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Indian Tobacco

July - Sep. 1957



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JULY—SEPTEMBER 1957

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(QUARTERLY)

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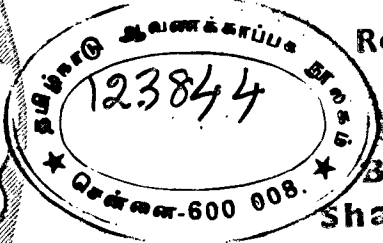
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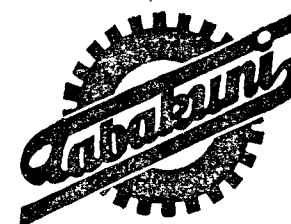
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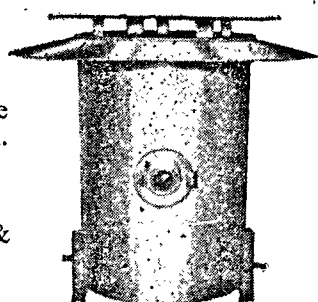
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3. Information of a miscellaneous nature and of interest to the general public, facts, observations, etc.

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

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ERRATA

In the note on "Preliminary Studies and control of cigarette beetle" published on page 108 of Vol. VII No. 2 issue of INDIAN TOBACCO, in the penultimate para, instead of "He observed that.....on the bales", please read—

"Under certain circumstances it has been observed that infestation in dealers' premises which are quite often maintained in an insanitary condition without any protective insecticidal sprays show a lesser degree of infestation than in storages maintained in a scrupulously clean condition with adequate spray coverage. Bales which are left in open godowns without any protection have not always shown a high degree of infestation as is to be expected. It is therefore interesting to investigate whether insecticidal formulations sprayed on infested bales act to an extent as a repellent so that beetles which might normally come out of the packages continue to multiply inside the packages. This is a problem worthy of investigation. If this is borne out after experimentation it would be preferable not to use direct sprays on bales but use instead smoke generators or insecticidal fogs which have been observed to result in greater kill than surface sprays."

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(A TELUGU QUARTERLY)

TRADE DELEGATION FOR INDIAN TOBACCO—PROSPECTS IN SOME AFRICAN COUNTRIES.

BY

DR. M. S. PATEL *

The Government of India recently sent a delegation to some African and West-Asian countries in order to assess the prospects for promoting the exports of bidis and Indian tobacco from this country. The delegation was successful in creating an interest for Virginia tobacco in Egypt, and for bidis in Sudan, Zanzibar and Aden. It suggested that sustained efforts should be made to push Indian bidis in these markets. It also stated that weevil-infected poor quality bidi tobacco should not be allowed to be exported to Aden as it would damage the reputation of better qualities of bidi tobacco. Generally, the delegation was able to pave the way for augmenting the exports of tobacco and their manufactures in some African and West Asian countries.

In their export promotion drive, the Government of India sent a delegation a few months ago to the West Asian and African countries with a view to exploring the possibilities of introducing bidi and tobacco in these areas. The delegation, consisting of two persons, i.e. Dr. M. S. Patel, Secretary, Indian Central Tobacco Committee and Member-Secretary, Tobacco Export Promotion Council and Sri Manubhai, a bidi

manufacturer of Saugor, Madhya Pradesh, visited, in their itinerary, Egypt, Sudan, Gold Coast (Ghana), Nigeria, British East Africa including Zanzibar and Aden.

The delegation has given an interesting account not only of the possibilities or otherwise of extending the market for Indian bidi and bidi tobacco but also of the customs and smoking habits of the people in these countries. Besides, it has given the present position of the cigarette industry in some of the countries it visited.

The best market for Indian tobacco among the above-mentioned countries at present is Aden which has been importing about 6 million lbs. per annum. The next is Egypt with slightly over 2 million lbs. Since Egypt has been importing between 24 and 26 million lbs. of tobacco per annum, the chances of India extending her market, particularly for Virginia tobacco, are considered good. Egypt does not produce tobacco, largely due to unfavourable climatic and soil conditions for producing good quality tobacco. The main suppliers of tobacco to Egypt are Turkey, America, South Rhodesia (Africa), Greece and India.

Cigarette smoking is the most prevalent form of tobacco consumption in Egypt. After World War II, the blended American cigarettes became widely popular. The present

* Secretary, Indian Central Tobacco Committee.

Egyptian cigarette industry is in a position to meet practically the country's entire requirements of Egyptian, Virginian and American type of cigarettes.

Next to cigarettes, the most popular form of tobacco smoking is what is known as "Moassal". This is a mixture of tobacco and molasses. The maximum limit prescribed is 100 parts of tobacco, 250 of molasses and 5 per cent of glycerine. This mixture is smoked through a pipe called Goza, somewhat like the Indian Hookah. Tobacco leaf of indigenous origin known as "Hassan Keif" is used in this mixture. The biggest supplier of "Hassan Keif" is Turkey. Sizeable quantities are also imported from Syria, Libya and China.

A special variety of tobacco known as Tombac is also smoked, particularly by the upper classes through a water bowl pipe called Narghile. In this, the tobacco is cut into shreads and smoked. The main supplier of Tombac is Aden being mostly re-exports of Tombac brought from Iran and Syria.

Tobacco chewing is also in vogue to a small extent. The main variety of tobacco used for this purpose is known as "Kwang Fang" and is imported from China. The use of cigars and snuff is negligible in Egypt.

The following table gives the trend of tobacco imports into Egypt in recent years from various producing countries:—

Country	1952	1953	1954	1955
	(in ton)			
Turkey	3,351	2,694	2,506	2,497
Africa	2,196	1,840	1,441	1,221
America	1,107	2,276	2,619	2,921
Greece	1,632	1,396	1,586	1,393
India	986	984	947	999

With the growth of the local industry and also on account of the heavy additional duties imposed on manufactured tobacco, imports of cigarettes, cigars and other sorts of manufactured products have steadily declined.

Tobacco is traded through normal trade channels in Egypt. The Government, however, exercise a strict quality control. They have, in recent years, increased the import duties on tobacco leaves to a great extent, the figures in 1953 being £E 3 per kilo. The income from tobacco dues to the Treasury is currently computed at above £E 35 million or 34 per cent of the total customs receipts and about 15 per cent of the total public revenues.

Indian tobacco can find a market in case it is butted and dark brown in colour, heavy bodied and gummy with good combustibility. It should also leave white ash after burning. It is suggested that efforts should be made to push into this market top grades of Virginia tobacco.

The delegation feels that it would be difficult to popularise bidi and bidi tobacco in Egypt in view of the high import duty on tobacco manufactured and unmanufactured. The import duty varies from Rs. 18 to 30 per lb., including special luxury and import taxes. It is estimated that the cost of the imported bidies will be more than the cost of several cheaper brands of cigarettes sold

in the country while bidi tobacco itself does not seem to be suitable for cigarette manufacture.

The delegation is of the view that their contacts with the manufactures of Moassal mixture have shown that NDR quality will be suitable for making Moassal. The possibilities of exporting larger quantities of this variety of tobacco to this country can be profitably pursued.

The delegation visited Ghana and examined the possibilities of marketing Indian tobacco in this part of Africa. The Government have, it is stated, been encouraging tobacco production, but have not yet attained complete success in growing quality tobacco. Total imports of unmanufactured tobacco into Ghana do not exceed 1.5 million lbs. per annum and they mostly come from the U.S.A. Import duty on manufactured tobacco is fairly high and it is stated that bidies are also subject to a duty of Rs. 18.66 per lb., same as in the case of cigarettes. In view of this high duty, the delegation feels that bidies could not be easily marketed in this State.

The position in respect of Nigeria is not dissimilar. In Nigeria, there are about 50,000 acres under tobacco cultivation. The annual production is estimated at 25 million lbs. Most of this tobacco is air-cured. Flue curing is rare. There are two cigarette factories. Annual imports of tobacco into Nigeria are estimated at 6 million lbs. As in the case of Ghana, import duty is pretty high in this country also. Further, the entire cigarette trade is practically in the hands of the Nigerian Tobacco Company and they have their own suppliers in all the major tobacco producing countries. Hence prospects are not good.

Imports of tobacco into Sudan mainly consist of manufactured tobacco in the shape of cigarettes, cigars and pipe tobacco. The manufactured tobacco imports are not appreciable. It is reported that about 55 million cigarette pieces per month are consumed in Sudan. At present, Sudan is not producing tobacco on a commercial scale but efforts are being made to grow tobacco internally.

The import duty levied on tobacco is at the rate of £E 3.450 (Rs. 47-7-0) per kilo net. Over and above this duty, a consumption duty is levied on the imports of tobacco at £E 1.350 (Rs. 18-9-0) per kilo net. For the purpose of these duties, only net weight of tobacco is taken into consideration e.g. in the case of cigarettes, duty is levied only on the weight of tobacco contained and not on total weight of cigarettes comprising tobacco, outer wrapping paper and in some cases cork tips.

Analysing the prospects for bidi tobacco in Sudan, the delegation says that as the duty is charged on net weight of tobacco and as the small bidies contain less tobacco, they will be cheaper, relatively speaking. Door to door propaganda is considered necessary in order to sustain the interest in Indian bidis. In this connection the delegation suggests the appointment of a Liaison Officer who could be continued in case he is able to show concrete results. As excise duty on tobacco exported from India is normally refunded and if machine made bidis are encouraged only for exports, it will go a long way in supplying standard bidis in these markets. At the same time, efforts should be made to improve the quality of manufactured bidis. In other words, the importance of standardisation, attractive finish, uniformity in burning, etc. in the production of bidis is considered necessary.

In British East Africa tobacco is grown in Uganda and Tanganyika. The quality, however, is not good. It is used for manufacturing cheap cigarettes for the Africans. It has an added advantage that it is free from import duty. This concession makes the cigarettes manufactured from local tobacco cheap. Again, imports of bidies are made costly, besides the high import duty of Rs. 22-1-0 per lb., by the levy of the duty also on wrapper leaf (Tendu) and not merely on the net weight of tobacco as in Sudan. However, the delegation was able to persuade a few local provision store-keepers to import bidis for trial purpose.

The import duty in Zanzibar Protectorate is comparatively very low both on manufactured and unmanufactured tobacco. Hence, the delegation is of the view that the scope

for introducing bidis is good. The delegation says that constant propaganda under the supervision of a Sales Promotion Officer will yield good results in due course.

Except for a small quantity from Rhodesia used for blending purposes, the entire requirements of unmanufactured tobaccos in Aden are imported from India. However, most of them are exported to her neighbouring countries. Bulk of these is re-exported to Yemen and to other places

like Djibouti, Jedda, etc. The delegation suggests that weevil infected poor quality bidi tobacco should not be allowed to be exported to Aden as it spoiled the reputation of good bidi tobacco and depressed its prices.

Generally speaking, the delegation has paved the way for augmenting exports of tobacco and bidis in the above mentioned countries. It has been successful in creating interest for Virginia tobacco in Egypt and for bidis in Sudan, Zanzibar and Aden.

TOBACCO INDUSTRY IN SOUTHERN RHODESIA

BY

N. R. BHAT †

[The first part of the report was published in the last issue and the second and the concluding part is published below]

REDRYING

49. The moisture in the leaf at the time of auction varies from about 14 to 19 per cent and, as the manufacturers require the tobacco with not more than 10 to 11 per cent moisture, the tobacco has to be redried in proctor machines in which it is heated upto a maximum temperature of 185°F.

RETURN OF HESSIAN AND WATER-PROOF PAPER

50. On unpacking the tobacco for re-grading, the buyer returns the hessian cloth and water-proof paper of the bales intact to the auction floor which in turn returns them to the growers.

PACKING FOR EXPORT

51. The redried tobacco is pressed by a hydraulic press, wrapped in water-proof paper and packed in either wooden cases or hogshead or hessian bales. The dimensions of the wooden cases are 3'-9" × 2'-4" × 2'-6", the gross weight inclusive of tobacco being 500 lbs. ± 10 lbs. The hogsheads are each 45" in length and 45" in diameter, the gross weight being 900 lbs. ± 10 lbs. The bales are of the size of 2'-6" × 24" × 28", the gross weight being 225 lbs.

The cases or hogsheads are made of either pine or eucalyptus wood. Formerly, the

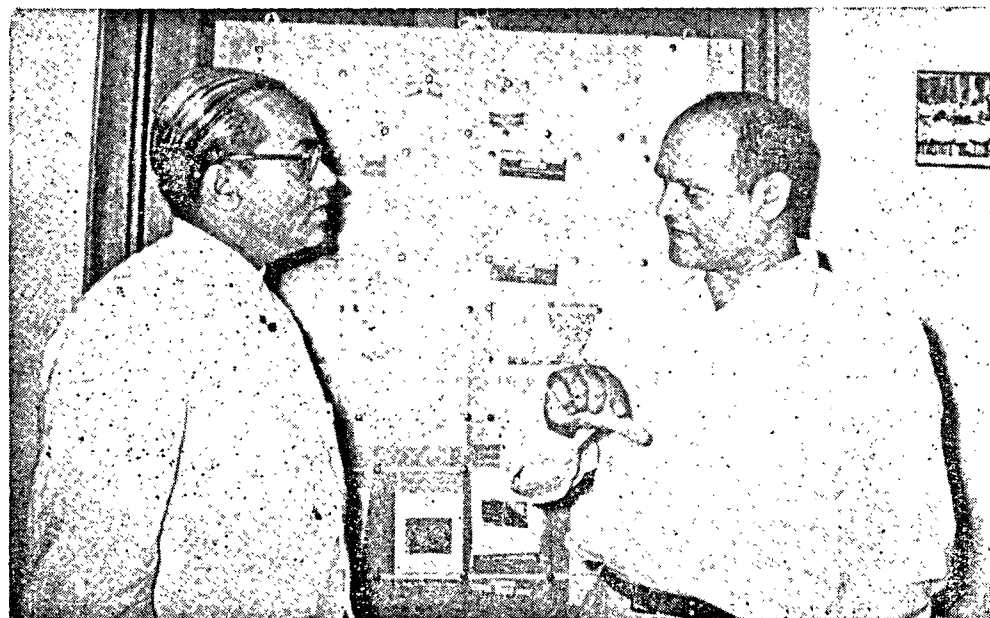
wood for the cases used to be imported from Sweden, but as the price rose steadily until a case cost 60 pence, the purchase from Sweden had to be drastically reduced, and diverted partly to South Africa, the remaining wood being obtained from within the Colony itself. The wooden cases cost about 42 pence each at present. Hessian cloth is imported mostly from India; some of it is locally manufactured from raw hessian imported from India. In 1955, a duty of 6 pence per square yard was levied on hessian imported from India. Recently it has been reduced to 4 pence per square yard, but a duty of 4 pence per lb. has been newly levied on imported hessian bags. Bituminised water-proof paper is imported from South Africa.

WAREHOUSE

52. A typical warehouse is of the size of about 4,700 sq. ft. It is closed on all sides, light being admitted through glass panes fixed in the walls and roofing. The height of the roof is 12 feet to 15 feet. The flooring is of cement. To ward off and kill cigarette beetle and moth, D.D.T. spraying is done every fortnight on walls as well as on hogsheads and cases in storage.

The Tobacco Marketing Board classifies the tobacco after sale with a view to analyse

† Director, Tobacco Research, Indian Central Tobacco Committee.



Sri M. R. Thadani (left), First Secretary-designate (Commercial) to the Indian Embassy in Sudan, with Dr. M. S. Patel, Secretary, Indian Central Tobacco Committee, when the former visited the Committee's Secretariat in August 1957.

the composition of the season's crop according to grades. Tables of analysis of the Southern Rhodesian leaf sold by auction in the seasons of 1954 and 1955 are given in Appendix 1.

EXPORTS

53. The cases, hogsheads or bales are transported by rail to port Beira in Portuguese East Africa from where they are exported to countries of their destination.

The country-wise exports and local consumption of flue-cured tobacco produced in Southern and Northern Rhodesias during 1955 are given below in table 1 (a), (b) and (c).

TABLE 1 *

(a) Exports of S. Rhodesian tobacco—

	Lbs.
United Kingdom ..	64,950,026
Australia ..	9,660,621
Union of S. Africa ..	6,073,878
Local market ..	6,274,404
Other markets ..	33,499,515
Unallocated ..	100,468
	120,558,912

(b) Exports of N. W. Rhodesian tobacco—

	Lbs.
United Kingdom ..	2,944,092
Australia ..	57,980
Union of S. Africa ..	381,534
Local ..	545,572
Other markets ..	1,430,488
Unallocated ..	4,214
	5,363,880

(c) Exports of N. E. Rhodesian tobacco—

	Lbs.
United Kingdom ..	673,835
Australia ..	25,636
Union of S. Africa ..	369,306
Local ..	168,300
Other markets ..	1,002,050
Unallocated ..	3,012
	2,242,139

The 7 million pounds of tobacco sold locally is utilised in the manufacture of cigarettes.

FIRE-CURED TOBACCO

54. As previously mentioned, fire-cured tobacco is grown only in the heavy soils. Its cultivation has fallen tremendously in recent years. The cured leaf is heavy and dark brown with a few spangles developed on it. Its cultivation is more like that of country tobaccos in India. The crop is manured at the rate of about 16 lbs. N per acre. It is topped by leaving 12 to 13 leaves on the plant. The leaves develop a few spangles. Curing is done in barns of the size of 20' × 20' × 20', which are usually back to back. The barns do not have any furnaces. But, 2 to 4 heaps of maize cobs are kept burned in pits almost the whole day and night for about 1½ months. In order to provide more space for the big sized leaf the number of tiers is limited to only six. The fire-cured tobacco produced in Nyasaland and Northern Rhodesia is better than that produced in Southern Rhodesia as the soils there are heavier. Exports of this tobacco go mainly to U.K., Bachuanaland and Belgium Congo, the remaining quantity being locally consumed for pipe and snuff. The cost of production is about £25 and the net profit about £10 to £15 per acre.

TURKISH TOBACCO

55. This tobacco is grown on a very small scale, but being more aromatic than that produced in Turkey and Greece, it is preferred by the U.S. manufacturers. On account of high labour requirements in its production, a European grower usually plants only about an acre or two of this tobacco. It is produced also by Africans in some of the native reserves. Fertilisers are not often applied but the application of about 300 lbs. of 4-18-15 mixture is recommended. Turkish tobacco is usually planted late, i.e., in Jan.-Feb., so as to mature for harvest after the rainy season, as it is to be cured in the sun. Spacing is 2' × 6". No topping is done and usually about 32 leaves

are harvested. The leaves are of the size of the palm. The harvest period commences from about April-May, and it is done by picking leaves as they mature. After harvest, the leaf is wilted for 24 hours and then sun-cured for 3 to 6 weeks. The yield is about 350 to 400 lbs. per acre, but yields as high as 1,000 lbs. are said to have been obtained at the Trelawney farm. The tobacco is usually sold ungraded on the string in the months of November-December, i.e., after the onset of rains of the next season when it comes to proper condition. It is sold locally to either individual buyers or through the growers' co-operatives. The cost of production is about £30 and the net profit about £15 to £25 per acre.

(d) Area, production and economics of flue-cured tobacco.

56. The cost of production of flue-cured tobacco in Southern Rhodesia on an acre basis, is given in Table 2.

TABLE 2
Details of cost of cultivation of flue-cured tobacco.

	£
Labour at one man unit per acre for the whole year ..	40- 0
Stumping ..	5- 0
Ploughing, ridging, etc. ..	3- 0
Seedbed preparation and management ..	1-10
Cost of seed—one ounce ..	0-10
Fertilisers ..	10- 0
Insecticidal treatment ..	1- 0
Suckering ..	1-10
Fuel for curing:	
If coal ..	3- 0
If wood ..	0-10
Grading 800 lbs. of leaf ..	9-10
Insurance ..	3-15
Total ..	79-5

57. The statistics about area, production, etc., for flue-cured, fire-cured and Turkish tobaccos, are given in the following table.

TABLE 3
Particulars of area, production, etc., for flue-cured, fire-cured and Turkish tobaccos.

Year	Area (acres)	No. of growers	Production in lbs.	Yield per acre	Total value (£)	Price per lb.	Cost of cultivation per acre
Flue-cured tobacco							
1954-55	173,000	2,529	120,559,000	697	20,326,000	40.46	80
Fire-cured tobacco							
1954-55	460	17	277,000	602	18,800	16.3	25
Turkish tobacco							
1954-55	400	186 *	160,000	400	17,183	33.00	30

* of whom 106 are Africans

In 1954-55, the average tobacco farming for the Federation was about 64 acres.

FLUE-CURED TOBACCO

Gross income from 64 acres at £117.5 per acre (price of 697 lbs.) ..	£ 7,520
Less cost of production at £80 p.a. ..	£ 5,120
Net income ..	£ 2,400

Less Income-tax at one-third the net income ..	£ 800
Net profit for an average holding ..	£ 1,600
(or £ 25 per acre)	

* From the Annual Report of Rhodesian Tobacco Marketing Board, 1954-55.

(c) *Organisations working in the interest of tobacco industry.*

58. The sound position in which the tobacco industry of Rhodesia is finding itself today, is due to the co-ordinated efforts of the organisations referred to in paragraph 12 above. The way these organisations are inter-related, and their constitutions and functions are elaborated below.

59. There are two parent organisations, viz., one of growers and buyers (Rhodesian Tobacco Association) and the other only of buyers (Tobacco Traders' Association of Rhodesia). Under the aegis of the Federal Ministry of Agriculture, the two organisations have co-opted to form two Boards, one called the Tobacco Research Board of Rhodesia and Nyasaland, for promotion of tobacco research and the other the Rhodesian Tobacco Marketing Board for the direction and control of the various phases of production and disposal. The concerted efforts of these two Boards have been primarily responsible for the rapid progress that the industry has been making in recent years. While the Tobacco Research Board has of late stimulated the production of superior tobacco through the introduction of better quality varieties and development of improved cultural practices, the Tobacco Marketing Board has put every aspect right from cultivation to marketing and export on a very sound basis by meticulously controlling every possible detail to the benefit of the industry. The activities of these Boards are governed by Acts Nos. 1 and 5 passed by the Federal Government. In addition, the Government has passed Act No. 2 of 1955 for collection of levy on tobacco which mainly finances the Rhodesian Tobacco Association. The way in which the Federal Government and the two Associations are represented on the two Boards is mentioned below:—

(i) *Rhodesian Tobacco Association.*

60. The membership of the Association comprises firstly, all registered growers of flue-cured and fire-cured tobaccos, and secondly, persons, companies, syndicates, and partnerships registered, in the Federation (plus the honorary members who may be

elected by a Council of the Association itself).

(ii) *Tobacco Traders' Association of Rhodesia.*

61. The membership of this Association consists of all registered buyers and traders in tobacco.

(iii) *Tobacco Research Board of Rhodesia and Nyasaland.*

62. This Board has a membership of 2 officials from the Federal Ministry of Agriculture; 3 persons chosen by the Minister of Agriculture from a panel of growers suggested by the Rhodesian Tobacco Association, 2 persons selected by the Minister from a panel suggested by the Tobacco Association.

