The voided urine is conveyed from the mouth of the urinal through a tube buried six to nine inches deep inside the drum. When the entire material is thoroughly saturated with urine, it is removed and spread out in a thin layer to dry in the sun. Or better, dumped in a pit and covered with loose earth. The drum is filled again with fresh material.—*No. 13.*

Getting More Returns from Phosphates

When phosphates are added to the soil, the full value of this plant-food is not realized on the crops grown. This is so because a major part of the phosphates get converted into insoluble and unavail-

able forms in the soil. Usually, crops are able to make use of only about 10 to 12 per cent of the quantity of phosphates added.

Lately, two new methods tried at the Indian Agricultural Research Institute, New Delhi, makes a greater quantity of phosphates available to plants, thus raising the yields of crops.

It was found by one method that mixing super-phosphate with about 20 to 50 times its weight of compost or farmyard manure and applying the mixture to the field permitted a greater return from the phosphates. By the second method, even better results were obtained by 'composting' the superphosphate with actively fermenting organic refuse. This is done by spreading the superphosphate powder in thin layers of about one-fourth inch thick over alternate layers of about six inches of mixed cattle-shed refuse or other compost material. The heap or trench so filled up is allowed to ferment for the usual period of four to six months after which the manure is well-mixed and applied to the field.

The compost ferments quicker and better if to the refuse cattle urine or ammonium sulphate is added.

This method can also be used for 'composting' rock phosphate and bone-meal, which contain insoluble phoshates. However, these fertilizers should be ground to a fine powder before 'composting' them.

At the Institute, four to six months after fermenting these fertilizers it was found that 50 to 70 per cent of the insoluble phosphates were converted into the more soluble forms plants could absorb.—*No. 14.*

Better Returns with Green Manures—Simple Rules to Follow

Farmers have come to realize the value of ploughing in a green manure crop before a grain crop is raised, and the practice is gaining popularity everywhere.

Yet, the full benefits of green manuring cannot be had unless farmers follow three simple rules in the application of green manures, crop scientists point out.

The green manure crop should be used at a stage when it is still succulent and not yet turned fibrous. Secondly, a period of six to eight weeks should elapse between the ploughing in of the green matter and the sowing of the next crop. The other equally important rule to be followed is to see that enough moisture is in the soil to allow the green matter to decompose and the next crop germinate. If too little rain is received, the field will have to be given irrigations to satisfy this condition. *No. 15.*

Tobacco Seed need not be Wasted—Profitable Utilization by Farmers

Research has found many uses for tobacco seed which is generally allowed to waste. India annually produces about 5,000 tons of this seed.

Among some of the new uses, research has shown that if ground into a fine paste a good cattle feed can be prepared out of tobacco seed. The feed does not contain nicotine or any other harmful substance.

Tobacco seed oil, like the seed, can be used for culinary purposes and as a semi-dry oil for paints and varnishes. The oil is better than linseed oil because it does not turn yellowish on keeping.

The oil burns readily, giving a mild and smokeless light. It also is a deterrent, to a small extent, to white ants.

The oil cake is cheaper than other cakes. It is good as a feed for cattle and horses or for manuring sugarcane or rice.

Like the seed, tobacco dust and waste have been shown to be useful in other ways. The dust when applied to the tobacco crop over a basal dose of groundnut cake increases yield and makes the crop mature early. Applying the stem dust to the field increases the organic matter in the soil.—*No. 25.*

Farm Fillers

One cheap and effective way of preventing river bunds being washed away by seasonal floods is planting such grasses as *Kusha*, Giant Star and Thin Napier. The grasses bind the soil and keep the bunds intact.

Eggs meant for hatching should be stored in a room free of smell such as of onions, kerosene oil etc. The eggs should be stored with their large end up.

Serving a cow soon after calving results in a low conception rate. The best way would be to avoid mating the cow during the two heat periods following calving.

There are 1·51 million acres under coconut in India annually producing coconuts valued at Rs. 78 crores. Two-thirds of the area is in Kerala.

Under the monsoonic conditions in India the nitrogen of the soil is lost both by washing down into the sub-soil and by a surface run off when heavy showers fall.