(iv) *Rhodesian Tobacco Marketing Board.*

63. The membership of the Board consists of:

- 1 Senior official of the Federal Ministry of Agriculture, who is the Chairman.
- 2 Persons selected by the Ministry from the panel suggested by the Tobacco Traders' Association.
- 3 Persons selected out of a panel suggested by the growers.

THE RHODESIAN TOBACCO ASSOCIATION

64. This Association was established in 1933. The objects of the Association, in general, are:—

- (a) to investigate and develop markets;
- (b) to insure crops against damage from hail (if possible, other causes). (For particulars, *vide* Hail Insurance Scheme below).
- (c) to collect and disseminate information amongst members;
- (d) to co-operate with other associations;
- (e) to affiliate with other associations having similar objects;
- (f) to conduct, encourage, assist and subsidise research into tobacco problems;

(g) to make representations to Government with a view to promoting and developing the tobacco industry;

(h) to introduce or oppose legislation if and when the interests of the tobacco industry are likely to be affected, etc.

The Association has a President, two Vice-Presidents and a Treasurer elected by the Council.

65. The business of the Association is managed and controlled by a Council consisting of (i) one councillor elected by postal ballot by each of the 22 tobacco producing districts of Southern Rhodesia, (ii) two councillors nominated by the North-Western Rhodesia Branch of the Association, and (iii) one councillor nominated by the North-Eastern Rhodesia Branch of the Association. The council elects a Working Committee and a Finance Committee from amongst its members or from other members of the Association to exercise such powers and carry out such functions as the Council may determine, to make regulation for the conduct of their meeting and transactions and to make reports to the Council.

66. The Association is a non-profit making body and none of its funds can be paid by way of dividend, bonus or otherwise to members. Its finances are derived, mainly from the sums placed at the disposal of the Association in terms of the Levy Act and such other funds as may be provided by grants, donation, bequests or other sources.

67. Federal Act No. 2 of 1955 provides for the collection by Government of levy on unmanufactured flue-cured (and fire-cured) tobacco grown in the Federation, at the rate of one-third of a penny per pound. In the case of flue-cured and fire-cured tobaccos, the levy is collected on the unredried weight without conversion into leaf, strips or stem scrap as prescribed in Federal Government Notice No. 56 and, in other cases, on the dry or export weight of the unmanufactured leaf. No levy is payable on (a) any tobacco which has been manufactured by a producer-manufacturer and sold or supplied by him to his own employees for their personal con-

sumption, or (b) any unmanufactured tobacco which is to be utilised for purposes other than manufacture into tobacco for smoking, chewing or snuff.

68. The levy is collected soon after auction either from the grower, his authorised agent, the buyer, the manufacturer or the owner of the licenced auction floor, the liability for the payment always resting with the grower. In the case of unmanufactured tobacco which is not sold on the licenced auction floor, the collection is made either at the time when such tobacco is consigned to a place outside the Federation, or when tobacco is delivered to a local manufacturer or to any person for local consumption. A producer-manufacturer has to pay the levy on the 15th day of each month in respect of the unmanufactured tobacco that he converted into manufactured tobacco during the previous month.

69. Payment of the levy cannot be deferred for a period longer than two months except with the permission of the Secretary, Federal Ministry of Agriculture.

70. A person failing to pay the levy under the provisions of the Act is charged guilty of offence and is liable to a fine not exceeding £50 or, in default of payment to imprisonment not exceeding six months.

71. The levy collected on flue-cured and fire-cured tobaccos is credited to the Tobacco Levy Account and the levy collected on Turkish tobacco to the General Levy Account. The funds credited to the Tobacco Levy Account are transferred from time to time by the Ministry of Agriculture to the Rhodesian Tobacco Association.

THE HAIL INSURANCE SCHEME

72. A scheme for insuring the crops of flue-cured, fire-cured and even Turkish tobaccos is run by and is available to all members of the Association. Only the planted crop (and not seedbeds) can be insured.

73. Any farmer desiring to insure his tobacco crop, whether flue-cured or fire-cured (and when accepted Turkish tobacco) has to insure his entire acreage planted on contiguous farms. It has all to

be insured for the same maximum compensation in the case of dry area and the same maximum compensation for irrigated area.

74. The maximum compensation for which a crop can be insured and the rates of premia are given below:—

	Maximum compensation	Premium
	Per acre	Per acre
	£	£
Irrigated crop	200	5- 0-0
Do.	225	5-12-6
Do.	250	6- 0-0
Dry crop	50	1- 5-0
Do.	75	1-17-6
Do.	100	2-10-0
Do.	125	3- 2-6
Do.	150	3-15-0
Do.	175	4- 7-6

For each tobacco growing area the Rhodesian Tobacco Association appoints 15 to 20 Hail Damage Inspectors from amongst the growers themselves, and the list of such Inspectors is forwarded to all the growers.

In the case of an irrigated crop, the grower has to satisfy the Inspector appointed by the Association and obtain a certificate from him to the effect that the lands in question were irrigated by spray or flood irrigation as the case may be and that he has the necessary equipment for irrigation such as piping, furrows, pumps, sprays, etc.

75. When there is a damage to the crop, the grower has to send a telegraphic or telephonic message to the Secretary of the Rhodesian Tobacco Association as well as to the nearest Inspector. On receipt of information, the Rhodesian Tobacco Association directs the Inspector nearest to the farm to inspect the damage to the crop. On receipt of the inspection report, the amount of compensation to be awarded is decided by an assessment committee consisting of two independent Chartered Accountants, the President of the Association, a representative of the Lloyds Bank and the Secretary of the Association. The compensation is awarded according to the percentage of loss caused to the tobacco crop. A second inspection is also done where necessary.

76. In awarding the compensation, the stage of the crop at which the tobacco was at the time of the damage is taken into account. If, after a thorough inspection, the crop is reported to be a complete 'write off', the grower is awarded compensation at the following rates:—

If the tobacco is 1/8th grown 45% of the maximum compensation.

If the tobacco is 1/4th grown 66-2/3% of the maximum compensation.

If the tobacco is 1/2 grown 80% of the maximum compensation.

If the tobacco is 3/4th grown 90% of the maximum compensation.

If the damage occurs when the crop is at the reaping stage, the damage is worked out as in the following example:—

(a) Maximum compensation, 20 acres insured at £100 per acre = £2,000

(b) Percentage of plants in the fields damaged = 80

(c) Average total number of leaves on damaged plants at the time of maturity = 15

(d) Average number of leaves hit by hail = 10

(e) Degree of damage caused to leaf by hail = 60%

The formula for compensation—

$$= a \times \frac{b}{100} \times \frac{d}{c} \times \frac{e}{100}$$

In this case the compensation would be:

$$= 2000 \times \frac{80}{100} \times \frac{10}{15} \times \frac{60}{100} \\ = £ 640.$$

77. The annual collection of premia comes approximately be about £500,000, i.e. 2.5 per cent of the total value of tobacco produced in the country. The Association has at present at large reserve fund of about £330,000 under the Insurance Scheme.

78. In the 1954-55 season, 1,781 or 71% of the growers in Southern Rhodesia, insured in all 126,311 acres or 73% of the total acreage planted. In North-Western Rhodesia 19 growers or 10% insured a total of 922 acres

or approximately 11% of the total acreage planted. No proposals were received from North-Eastern Rhodesia. The actual compensation given during the season was about £177,200. This was paid to 193 growers for damage to 423 different fields covering 5,754 acres damaged by hail.

TOBACCO TRADERS ASSOCIATION OF RHODESIA

79. The membership is open to any partnership, syndicate, company or person established in Rhodesia who is engaged in the auctioning, buying, handling, packing or exporting of leaf tobacco of any kind or description. There are at present 20 members in the Association including Messrs. Imperial Tobacco Co., Messrs. United Tobacco Co., and Messrs. Gallaher Ltd.

The entrance fee for membership is 50 guineas. In addition a member has to pay an annual subscription of 25 guineas together with a subscription of 5 guineas for each sub-section of the trade to which he belongs.

The President and the Vice-President are elected in each annual general meeting. The ordinary business of the Association is conducted by a Council consisting of one representative of each trade sub-section and the President of the Association.

80. The objects of the Association are:—

(a) to promote, advance and protect the tobacco industry of Rhodesia and the interests of all sections and classes of *bona fide* companies, partnerships or persons engaged in the auctioning, buying, handling, packing and exporting of leaf tobacco of any kind or description;

(b) to collect and supply information affecting the industry to members;

(c) to join, federate or affiliate with, or to take joint action with any other association within or without Southern Rhodesia having similar or allied objects;

(d) to encourage, assist or conduct research in regard to problems relating to the production, handling,

manipulation, grading and storage of leaf tobacco;

(e) to promote, to draft or to assist in promoting or drafting any Bill or Ordinance calculated to further the said objects for presentation to Parliament or any other Legislative Authority and to assist in procuring the enactment, promulgation and enforcement of relative legislation;

(f) to make representations to any Minister, Government or Public Authority, relative to the necessity for the enactment of new legislation or for the amendment of any existing legislation or for the issue, repeal or amendment of regulations, bye-laws, ordinances or rules in any way connected with or incidental to the said objects. To oppose any legislation which might be harmful or opposed to the said objects.

TOBACCO RESEARCH BOARD OF RHODESIA AND NYASALAND

81. The Board was first constituted under the Tobacco Research Act of 1938. It did not work satisfactorily till, by popular demand, it was reorganised in 1950. It is now functioning under Federal Act No. 1 of 1955, which substituted the original Act of 1938. As previously mentioned, the Board consists of 7 members who are selected by the Minister of Agriculture.

The Board annually elects one of its members as the Chairman and another as the Deputy Chairman. It may appoint an Executive Committee consisting of 4 of its members and may delegate to it such of its powers as it may from time to time determine.

82. The functions of the Board are to direct, control, and carry out tobacco research in the Federation. For this purpose, the Board runs two research stations, a main station at Kutsaga and a sub-station at Trelawney. The total area of the Kutsaga Research Station is about 500 acres, of which about 30 acres are under tobacco. The total expenditure is £48,200 of which salaries are £25,000. The Trelawney sub-station is an

old farm converted into a sub-station. It is more like a grower's farm and has an area of about 4,000 acres, of which about one-third is cultivated. Tobacco is grown on about 50 acres. The total cost of the sub-station comes to £28,000 out of which staff salaries are £13,000.

83. The Board receives a certain annual grant from the Federal Government and its expenditure exceeding this grant, minus the revenues from the research stations is contributed by the Rhodesian Tobacco Association. During 1955, the Government's grant was £50,000, receipts from the research stations £15,000 and the contribution of the Rhodesian Tobacco Association £60,000. Of the total amount expended by the Board salaries were about £63,000 and cost of publication about £4,000.

84. The expenditure of the Tobacco Research Board is proposed to be raised to £160,000 of which £50,000 will be grant from Government, £95,000 will be met by the Rhodesian Tobacco Association from the levy, £15,000 receipts from the two farms.

85. The Government is prepared to spend upto 1% of the total value of tobacco produced in the country as the total expenses of the Tobacco Research Board.

KUTSAGA RESEARCH STATION

86. The Kutsaga Research Station situated south of Salisbury, 10 miles away on Prince Edward Dam Road, was started in the year 1951. The Director, Tobacco Research is the controlling authority in all administrative and technical matters of this station as well as its sub-station at Trelawney. It has the sections of Agronomy, Chemistry, Plant Breeding, Plant Pathology and Engineering, each being in charge of a senior research officer who is assisted by one or more assistants according to the number of research projects handled in the section. Wherever and whenever possible, problems are being tackled co-operatively by the sections concerned. There is also a Biometrician to plan experiments, analyse and interpret their results. The laboratories are newly built and some of the buildings are still under construction. They are fairly well equipped. Glass houses have been built

and are in use. The Station has a Library which possesses up-to-date tobacco literature in the shape of books and periodicals.

TRELAWNEY SUB-STATION

87. The Trelawney Sub-station is situated about 60 miles west of Salisbury. The Entomology section of the Research Board is located there. In addition, a number of agronomic experiments are also conducted.

Since the establishment of the Tobacco Research Board in 1950 and the appointment of its Director, Tobacco Research the research work on tobacco has been organised on sound practical lines. The work is being concentrated on three main objectives, viz., higher average yields, better average quality, and more economic production. The problems existing in flue-cured tobacco production in Southern Rhodesia, the solutions already found if any, and the manner in which the unsolved problems are being tackled, are described below:—

DEFICIENCY OF HUMUS AND HIGH INCIDENCE OF EELWORM IN TOBACCO SOILS

88. The system of rotation followed in tobacco soils till recently in Southern Rhodesia was: (i) leaving the land fallow for 5 to 6 years; (ii) growing rotation crops of maize, groundnut, sunflower or fodder grasses such as elephant grass, paspalum, Rhodes grass, etc., with a view to build up the humus in the soil. Leaving fallow for many years involved wastage of land. Most of the rotational crops being susceptible to eelworm causing either root-knot or brown root rot, increased their infestation. Experiments conducted at the Kutsaga and Trelawney research stations have shown that weeping love Grass is highly resistant to eelworm attack and builds up adequate humus in the soil in the course of only two seasons' growth in addition to giving high yields of fodder and seed. Hence, rotation of Love Grass has been recommended and is being quickly adopted by the farmers.

BUILDING UP NITROGEN STATUS OF THE SOIL

89. Early ploughing in February previous to cropping has been recommended to allow nitrification for a longer period.

PROMOTION OF GOOD ROOT DEVELOPMENT

90. Early and deep ploughing upto 9" combined with the farmers' practice of planting on ridges, application of large doses of phosphorus, is the combination of improvements recommended. The benefits of these recommendations are being realised by the growers.

FERTILISING THE SOIL

91. Large doses of P_2O_5 and K_2O (100 lbs. and 90 lbs. respectively per acre) in combination with appropriate quantity of N (varying according to experience from 4 to 6 lbs. N per acre) have been recommended on the basis of responses observed in respect of both yield and quality at the research station. Under certain conditions very high doses of P_2O_5 and K_2O , even upto 400 lbs. and 200 lbs. respectively per acre, are being recommended. Fertiliser mixtures based on these recommendations are being used by many cultivators. Minor elements like copper, magnesium, etc., are being tried. There are indications of response to copper applied as copper sulphate.

VARIETAL IMPROVEMENT FOR IMPROVING YIELD AND QUALITY

92. The two varieties, Hicks and Delcrest, were introduced by the Tobacco Research Board from Canada about 5 years ago, and have very quickly replaced some of the older varieties such as White Stam Orinoco and Jamaica wrapper, on account of the superior quality of their leaf combined with satisfactory yield. Due to the high appreciation of their leaf by the buyers, the new varieties have enhanced the reputation of flue-cured tobacco industry in Southern Rhodesia.

These varieties have narrower leaves than varieties like Virginia Gold, Harrison Special and Oxford 26; but are much superior to the latter in respect of quality. For example, in varietal trials, Virginia Gold has been found to top the list in regard to yield, but is not liked by the buyers on account of its broad leaf and its characteristic of losing colour fast. To combine the merits of the high yielding broad and narrow leaved quality varieties, suitable crosses and back crosses have been made

between them. The derived cultures are under tests for their economic characters.

A Grade Index method has been developed for the rating of varieties, strains, and cultures for leaf quality.

EELWORM IN THE NURSERY

93. The recommendations are: (i) to select a site for nursery which is least infested with eelworm; (ii) treating the nursery soil with Methyl Bromide at the rate of $\frac{3}{4}$ lbs. to 1 lb. per 100 sq. ft. and covering it up for 48 hours before making the beds; Plastic sheeting of 100' x 12' size is found suitable for covering the bed of 100' x 3½'; (iii) using water only from wells and bore wells for watering.

The species *N. repanda* has been found to be immune to nematode and therefore crosses have been effected between *tabacum* and *repanda*.

CATERPILLARS

94. Dieldrin spray is recommended.

DAMPING OFF (PYTHIUM)

95. Spray of perenox or Bordeaux mixture is recommended. Watering is to be done moderately.

FROG EYE

96. The incidence is high in late sown nurseries. Recommendations for control are: (i) early sowing (ii) spraying of nurseries with Bordeaux mixture.

ANTHRACNOSE

97. Experiments with organic fungicides like Cyneb, Manch, Thairam, Dithene Z-38 and parzate in progress.

OPTIMUM TIME OF PLANTING

98. Early planting, so as to give about a fortnight's dry weather to the transplants to establish themselves well, is recommended.

FIELD PESTS-APHIDS

99. Spraying with parathion and Malathion is recommended, and is practised by growers. No after-effects on the leaf are said to have been reported.

CATERPILLARS

100. Dieldrin spray is recommended.

FIELD DISEASES-FROG EYE

101. The control measures recommended are: (i) advancing the planting date to enable harvesting before wet weather; (ii) application of more nitrogen through a well balanced fertiliser mixture; (iii) introduction of steam into the barn during the yellowing stage to maintain the wet bulb temperature above 96°F.

WHITE MOULD

102. Experiments on control are in progress. Spraying of Karathane is found useful. Actitane and maneb are also being tried.

For developing resistance to white mould in the cultivated varieties, *N. tabacum* has been crossed with resistant types of *N. glutinosa*, *N. silvestris* and *N. Dirugla* species. Cultures which are almost completely like *tabacum* and possessing the full resistance to white mould, have been secured in the 5th back-cross generation of the inter-specific cross between *N. tabacum* and *N. glutinosa*.

They are under study for their economic characters.

ANTHRACNOSE

103. Organic insecticides are being tried. A strain of the species *N. sandaræ* is found to be resistant and is proposed to be crossed with *N. tabacum*.

ALTERNARIA, AND ANGULAR LEAF SPOT

104. A strain of the species *N. suarcolens* has been found to be resistant to alternaria and is proposed to be crossed with *N. tabacum*. It is felt that the application of a balanced fertiliser reduces the incidence of the diseases. Alternate hosts are being investigated.

MOSAIC

105. Washing of hands with soap and running water at every stage at which the seedlings or plants are handled is recommended.

Resistant material has been created by crossing Vamor-50 with yellow Marmoth and Delcrest.

LEAF CURL, ROSETTE, AND WILD FIRE

106. Clearing of stalks after harvesting to limit the population of white Flies and tobacco aphids is recommended.

REMOVAL OF SAND LEAVES

107. The Tobacco Research Board recommends the retention of sand leaves as the plant food manufactured by them is translocated to the upper leaves which benefit therefrom. A few farmers have started adopting the recommendation.

OPTIMUM TIME AND LEVEL OF TOPPING

108. Cultivators used to top their crop rather indifferently, quite often, later than at the appropriate stage. The Tobacco Research Board has recommended the time when one tenth the number of flowers appear on the plant, as the correct stage of topping. More leaves being left when the plant is vigorous and less when its growth is satisfactory. Emphasis is laid on not postponing the operation irrespective of the number of leaves to be left on the plant. This recommendation has been adopted on a large scale and has been responsible for boosting the yields and improving the quality, more particularly the body and texture of the leaf.

CONTROL OF SUCKERS

109. The Tobacco Research Board has recommended the application of Bayol or Suckerine (the mineral oil emulsions produced by Standard Vacuum Oil Co., Ltd.) on a clear day, to the buds in the two top leaf axils (for details, please see 'Suckering' under general cultivational operations). This recommendation is being adopted by farmers.

The board also recommends that suckers should not be removed when only the top leaves on the plant remain to be harvested, as otherwise they are likely to turn green and coarse.

BARN ACCOMMODATION

110. In general, the yields per acre have gone up; but, the farmers have not constructed additional barns due to which there is usually overloading. The Board has recommended barn construction at the rate of one per 5-6 acres; but, as construction

is costly, the recommendation is yet to come into practice.

BARN SPOT (CAUSED BY FROG EYE DISEASE)

111. The Tobacco Research Board recommends the introduction of steam at a pressure of 25 to 30 lbs. per sq. inch into the barn during the yellowing stage. This is done to raise the wet bulb temperature in the barn rapidly to about 100° to 102° F. and the humidity to 100% within an hour or two after loading. These temperature and humidity conditions are to be maintained during the first 18 to 20 hours of the yellowing stage, after which the steam is to be cut off, the furnace being meanwhile adjusted to maintain the temperature, at 100°F. to 102°F. This practically eliminates barn spot development.

VENTILATION FOR PREVENTION OF BARN ROT

112. To get the moisture out of the barn, whether curing is done with steam or not, 2 sq. ft. of top and 2 sq. ft. of bottom ventilator are recommended for every 100 sticks of tobacco. This is thought to be satisfactory for prevention of barn rot also.

MAINTENANCE OF PROPER HUMIDITY WITHIN THE BARN

113. The Tobacco Research Board is experimenting with different materials such as paints to act as waterproof agents to the inside and outside walls.

FARMERS' WEEKS AND VISITS OF SPECIALIST OFFICERS TO FARMERS' FIELDS

114. The Tobacco Research Stations hold Farmers' Weeks during the season. In addition, the specialist officers go in teams accompanied by the Chief Tobacco Extension Officer and address meetings of farmers in a few centres just before the advent of the season.

TOBACCO EXTENSION ORGANISATION

115. The work of research findings is done by a section in the Soil Conservation and Extension Wing of the Federal Department of Agriculture, which works in full co-operation with the Tobacco Research Board. There is a Chief Tobacco Extension Officer for Southern Rhodesia who looks after 35 tobacco extension districts, each

consisting of about 80 growers. There are eight assistants under him who do the advisory work in the major tobacco growing areas. Where there are only a few growers, tobacco extension work is done by the general Extension Staff of the Agricultural Department.

116. Each Extension Officer is trained for a season or two on the farms of experienced, reputed growers. During the period of training, he visits the Research Stations twice in a month during the tobacco season. He also spends two weeks at the commercial graders' sheds and two weeks at the auction floors to get thoroughly conversant with the methods of grading and evaluation of the leaf.

117. After this basic training, he is allotted a division for extension work. Even thereafter, in order to keep himself abreast of the findings of research, he visits the Research Stations, grading sheds and auction floors 2 to 3 times in a season. He keeps himself in touch with the members of the Council of the Rhodesia Tobacco Association, and discusses with them the problems of the farmers. He visits the tobacco growers in his area as frequently as possible, studies their problems, and gives whatever advice he can. For more difficult problems he makes reference to concerned officers.

He tours about 22 days in a month. The total number of visits made by all members of the Tobacco Extension Staff in the years 1953-54 and 1954-55 are mentioned below :—

	1953-54	1954-55
Farm visits ...	2,219	2,205
Tobacco Research Stations ...	150	132
Grading sheds ...	229	158
Miscellaneous ...	249	88
Total ...	2,847	2,673

Of the farm visits in 1954-55, 1,163 visits, or 51% were made at the request of the farmers concerned. This shows the confidence that the Extension Staff commands amongst the growers. The Extension officer also arranges tobacco exhibits in Agricultural

shows, and writes articles for the Tobacco Review and the Rhodesian journals.

THE RHODESIAN TOBACCO MARKETING BOARD

118. A Rhodesian Tobacco Marketing Board which was formed as early as in 1930 has been functioning under the Tobacco Marketing Act since 1936. This Act has now been substituted by the Federal Act No. 5 of 1955. As previously stated this Board controls all aspects of the industry right from cultivation upto auction sales and exports. The Board consists of 6 members who are appointed by the Minister of Agriculture.

119. According to the Act, the Secretary of the Federal Ministry of Agriculture has to keep an annual register of growers. Each grower has to submit his application for registration according to prescribed rules, and unless he does it, he is not entitled to sell tobacco in the prescribed area or export it on consignment. The owner of a licenced auction floor is prohibited from selling on his auction floor tobacco of a farmer who is not registered with the Ministry. Each registered grower is allotted a number which he has to stencil on every bale that he sends to the auction floor for sale. The grower cannot put any registered number other than his own nor can he send tobacco not grown by him under his number.

120. The Minister in consultation with the Buyer's Association and the Growers' Association, prescribes types or varieties of tobacco which are to be grown and sold in and exported from the Rhodesias. The varieties of Virginia tobacco prescribed for growing are Bonanza, Cash, Daines Bright Leaf, Delcrest, Duquesne, Gold Dollar, Hicks, Jamaica Wrapper, Trelawney C. 7, Trelawney C. 10, Vamoor 50, Virginia Bright, Virginia Gold, Warne, White Mammoth, White Stem Orinoco, Yellow Leaf, Willow Leaf, Yellow Mammoth, Yellow Pryor. The grower's fields are liable to be inspected by Inspectors appointed by the Board, and if any unlicensed variety is grown it is liable to be destroyed.

121. There is a provision in the Act for quota allocation of tobacco to be sold in the Federation or exported from the Federation

by grower in a prescribed period, if in the opinion of the Minister the quantity of tobacco produced in the Federation is likely to be in excess of the anticipated requirements of the markets.

122. Commercial graders are annually licenced under the Act, for which a fee of £5 is required to be paid to the Board by each grader. The Board specifies conditions which are binding on licenced graders relating to any of the following matters:—

- (a) Handling; storage of tobacco.
- (b) Grading of tobacco.
- (c) Any process of conditioning or treating tobacco.
- (d) Supervision to be exercised over the handling, grading and storage or despatch of tobacco.
- (e) The manner in which tobacco is to be despatched after it has been graded.
- (f) The buildings, plant and equipment used for or in connection with the handling, grading, storage and despatch of tobacco.
- (g) Receipts, returns and documents to be furnished to the growers and to the Board.

123. The Board appoints Inspectors who are authorised to inspect the premises of any licenced grader without previous notice to see that he complies with the various provisions of the Act.

Auction floors are also licenced annually for which the owner of each floor has to pay to the Board a fee of £50.

For construction or modification of an auction floor, the permission of the Board is necessary.

The buyers are annually licenced by the Board for which a fee of £10 is to be paid to the Board.

Nothing of the following can be done without the written permission of the Board:

- (a) Sale of tobacco—even on barter system—within a prescribed area in any manner other than by auction on a licenced auction floor.

- (b) No tobacco other than flue-cured and fire-cured can be offered for sale or sold on any licenced auction floor.
- (c) No tobacco which is not grown in the prescribed area, can be offered for sale or sold on any auction floor.
- (d) No person can deliver to an auction floor tobacco reaped during the 12 months preceding the last day of the auction sales in any year for sale during the subsequent year.

124. The Board fixes from time to time the quantity of tobacco which may be stored at any one time by the auction floors and the auction floors cannot at any time store tobacco in excess of the quantity so fixed. In order to avoid any rush of bales coming in large numbers at one time, the Board fixes periodical delivery quotas of bales to be sent to the auction floors by each farmer taking into consideration his area under tobacco. The quota of a farmer includes the bales, if any, he may have sent to any commercial grader. The days and hours of sale are stipulated by the Board.

The minimum selling price on the auction floor is also prescribed under the Act as one penny per pound.

125. Before opening of the auction sales each year, the Minister of Agriculture, in consultation with the Board, announces in the Federal Gazette a minimum price or prices for the local market and for other markets for the ensuing season. The minimum for local sale cannot exceed 4½ pence per pound and that for any other market 3 pence per pound.

126. The Board appoints a Sales Supervisor with wide powers to supervise, control and regulate sales.

127. The Board has appointed in 1955 a Sales Advisory Committee consisting of 2 members of the Tobacco Traders Association and a representative of each auction floor, to act as an Advisory Committee to the Sales Supervisor in matters affecting the programme and progress of sales.

128. The Board has prescribed:—

- (a) Duties of sellers in regard to the packing of tobacco, marking of bales, condition of tobacco, removal of the unsold tobacco and the disposal of hessian and other material used for packing tobacco.
- (b) Prohibition of sale on a licenced auction floor of tobacco which is either ungraded, improperly packed or suspected to be unlicensed tobacco. According to rules made under the Act, the following things are enforced:—

Nesting, i.e., packing of tobacco into bales in such a manner as to deceive the buyer as to the nature and quality of the contents as a whole, is taken to be a serious offence. Any seller who offers for sale tobacco which is found to be nested is made liable to a fine of £10 for the first offence and £20 for each subsequent offence payable to the Board. Should tobacco offered for sale by a seller be found to be nested on a second or a subsequent occasion, his number is posted in a conspicuous place at the auction floor.

In split bales, the different grades packed are to be separated by sheets of water-proof paper 34" × 24" in size. The word 'split' is clearly printed on the bale ticket and the bale is declared as 'split' to the buyers. The method of filling the bale in the case of strips and scraps is also prescribed.

- (c) The duties of the owners of the auction floors in regard to tobacco accepted for sale; the method of storage of tobacco (tobacco is to be stacked not higher than equivalent to 4 bales of normal size), the disposal of the hessian and other packing material; the observance by sellers of their prescribed quotas; the liabilities to make good any losses through errors in weigh-

ing; maintenance and submission of accounts, etc.

- (d) The maximum speed at which tobacco may be sold on an auction floor.
- (e) The procedure to be adopted in regard to unsold tobacco.
- (f) The circumstances in which a seller or a buyer may repudiate or cancel a sale.

A seller can cancel the auction sale of his bale by tearing off the bottom right-hand corner of the bale ticket before the sale has been recorded in the auction floor recording sheets or books. Such bales are offered for re-sale without declaring the identity. Similarly, the buyer can cancel his purchase by tearing off the bottom left-hand corner of the bale ticket before the sale is recorded.

- (g) The fees to be paid by the buyer for the examination of tobacco sale of which he wishes to repudiate.
- (h) The duties of buyers in regard to the removal of bales from licensed auction floors and the handling of hessian and other material by them and its return.
- (i) The examination of records.

The buyer has to pay to the auction floor the price of tobacco purchased by him within 24 hours. From the amount received from the buyer the owner of the auction floor deducts the tobacco levy and his authorised charges, i.e., his commission and weighing and selling charges, and pays the remaining amount to the grower. The authorised charges of the auction floor are fixed by the Board, in consultation with the owners of the auction floors.

129. For the 1956 season, the commission on sales was 2% and weighing and selling charges were each six pence per bale (actu-

ally, the owner of the auction floor issues the cheque to the grower on the very same evening on which the auction takes place and receives the amounts from the buyer the next day).

130. The buyers have to promptly return to the owners of the auction floors in neat rolls all hessian and paper in which tobacco purchased on such floors has been packed.

131. The export of tobacco is controlled as per the Act. No unmanufactured tobacco or manufactured tobacco other than tobacco which is cut at not less than 4 cuts per inch can be exported, except with a permit issued under the authority of the Minister.

There is prohibition on the export of tobacco on a consignment basis unless the value per pound weight is certified by the Board.

132. The local manufacturer cannot use for manufacture or sale any tobacco other than one which is grown and purchased in auction in the prescribed area.

Outside tobacco is allowed to be purchased at a price below the minimum price prescribed by the Minister, provided the manufactured tobacco is to be sold for consumption outside the Federation.

133. Any person who is guilty of offence in contravening the provisions of the Act is liable to a fine not exceeding £500 or in default of payment to imprisonment for a period not exceeding 12 months.

TRADE AGREEMENTS

134. Most of the flue-cured tobacco in the Federation of Rhodesia is exported. A high proportion of the exports go to the U.K. and Australia under 5-year purchase agreements which guarantee certain specified minimum uptake by those countries. These agreements have stabilised the export trade of Rhodesia to a considerable extent.

135. *The London agreement.*—Southern Rhodesia has been, since many years, having a 5-year agreement with the Board of Trade of U.K. for the uptake of Rhodesian flue-cured tobacco. The agreement was being extended so that at any time the 5-year period ahead is covered. According to the

London agreement, the U.K. has to take a minimum of 85 million lbs. of Southern Rhodesia flue-cured tobacco per year in 1954 and 1955 and 80 million lbs. per year in 1956, 1957 and 1958 provided:—

- (i) sufficient quantities of suitable grades are available;
- (ii) the prices are reasonable; and
- (iii) the consumption in the U.K. remains steady.

However, the Tobacco Advisory Committee of the Board of Trade of U.K., indicated that, since 1953, conditions of virtually free competition had increased in the home trade and there had been changes in the relative position of individual manufacturers and in the pattern of trade as between brands: and therefore the Committee did not feel that it could continue to anticipate the U.K.'s requirements of leaf from any source as far ahead as 5 years. But, the Committee undertook to provide to the Marketing Board, year after year, from July 1956 onwards, closest estimates that could be made of the quantities of Southern Rhodesian flue-cured tobacco that the U.K. would wish to purchase for each of the following three years:—

The estimate that could be given in July 1956 would relate to 1959.

The July 1957 estimate would cover 1959 and 1960.

The July 1959 estimate would cover 1959, 1960 and 1961 and so on.

These forward indications of the U.K. purchases would be subject to the proviso that Southern Rhodesian flue-cured crops are of sufficient size and quality to permit of U.K. buyers achieving their target purchases of suitable quality tobacco at reasonable prices. The Tobacco Advisory Committee looked to the Marketing Board to take all measures necessary to meet this proviso.

There is also a duty preference of s. 1 p. 6½ per lb. on unmanufactured Rhodesian tobacco in the U.K. market.

136. *The Australian agreement.*—Australia has effected an agreement with Southern Rhodesia on lines similar to those of Tobacco Advisory Committee of U.K. Under the agreement the Australian buyers have under-

taken the purchase of, every year, from Southern Rhodesia either 9.72 million pounds or 6½% of the total production of flue-cured tobacco, whichever may be less.

Southern Rhodesian tobacco enjoys also a duty preference of 9 Australian pence per lb. in the Australian market.

137. *Agreement with the Union of South Africa.*—Southern Rhodesia has also a trade agreement with the Tobacco Industry Control Board of South Africa. The following are the main points of the agreement:—

In order to make up the stock shortfall of 10 million lbs., South Africa would permit duty free imports upto a maximum quantity of 5 million lbs. from the 1954-55 crop, and, if necessary, further imports upto 5 million lbs. from the 1955-56 crop. In addition to the above, South Africa undertook to permit the import annually of a quantity, not more than 3 million lbs. plus 25% and not less than 3 million lbs. less 25% from the Rhodesian crops of 1955-56, 1956-57 and 1957-58.

138. *Agreement with France.*—In 1953 there was a trade agreement between Southern Rhodesia and France which provided for purchases by France, of flue-cured tobacco worth £215,000.

In April 1955, the agreement was reviewed and renewed on a modified basis. The French gave credits for sterling francs for the purchase of Federal tobacco by metropolitan France and her Colonies for amounts totalling £430,000.

139. Germany, Hungary, Denmark and Norway are said to have been interested in Rhodesian tobacco, and it is possible they also may think of making agreements with Rhodesia.

PRESENT POSITION AND FUTURE PROSPECTS OF FLUE-CURED TOBACCO INDUSTRY IN SOUTHERN RHODESIA

140. Southern Rhodesia enjoys a number of natural advantages for the production of flue-cured tobacco. The soils in a large part of the Colony are light, i.e., sandy or sandy-loams. Chemically they are on the acidic side with pH varying from 5.5 to 6. This is favourable for the availability of nutrients

such as P_2O_5 and minor elements to the crop. The growing period synchronises with the rainy season as a result of which the moisture in the soil is adequate for the intake of the nutrients by the crop during its stand.

Tobacco cultivation is done mostly in large holdings varying in extent from 1,000 to 7,500 acres. These holdings are highly economic, as they grow paying crops such as tobacco, maize and groundnut, and in addition maintain several heads of cattle for which fodder crops can easily be raised. Each such farm has plenty of bush and arable land on account of which the farmer can not only secure some area of virgin land which is known to be very suitable for the production of high quality tobacco, but also afford to shift the tobacco cultivation from plot to plot leaving the cultivated area fallow for several years to build up humus and recoup fertility.

141. As only about 28 per cent of the arable land is supposed to be under cultivation at present, there is plenty of scope for further expansion of the cultivation of crops including tobacco.

142. The grower is invariably a European farmer with adequate means of production and is well versed in land and labour management, use of machinery, and is in a position to adopt with scientific understanding the improvements advocated on the basis of research findings.

143. Invariably the grower is the owner of his land and has not to pay any assessment on the land or duty on tobacco to Government.

144. The Tobacco Marketing Board which has been working under the Tobacco Marketing Act since the year 1936 has meticulously standardised every possible detail of all aspects of the industry from cultivation to marketing and export, more particularly the aspects of grading and marketing. With the availability of overwhelmingly large natural advantages, the existence of such an organisation, the rise in demand of flue-cured tobacco in the U.K. on account of dollar shortage since the Second World War, and the consequent trade agreement with that and other countries ensuring guaranteed

markets, there would have been much better progress than what has been achieved had it not been for the weakness on the production side, which seems to have continued till the establishment of the reorganised Tobacco Research Board in the year 1950.

145. Since the establishment of the Research Board, research has been making rapid strides on practical lines, and under the overwhelmingly favourable natural circumstances, whatever has been done during the short period till today, has gone a long way to stabilise the industry. The most important amongst the improvements recommended by the Tobacco Research Board and adopted on a large scale by the growers, are:—

- (1) Introduction of responsive, quality varieties.
- (2) Early and deep ploughing.
- (3) Early planting.
- (4) Inclusion of high doses of P_2O_5 and K_2O in the manure mixtures.
- (5) Topping at the appropriate stage.
- (6) Control of barn spot by steam curing.

The recent finding of rotation of tobacco with Weeping Love Grass which is capable of quickly building up the humus and reducing the eelworm infestation in the soil while giving high yields of fodder and seed, is expected to increase considerably the production of high quality tobacco without appreciable increase in the area of cultivation. The breeding of varieties resistant to numerous diseases prevalent during the growth of the crop in a wet period has been taken up. Already, tobacco strains which have high resistance to White Mould (ash disease), which is a serious disease, have been secured and are under trials for their economic characters. Other measures of controlling diseases are also being devised.

146. It should be clear from what has been stated above that the position in regard to flue-cured tobacco industry in Southern Rhodesia is not only fairly sound to-day, but has possibilities of rapid improvement within the next few years.

LITERATURE COLLECTED

147. A list of literature collected in Southern Rhodesia is attached (*vide* Appendix II).

ACKNOWLEDGEMENTS

148. The information presented in this report was collected through the courtesies of the Ministry of Agriculture, Federation of Rhodesia and Nyasaland; the Rhodesian Tobacco Association; the Tobacco Research Board of Rhodesia and Nyasaland; and the Rhodesian Tobacco Marketing Board and Tobacco Traders Association of Rhodesia all of which willingly kept at my disposal the facilities required for studies of the concerned aspects of the tobacco industry in Southern Rhodesia.

I am deeply indebted to Dr. F. A. Stinson, Director, Tobacco Research and his staff at the Kutsaga Research Station and its Substation at Trelawney who, in addition to

furnishing me with all possible information, date and literature on the different aspects of tobacco research, extended cordial hospitality during my visits to the research stations. I am also highly obliged to Mr. C. Rose, Chief Tobacco Extension Officer, who took me round to distant farms of tobacco growers and concerns of commercial graders and packers, and spared no pains in giving me very useful information and literature not only on the tobacco extension service but also on the varied aspects of tobacco production in Southern Rhodesia. Lastly, my heartfelt thanks are due to the Hon. Mr. J. S. Parker, J.P., Secretary of both of the Rhodesian Tobacco Association and the Tobacco Marketing Board who acquainted me fully with the working of both the organisations, supplied me copies of the Federal Acts, notices, circulars, reports, etc., and showed me round the tobacco auction floors.

[FOR APPENDICES I & II, P.T.O.]

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APPENDIX I

* Grade analysis of flue-cured tobacco leaf sold on the auction floors at Salisbury
1953-54 Season

Type grades	Colour grades						Total
	Lemon	Orange	Red	Light mahogany	Dark mahogany	Dark	
Wrappers	.003	.011	...	.008	.001	...	.023
Leaf	2.519	14.091	.429	11.105	2.861	.419	37.227
Leaf (sub-grade H)	.305	2.360	.070	2.289	.705	...	6.266
Cutters	3.773	3.913	...	...	...	...	8.198
Lugs	3.649	9.236	...	1.017	...	...	14.769
Strips	.190	.556	...	.439	.040	...	1.307
Scrap	.126	...	...	1.020	.053	...	1.267
Non-descript	...	...	...	...	...	23.706	23.706
Mixed (Retained by buyers)	...	...	...	...	...	7.237	7.237
Total	10.565	30.167	.499	15.818	3.660	4.419	100.000

1954-55 Season

Type grades	Colour grades						Total
	Lemon	Orange	Red	Light mahogany	Dark mahogany	Dark	
Wrappers	.004	.015	...	.008	...	...	.027
Leaf	2.770	13.679	.285	9.674	3.399	.969	39.087
Leaf (sub-group H)	.206	1.263	.019	.987	.490	...	3.281
Cutters	4.118	5.376	...	...	...	...	10.777
Lugs	5.228	8.466	...	.679	...	...	15.779
Strips	.210	.530	...	.255	.036	...	1.157
Scrap	.164	...	...	.539	.034	...	.850
Non-descript	...	...	...	...	...	22.060	22.060
Mixed and split (Retained by buyers)	...	...	...	...	...	6.982	6.982
Total	12.700	29.329	.304	12.142	3.959	9.969	100.000

* From the Annual Report of the Tobacco Marketing Board—1955-56.

N. R. Bhat

APPENDIX II

List of tobacco literature collected by Dr. N. R. Bhat, Ph.D. (Cantab.), Director, Tobacco Research, during his deputation to Southern Rhodesia

S. No.	Author/Publisher	Subject
1.	Pretorius ...	Land selection for tobacco.
2.	Tobacco Research Board ...	Delcrest and Ricks lead variety trials (Report No. 2—September 1953).
3.	Do.	How to grow quality tobacco seedlings in Southern Rhodesia—Bulletin No. 2.
4.	Do.	Alkalinity and Salinity in Seedbeds.
5.	Do. ...	Balancing Tobacco Fertilisers—(Leaflet-June 1953).
6.	Do. ...	Fertilising flue-cured tobacco (Leaflet—August 1954).
7.	Central African Fertilisers Ltd.	Guide to the use of fertilizers in Central Africa. (Booklet, 1954).
8.	Tobacco Research Board ...	Fertilizing flue-cured tobacco (Leaflet—July 1955).
9.	Tobacco Extension Branch ...	Why burn tobacco stalks, money and fertility ?
10.	Rose, C. ...	Nyasaland, Flue-cured tobacco and some of the aspects affecting fertilization of the crop in this territory.
11.	Stephen, R. C. ...	Control measures for tobacco diseases (T.R.B. Interim report No. 4).
12.	Tobacco Research Board ...	Frog Eye and Barn Spot (Bulletin 4).
13.	Plant Protection Division of African Explosives and Chemical Industries (Rhodesia) Ltd.	Plant Protection—Tobacco Growers' Chart.
14.	Pl. Protection Division of Cooper and Nephews, S. Africa (pty.) Ltd.	Physical and chemical compatibility (Chart).
15.	Pest Control (Central Africa) Ltd	Pest Control Chart, 1951-52.
16.	Tobacco Research Board ...	How to control insects attacking tobacco (Interim Report No. 3—October, 1953).
17.	Do.	Equipment and method for flue-curing tobacco. (Interim Report No. 5—November 1955).
18.	Tobacco Extension Branch ...	Tobacco Barn Accommodation.
19.	Federal Department of Conservation and Extension.	Tobacco target—Chart.

[P.T.O.]

20. Harland, R. B. ... Hints to new growers on handling and grading fire-cured tobacco (Press report).
21. The Rhodesian Farmer ... Return of Hessian and Paper to growers. (May 9, 1951).
22. Tobacco Research Board ... Results of experiments—1949–51 (Bulletin 1—June 1952).
23. Do. ... Report of progress, 1951–53 (Bulletin 3—December 1953).
24. Do. ... New Headquarters for the T.R.B. of Southern Rhodesia—Kutsaga Research Station. (Leaflet, January 1954).
25. Federation of Rhodesia and Nyasaland. Act No. 2 of 1955—
 - (a) Fed. Govt. Notice No. 52 of 1955 (Act 2/55).
 - (b) Do. No. 53 of 1955 (Act 2/55).
 - (c) Do. No. 54 of 1955 (Act 2/55).
26. Revised Constitution and Rules of the Rhodesia Tobacco Association.
27. Tobacco Hail Insurance Scheme, 1955–56 (with 2 forms and special instructions).
28. Federation of Rhodesia and Nyasaland—Act No. 1 of 1955.
29. Federation of Rhodesia and Nyasaland—Act No. 5 of 1955—
 - (a) Federal Govt. Notice No. 37 of 1956 (Act 5/55).
 - (b) Do. No. 50 of 1955 (Act 5/55).
 - (c) Do. No. 55 of 1955 (Act 5/55).
 - (d) Do. No. 56 of 1955 (Act 5/55).
 - (e) Do. No. 87 of 1955 (Act 5/55).
30. Rhodesian Tobacco Marketing Board. Annual report for the period 7th October 1954 to 19th September 1955.
31. Rhodesian Tobacco Marketing Board. Revised classification of specifications.
32. Rhodesian Tobacco Marketing Board. Circular to all tobacco growers and warehouses.
33. Constitution and regulations of the Tobacco Trade Association of Rhodesia—2.
34. Tobacco Trade Association of Rhodesia. Eighth Annual General Meeting—Proceedings.
35. Brown D. D. ... Dark Fire-cured Tobacco—Field operations. (Bulletin No. 771 issued by the authority of Minister of Agriculture and Lands).
36. Do. ... Dark Fire-cured Tobacco Culture in Southern Rhodesia. (Bulletin No. 1420 issued by authority of the Minister of Agriculture and Lands).
37. Eighth Report of the Agricultural and Pastoral Production of European Farmers—1953–54.