In the present day crop production over 70 per cent of the cultivated area is cropped with cereals as against less than 5 per cent with pulses. Pulses are nitrogen recuperating crops, and should be included in the cropping programme to a greater extent.—*No. 16.*

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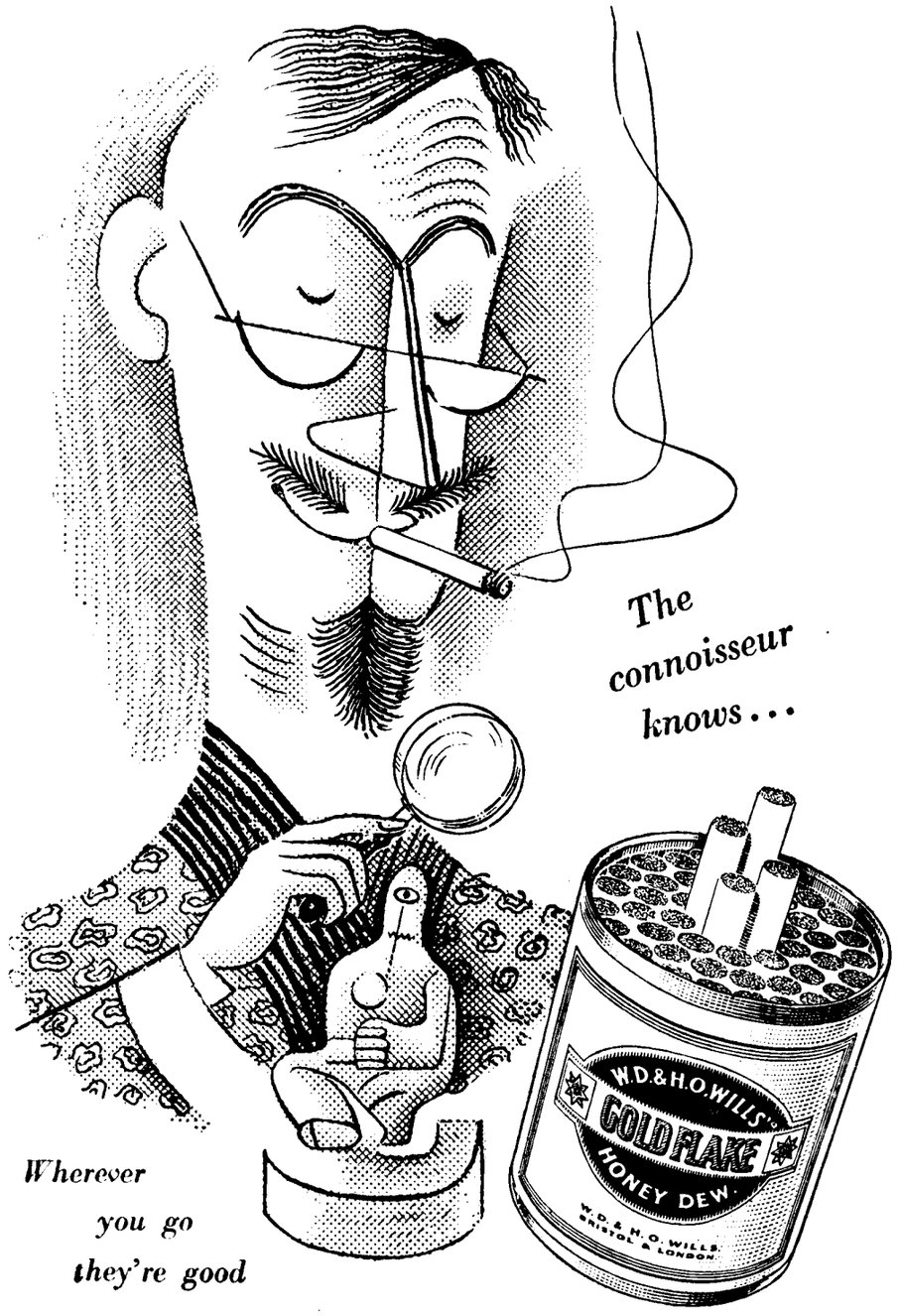

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