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

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The Indian Council of Agricultural Research has, with a view to creating an incentive for research workers and to recognising outstanding research work done by them in the fields of agriculture, animal husbandry and allied subjects, decided to institute 11 prizes of the value of Rs. 5,000 each. These prizes will be known as "The Rafi Ahmed Kidwai Memorial Prizes for Agricultural Research" and one prize will be awarded annually for outstanding research work done in India in each of the following subjects :—

1. Agronomy
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4. Agricultural Botany
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6. Horticulture
7. Animal Breeding
8. Animal Nutrition (including Physiology and Biochemistry),
9. Animal Diseases
10. Dairying, and
11. Agricultural & Animal Husbandry Economics and Statistics.

2. These prizes will be in the form of gold medals or cash or both and the first prize in each subject will be awarded for outstanding research work done in the country either individually or jointly, during the calendar year 1957, *i.e.*, 1st January to 31st December, 1957, and thereafter for such research work carried out during each subsequent calendar year.

3. The award of each of the prizes shall be based on significant advances in human knowledge in a particular subject as revealed by books, monographs or papers published in the name of the candidate or any other unpublished account of the outstanding research work done or discoveries and inventions made by him. The selection of a candidate for the award of a prize will be made on the recommendations of a Judging Committee consisting of eminent scientists appointed for the purpose by the Indian Council of Agricultural Research. The award of a prize may be made to more than one research worker and the prize money divided amongst them in such proportion and manner as may be decided by the Council.

4. All research workers, engaged in research work in India, in the fields of agriculture, animal husbandry and allied sciences are eligible for competing for these prizes. Applications should be submitted in **quintuplicate**, in the prescribed form, which can be had, free of cost, from the Additional Secretary, Indian Council of Agricultural Research, Queen Victoria Road, New Delhi. Candidates working in Research Institutes etc., should submit their applications through the Head of the Institute/Department etc. Others may submit their applications direct.

5. All applications should be sent in a sealed cover and addressed to the Additional Secretary, Indian Council of Agricultural Research, Queen Victoria Road, New Delhi, so as to reach him not later than the 30th April, 1958. The cover of applications should be superscribed as under :

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....."

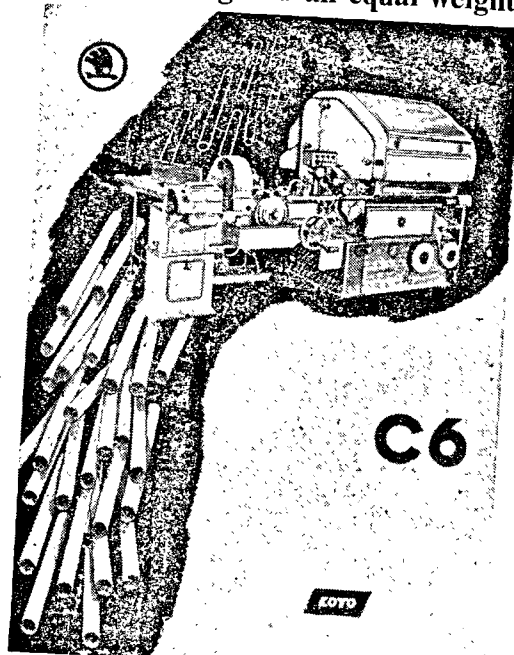
Applications received after the 30th April, 1958, will not be considered.

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SPANGLING IN BIDI TOBACCO

BY

**B. S. KADAM¹, T. KRISHNAMOORTHY²
AND N. A. AWATRAMANI³**

Introduction

In bidi tobacco the development of spangles on the leaf is an important commercial character. The extent of development of these spots is an important criterion in the quality assessment of bidi tobacco in Gujarat and Nipani, the two most important bidi tobacco areas in the Bombay State. Leaves which have a larger number of spots generally fetch a higher price. (Figs. 1 and 2). These spots are called *butta* in Gujarat and *mohor* in Nipani.

Critical observations regarding the development of these spots were made at the Bidi Tobacco Research Station, Anand, Gujarat. In this area bidi tobacco is normally planted in the first week of September and becomes ready for topping in the third week of October. During the first two weeks after topping maximum development in length, width and thickness of leaves occurs. Subsequently, however, leaves develop in thickness only resulting in puckered surface. Maximum amount of puckering is achieved by the leaves by the middle of December when the crop commences to mature. At this stage, the formation of spangles becomes apparent. In the highly puckered individual areas, which appear slightly elevated pin-



Fig. 1.—A mature bidi leaf showing good development of spangles.

point yellowing is first observed. The yellow area gradually enlarges radically and is followed by the appearance of a light red

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³ Technical Asst., Central Tobacco Research Institute, Rajahmundry.

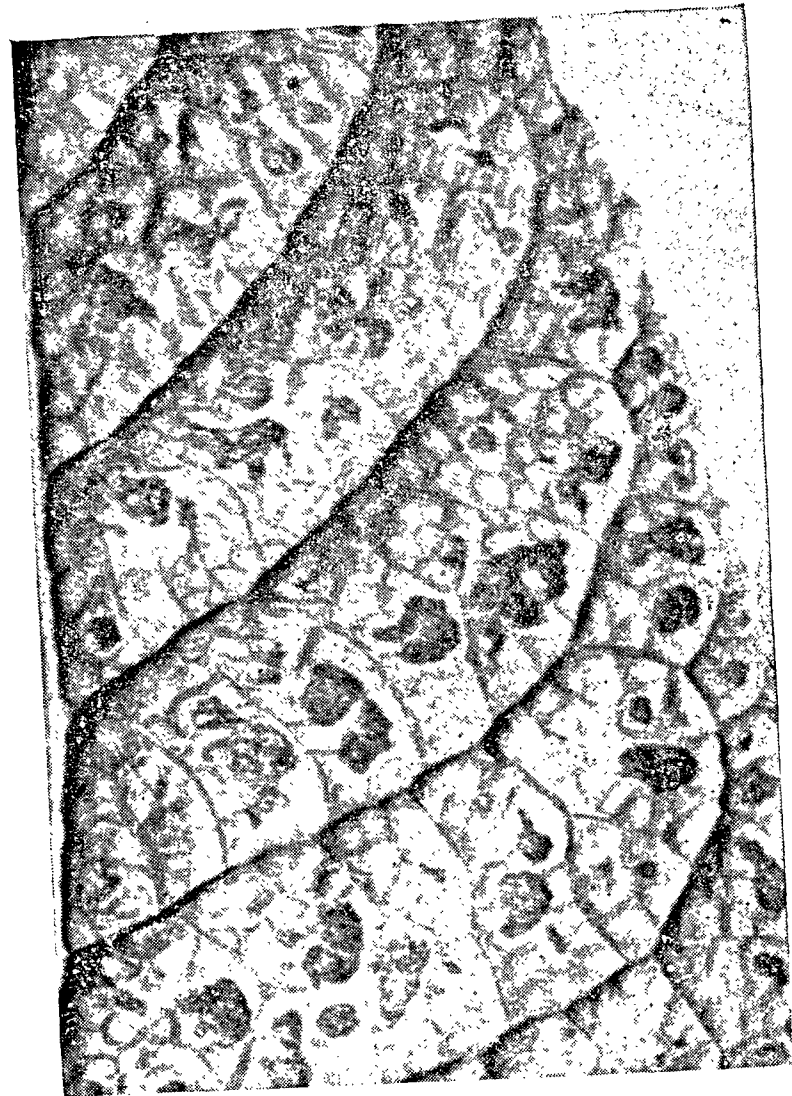


Fig. 2.—Enlarged portion of leaf showing size and distribution of Spangles. Note also the highly pickered surface.



Fig. 3. Showing excessive coalescence and fraying of the margins.

brownish tinge at the centre of the yellow area. The reddish area also enlarges becoming more deep and ultimately results in a reddish brown spot or spangle. On the lower side of the leaf, the spangle is not as reddish brown as it is on the upper side.

tions of the leaf become greenish yellow on drying but the spangles retain the original brick-red colour.

The character of spangling, as such, does not find any mention in tobacco literature, as in other countries bidi tobacco is not grown. Certain "physiological" conditions, more or less resembling spangling have been, however, described by Garner (1946), Wolf (1935), Hopkins (1931) and Shear (1941). Garner mentions 'drought spots' injury caused by drought. These 'drought spots' arise in the same way as spangles. Wolf attributes 'drought spots' to deficient moisture supply for protracted periods. Hopkins has named a similar condition as 'red rust'. He mentions that this type of symptom appears towards the end of the season and is usually most severe on heavy types of leaf. Shear's description of what he calls physiological breakdown of matured tobacco is almost similar. According to him, nitrogenous fertilisers and low topping increases such injury. The above observations are based on cigarette tobaccos which have relatively thinner leaf and are not normally heavily fertilised or topped low as the tobaccos required to produce thicker leaf.

Bidi tobacco is however topped early with only 10 leaves per plant. The duration between topping and harvest is of at least 3 months which is comparatively longer than such periods in other topped tobaccos. Mature bidi tobacco leaf is therefore very thick as compared to other kinds. The development of spangles in bidi tobacco is comparatively less intense unlike the 'drought spot'. In 'drought spot' injury, the spots are reported to coalesce and form red blotch on the entire interveinal area. Excessive coalescence of spangles in bidi tobacco by delaying harvest too long also leads to a similar condition. Perhaps due to the thickness of the leaves, the breakdown is controlled and does not result in inward rolling of margins and rim burn as observed by Shear. The physiological and chemical aspects of spangle development in this tobacco have not been studied so far. A few physical observations regarding this character from some preliminary experi-

In the interveinal area, adjacent spangles coalesce to form bigger ones. Coalescence of spangles does not take place between the adjacent interveinal areas of the secondary veins or across the midrib. Spangles are of various irregular shapes and different sizes but, more often, they are roughly oval. Well developed spangles may vary from small spots-one-tenth inch across to small patches of one half to three-quarter inch. A fully developed spangle is practically a dead tissue and can be easily separated off from the adjoining green portion of the leaf. If the harvest is delayed, spangles over-develop and larger ones coalesce, (Fig. 3.) the entire interveinal area becoming a brownish red band. In the harvested plants the green pro-

ments at the former Bidi Tobacco Research Station, Anand, are presented below:—

Experimental

1. *Season*:—The observations were recorded during three seasons from 1948-49 to 1950-51, the total rainfall in each of these seasons was 11, 26 and 45 inches respectively; the average for 25 years being about 40 inches. The rainfall in the second season though deficient, was well distributed and was conducive to good spangle development. In the first season, the development was sub-normal, while in the third season it was normal only in medium soils.

2. *Varietal differences*:—Varieties differ in their extent of spangling. *Keliu-49*, an improved train of bidi tobacco, spangles best and has a number of large spangles. In *Gandiu-6*, another improved strain of bidi tobacco, spangles are smaller and sparser in effect. In *Saijpuriu*, puckering is very pro-

nounced and small spangles develop at the highest points of the puckered area so that they look like reddish brown pimples. The *Surti* variety of Nipani has a smaller number of spangles than *Keliu*, but the spangles are bigger. *Piliu*, a chewing variety, is similar to *Keliu*. Cigarette varieties, Harrison Special, Amarelo and White Burley, even when manured heavily and topped, low, do not spangle like bidi tobaccos. The spots produced in these varieties resemble more the 'drought spot' than the spangle and the leaves get frayed very soon after the formation of the spots.

3. *Variation within the same plant*:—The development of spangles is not similar in the different leaves of even the same plant. In connection with grading of bidi tobacco, Kadam *et al.*, (1951) studied spangling of individual leaves and have devised a method of rating each leaf. The summary of data collected by them is given in table 1 below:

TABLE I
Mean number of marks for spangling (Average of 210 plants studied over 3 seasons)

Leaf No. from base to top	Marks	Leaf No. from base to top	Marks
1	0.22	7	1.64
2	0.32	8	2.54
3	0.55	9	2.68
4	0.81	10	2.28
5	0.74	Mean	1.35
6	1.75	S.E.	0.12

Significance :— 9 8 10 6 7 4 5 3 3 1

The data show that all the leaves in a plant do not spangle in the same manner and that there is a distinct gradient from lower to upper leaves. Top leaves develop more spangles than the lower ones on the same plant.

4. *Variation within the leaf*:—The development of spangles within a leaf is also not uniform. This variation was studied

in a normal plant. The number of spangles, more than one-fourth inch across, were counted in each interveinal portion on either side of the leaf in the top six leaves. Lower leaves were not included as they were shaded by the top leaves which affects the development of spangles as has been shown later in this article. As the interveinal sections at the apex and base of each leaf are much smaller than those in the mid-region three

such sections at both ends of the leaf were taken together. There were thus nine sections for both the halves of the leaf. The data are given below:—

TABLE 2
Mean number of spangles in each interveinal area

Interveinal area from base of leaf	No. of spangles	Interveinal area from base of leaf	Number of spangles
1	2.75	7	4.42
2	4.42	8	4.00
3	6.00	9	4.08
4	5.50	Mean	4.72
5	6.17	S.E.	± 0.63
6	5.17		

Significance :— 5 3 4 6 2 7 9 8 1

It will be observed that the central area of the leaf develops more spangles than the basal and apical parts.

5. *Variation due to cultural methods*:—
(a) *Nitrogen*: It is well known to bidi tobacco growers in Gujarat that poorly manured crops do not spangle well. Very high doses of nitrogen are therefore applied more with a view to make the plants spangle better, than for yield. In an experiment of 1949-50 (Krishnamoorthi *et al.*, 1954) with three manures, farmyard, castor and ground-nut cake and 4 leaves of nitrogen

20, 40, 80 and 120 lbs. per acre, one of the replications was studied for spangle development. The individual leaves were rated for spangling as per method adopted by Kadam *et al.*, (1951). Leaves from only two harvests instead of three were available as the plants of the third harvest were affected by frost. Plants from no manure plot could not be included as sufficient number of leaves were not ready even at the second harvest. Therefore the percentages of leaves from the two harvests, on the basis of the total number of leaves harvested in each treatment are given below:—

TABLE 3
Intensity of spangling of bidi leaves (in per cent) with varied doses and sources of nitrogen

Marks	Source of N			Quantity of N per acre		
	F.Y.M.	Castor cake	Ground-nut cake	40	80	120
4	5.0	12.1	8.7	5.3	11.2	9.6
3	15.5	19.5	19.2	14.0	18.7	21.7
2	51.6	48.0	50.0	52.9	50.9	45.9
1 & 0	27.8	20.3	22.0	27.8	19.2	22.7

Considering 4 and 3 marks together, as both indicate good spangling, the largest percentage (31.6) is obtained with castor cake as against 27.9% and 20.5% from ground-nut cake and farmyard manure respectively. Similarly 31.3% have spangled well under 120 lbs N as against 29.9% and 19.3% with 80 and 40 lbs. N respectively. Castor cake appears to be a slightly better source of nitrogen than ground-nut or farmyard manure for development of spangles and both 80 and 120 lbs. of Nitrogen induce spangling better than 40 lbs. N. Bidi tobacco growers in Gujarat prefer castor cake to ground-nut cake but do not generally use it,

due to its higher price. It is most probable that the higher phosphate content of castor cake, compared to that of the ground-nut cake might also contribute to better leaf development.

(b) *Number of leaves maintained at topping*:—Bidi tobacco is topped very low, even before the inflorescence is seen within the terminal whorl of leaves and the number of leaves maintained per plant varied from 10 to 15 (excluding sand leaves). Spangling was studied in an experiment with 5, 7, 9, 11, 13 and 15 leaves per plant. The details are given in table 4.

TABLE 4
Mean spangling marks per leaf for different number of leaves per plant. (mean of six plants per treatment)

No. of leaves per plant			Marks
5	...	...	2.6
7	...	...	2.7
9	...	...	2.1
11	...	...	1.2
13	...	...	1.0
15	...	...	0.7
Mean			1.7
S.E.			± 0.11

Significance :— 7 5 — 11 13 15

It will be observed that there is an inverse relation between the number of leaves and the degree of spangling. The differences among the first three treatments 5, 7 and 9 leaves per plant are not however significant. This suggests that maximum development of spangles can be obtained upto nine leaves per plant. A larger number of leaves reduce development of spangles in each leaf.

(c) *Population*:—The number of plants per acre also affects the extent of spangling. With large populations the plant develop longer stalks and the leaves are comparatively under-sized and thinner. Under these condi-

tions it is found that spangling is not as good as in a normal crop. No data were however recorded for this observation as it involved considerable work, which could not be undertaken due to insufficiency of technical help.

6. *Variation due to other causes*:—It was observed that those leaves, which were facing east received full sunlight from early morning, spangled better than those on the opposite side. This aspect of spangling was studied in detail in 35 mature plants which were ready for harvest. These plants were grown at the recommended spacing of 3' in both directions. Leaves receiving sunlight

in the morning were harvested first and then were rated individually for spangling and the opposite leaves. The leaves in each group the data are presented in the table below:—

TABLE 5
Rating of leaves for spangling in 35 plants

Rating marks	Number of leaves		Total marks obtained	
	Receiving morning sunlight (A)	Not receiving morning sunlight (B)	(A)	(B)
4	...	32	5	128
3	...	30	22	90
2	...	31	26	62
1	...	39	46	39
No. of spangled leaves	132	99	319	184
Mean	...	...	2.41	1.86
Unspangled leaves	...	22	56	...
Total No. of leaves	...	154	155	...
% Unspangled leaves	...	14.3	36.1	...

It will be observed that the leaves receiving morning sunlight have spangled better. The rating of 4 marks is obtained by 32 leaves in group A as against only 5 leaves of the opposite side. Differences of similar magnitudes are observed also in ratings with three and two marks. The number of unspangled leaves on the east side is 14% whereas 36% of such leaves occur on the western side. The average rating per leaf (taking into account only spangled leaves) is 2.41 for those facing east as against 1.86 of the opposite side. It may be also mentioned here that the dry weight of leaves on the east side was higher than those of the west. It appears therefore that in addition to nitrogen, there are other factors responsible for the development of spangles such as sunlight which have an influence on the photosynthetic activity of the plant.

Discussion

From the data presented so far, it would appear that there are a number of factors that influence spangle development in bidi tobacco. Better spangling appears to be the result of better development of the plant which can be only obtained in plant population with certain number of leaves per plant and optimum amount of manuring. Insufficient manuring reduces both yield and intensity of spangling likewise affected. Too many plants per acre and too many leaves per plant adversely affect the quality of leaf. Under such conditions not only spangling is reduced, but the leaf does not develop proper colour and granular structure which are contributive attributes of quality in bidi tobacco. While it is too early to conclude that nitrogen alone or any other nutrient in

particular is responsible for spangle development, it is reasonable to assume that a balance of plant metabolic activity in relation to the building up of reserves of food materials, and other substances, which contribute to the body of the leaf that will favour good development of spangles.

The part played by spangling in assessing quality is very important in addition to smoking tests. Smoking tests with spangled and unspangled parts of leaves have, however, given conflicting results. It is probable that these spangles which develop well under good field culture provide an index for qualities of the crop—namely, whether it will age and mellow as required, how far it will retain its strength in starch etc., depending upon the requirements of the market. In other words merchants seem to believe that a produce well spangled could have been grown only under optimum conditions of manuring, populations, topping etc., that contribute towards good smoking and keeping quality.

The physiological and bio-chemical aspects of spangling are yet to be investigated. Until

more work is done, it will not be possible to explain the origin and role of this phenomenon. From the observations recorded so far, spangling may be considered as the physiological breakdown of the matured leaf after reaching optimum development.

Summary

Bidi varieties differ in the capacity and extent of spangling. The development of spangles in the mature leaf is an important quality character of bidi tobacco. Upper leaves spangle better than lower ones. The central portion of the leaf has more spangles than the apical and the basal portions. Good manuring, optimum population and low number of leaves per plant at the time of topping favour better spangle development, whereas high population, poor fertility and a large number of leaves per plant work in the opposite direction. It appears probable that the importance attached by the trade to spangling is due to this character providing an indirect estimate of the conditions under which the crop is grown on which also the quality of the crop depends.

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INFLUENCE OF TOPPING AND SPACING ON YIELD AND QUALITY OF HOOKAH AND CHEWING TOBACCO (*N. TABACUM*) IN NORTH BIHAR*

BY

B. T. SAJNANI †

INTRODUCTION

The area under tobacco in Bihar has declined from 127,000 acres in 1936-37 to 38,000 acres in 1954-55. This area is concentrated mostly in the districts of Muzaffarpur, Darbhanga and Purnea of North Bihar. Out of these 38,000 acres, 20,000 acres are reported to be under the species *N. rustica* and 18,000 acres under *N. tabacum*. The decline in tobacco cultivation is probably due to diversion of area to other cash crops like sugarcane and chillies partly because they are at present more remunerative and are grown with less effort and cost than tobacco, and partly due to increased emphasis laid on the cultivation of sugarcane and food crops by the Bihar Agricultural Department. The need for improving the yield and quality of tobacco so as to make it more remunerative is therefore obvious. The Hookah and Chewing Tobacco Research Station established in 1950 at Pusa (Darbhanga) under the Indian Central Tobacco Committee has been conducting research with this end in view.

Of the various cultural practices influencing yield and quality of tobacco, spacing of plants and height of topping are the two factors of major importance. In North Bihar,

tobacco of *N. tabacum* type used for hookah and chewing is usually planted with a spacing of 3 feet both ways and topped at 8-10 leaves excluding the sand leaves. The sand leaves are however retained on the plant till the harvest is over and used as "Kharsan", a low grade tobacco, used for smoking purposes. In some places e.g., round about Dalsingsarai, closer spacing of $2\frac{1}{2}' \times 2\frac{1}{2}'$ and higher topping at 16-18 leaves is practiced, as the sun-cured tobacco used to be purchased by Cigarette factories at Dalsingsarai for use in cigarette manufacture, till the factories closed down in 1953. Even now, the old practice of closer spacing and higher topping is being continued by the cultivators there, although the tobacco is used for hookah and chewing purposes. With a view to determine spacing and topping which would be optimum from the point of yield and quality, a complex experiment was started in 1950 and was continued for four years. An idea of the comparative price rates obtained for quality of leaf produced under the different treatments could not be had due to difficulties in getting the buyers to evaluate. The results obtained from the experiment are discussed in these pages.

* This paper was read at the First Conference of the Tobacco Research Workers in India, held at Bangalore on 31-1-57 and 1-2-57.

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Material and Methods

The experiment was conducted in a split plot design consisting of 4 spacings and 4 toppings. It was commenced in 1950-51 and continued upto 1953-54. Spacing between rows was kept constant at 36" while spacing between plants was varied from 24" to 36"

Topping was done by nipping off the shoot as soon as the required number of leaves excluding the lower 2-3 sand leaves had emerged. The sand leaves were removed at the time of topping and the required number retained. The treatments studied were combinations of the following:—

Topping		Spacing	
A.	8 leaves per plant	...	(a) 36" × 24" or 7,260 plants per acre.
B.	10 leaves per plant	...	(b) 36" × 27" or 6,435 plants per acre.
C.	12 leaves per plant	...	(c) 36" × 31" or 5,610 plants per acre.
D.	14 leaves per plant	...	(d) 36" × 36" or 4,840 plants per acre.

The four topping treatments were allotted at random to the main plot in a 4 × 4 latin square and spacings to sub-plots within each topping. The net size of the ultimate plot, discarding one row all round to eliminate the border effect varied slightly from year to year from 36' × 15' to 42' × 18'. The site of the experiment was changed every year, care being taken to see that the soil was more or less similar. The variety of tobacco used was N.P. 63 in the first year and N.P. 70 in the latter years.

During the first year of the trial in 1950-51, neither green manuring could be done nor could bulky manure be given as a basal dose before planting tobacco, but fertilizers were applied after planting at the rate of 50 lbs. nitrogen per acre, in the form of ammonium sulphate and ground-nut cake in equal doses and 30 lbs. P₂O₅ per acre in the form of super phosphate. During 1951-52, green manuring with Meth (*Phaseolus calcaratus*) was done after fertilizers at the above rates were applied in two equal doses; the first a month after transplanting and

the second a month later. In 1952-53 and 1953-54, green manuring was done with Sannhemp (*Crotolaria juncea*) and fertilizers at the above rates were applied in addition to potassium sulphate at the rate of 50 lbs. K₂O per acre. The fertilizers were given in two equal doses.

Hand watering was done immediately after the application of fertilizers. Cultivators normally irrigate the tobacco from wells once or twice at the time of topping but in the absence of adequate irrigation facilities at the farm, hand watering was done to the extent possible.

During 1950-51 and 1951-52 the rainfall was much below the normal and as such the growth of the crop was poor and the yields obtained were low. In 1952-53 and 1953-54 the rainfall was above average resulting in good growth of the crop and higher yields. The rainfall data for four years classified according to the growth phases of the crop are given in Table I along with decennial averages.

TABLE I
Summary of Seasonal Rainfall from 1950-51 to 1953-54

Month	Tobacco season	1950-51		1951-52		1952-53		1953-54		Decennial average 1944-45 to 1953-54	
		Rain- fall in inches	Rainy days	Rain- fall in inches	Rainy days	Rain- fall in inches	Rainy days	Rain- fall in inches	Rainy days	Rain- fall in inches	Rainy days
June 1st to July 15th.	Pre-nursery	...	31	11.58	16	24.10	23	18.41	20	14.15	20.9
July 15th to September 16th.	Nursery	...	40	14.16	24	16.06	30	22.08	40	19.79	35.0
September 16th to October 15th.	Transplanting	...	4	1.19	7	6.21	9	1.90	7	4.06	8.5
October 16th to December 31st.	Growth	...	1	0.50	2	...	...	...	...	1.83	2.9
January to March.	Harvesting and curing	...	4	0.67	4	2.43	5	1.07	6	1.39	4.5
April to May	Curing and packing	...	1	0.67	4	2.70	7	2.05	5	2.40	6.2
	Total	...	81	28.77	57	51.50	74	45.51	78	43.61	78.0

The following data were collected:—

1. Relative growth under various treatments at different stages of crop growth

- just after topping
- immediately before harvest, and
- after curing.

2. Yield of cured leaf.

The growth data were confined to length and breadth of leaves. The leaves were numbered serially downwards from the top. The length of the leaf was measured from the base to the tip of leaf lamina and the breadth was taken at the widest portion of the leaf. The average value of five random by selected plants was taken as the treatment average. The growth observations were recorded during the years 1952-53 and 1953-54.

Results

The data of cured leaf yield obtained from various treatments during the four years was worked out statistically for individual years. The combined statistical analysis of the cured leaf data for the four years has not been done as the manurial treatments in the first two years were different from those of the last two years and the variety during the first year was different from the one used in subsequent years. The results were highly significant for spacings and toppings in all the four years while the response due to interaction was not significant in any of the years. The results for toppings and spacings are discussed below separately.

Topping

The cured leaf yields obtained for the different topping levels during the four years are given in Table II.

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TABLE II
Cured leaf yield in lbs. per acre and relative influence of topping on yield of cured tobacco

Topping	Average leaf population per acre	Yield of cured leaf in lbs. per acre and percentage increase in yield in relation to 8 leaf topping						Average yield and percentage increase in						Average yield and percentage increase in 4 years	
		1950-51		1951-52		1952-53		1953-54		1950-51 and 1951-52		1952-53 and 1953-54		1950-51 and 1951-52	
		Yield	Per-centage increase	Yield	Per-centage increase	Yield	Per-centage increase	Yield	Per-centage increase	Yield	Per-centage increase	Yield	Per-centage increase	Yield	Per-centage increase
8 leaf	...	786	...	767	...	1,046	...	968	...	776.6	...	1,007	...	892	...
10 leaf	...	951	21	1,017	32.6	1,202	14.9	1,071	10.6	984	26.8	1,136.5	12.8	1,060	18.8
12 leaf	...	1,075	36.8	1,029	34.2	1,501	43.5	1,486	53.5	1,052	35.5	1,493.5	48.5	1,273	42.7
14 leaf	...	1,196	52.2	1,072	39.8	1,646	56.9	1,567	61.9	1,134	46	1,606.5	59.4	1,369	53.6
Mean	...	1,092	...	971	...	1,348	...	1,273	...	989	...	1,311	...	1,149	...
C.D. at 5%	...	163	...	157	...	178	...	226	...	...	...	...	...	...	...

Statistical interpretation		Toppings			
Year	1950-51	14 12 10 8			
		...	...	...	...
		...	...	...	...
		...	...	...	...

It will be seen from the results that the order of the treatments has remained unchanged inspite of differences in the nature of seasons, varieties and manurial treatments, there being a progressive increase in yield with higher and higher topping. It will also be noticed that the increases have been substantial during the normal seasons of 1952-53 and 1953-54.

The quality of Hookah and Chewing tobacco is judged by the size and thickness of the leaf. The bigger and thicker the leaf the better the quality. In order to give a rough idea of this character the leaf area was worked out by adopting the formula $2/3 (L \times B)$. The results obtained in two years both for green and cured leaf are given in Table. III.

TABLE III

Effect of topping on quality of Hookah and Chewing tobacco

TOPPINGS

	Year	8 leaf	10 leaf	12 leaf	14 leaf	Average
Average area per leaf in sq. inches (green).	1952—53	108.5	108.9	116.4	133.9	116.9
	1953—54	132.1	125.8	130.3	135.4	130.9
	Average	120.3	117.4	123.4	134.7	124.0
Average area per leaf as per cent relative to 8 leaf topping (green).	1952—53	100.0	100.3	107.3	123.4	107.8
	1953—54	100.0	95.2	98.6	102.5	99.1
	Average	100.0	97.7	102.9	112.9	103.5
Average area per leaf in sq. inches (cured).	1952—53	70.6	69.0	81.0	84.7	76.3
	1953—54	91.3	88.4	94.4	88.5	90.7
	Average	81.0	78.7	87.7	86.6	83.5
Average area per leaf as per cent relative to 8 leaf topping (cured).	1952—53	100.0	97.7	114.7	120.0	108.1
	1953—54	100.0	96.8	103.4	96.9	99.3
	Average	100.0	97.8	109.1	108.5	103.7

It will be observed that for both the green and cured leaf there is a tendency for the leaf area to increase with higher topping, the biggest leaf being that of 14 leaf topping in the case of green leaf area and 12 leaf topping in the case of cured leaf. The cured leaf area should, for obvious reasons, be taken as less accurate, as, firstly it is difficult

to measure the cured leaf, and secondly some of the cured leaves were damaged in curing. The average green leaf area under 8 leaf topping was 120.3 square inches while with 14 leaf topping it was 134.7 square inches i.e. over 12% increase in leaf area occurred in higher topping at 14 leaves.

From the data collected it was also found that there was a gradual increase in leaf area from the lowermost to the uppermost node. The data are presented in Table IV.

TABLE IV

Size of green leaf (just before harvest) according to position of leaves on the plant

(LEAVES COUNTED FROM BOTTOM TO TOP)
(LEAF AREA IN SQUARE INCHES)

	1952—53				1953—54			
	8 leaf	10 leaf	12 leaf	14 leaf	8 leaf	10 leaf	12 leaf	14 leaf
1st	56.5	49.8	39.8	...	78.4	72.3	77.8	70.8
2nd	77.4	59.1	55.3	64.5	95.6	93.5	93.2	89.8
3rd	93.6	79.6	68.9	81.5	115.3	109.1	109.7	106.2
4th	112.2	100.4	90.1	95.8	137.3	129.3	124.3	124.1
5th	121.8	110.7	109.4	110.8	149.1	135.6	135.4	143.2
6th	130.0	126.6	122.5	122.0	156.7	142.6	139.8	144.1
7th	142.2	129.6	125.3	131.2	168.7	138.1	138.1	147.5
8th	151.2	144.6	136.9	137.7	168.0	141.3	138.8	144.3
9th	...	153.8	144.8	145.9	...	151.3	142.6	144.5
10th	...	154.4	159.7	151.8	...	151.7	154.5	147.1
11th	...	...	164.2	157.4	...	...	157.9	147.4
12th	...	...	166.4	164.7	...	...	152.2	154.9
13th	...	...	...	166.9	...	...	...	159.7
14th	...	...	...	158.4	...	...	...	142.3

It will be seen from the above data that in 1952-53 toppings at 8, 10 and 12 leaves have given a gradual and continuous increase in leaf area from the lowermost to the uppermost leaf. In the case of 14 leaf topping the increase is manifest upto the 13th leaf. But, in the year 1953-54 the increase in leaf size from bottom to top is not in a regular order in toppings at 10, 12 and 14 leaves.

This may probably be due to experimental error. There is, however, a definite tendency for the leaf area to increase upto the 13th leaf, the leaf size decreasing from the 16th or 17th node onwards including the nodes of sand leaves. The thickness of the leaf could not be estimated accurately for want of proper facilities.

The cured leaf yields obtained for different spacings during the four years are summarised in Table V.

TABLE V
Cured leaf yield in lbs. per acre and relative influence of spacing on yield of cured tobacco

Spacing	Plant population per acre	Yield of cured leaf in lbs. per acre and percentage in yield in relation to 36" spacing								Average yield and percentage increase in			
		1950-51		1951-52		1952-53		1953-54		1950-51 and 1951-52		1952-53 and 1953-54	
		Yield	Per-centage increase	Yield	Per-centage increase	Yield	Per-centage increase	Yield	Per-centage increase	Yield	Per-centage increase	Yield	Per-centage increase
36" x 36"	4,840	904	...	831	...	1,149	...	1,077	...	568	...	1,113	...
31" x 36"	5,610	913	1	906	9	1,324	15.2	1,233	14.5	910	5	1,279	14.9
27" x 36"	6,435	1,080	19.5	970	16.7	1,415	23.2	1,352	28.3	1,025	18.1	1,399	25.8
24" x 36"	7,260	1,111	22.9	1,177	41.6	1,504	30.9	1,400	30.0	1,144	32.3	1,452	30.5
Mean	...	1,002	...	971	...	1,348	...	1,273	...	912	...	1,311	...
C.D. at 5%	...	91	...	97	...	124	...	96	...	...	...	...	...

Conclusions

1950-51	...	...	24	27	31	36
1951-52	...	...	24	27	31	36
1952-53	...	...	24	27	31	36
1953-54	...	...	24	27	31	36

Closer spacing or increase in plant population resulted in a progressive increase in yield of cured tobacco during all the four years. But, as expected, the increase in yield was not proportionate to the increase in the plant population.

It will also be seen that the average percentage increase in the yield in the first two unfavourable seasons was lower as compared to that in the following two normal years

except in 24" spacing in which case the average percentage increase in yield was more in the season of low rainfall than in the normal season. This shows that the vigour of the crop modified the spacing effects.

The average green and cured leaf area worked out for the different spacings during the two years 1952-53 and 1953-54 are presented in Table VI.

TABLE VI
Effect of spacing on quality of Hookah and Chewing tobacco

	Year	Spacing				Average
		24"	27"	31"	36"	
Average area per leaf in sq. inches (green).	1952-53	112.1	117.4	118.2	120.2	117.0
	1953-54	124.4	131.1	128.4	139.6	130.9
	Average	118.3	124.3	123.3	129.9	124.0
Average area per leaf as per cent relative to 24" spacing (green).	1952-53	100.0	104.7	105.4	107.2	104.4
	1953-54	100.0	105.4	103.2	112.2	105.3
	Average	100.0	105.1	104.3	109.7	104.9
Average area per leaf in sq. inches (cured).	1952-53	73.1	75.9	78.5	77.9	76.4
	1953-54	84.7	91.4	88.6	97.5	90.6
	Average	78.9	83.7	83.6	87.7	83.5
Average area per leaf as per cent relative to 24" spacing (cured).	1952-53	100.0	103.8	107.4	106.6	104.5
	1953-54	100.0	107.9	104.6	115.1	106.9
	Average	100.0	105.9	106.0	110.9	105.7

It will be seen from the table that there is a general increase in size of both the green and the cured leaf with increase in spacing, i.e., wider the spacing greater the leaf area.

It seems therefore that the wider spacing of 36" gives better quality tobacco while the closer spacing of 24" gives the highest yield. With wider spacing of 36" the average leaf size increased in green leaf by 9.7% over that in 24" spacing. The average yield of cured leaf obtained from 36" spacing during

the four years was 990 lbs. per acre as against 1,298 lbs. per acre from 24", i.e. over 31% more yield was obtained in closer spacing. Thus, the loss in yield in wider spacing at 36" is much greater than the gain due to increase in leaf area. The evaluation of tobacco from various treatments would not be done due to reasons already stated but it is felt that the little increase in price which may be offered for the slightly better quality tobacco under the wider spacing will not make up the heavy loss in yield in such spacing.

Effect on the growth and development of the individual plant

The effect of different spacings and toppings on the plants was studied by taking into account the average green and cured weight of individual plants. For this purpose,

5 random normal plants were selected from each treatment in each replicate and their yield was recorded. The average green weight and cured weight per plant for different spacings and toppings are summarised in Table VII.

TABLE VII

The influence of topping and spacing on average green and cured weight per plant (weight in ounces)

Treatment	1952-53		1953-54	
	Green wt.	Cured wt.	Green wt.	Cured wt.
8 leaves	24.12	4.33	21.66	4.14
10 leaves	27.16	4.72	24.65	4.55
12 leaves	35.23	6.36	30.50	5.85
14 leaves	40.74	6.78	36.65	6.46
<i>Spacing :-</i>				
24" × 36"	22.76	4.76	28.70	5.05
27" × 36"	25.15	4.94	31.08	5.60
31" × 36"	25.57	5.02	31.14	5.27
36" × 36"	26.17	5.08	36.32	6.28

It will be seen from the data presented above that the highest yield per plant was obtained with topping at 14 leaf and the lowest with 8 leaf topping. As regards spacing, wider spacing has induced better growth and development of individual plants than closer spacing. There has been a progressive increase in yield of average weight of both the green and the cured weight per individual plant with wider spacing in all the treatments except in the case of cured

weight per plant from 31" spacing in 1953-54 which is less than the cured weight per plant obtained from 27" spacing. This is probably due to the fact that some of the leaves got damaged in the process of curing because of the limited facilities available for curing. Thus, it is clear that the decrease in average weight of green and cured plant in closed spacing is due to the reduction in stem and leaf size. The latter can be seen from the average leaf area of plant in different spacings.

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The combined effect of various toppings and spacings on the size of leaf is shown in the Table VIII.

TABLE VIII

Topping & Spacing

(GREEN LEAF AREA IN SQ. INCHES)

Average of two years (1952-53 & 1953-54)

	A (8 leaf)	B (10 leaf)	C (12 leaf)	D (14 leaf)	Mean
(a) (36" × 24")	117.5	108.1	118.1	129.6	118.3
(b) (36" × 27")	117.5	126.8	125.5	127.3	124.3
(c) (36" × 31")	124.0	110.0	122.3	137.6	123.4
(d) (36" × 36")	122.5	125.3	127.8	144.2	130.0
Mean ...	120.4	117.5	123.4	134.7	124.0

PER CENT RELATIVE TO 8 LEAF TOPPING AND 36" SPACING
(Farmer's practice)

	A (8 leaf)	B (10 leaf)	C (12 leaf)	D (14 leaf)	Average
(a) (36" × 24")	95.9	88.2	96.4	105.8	96.6
(b) (36" × 27")	95.9	103.5	102.4	103.9	101.4
(c) (36" × 31")	101.2	89.8	99.8	112.3	100.8
(d) (36" × 36")	100.0	102.3	104.3	117.7	106.1
Mean ...	98.3	96.0	100.7	109.9	101.2

It will be seen that although the leaf size has decreased in closer spacing at 24" when compared to 36" spacing it increased in 14 leaf topping as compared to 8 leaf topping. It may however be seen that the overall combined effect of 24" spacing and 14 leaf topping has given an increase of 5.8% in leaf size as compared to the practice followed by the farmers, i.e., 36" spacing and 8 leaf topping.

The results obtained at this Research Station are in general agreement with those of chewing tobacco of Cigar & Cheroot Tobacco Research Station, Vadasandur, Dindigul (1952) by Kadam and Khemchandani, as regards effect of topping and spacing on yield is concerned but in case of effect on quality there is little variation. At both the Research Stations it was found that

higher topping and closer spacing gave progressively higher yields of cured tobacco and that the vigour and growth of the crop modified the topping and spacing effects. As regards quality, it was found at Vadasandur that there was a tendency for the leaf area to increase with increasing number of leaves per plant upto 12th leaf topping and decrease with higher topping at 14 and 16 leaves while at Pusa it was found that there was a tendency for the leaf area to increase upto 14 leaf topping or to be exact, the 13th leaf counted from bottom to top (excluding 2-3 sand leaves) was found to be the biggest. At both the places wider spacing was found to give better developed leaf than closer spacing.

In North Bihar tobacco is topped at 8-10 leaves and spaced at 36" both ways. The

results obtained at this Research Station, however, show that 14 leaf topping gives 28.8% more yield than topping at 8 leaves. Closer spacing at 24" between plants gives more than 31% higher yield than wider spacing at 36". The leaf size in case of closer spacing was slightly reduced, it however increased with higher topping at 14 leaves. The combined effect of 14 leaf topping and 24" spacing was an increase in leaf size by 5.8% when compared to 8 leaf topping and 36" spacing. Closer spacing at 24" combined with highest topping at 14 leaves gave more than double the yield obtained from 36" spacing combined with 8 leaf topping.

Summary

A spacing cum topping experiment on hookah and chewing tobacco conducted for four years showed that in seasons of normal rainfall the crop responds well to high topping.

Closer spacing at 24" and 27" between plants with a common row spacing of 36" was found to be superior in yield to wider spacing of 31" and 36".

In normal seasons 12 and 14 leaf toppings gave significantly higher yield than topping at 8 or 10 leaves. The average leaf area per plant showed a tendency to increase with

higher toppings the largest average leaf area being that in high topping at 14 leaves.

There was a marked increase in the weight of individual plant with wider spacing. The increase was not enough to make good the loss in yield due to reduced plant population per acre.

In irrigated cultivation as is practised by the farmers, 24" spacing and topping at 14 leaves would maximise the yield of hookah and chewing tobacco without impairing the quality to an appreciable extent. This is borne out by the fact that only with normal rainfall, without any supplementary irrigation from wells, high topping at 14 leaves combined with the close spacing of 24" gave 1,581 lbs. cured leaf per acre as against 782 lbs. per acre obtained by farmers practice of 8 leaf topping and 36" spacing, i.e., an increase of 799 lbs. of cured tobacco per acre.

Acknowledgment

My thankful acknowledgments are due to Dr. B. S. Kadam (former Director, Tobacco Research) under whose general guidance the experiment was carried out.

I am also deeply indebted to Dr. N. R. Bhat, Director, Tobacco Research, whose help and advice was valuable in preparing the article.

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DIELDRIN 50% W.P. IN TRANSPLANT WATER FOR THE CONTROL OF GROUND BEETLES ATTACKING TOBACCO

BY

ANNAMMA PHILIP¹ AND B. G. JOSHI²

Three species of ground beetles, namely, *Mesomorphous Villiger*, *Sceleron latipes*, and *Opatroides frater* are found to attack the newly transplanted tobacco seedlings. Damage to the seedlings either by gnawing the tender stems or by cutting them down takes a heavy toll and causes many gaps in the field in certain years. As gap filled plants do not grow as vigorously as those that are planted earlier, the yield suffers to an appreciable extent.

Review of literature

Most of the work done on these beetles, or other soil insects in India is by way of control through cultural practices. Ramakrishna Iyyer (1941) suggested hand picking of beetles or charging irrigation water with a poison bait. Radhakrishnamurthy and Kadam (1951) found that 10 lbs. per acre of Toxaphane, Gammexane (BHC) or D.D.T. used as dust mixed with sand around each plant had a repellent effect, but failed to obtain any kill of the beetles. In the United States, various insecticides have been tried for the control of soil insects. Townes (1952) reported that as little as 6½ lbs. of BHC per acre put on the soil and disced in

gave a strong taint to the tobacco crop. Studying the phytotoxicity of several insecticides to tobacco, Patel, H. K., *et al* (1956) found that Dieldrin was the least and BHC was the most toxic to tobacco seedlings. They recommended that as BHC was highly toxic should not be used for the control of tobacco pests, both in seed bed area as well as in transplanted fields. Eide (1955) found that, among various insecticides tried, Aldrin, Dieldrin and Chlordane gave varying differences of control according to dosages, whereas no control could be obtained at any of the doses in the case of Toxaphane, D.D.T. Methoxychlor and BHC. Fluke and MacIntyre (1952) found that soil application of Aldrin and Dieldrin was effective. Snapp (1953) substantiated these results by reporting satisfactory control with Aldrin and Dieldrin at the rate of 2 or 4 lbs. per acre.

Materials and Methods

Experiments were conducted at the Central Tobacco Research Institute Farm during the 1954-55 and 1955-56 seasons with the object of finding out a method of controlling ground beetles on tobacco. Dieldrin 50% W.P. was tested in 4 concentrations, namely, 20 oz.,

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40 oz., 60 oz., and 80 oz., in 100 gallons of water respectively. Applications to the soil were done at the transplanting time to find out their effect on the mortality of ground beetles soon after transplanting. Two methods of application, viz., (i) mixing the insecticide in transplanting water and (ii) spraying the soil with it before transplanting were compared in the same experiment which was laid out in a split plot design. The two methods formed the main treatments and the four concentrations of Dieldrin the sub-treatments. There were six replications. Spraying was done on the plots just before transplanting and the transplanting water was given just at the time of transplanting. Counts of the number of beetles found dead per plot were taken every week upto a month after the treatment. The experiment was repeated in two seasons for confirmation of the results.

Results and Discussion

The results are as shown in Tables I to IV. In both the years, the mortality of beetles in all the treatments of Dieldrin were significantly higher than that in control plots treated with water. In 1954, the mortality of beetles in the field seemed to increase as the concentration increased except in that of 60 oz. in 100 gallons of water. But this discrepancy was not seen in the 1955 experiment in which there was an increase in mortality as the concentration increased. Though the two methods, viz., spraying the field before transplanting and the application of Dieldrin in transplant water did not show any significant differences, the mortality of beetles was higher in transplant water application during both the seasons. Weekly counts of mortality for the first four weeks after transplanting showed that it took about two weeks after the application of the insecticide to obtain the maximum kill. In 1954, (Table II) the observation showed that kill of beetles was obtained even from the first week and the maximum kill was obtained in the second week. In 1955 (Table IV) the kill of the beetles started in the second week and the maximum kill was obtained during the third week.

The significant results obtained as above would indicate that the ground beetles in the tobacco fields can be effectively controlled by applying Dieldrin 50% W.P. at rates ranging from 20 oz. to 80 oz. per 100 gallons of water, either in transplant water or as a soil spray just before transplanting. The application in transplant water is to be preferred as it is less costly for about the same amount of kill. In none of the concentrations tested was any apparent injury to the plant observed.

Summary

Ground beetles cut the tobacco seedlings soon after transplanting and cause gaps in the tobacco field. In some years damage caused is heavy.

Field experiments were conducted at the Central Tobacco Research Institute, Rajahmundry during the 1954-55 and 1955-56 seasons with Dieldrin 50% W.P. in the concentrations ranging from 20 oz. to 80 oz. for 100 gallons of water. The insecticides were applied by two methods, viz., (i) application in transplanting water and (ii) as a soil spray.

Dieldrin in all the tested concentrations gave significantly higher mortality of beetles than the control treatment with water. Application in transplant water was somewhat more effective than application in both the years. The kill of the beetles was the maximum about two weeks after the application of the insecticide. The most economic treatment would be to apply Dieldrin in transplanting water at the rate of 20 oz. in 100 gallons of water.

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TABLE I
Total mortality of beetles one month after treatment, 1954-55

Treatments	Amount of toxicant in 100 gallons of water	Mean number of beetles dead		
		in trans-planting water	spray-ing plots	Mean
	oz.			
Dieldrin 50% W.P.	20	12.83	11.83	12.33
Do.	40	14.00	10.33	12.17
Do.	60	8.66	9.00	8.83
Do.	80	13.83	10.66	12.25
Check-water	...	7.33	4.83	6.08
Mean	...	11.33	9.33	...
C.D. at 5% for concentrations	...	...	2.872	...

TABLE II
Progressive mortality of beetles

Treatments	Amount of toxicant in 100 gallons of water	Mean number of beetles dead per plot							
		In transplanting water				Spraying plots			
		1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week	4th week
Dieldrin 50% W.P.	oz.								
	20	3.6	9.8	11.8	12.8	3.0	8.1	11.0	11.8
Do.	40	4.1	9.3	12.1	14.0	3.8	8.1	10.3	10.3
Do.	60	3.1	5.6	7.8	8.6	3.3	7.0	8.3	9.0
Do.	80	3.8	9.0	12.6	13.8	4.1	7.1	9.5	10.6
Check-water.	...	2.5	5.5	7.0	7.3	1.5	4.1	4.5	4.8

TABLE III
Total mortality of beetles one month after treatment (1955-56)

Treatments	Amount of toxicant in 100 gallons of water	Mean number of beetles dead		
		in trans-planting water	Spray-ing plots	Mean
	oz.			
Dieldrin 50% W.P.	...	...	20	6.6
Do.	...	...	40	8.6
Do.	...	...	60	9.8
Do.	...	...	80	13.1
Check-water	...	...	...	0.5
Mean	...	...	...	7.8
C.D. at 5% for concentrations	...	...	...	1.770

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TABLE IV
Progressive mortality of beetles

Treatments	Amount of toxicant in 100 gallons of water	Mean number of beetles dead per plot							
		In transplanting water				Spraying plots			
		1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week	4th week
Dieldrin 50% W.P.	oz.								
	20	...	1.0	4.6	6.6	...	1.5	4.6	6.3
Do.	40	...	1.6	6.3	8.6	...	1.1	4.8	7.5
Do.	60	...	1.8	7.1	9.8	...	1.6	5.8	9.0
Do.	80	...	2.3	8.1	13.1	...	2.0	7.5	11.6
Check-water.	...	...	0.3	0.3	0.5	...	0.3	0.6	1.0

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NEW RESEARCH FINDINGS OF INTEREST TO FLUE-CURED TOBACCO GROWERS

BY

N. R. BHAT *

Promotion of quality together with yield to improve the monetary returns from flue-cured Virginia is the main theme of experiments in progress at the Central Tobacco Research Institute, Rajahmundry, and its sub-station at Guntur. A number of varieties as well as cultural methods are being tried to find out those that are beneficial in fulfilling the above objective. Certain new findings made from the above experiments are being brought to the notice of the farmers.

The findings are given under two categories, viz., (I) proved findings and (II) preliminary findings. The proved findings are those of which the merit has been tested over several seasons and would be useful to tobacco growers in general. *The preliminary findings are indications obtained in only one season and, therefore, need further confirmation.* But, they could be of interest to a few enterprising growers who would like to try them out on their own farms.

I. PROVED FINDINGS

It is better to plough less in F.C.V. fields

F.C.V. growers in the Guntur tract plough their fields a number of times in the pre-planting period. Those who can afford, do a ploughing whenever there is a break in monsoon. The number of ploughings done are sometimes as many as about 8. Harrowings are done in addition. In order to see as to what amount of tillage is really desirable, an experiment was carried out at Guntur during the four seasons from 1953-54 to 1956-57. The treatments tried were:—

- (i) 3 ploughings combined with no harrowing and 1, 2 or 3 harrowings.
- (ii) 4 ploughings combined with no harrowing and 1, 2 or 3 harrowings.
- (iii) 5 ploughings combined with no harrowing and 1, 2 or 3 harrowings.
- (iv) 6 ploughings combined with no harrowing and 1, 2 or 3 harrowings.

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It was found that, except in the season of 1954-55 in which there was a higher amount of rainfall (33.7 inches) during the period from June to October, less ploughings consistently gave somewhat higher outturns of

cured leaf and bright leaf, and higher cash returns as can be seen from the following data which are averages of the three normal seasons:—

Number of ploughings	Cured leaf	Bright leaf	Estimated* total cash returns
	(LBS.)	(LBS.)	(RS.)
3	547	251	537
4	534	249	513
5	439	201	419
6	420	186	408

* Note :—Cash returns are estimated at the rates of Rs. 1-8-0 per lb. of bright grades and proportionate rates for medium grades. Low grades are left out of consideration.

The number of times harrowing was done in addition to ploughing did not make a difference in the yield.

The results go to show that, in ordinary seasons, farmers stand to lose by ploughing more times, to some extent by reduction in yield and to some extent by way of extra effort and expenditure on the extra cultivation beyond three ploughings.

II. PRELIMINARY FINDINGS

(A) Deep ploughing in summer and deep application of fertilisers push up yields of F.C.V. tobacco

Deep ploughing in summer was tried with a view to promote soil nitrification, moisture conservation and root development and deep application of fertilisers to supply fertilisers where there is more moisture. The deep (9 inches) ploughing was done with a tractor. Fertilisers were applied 6 inches deep by digging holes with a crow bar 6 inches away round the plants. The results of the above treatments in comparison with normal cultural practices in the experiments conducted at the Central Tobacco Research Institute, Rajahmundry, in the 1956-57 season, were as follows:—

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Fertiliser treatment	Cured leaf (lbs.)			Bright leaf (lbs.)			Estimated cash returns (Rs.)		
	D.P.	N.P.	Extra yield due to D.P.	D.P.	N.P.	Extra yield due to D.P.	D.P.	N.P.	Extra due to D.P.
(a) No fertiliser.	955	820	135	491	400	91	1,007	812	195
(b) Fertilisers applied 6" deep round the plants :—									
(i) 20 lbs. N per acre.	1,199	1,107	92	565	521	44	1,194	1,073	121
(ii) 20 lbs. N + 100 lbs. P ₂ O ₅ , p.a.	1,154	1,058	96	546	488	58	1,152	1,026	126
(iii) 20 lbs. N × 100 lbs. P ₂ O ₅ + 100 lbs. K ₂ O, p.a.	1,195	946	249	572	481	91	1,218	980	238
D.P. = Deep ploughing. N.P. = Normal ploughing.									

The figures given above are suggestive of the following:—

- Deep ploughing by itself increased the yield from 820 lbs. to 955 lbs. per acre even when no fertiliser was applied.
- The yield rose from 820 lbs. to 1,107 lbs. per annum even with ordinary ploughing, when 20 lbs. N was applied 6 inches deep into the soil. The very high increase caused by N, which is very unusual, has to be ascribed to its deep application. The yield rose further to 1,199 lbs. p.a. when

nitrogen was applied deep after deep ploughing in summer.

- Supplementing nitrogen by phosphorous and potash did not increase the yield further even with deep application whether ploughing was shallow or deep. With shallow ploughing it reduced the yield to some extent, as is usually the experience.

The percentages of bright grades in the different treatments were not very different. The improvement in leaf quality, if any, caused by either phosphorus or potash was not visual. No opinion can be given on this

point till results of chemical studies become available.

At Guntur, where the experiment was conducted with different fertiliser treatments, similar benefits have been derived from deep ploughing and deep application of fertilisers, deep cultivation having raised the yield from 312 lbs. to 510 lbs. and deep application of fertiliser, whether N or NP in addition to deep ploughing, to about 730 lbs. per acre.

An implement for the deep placement of the fertiliser has been fabricated at the Institute and is being tested.

(B) Mulching the field benefits the crop

Mulching was done after the first interculturaling for conserving soil moisture, during the stand of the crop. For this purpose, paddy straw was spread between rows of tobacco at the rate of 3 cartloads per acre. The results in tractor ploughed field are given below:—

Fertiliser	Cured leaf (lbs.)			Estimated cash returns (Rs.)		
	Mulched	Non-mulched	Extra yield due to mulching	Mulched	Non-mulched	Extra due to mulching
20 lbs. N. p.a. ...	1,220	1,121	99	1,280	1,187	93
20 lbs. N + 100 lbs. P ₂ O ₅ + 100 lbs. K ₂ O p.a.	1,295	1,165	130	1,434	1,278	156

It will be seen that the yield of cured leaf rose by about a hundred pounds per acre due to mulching. The response to phosphorus and potash was a little better in the mulched plots. The proportion of bright grades did not change appreciably due to mulching. Neither was any alteration in the quality of leaf noticeable.

Similar effect of mulching was observed even in fields ploughed shallow with the wooden plough, but as the plots were disturbed by other causes, the results are not presented.

The economic advantage of mulching is obvious. The cost of paddy straw was about Rs. 50. The straw used for mulching can be used for either thatching, spreading in the cattle buyer or composting. After deducting its cost, the extra return may exceed Rs. 40 per acre. Paddy straw can be substituted by any cheaply available material, e.g., grass, twigs, etc.

The usefulness of mulching was obvious in a field where the leaf turned dark green due to ridge cultivation. In this field, half the area had been mulched with paddy straw, the other half having been left unmulched. It was found that the treatment changed the colour of the leaf from dark green to light green.

Farmers may, therefore, like to try mulching particularly in fields where usually the leaf is known to turn green.

(C) Variety, Delcrest gives more bright grades

The variety, Delcrest, which is very largely grown in Southern Rhodesia and prized as a quality variety by traders and manufacturers in U.K. was compared with Harrison Special at Rajahmundry and Guntur in 1956-57. The comparison was repeated six times. In the field, the variety was less vigorous than Harrison Special, but gave a little more cured leaf yield than

Harrison Special. Its special advantage lay in the much higher proportion of its bright grades. The results obtained at Rajahmundry are given below:—

Variety	Cured leaf	Bright grades	Average bright grade per-cent	Estimated cash returns
	LBS.	LBS.		RS.
Delcrest ...	1,093	674	61.7	1,178
Harrison Special ...	1,052	414	39.8	861

At Guntur the crop was very poor, but Delcrest gave 61% bright grades as against 55% given by Harrison Special. The total quantity of bright grades produced by Harrison Special was higher than that of Delcrest. This was probably due to the higher amount of rainfall received there in the later part of the 1956-57 season.

Delcrest responded much better to topping than did Harrison Special. Also, its leaf became more uniformly available for picking. The number of leaves obtained per plant from Delcrest were 4 or 5 less than from Harrison Special and yet the former was

slightly better in cured yield than the latter. This happened on account of the better body of its leaf.

If the very promising performance of Delcrest is confirmed, it should be suitable for replacing Harrison Special since, as mentioned above, it is a variety which is known for its quality.

The seed of Delcrest is not, at present, available with the Institute for supplying even for trials to farmers. However, enough seed will be produced for trials by the time the merits of the variety are confirmed.



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NO ONE BENEFITS FROM LOW GRADE VARIETIES— DO NOT GROW THEM

An appeal to flue-cured Virginia
Tobacco growers

BY

N. R. BHAT *

Of late, farmers in certain areas seem to favour the growth of non-standard flue-cured types such as Guba, Dhone, Puteha, Karedu, etc., under the belief that either they give higher yield or higher proportion of bright grades or both. Experience in systematic trials conducted at the Central Tobacco Research Institute with some of these types such as Puteha and Karedu has shown that these are neither high yielders nor producers of better grades. The impression that they give more bright grades is due to the thinness of their leaf which is a great demerit in flue-cured Virginia tobacco. Further, it has been observed that these types suffer far more from aphids, powdery mildew and such

other pests and diseases. Therefore, by growing them, farmers not only stand to lose themselves, but also create source of infection to fields of their neighbours.

Unlike Harrison Special and Chatham, these types are mongrels which may have arisen from the outcrosses of Harrison Special with undesirable types such as Amarelo and Natu. They are neither pure, nor stabilised and go on splitting for yield and quality. Naturally, therefore, traders have an aversion to the produce from them. The growth of these types would, therefore, serve only to lower the quality of Indian flue-cured Virginia tobacco, the reputation of which is already at stake.

* Director, Tobacco Research, Central Tobacco Research Institute, Rajahmundry.

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Radiosensitivity of *N. tabacum* and *N. rustica* to certain ionizing radiations

This was the subject of the seminar talk given by Mr. B. Radhakrishna Murty on 18th April, 1957. Dr. N. R. Bhat, Director, Tobacco Research, presided. Dr. N. S. Reddy and the Scientific Officers of the Indian Leaf Tobacco Development Co., Ltd., also attended.

Opening the discussion, Mr. Murty pointed out how it is a pre-requisite to determine the radiosensitivity of the materials before actually planning radiation experiments and detailed the common indices which are employed in measuring the sensitivity such as (1) the extent of chromosomal abnormalities, (2) degree of seed lethality and (3) growth inhibition. The speaker also gave an account of the mechanism of actions of the radiations such as X-rays, Ultra-violet rays, Beta particles from radio isotopes from p^{32} and s^{35} and fast neutrons. The differences in action by different radiations with or without pre-treatment such as pre-soaking was then described. After discussing the internal and external factors influencing the radiosensitivity of an organism, the effects of prior irradiation of the medium in which the material is to be grown and their bearing on the target hit theory and the theory of indirect effect of chromosome breakage by ionizing radiations were explained with graphs and photographs, used in his investigations. The effects included inhibition or delayed germination of seed, morphological abnormalities of the leaves and buds, and pollen sterility.

Comparing the effects, he stated that there is a drop in germination and increase in seedling lethality in both the species although *N. tabacum* was found to be more susceptible than *N. rustica*. Though Ultra-violet rays had no effect by themselves, they increased the damage when given prior to X-ray treatment. Pre-soaking of seeds, for about 8 hours before irradiation also was found

to cause heavy damage. In the case of radio isotopes, no difference in initial germination was noticed but with higher doses, growth was inhibited and there was increase in seedling lethality in both the species, although *N. tabacum* was found to be less susceptible than *N. rustica*. In neutron treated materials similar susceptibility was noticed, although recovery from damage was quicker in the case of *N. tabacum*. The neutron effect on growth was found to be much less in both the species.

He next referred to the occurrence of specific cytological abnormalities such as error bridges, rings, interlocking bridges, point error configurations and their significance. He stated that sensitivity as measured by direct effects was found to be similar to that observed on the physical growth and development.

As chromosome length was also considered to be a major factor besides the genomic constitution, he compared the effects of different types of radiation in both the species on the basis of number of aberrations per unit length of chromosomes. The results, he stated, showed that *N. tabacum* was more susceptible to X-rays either with or without pre-soaking or pre-treating. The differential response in the case of p^{32} was explained as probably due to the greater size of the seeds of *N. rustica* resulting in greater uptake of radio-active material.

Referring to his studies on the effects of pollen germination and growth, he stated, that *N. rustica* required greater dosage for inhibition. Stimulation was observed in both the species, at 2400 — r in *N. tabacum* and 7,200 to 9,600 — r in the case of *N. rustica*. He indicated the possibility of utilising this pollen growth stimulation by rays for overcoming incompatibility in crosses.

In the discussion that followed, Dr. Pal, the Plant Physiologist of the Institute requested for clarification as to how the normal growth of the tissues could take place in spite of the abnormalities resulting from the effect of radiation. Shri Murty explained that the abnormalities were produced in only a few cells and, if they were not drastic, they could produce variants. Shri P. Sitapati enquired if there was hope of producing beneficial mutants in view of the drastic adverse effects brought about by radiation. Admitting that they would but be few, the speaker said that there would yet be possibilities of securing them, as has been done in barely and tobacco, from material in which radiation would produce alterations of characters either through direct or indirect effects on the genes or through recombination of genes or even parts of chromosomes.

In his concluding remarks, Dr. Bhat observed that radiation had proved to be a new tool for producing variability for selection in plant material. He pointed out that as the production of variants artificially by radiation involved the upsetting of chromosomal balance and consequently the physiology of the treated material, extremely few of the variants could be expected to possess satisfactory adaptability and capacity for good performance. Therefore, if useful results are to be obtained, plant material will have to be treated and tested on a large scale for a number of seasons under widely varying environmental conditions but such efforts would be worthwhile.

With a vote of thanks the meeting concluded.

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& (iii) The Officer-in-charge, Tobacco Research Station, Hunsur, (Mysore State).

SOME CHEMICAL CHARACTERS INFLUENCING BURN IN FLUE-CURED TOBACCO

Seminar at

Central Tobacco Research Institute,

Rajahmundry

A seminar was held at the Central Tobacco Research Institute, Rajahmundry, on the 18th May, 1957 on the subject "Some chemical characters influencing burn in flue-cured tobacco". Dr. N. R. Bhat, Director, Tobacco Research, presided. Shri K. V. Venkataraman, Pedology Assistant was the main speaker. The Chemist and the Pathologist of the Experimental Branch, Messrs. Indian Leaf Tobacco Development Co., Ltd., attended the seminar by invitation.

Commencing with the quality characteristics of smoking tobacco, Shri Venkataraman said that amongst all the quality characteristics of any smoking tobacco, burning quality, which is largely controlled by the chemical composition of the crop, is the most important one. Burning does not generally present itself as a problem in flue-cured tobacco, as it does in the case of cigar tobacco, because of the inherent composition of the latter crop which accumulates only low quantities of mineral nutrients. But following frequent reports about the poor burning qualities of Indian flue-cured tobacco, the factors associated with burn in this type of tobacco were taken up for detailed study.

After giving a brief review of literature pertaining to the topic under discussion, the speaker observed that equations for the expression of leaf burn in terms of its

chemical constituents developed for cigar tobacco were found inapplicable to flue-cured virginia, perhaps due to the differences in the composition of the crop as influenced by the varietal, edaphic and climatic conditions. He described in detail the technique of testing leaf burn from data collected on a set of 43 samples which varied very widely in their leaf burn and chemical composition. A multiple regression equation for the expression of leaf burn with total nitrogen, K_2O , CaO , MgO and chlorine as the five variables was constructed. Sulphur and P_2O_5 were not included in the study as their range of variation in these samples was very small. The equation obtained was
$$Y \text{ (leaf burn in seconds)} = 22.22 - 11.81 N + 5.06 K_2O + 1.49 CaO - 6.02 MgO - 2.21 Cl.$$

The multiple correlation was 0.80 and was highly significant. All the partial regression co-efficients, except that due to Ca were significant. However, the correlation did not improve when a fresh equation eliminating this variable was constructed. As the mean and range of variation of all these constituents varied very widely, the overall and partial influence of all these constituents, as also their relative effects are rendered more comparable by expressing the partial regression co-efficients in terms of their standard deviations from the means. A study of the standard co-efficients thus obtained indicated that the deleterious effects of nitrogen were nearly three times that of either chlorine or magnesium or 1.12 times the beneficial effect of potassium. Calcium had little or no direct influence on burn.

Shri Venkataraman observed that while the effect of some of the physical properties of the leaf like thickness and leaf structure and of certain other chemical constituents,

cannot be disregarded, the highly significant co-efficient of multiple correlation and the co-efficient of determination $R_2 = 0.64$ would suggest that 64 per cent of the variations discussed in this case would appear to be the major ones that influence burn, since only 36 per cent of the variation remain to be accounted for by all the other factors together.

Dr. Shanmuga Rao of I.L.T.D. Company, Ltd., inquired why organic acids which were easily oxidisable and which were known to support combustion, were not included in the study. The speaker replied that the high correlation obtained in the study indicated that the nutrients discussed rather than organic acids were the major factors associated with burn. Dr. Pal, felt that since cellulose by itself was capable of combustion, it was only the changes in its structure that should be studied rather than the mineral nutrients. Mr. Venkataraman said that since the organic composition of a plant was largely influenced by its mineral content, growth and composition being the products of enzyme activity, and since synthetic studies had clearly indicated that a leaf

with good burn leached for a long time in running water did not possess any burn, and the burning capacity could be restored by impregnating it with salts that promote combustion, the role of these mineral constituents could not be overlooked. He also explained how potassium, which acted as a metallic catalyst and oxygen carrier support combustion and chlorine discouraged burn because of its antioxygenic properties. There was also an interesting discussion on the accumulation of potash in the leaf and its availability in the soil, on which some data were presented; the need for potash fertilisation of the crop specially in soils with poor recuperative capacity was stressed.

The President in his concluding remarks observed that these studies had thrown light on one major point, viz., the deleterious effect of nitrogen, in addition to the influence of potash and chlorine. He said that the findings were especially helpful in interpreting the results of leaf burn tests of four samples of Indian flue-cured leaf returned from U.K, two of which possessed good burn and two poor burn, in spite of their having almost the same content of potash and chlorine.

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PROGRAMME OF AGRICULTURAL OPERATIONS FOR THE QUARTER

OCTOBER—DECEMBER

FOR FLUE-CURED TOBACCO

Received from

Central Tobacco Research Institute,

Rajahmundry

Nursery

Diseases:—Nursery, the sowings of which must have been completed by about the middle of September, must be coming up satisfactorily. This is the time when the diseases and pests will be occurring in a virulent form and every precaution is to be taken to ward them off. The most important and common disease is "damping off" with which all the nurserymen are quite familiar by now. This can very well be avoided and controlled by taking proper precautions regarding drainage, sterilisation of the beds before sowing, adopting optimum seed rate, judicious watering and frequent sprayings with the fungicides like Bordeaux mixture or Perenox. It must be clearly understood that this is a soil borne disease and as such at the time of spraying it is not sufficient merely to cover the foliage with the fungicide but it should be applied till the soil is saturated with it. Then only the fungicide can

check the growth of the fungus in the soil. Every morning before the starting of watering the beds and every evening after the waterings are over, all the beds should be closely examined for any disease and pest and suitable action taken immediately.

Next in importance to "damping off" are the spot diseases caused by *Alternaria* and *Cercospora*. These spot diseases can also be very well controlled by frequent sprayings with Bordeaux mixture. If the disease is severe, all the badly affected leaves should be removed and the beds sprayed with Bordeaux mixture.

In previous years "blight" caused by peronospora was also noticed in certain areas in an epidemic form. It starts as a small brownish spot from the edge of the leaf and enlarges to a size of a four anna or a half rupee coin. With two or three such spots the whole leaf collapses and rots off, if the weather is damp, and finally the seedling dies. This can also be very well controlled by spraying Bordeaux mixture.

Occasionally we may get mosaic disease also in the nursery, particularly in the beds where tobacco midribs were used as a manure and where no sanitary precautions have been taken, specially regarding the prevention of usage of tobacco for chewing and smoking in the nursery. In an advanced case the disease can easily be identified as the surface of the leaf will form elevation and depressions as in the case of "Seetha Phal" (custard apple). In early stages it is a little difficult to identify it. If there is a suspicion the affected leaf may be held against the sun when mosaic pattern of

For Flue-cured Tobacco

dark green and light green colours will be visible. If there is a doubt that some seedlings are having mosaic, even if they are very few, it is advisable to discard that bed completely, without using any seedlings from them for planting, because in such cases it is more probable than not that the remaining seedlings are also affected with mosaic disease though they may be looking normal at that time and they may show up that disease in the field soon after planting. As there is no curative measure known so far for this disease and as mosaic affected leaves are going to be a total failure in the barn all the plants having this disease are to be pulled out to prevent its spreading to the neighbouring healthy plants. To avoid this unnecessary expenditure on planting and replanting and to keep off the disease from the field, seedlings from the beds where a few plants had mosaic should be avoided for planting.

Pests:—This is the time when most of the nursery pests make their appearance. The chief among them are the caterpillars and cutworms. If timely precautions are not taken to prevent and check them, they may reduce the luxuriantly growing nurseries to mere standing sticks by eating away all the leafy areas. Periodical spraying with Gusserol (50% W.P. D.D.T.) at the rate of 2½ lbs. in 100 gallons will successfully kill these pests. If seedlings from badly infected nurseries are to be used for transplanting, it is always advisable to spray the nursery with Gusserol a day previous to the removal of the seedlings so as to prevent the carrying of those pests to the fields also through the eggs laid beneath the leaves.

In the previous seasons, it was observed that another pest, the root knot nematode, is damaging the nurseries to some extent particularly in the sandy areas of Sarpavaram in Kakinada taluk and Hukumpet in Rajahmundry taluk. It was observed to be affecting the seedlings round about palmyra and date palm trees. Hence such trees should be removed in the nursery site to prevent this disease. The affected seedlings are stunted in growth and start withering in patches. When pulled out and examined

such seedlings have gall like formations on the roots. As such seedlings when planted remain stunted in growth or may die causing gaps, they should be avoided for planting.

Top dressing:—If the growth of the seedlings is not satisfactory, it may be advisable to apply ammonium sulphate to the beds at the rate of 1 to 1½ lbs. per cent to boost up the growth. But, it should be understood clearly that seedlings cannot be pulled out from the beds for 7-10 days to come after the application of the ammonium sulphate. If the seedlings are too thick in the bed, they not only harbour diseases and pests but the growth of the seedlings will be poor and such seedlings may not establish well in the field after planting. To avoid these drawbacks, thin out such beds when the seedlings are about 3-4 weeks old and replant the thinned seedlings on vacant beds. If the growth is luxuriant and if there is a tendency for the seedlings to overgrow, the growth can be to some extent checked by trimming off the bigger leaves of the seedlings.

Transplanting is a shock to the seedlings and it should be prepared to withstand it successfully. Tender and succulent seedlings are more likely to die after transplanting than hardy ones. Hence it is necessary to make the seedlings hardy. This can, to some extent, be achieved by withholding excessive watering a week prior to pulling. On the day of pulling the beds should first be watered and when the soil is sufficiently moist to permit the pulling off of seedlings without breaking the roots, they should be pulled out. Care should be taken to see that the adjacent seedlings are in no way damaged during pulling. After each pulling, the beds should be watered, if necessary with a little ammonium sulphate in it, to cover up all the exposed roots of the seedlings in the bed and to boost up their growth.

If sufficient interest is taken and care bestowed in following the above recommendations your nursery is likely to be successful and you should get enough good and healthy seedlings at the correct time to plant your fields.

Field

Preparatory cultivation:—As most of the flue-cured Virginia tobacco fields are fallow in the kharif season, it gives enough time for good preparatory cultivation. By October, most of the preparatory cultivation must have been over as it is generally started with the first showers in May-June and continued as and when the field conditions and time permit. It is generally advantageous to give the first ploughing either by a tractor or with a heavy mould board iron plough. This gives not only a deep ploughing but gives the desired turning of the soil taking the depleted top soil to the bottom and the rich bottom soil to the top. As flue-cured Virginia tobacco areas consist of heavy black soils which do not normally permit good root growth, deep ploughing will loosen the soil to a greater depth and thus aid in the formation of good root system which in turn means good crop growth. If the fields are of average fertility 5-6 cartloads of farmyard manure may be applied during summer and ploughed in with the first ploughing. Subsequent ploughings may be given either with a country plough or with a junior hoe. At this rate by the time of planting the field will get 2-3 ploughings and 3-4 harrowings. As the rainfall during this period is heavy it is always advantageous to plough the field across the slope as this will help in preventing the erosion of the top soil and in the conservation of moisture.

It should be remembered that flue-cured Virginia tobacco is raised as a dry crop in dry lands without any irrigation and as such every measure taken for the conservation of moisture is going to help the crop.

Manuring:—In the beginning of October when most of the preparatory cultivation is over, manuring of the field with artificial fertilisers is to be attended to. It is advantageous to apply the fertiliser 15-20 days in advance of planting. Instead of broadcasting the fertiliser it is always desirable to apply it in deep furrows along the planting lines so that it may be readily available to the plant. This can be done by marking the field with a tobacco marker in one direction and opening deep furrows

with a heavy country or iron plough along the markings. Fertiliser should be applied in the furrows after which they are to be covered by working a plank across the furrows. At the time of planting, care should be taken to see that the plants are planted on the covered furrows. Experiments have shown that ammonium sulphate at 100 lbs. per acre is enough to support normal growth in fields of average fertility. Application of phosphorus in the form of superphosphate and potash in the form of potassium sulphate has not been found either to increase the yield or improve the commercial characters of the leaf. However, in several of the fields, usually response to about 20 lbs. N per acre is observed, the response depending upon the type of field. The application of such a quantity of N in the form of ammonium sulphate (not oil cake) is recommended; though the grower will have to reduce the quantity in fields where the leaf turns coarser green and increase it slightly in low-lying water logged fields where leaf is thin.

Planting:—It is needless to stress the importance of planting pure, fresh and healthy seedlings for obtaining maximum yields of high quality. The seedling should be removed from the nursery in the morning and transported for planting in the evening. If seedlings are to be brought from long distances naturally they cannot be planted the same day. Hence not only they get damaged during the transit but become stale by the time they are set in the field. This results in higher percentage of gaps and stunted growth of the surviving plants. These can be avoided by the cultivators by raising their own nurseries in nearby areas. After removal from the beds the seedlings should be closely examined and any diseased or damaged seedlings should be rejected and only healthy and vigorous seedlings taken for planting. The lower and diseased leaves of the seedlings should be removed before planting keeping only few healthy leaves surrounding the growth point. This also helps the plant in quicker establishment by cutting down the transpiration to the minimum during this critical period.

It is always better to plant in a ploughed field when it is in condition i.e., there should not be any intervening rain between the last ploughing or harrowing and planting. After the application of the fertiliser if there is no intervening rain the seedlings may be planted on the covered furrows straightaway. If there is an intervening rain give the field a light harrowing with a junior hoe or *gorru* when it comes to condition and plant seedlings on the manured furrows. If plantings are done in a wet field the growth may be stunted in the initial stages as the soil is likely to become hardy with the setting in of dry weather. Due to late season, if such planting become unavoidable, the field should be intercultured as soon as it comes to condition.

The optimum distance for a field of average fertility is 33" either way between plants. This permits enough aeration between plants when fully grown. If your fields are less fertile, or are usually affected by ash disease or if you are planting late in the season, the distance between plants may slightly be increased with advantage. Conversely, if your fields are found to produce green leaf, the distance between the plants may slightly be decreased. The optimum period for planting in these districts is from the middle of October to middle of November and in some taluks where the monsoon sets in and ceases early the optimum period will be from the beginning to the end of October.

Plantings are to be done in the evenings to cut down the transpiration to the minimum on that critical day of transplanting. As stated above, if the seedlings are sufficiently hardened in the nursery, they establish well. If it is cloudy, the plantings can be done throughout the day. Marking the field with a tobacco marker and planting the seedlings at the junctions may be more economical than planting with a marked rope or chain. At the point of planting a shallow hole is to be dug and a seedling is planted in it after putting a little water. After covering, the earth round about the seedlings should be firmly pressed for sure establishment and the surface covered with a little dry earth.

Or else, after 2 or 3 days the soil near the seedling may crack injuring the freshly developing roots. If there is enough moisture in the field or if there are 1 or 2 showers after planting, no pot waterings need be done. Otherwise, 1 or 2 pot waterings at 4-5 days interval are to be given after planting to ensure good establishment. If for any reason it is not possible to manure the field early, still the initial growth of the crop can be boosted by applying ammonium sulphate through the pot watering water.

Even with all the care a few seedlings may die resulting in gaps. In a well planted field, using good healthy seedlings the percentage of gaps do not generally exceed 2-3%. To ensure uniformity in growth and maximum yield, all the gaps should be filled within a week of planting, otherwise the gap fills will be stunted in growth resulting in lower yields.

The first pest we come across after planting is the ground beetle. It is a small black insect which gnaws off the freshly planted seedlings at the ground level. The badly damaged seedlings topple down and die resulting in gaps. Even when the damage to the seedling is not severe the affected seedling takes a long time to overcome the damage and thus is stunted in growth. Add 1½ lbs. of Dieldrin (50% W.P) to 100 gallons of transplanting water which has been found to be effective in killing the ground beetles, at the Institute farm.

One or two light irrigations given during the early growth period will greatly accelerate the growth without impairing the quality. So if facilities exist the cultivator may give one or two irrigations during the first six weeks but care should be taken to see that water does not stand in the field as tobacco cannot tolerate water logging. After each irrigation the field should be intercultured as soon as it comes to condition. Too many irrigations should be avoided as they are likely to make the leaf thin and papery and may also accelerate the spread of spot disease.

Within a month of planting caterpillars and cutworms are also likely to make their appearance in the field, particularly if the seedlings are obtained from infested nurseries. They can be controlled, like in the nursery, by spraying D.D.T. (50% W.P) at $2\frac{1}{2}$ lbs. in 100 gallons water concentration, at the rate of about $3\frac{1}{2}$ gallons per cent.

Interculturings and weedings are to be attended to as and when found necessary. Interculturing is better done by a junior hoe than with a country plough. During interculturing some clods of earth might have been thrown out on the plants which should be promptly removed. On the whole about 4 interculturings and weedings may be necessary. Fields should be kept clean by removal of dried off sand leaves which generally harbour pests and diseases.

When the crop is $1\frac{1}{2}$ months old, the Orobanche makes its appearance. It is a parasite and attaches itself to the root of the tobacco plants and draws out the nourishment with the result the tobacco plant is stunted in growth and withered in appearance. Leaf from such affected plants perish in the barn during curing, resulting in total loss to the cultivator. Hence every step should be taken to prevent this infection. It can easily be eradicated by pulling it out before it sets seed. As an Orobanche shoot is likely to produce about a lakh

seeds, it should not be allowed to set seed. If the Orobanche is removed before it flowers, there is no harm even if it is left out in the field but if it is removed after flowering and setting seed they should be gathered carefully and buried in a pit or burnt so that the seeds are not dispersed in the field. Some people feed the cattle with the removed Orobanche which is an undesirable practice as the seeds pass on through the dung undamaged and when such farmyard manure is applied to the fields, the seeds get dispersed in the field along with the manure. Experiments conducted at the Institute have shown that careful and thorough removal of all Orobanche before it sets seeds, for a continuous period of three years reduces Orobanche infection considerably. Hence see that all Orobanche is removed from your fields as soon as they make appearance above ground.

By about the end of December when the crop is about $1\frac{1}{2}$ to 2 months old ash disease (*Budida thegulu*) makes its appearance. It is more common and causes much damage in field planted too close where there is not sufficient aeration or in low-lying areas where there is too much of moisture. The disease can very well be controlled by the application of 40 lbs. of sulphur on the ground between rows of plants, six weeks after planting or as soon as the disease makes its appearance. During application care should be taken to see that no sulphur falls on the leaf.

FOR CIGARETTE TOBACCO

Received from

Cigarette Tobacco Research

Sub-station, Guntur

Preparatory Cultivation

By the time October is reached most of the preparatory cultivation should have been over. In October however, the final ploughings are done. If there are rains which would naturally harden and compact the soil the field should be ploughed to get good tilth. The ploughing may be done as close as possible. The last ploughing before the crop is planted may not be deep; it would be sufficient if the top few inches are broken and loosened. It is beneficial to plough the field either diagonally or across the slope of the field so as to prevent flow of water over the field.

Manuring

If manuring has not been done earlier it would be time it is done as early as possible in October. Farmyard manure if available should be applied at about 6 cartloads per acre early at the start of the monsoon in the months of June to July. It is not a good practice to apply farmyard manure late in the season. Fertilisers however may be applied early in October about 3 to 4 weeks before planting. It is advantageous to give the fertiliser in plough furrows about 7 to 9 inches deep, which could be obtained by working a short heavy plough followed by another plough immediately following behind. Soon after the application of the

fertiliser in the plough furrow, the furrows may be closer by working a plank across the furrows or running a plough along-side the furrow so that the soil brought out closes the furrow.

The most important manurial ingredient that is useful to the crop is Nitrogen. About 20 lbs. of Nitrogen supplied in the form of 100 lbs. of Ammonium Sulphate per acre is to be given. Application of Superphosphate and Potassium Sulphate do not seem to benefit the crop in any appreciable extent and their use in the fertilisation of the crop may not be of great utility or importance.

Planting

On the completion of the ploughings and manuring, the field may be given one final harrowing in both the directions of the field, so that the surface of the field may be levelled up and brought into fine tilth. The final harrowing may be done as immediately before planting as possible. A marker should be passed over the field to demarcate lines in order to facilitate planting the crop in lines and keeping the plants at equidistant spacing. The spacing of $33'' \times 33''$ to give 5,760 plants on acre may be adopted with advantage. Depending upon the fertility status of the field the spacing may however be changed to suit particular conditions. In rich soils closer spacing and in poor soils a wider spacing may be helpful. Wider spacing will also be found advantageous in fields usually affected by ash disease.

At every crossing of the lines, shallow holes to a depth of about 2" to 3" should be made with flatish, but sharp hoe. Locally an implement called "Alugu" is used for the purpose which is quite satisfactory. These holes will receive one seedling each in planting the field. It is better the marking of the field, forming holes and planting follows one another without any long delay in between the operation. If there is much delay between the operations the soil may get

dried up which condition is not quite suitable for the good establishment of the seedling. Provided that rain and other climatic factors do not come in the way, the crop should be planted early in the season. Normally the time for planting is between middle of October to middle of November. But occasionally the planting may be delayed to as late as end of December. The late plantings do not put forth well developed crop but would result in poor yields and returns.

Well-grown, hardy seedlings pulled from the nursery beds in the cool morning hours kept ready under shade are to be used for planting later in the evening. While pulling the seedlings care should be taken not to injure the roots. The seedlings should be such that they are about 6 inches long, of proper hardness and free from pests and diseases. Any swelling in the stem is an indication of the presence of "stem-borer" and such a seedling should be discarded and destroyed. Seedlings with spots, mosaic appearance, weak stems, nodular roots, etc., should also likewise be rejected and destroyed. On pulling the seedling from the beds a few bottom leaves should be clipped off cleanly from the stem.

It is always safe to plant the crop in evening hours, when the sunshine is not intense. To facilitate planting, the workers may be divided into three groups, one to place the seedling at the holes, the second to water the holes and the third batch to plant the seedling. Separate arrangements for the carriage and supply of water efficiently and quickly should be made. The water is poured from a narrow necked pot on to the hole and the seedling is put in and the hole covered with the surrounding dry soil. The seedling should be firmly fixed with the soil as otherwise the establishment of the seedling may not be proper or even fail. Just sufficient water to keep the seedling in an erect position should be given. If dry weather follows immediately after planting it would prove useful if the seedlings are rewatered for two or three days. This would help in the good establishment of the seedling.

Occasionally planting has to be done under wet conditions of the field. In this

case it would be better that the field is not trampled by too many people. Only minimum number of required personnel should be used. Transplanting the wet field would very much harden the soil on drying and would not be conducive to the optimal growth of the crop. If it could be helped it is better wet planting is avoided.

Death of seedlings in the field occurs due to various reasons, thereby leaving gaps in the planted field. The gaps should be filled up with fresh seedlings as early as possible as otherwise uneven crop results which interferes with the harvest of properly matured leaf. For the same reason prolonged gap filling till very late in the season should be avoided. If there arises a necessity for heavy and prolonged gap filling the field could as well be ploughed up and complete replanting done.

Interculturing

After about three to four weeks from planting the crop would have put forth some growth and from this time onwards interculturing may be taken up. To begin with three tined harrows may be used for interculture. The implement will loosen the soil in the top few inches and also will uproot any weeds that may be there on the field. Interculturing may be done at intervals of 2 to 3 weeks depending upon the condition of the field. As the season progresses the weather becomes warmer and the soil begins to develop cracks. These cracks should be closed by working the three tined harrow followed by a blade harrow. If the cracks are not filled, the crop may ripen prematurely. If there be excess of moisture in the soil the field may be given one or two intercultures with a small plough and later with the three tined and the blade harrow. Soon after every interculture the field should be walked over to lift the plants free from the soil covering them which might have occurred in interculture. Before each interculture is done, plants showing symptoms of diseases specially the mosaic plants should be pulled out as otherwise the contact of the implements, men or bullocks with the diseased plant might spread the disease to other plants also.

Diseases and pests

Mosaic disease causes appreciable damage to the crop. The casual organism of the disease is a virus. As already stated earlier strict care should be taken that no diseased seedling is used at planting and contact with diseased plants be avoided. All affected plants should be pulled out and burnt. Strict field sanitation should be observed.

Any time during the growth of the crop specially in the month of December "ash disease" may show its appearance. The disease occurs more commonly in fields having more moisture. Its appearance is seen by the development of whitish spots on the upper first and later on the lower surface of leaves. The bottom leaves are first attacked and later the disease spreads to the upper leaves also. If control measures are not taken the entire plant gets affected and the whole crop ruined. With the earliest symptom of the disease a few lower leaves should be removed immediately and burnt. The leaf shall not be allowed to touch the ground. Free access for the circulation of air on the ground should be allowed. About 40 to 50 lbs. of Sulphur powder per acre should be sprinkled in between the rows and later an implement worked to cover the sulphur.

The fields should be kept free from weeds and specially "Orobanche", popularly known as "Tokra" or "Malli". The weeds as well as the "Tokra" if allowed to grow will reduce the vigour and growth of the crop resulting in decreased yields. Contrary to the belief that "Orobanche" develops spontaneously due to some mysterious winds, "Tokra" germinates and develops from its

seed when it comes in contact with the root of tobacco. It is an obligatory parasite. "Tokra" may emerge from the soil either in single stoutish shoots or in thin clusters. The damage done to tobacco crop is severe more often with the latter type of Orobanche. If the shoots are not pulled out early the capsules formed on ripening dehisce and shed the seed on the fields. The seeds are blackish, dust-like and tiny. They are dispersed by wind, water and by any mechanical means. Very large quantities of seed is shed by each shoot and when large numbers of "Orobanche" develop which is common, vast quantities of the seed are dispersed. The seed on coming in contact with the root of the tobacco plant or some other particular types of plants, germinate on the root of and feed on the host. Generally many members of solonaceous family of plants like, Brinjal, Potatoe, Datura, etc. act as alternate hosts. Orobanche develops on plants like mustard and the like also. To control the pest the shoots should be hand-packed as soon as they emerge from the soil. The shoots may then be buried in pits and covered with earth. Very frequent and persistent pullings should be done to control the pest. In the first few years this may appear a formidable task but after a time, the intensity of infestation of the pest will be very much reduced. It is worth while incurring even very heavy expenditure on the handpicking of "Orobanche" as in the long run it will pay very good dividends.

By about the end of December, the plants would have come to the flowering stages or near about. By this time all arrangements for the coming harvests and flue-curings should be completed.

FOR HOOKAH & CHEWING TYPES OF N. TABACUM AND N. RUSTICA SPECIES

Received from Hookah & Chewing Tobacco Research Station, Pusa

In Bihar the cultivation is confined to only Hookah and Chewing types of *N. tabacum* and *N. rustica* species. *N. tabacum* is used for both hookah and chewing purposes while *N. rustica* is mostly used for hookah purpose only.

Preparation of Land

The field intended for planting tobacco should receive ploughings from the month of April to September. 2-3 ploughings per month will be sufficient. It is advisable to give first one or two ploughings with mould board plough and subsequent ploughings with country plough and harrowing with five tined cultivator. If the tobacco crop is to be green manured sow the sanai early with the first showers of rain in the month of June. The preparatory cultivation of the field is to be done as and when the conditions permit if no green manure crop is grown. The land should be brought to a fine tilth and in well pulverised condition.

Manuring

The farmyard manure should be applied at least one month before transplanting and should be well rotten. 50 cartloads of farmyard manure will be sufficient. In addition 50 lbs. Nitrogen in the form of mustard cake and ammonium sulphate may be given with advantage. If green manuring is practised the sannhemp should be buried in

the month of August. Apply 50 lbs. Nitrogen half as sulphate of ammonium (125 lbs.) and half as mustard cake (555 lbs.) The cake is to be applied 1-2 days before planting and ammonium sulphate is applied one month after transplanting round about the plants. Care should be taken not to allow the fertilizer to fall on the leaves. In rich soils, application of more than 50 lbs. Nitrogen does not show appreciable effect on yield while in poor soils applications of even 150 lbs. Nitrogen is observed to be beneficial.

Time and method of transplanting

The crop is to be planted during optimum period. "Uttara" and "Hathia" Nakshatra which fall in the period from second fortnight of September to middle of October are the best for planting *N. tabacum* as usually last showers of rain are received during this period which help considerably in the establishment of seedlings. The best time for planting *N. rustica* tobacco is from second fortnight of October to middle of November. For planting, only robust and vigorous seedlings with good root system should be selected. The damaged leaves should be removed before planting and only healthy seedlings should be used. As late planting reduces the yield, care should be taken to plant the crop in optimum period. The planting is to be done in the afternoons. If

the weather is cloudy and drizzling it may commence in the morning also.

Spacing of plants and rows

A narrower spacing of 3' × 2' is found to be suitable for *N. tabacum* species. For *N. rustica* species a spacing of 1½' × 1' should be given.

Care after transplanting and cultivation of crop

If there is no rain at the time of planting, give pot watering at the time of transplanting and continue it for 3 to 4 days till the seedlings get established. The gap filling, if any, should be completed within 10 to 15 days after planting. Plants gap-filled later rarely put on good growth and their yield is considerably reduced. Hence it is necessary that good stand is ensured for getting good yield. If the land is planted when too wet, interculturing followed by hand hoeing round the plants should be taken up immediately after the soil comes into proper condition. 3 to 4 hoeings at an interval of 20 days with "kurpi" (hand hoe) are sufficient. The first hoeing should be deep enough. Keep the field clean. Interculturing with planet junior cultivator is more economical and if given, 1 to 2 hand hoeings instead of 3 to 4 will be enough.

Watering

If there is insufficient moisture in the soil, give 3 to 4 pot waterings after planting at an

interval of 1-2 days to help the establishment of seedlings. The crop should be flood irrigated once or twice at the time of cropping. If there are no proper irrigation facilities it will be necessary to do pot watering 3 to 4 times during growth period.

Topping

The flowering stalk should be removed as soon as it appears after 1 to 1½ months of transplanting in the month of October and November so that all the food nutrients may be diverted for the development of leaves. Topping should be done at 14 leaves excluding sand leaves (bottom 2-3 leaves) which should be removed at the time of topping.

Suckering

After topping the said shoots called suckers begin to grow from the axil of leaves. These suckers are to be removed 4-7 times at an interval of 10-12 days from November onwards. Application of vegetable oil to axils of leaves also reduces the growth of suckers.

Harvesting

The plants get matured after 3½-4 months. Harvesting should start from January onwards. Harvesting should be done early in the morning by cutting the whole plant from the base with sickle or kurpi.

FOR MOTIHARI & JATI VARIETIES OF HOOKAH TOBACCO & WRAPPER TOBACCO

Received from

Wrapper & Hookah

Tobacco Research

Station, Dinhata

(i) WRAPPER TOBACCO

October:—Looking after the nursery sown during the third week of September and preparation of land for planting two important operations in this month.

Germination in the Wrapper tobacco nursery sown in September is usually complete by the first few days of this month and weeding accompanied by partial thinning is commenced. Weeding, thinning and occasional stirring of the top soil with thin pointed bamboo pegs is continued till the 3rd week of October. Judicious spray irrigation with rose cans is done as and when required. Periodic sprayings of 'Perenox' is done as a precaution against 'Damping off'.

Preparatory cultivation of the fields where tobacco is to be transplanted is continued vigorously till the last week of the month. Usually 10—12 ploughings each followed by a double planking are given. Undecomposed weeds, roots or stubbles of the previous crop

are collected and removed as the ploughings progress. Farmyard manure is applied after 6—7 ploughings. If the seedlings are ready and the fields in condition, transplanting is commenced during last week of the month.

November:—Transplantings are continued during the earlier part of the month. Gap filling, once or twice, is done 7—10 days after planting. Soon after the crop is established interculturings are commenced at 4—5 days interval for the first 2—3 weeks and continued at weekly intervals thereafter, till it is no longer possible to work without damaging the leaves.

The operation of weeding with clod crushing is done about 3 weeks after planting.

December:—No topping or suckering is practised in Wrapper tobacco and the crop is allowed to flower. Usually one irrigation is given during this month.

(ii) MOTIHARI TOBACCO (N. RUSTICA)

October:—Sowing of motihari nursery should be completed during the 1st week of October. The total nursery area may be divided into 2—3 portions and different portions sown on different dates during the week. Flat beds about 3½' wide and of convenient length may be prepared side by side with 2' wide and 2"—3" deep drains intervening between two successive beds. The soil of the beds should be thoroughly pulverised and cleaned of weeds, stubbles, etc. The beds then should be levelled and sown broadcast at the rate of 5 lbs. seed per acre of effective nursery area. The seed should be lightly mixed in the surface soil by working the top ½" soil with fingers. The surface of the bed should then be levelled and lightly pressed.

Watering of the nursery may be started when the surface soil appears to be getting dry. Watering should be done with rose cans in the morning or late afternoon as and when required depending upon the weather conditions.

A weeding cum thinning operation may be done in the nursery about 12—15 days after sowing. A second weeding may be required about a week after the first one.

The beds should be closely watched from time to time for any insect pests which should be hand-picked and destroyed. If "damping off" disease is observed in the nursery spraying of perenox (@ 1 tola perenox dissolved in 1 gallon of water and sprayed in one bed of 10' × 3½') should immediately be done, and repeated after 5—6 days if required. If the growth and vigour of the seedlings are poor, ammonium sulphate (@ 1 oz. of ammonium sulphate dissolved in 1 gallon of water and sprayed in one bed of 10' × 3½') should be applied.

Meanwhile preparatory cultivation of the land should be continued. A total of 10—12 ploughings each followed by double plankings should be adequate. Undecomposed weeds, stubbles of previous crop, etc. should be removed. Farmyard manure should be applied to the land prior to the last 3—4 ploughings.

November:—Motihari nursery sown early in October would be ready for first pullings during the 1st week of November, about a month after sowing. Effort should be made to complete plantings during the 2nd week of November. Give light watering before pulling out the seedlings. Seedlings need to be pulled out during morning hours and they should be transplanted during late afternoon hours. About 5—6 days after planting move in the field and finish up gap filling. Interculture operations should be commenced thereafter.

Interculture operations would continue throughout the month @ 4—7 days' intervals, the frequency of operations diminishing gradually as the crop advances and the excessive moisture in the soil is reduced.

Weeding with clod crushing may be done by the end of November, viz., about 20 days after planting. If the season is dry, interculturings should not be resumed until about a week or ten days after weeding and clod crushing. It helps the sub-soil moisture rise up into the root zone. Top dressing with fertilizers may be done around the plants

prior to weeding so that the fertilizer gets thoroughly mixed in the soil during weeding and clod crushing.

December:—As the crop grows and starts covering the land it is no longer possible to continue interculture without damaging the leaves and at this stage this operation should be discontinued. By this time the flower-head begins to appear on the top of the plants and such plants are now ready for topping. On these plants, ready for topping, the lowermost 4 to 5 leaves should be removed first, then next 5—7 leaves depending upon the vigour of the plant retained, and just above the uppermost leaf so retained the flower-head at the tip of the plant should be pinched off. An irrigation should follow the operation of topping.

This would be late December and the crop now should be left to grow undisturbed. Suckers developing in the axils of leaves should be removed at 7—10 days intervals. Leaf eating caterpillars if observed on the plants should be picked and destroyed. Virus and other disease affected plants must be uprooted and burnt.

(iii) JATI TOBACCO (N. TABACUM)

October:—Sowing of jati nursery should have already been done in the 3rd week of September. Since heavy showers are not uncommon upto the 1st week of October, it is desirable that jati nursery be provided with some protection against rain. A simple method to do so is to spread a thin layer of Aus paddy straw or jute stick directly on the bed surface immediately after seeding. This helps better germination by keeping the bed surface from drying and protects the young seedlings against the beating action of rain. About 15 days after seedling, such a layer, however, should be removed.

Weeding, watering and care against diseases and pests, etc. should be done as in the case of motihari nurseries. However, phasing of nursery or sowing small portions of nursery at short intervals and even sowing at different locations is very necessary as a protection against nursery failures due to heavy rains, etc. and in order to regulate the supply of seedlings according to planting requirements. Preparatory cultivation

of land and manuring, etc. are to be done much the same way except that transplanting of jati tobacco commences considerably earlier, viz., after 20th October. Planting of chama variety should be finished by the end of October while those of podali may be continued during the 1st week of November.

About 5—6 weeks' old, healthy and well developed seedlings should be preferred for planting at a distance of 3' X 3'.

November:—About a week or so after planting, move in the fields and finish up gap filling. Interculturing operations should be commenced thereafter. This operation would continue at 5—7 days interval depending upon the moisture status of the soil. Weeding with clod crushing should be done about 3—4 weeks after transplanting. Resume interculturing 7—10 days after

weeding cum clod crushing operations and should be continued till it is no longer possible without damaging the leaves.

December:—Topping, suckering and irrigation are the main operations to be carried out in this month. The flower-head of jati plants remains obscured from view till quite an advanced age of the plant. However, topping can and should be done as soon as the required number of leaves are available on the plant. As a simple rule all leaves upto a height of 9"—10" from the ground level should first be removed, then next 7—9 leaves be retained for maturing and the rest of the top leaves pinched off along with the flowered-head. This operation would usually be required to be done in mid-December. An irrigation should normally follow an operation of topping. Suckering should be done as and when required.

ILLUSTRATED COLOURED LEAFLET IN ENGLISH

Leaflet No. 2.—Manuring, Transplanting and Care of Virginia Tobacco.
(Revised)

Copies available for free distribution to the Tobacco growers

- from
- (i) The Secretary, Indian Central Tobacco Committee, 38, Mount Road, Madras 6.
 - (ii) The Director, Tobacco Research, Central Tobacco Research Institute, Rajahmundry.
 - (iii) The Plant Breeder, Cigarette Tobacco Research Sub-station, Brodiepet, Guntur.
 - (iv) Asst. Tobacco Extension Officer, Guntur.
 - (v) Asst. Tobacco Extension Officer, Eluru.
 - (vi) The General Manager, The Mysore Tobacco Co. Ltd., Bangalore.
 - (vii) The Officer-in-charge, Tobacco Research Station, Hunsur (Mysore State).

FOR BIDI TOBACCO

Received from Bidi Tobacco Research Station, Anand

OCTOBER:—

Topping

The crop which has reached topping stage should be topped. 11 to 12 leaves are maintained per plant after removing 4—5 bottom leaves.

Suckering

After topping suckers that develop in the leaf-axils and near the collar should be removed every week.

Interculturing

Interculturing should be done as needed. The last interculturing should be 4"—5" deep. After the leaves get intermingled, interculturing will be harmful; hence it should not be attempted. Interculturing should preferably be done in the afternoon, in order to avoid breakage of leaves.

Irrigation

If the crop does not develop normally, irrigation may be given. Along with irrigation application of ammonium sulphate or ammonium sulphate nitrate or any other nitrogenous fertilizer which is not likely to leach down, should be done. If the plot has infestation of Orobanche, measures to control the parasite should be undertaken. Crag Herbicide I has been found effective against the parasite.

NOVEMBER:—

Topping

Whatever untopped plants are there, should be topped irrespective of size of plant, in order to have even maturity.

Suckering

Removal of suckers should be carried out every week. De-suckering should be done carefully and leaf injury should be avoided.

Irrigation

Irrigation should be given if necessary. *Orobanche*, if any, should be uprooted and removed from the fields and buried. Feeding of *Orobanche* to animals should be avoided. Second spraying of Crag Herbicide I should be given if one spraying is done in the month of October.

DECEMBER:—

Removal of suckers should be continued every week. The bottom leaves that have dried up should be collected before they break into pieces.

Mature plants (indicated by spangle development on majority of the leaves) should be harvested following any one of the methods:

- (1) **Whole plant harvest:**—Well matured plants are cut at the bottom (ground level) and kept inverted in the field for 2—4 days for drying in the sun. On drying, they are collected in a tarpaulin and the lamina is stripped off the midribs. Midribs are separated from the stalks and kept for further drying. After 4—5 days, the pieces of lamina adhering the veins are removed and the midribs are allowed to dry.
- (2) **Leaf-wise harvest:**—Only the mature leaves (leaves with full spangle development) are plucked from the plants and put separately on the ground for drying keeping their upper side downwards. The leaves when dry are collected and the lamina is stripped off. The handling of midribs is done in the same manner as in (1)

(3) *Gugro Method*:—Green lamina of mature leaves is stripped off the midribs from the standing plants, and kept spreaded for drying in sun. When dry, it is collected and taken to store. The midribs are detached and dried as above.

Harvesting should never be undertaken when the following conditions prevail:

(1) On cloudy day or when there is likelihood of rain.

(2) When there is heavy dew fall.
(3) When there is low temperature.

However of a severe cold wave is expected, the mature plants should be harvested immediately in order to avoid damage due to frost occurrence, if any.

Storage

Temptation to store the produce with more moisture is disadvantageous on the whole and such storage should be avoided.

ILLUSTRATED COLOURED LEAFLET IN TAMIL



Leaflet No. 2 :—

CONTROL OF OROBANCHE

Copies are distributed free to the Tobacco growers
through the Officer-in-charge, Cigar & Cheroot
Tobacco Research Station, Vendasandur,
(via) Dindigul (Madras State)

FOR NORTHERN REGION

Received from Hookah Tobacco Research Sub-Station, Ferozepur

Tobacco is generally a transplanted crop, though in some parts of the State, tobacco is raised in situ. Nursery sowing should be preferred for getting a good crop of tobacco. Both for *N. Tabacum* and *N. Rustica*, which are generally sown from the middle of November to middle of December, the period under review is characterised as nursery period and following is the schedule of operations to be followed during this period.

OCTOBER

1. *Selection of site for seed-beds*:—The land selected for seed bed should be near the water source and should not have had tobacco during the previous year. The land should be well drained and on higher level especially where the soil is heavy so as to ensure easy drainage of excessive water.

2. *Preparation of seed beds*:—The land selected for seed bed should be periodically opened by means of spade or country plough so as to keep it free from weeds and stubbles.

NOVEMBER

1. *Manuring of Nursery*:—For sowing nursery of one acre, 272 sq. ft. i.e. one marla of land will be enough in case of Desi Tobacco while double the area will be required for Kalkattia tobacco. This area should be laid out into nursery beds of convenient size. They may be of any length required but should be not more than 4 to 5 ft. in width. Such width is convenient to attend to watering and weeding as a worker can easily reach the middle of the bed from either side. The beds should be separated by drains 1½' wide and 5-6" deep for drainage. After this these beds should be heavily manured with well

decomposed Farmyard Manure or city compost at the rate of 6-8 maunds per marla and the manure well mixed with top 2 to 3" of the soil. The seed beds should then be properly levelled.

2. *Seed rate and method of sowing*:—Tobacco seed is very small and great care should be exercised in sowing of nursery. The seed should be mixed with cow dung ash or fine sand and then broadcast. A very thin layer of F.Y.M. should be applied over it so that seed may not collect on one side while watering. The seed beds be well pressed and watered by means of flower can. The seed in no case be sown deep. The nursery should be regularly watered and care should be taken that the surface of the seed bed does not dry and no crust is formed. Tobacco seed normally requires 7 to 10 days to germinate and during this period it is advisable to keep the seed bed moist. Generally 4 to 8 chts seed rate per marla is used for raising nursery to cover an acre but low seed rate gives better results. In experiments conducted at Ferozepur lower seed rate of 5 seers per acre of nursery as compared to 20 to 40 seers commonly used by the farmers has been found to be optimum for raising sturdy and healthy seedlings. This practice results in saving of 75% of the cost of seed. For planting an acre ½ chts. of seed (one oz) per marla (272 sq. ft.) of nursery will be enough. For Kalkattia tobacco, one cht. per marla (2 oz) or 10 seers per acre of nursery has given better results than higher seed rates.

3. *Time of sowing*:—The best time of sowing nursery is from middle of November to end of November in Desi Tobacco and first week of December for Kalkattia tobacco for normal sown crop. When the nursery is to

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be sown on a large scale it will be desirable to make two sowings at an interval of 7 to 10 days so that in the event of bad weather the seedlings do not over grow and thus the seedlings are available for transplanting under these conditions.

4. For raising seed crop of *N. rustica* tobacco, seed should be sown in well prepared beds during the first week of November so that seedlings are available by the middle of December. Winter crop of *N. rustica* not only gives good seed setting but gives comparatively heavy outturn of leaves per acre. It is, therefore, advisable to plant early crop of *N. rustica* in the State especially in Ambala Division where there is no danger of frost to the crop. At Ferozepur winter crop has given very good crop of *N. rustica* and also resulted in saving of expenditure on irrigation. So early sown nursery of tobacco should be properly thinned so as to avoid over-crowding in order to get sturdy seedlings.

5. *Improved strains*:—It is always desirable to sow improved varieties. Type 238 in Kalkattia and T. 17 in Desi Tobacco have given very encouraging results and can be safely recommended for cultivation in the State. Seed of good quality types viz. T. 23 and T. 337 in Desi Tobacco though slightly low yielders is also available. The seed of all these improved types can be had from the Economic Botanist for Millets, Ferozepur Cantt.

6. Lead arsenite spray 1 to 500 in water or Bordeaux mixture 2:2:50 should be done as a safeguard against "damping off". The spraying should be commenced from the time the seedlings develop first pair of leaves i.e. 20 days after sowing.

DECEMBER

1. *Check against frost*:—Sarkanda Chapar should be provided to normal sown nursery in first week of December as a safe-

guard against frost especially in Jullundur Division where frost is sometime very severe.

2. First spraying with lead arsenite in the ratio 1:500 in water or with Bordeaux mixture against "damping off" should be done in the case of normal nursery and subsequent spraying attended at weekly intervals. If there is continuous rain or cloudy weather interval should be further reduced.

3. *Weeding of the nursery*:—Seed beds should always be kept free of weeds.

4. *Thinning of nursery*:—Should be attended to in normal sown nursery. It is well said that much of the success of a good crop of tobacco depends on the production of the healthy seedlings.

5. *Top dressing of nursery*:—In case the nursery is making poor growth, its growth can be accelerated by the addition of 50 lbs. of Nitrogen in the form of Ammonium Sulphate per acre (3 maunds of Ammonium Sulphate) per acre or 12 chts per marla. Fertilizer should be applied in dilute solution i.e. 1:500 water solution. Immediately afterwards water should be sprinkled over the seedlings to wash off the fertilizer from leaves. The application of fertilizer should begin when the seedlings are 3 to 4 weeks old. 4 to 5 applications are sufficient to give good growth to seedlings.

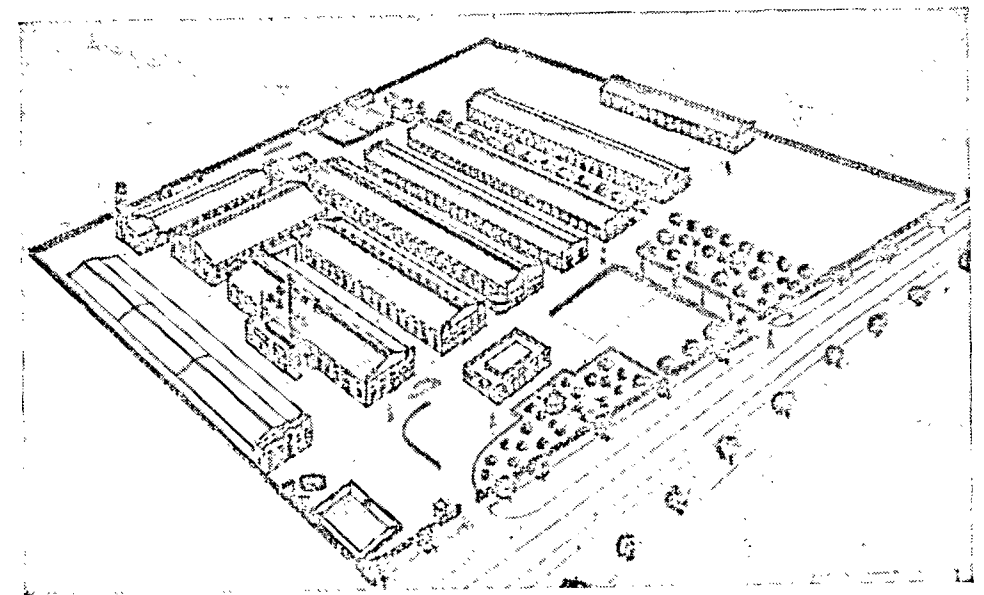
6. Transplanting of winter crop of *N. rustica* should commence from the first week of December in well prepared land preferably on ridges 1½' to 2' apart and at 9" spacing from plant to plant. The first irrigation should immediately follow after transplanting and subsequent irrigations applied at proper interval depending upon the nature of the land and weather conditions. In the event of danger of frost, the crop be irrigated.

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BRITISH INDIA TOBACCO CORPORATION LIMITED

GUNTUR, SOUTH INDIA

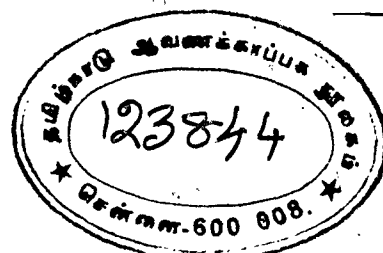


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Handwritten notes and signatures in the bottom right corner of the page, including the name 'INDIAN TOBACCO' and some illegible scribbles.

INDIAN TOBACCO

72/12/57
TOBACCO GROWERS—

BUY YOUR COAL AS SOON AS YOU GET YOUR COAL CARD

Because of the difficulties in supplying adequate quantities of coal during the months of December and January when the demand is greatest, the Coal and Railway Authorities have agreed to spread the movement of coal over a longer period — from August 1957 to February 1958.

If you are a Flue-cured tobacco grower, we would strongly advise

you to buy your coal as soon as you get your coal card. If you do so, the Distributors will be able to clear their stocks and constantly get fresh supplies from the collieries, the Railways will be able to keep up a steady supply of wagons, and the collieries will not be faced with a sudden demand which they cannot meet immediately. Above all, you will get your coal!

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