Some varieties take different periods to ripen off in different localities, owing probably to a change in the environment, especially the climatic conditions. Ratnachudi which takes about 5½ to 6 months to ripen in the northern circars ripened in about 4 to 4½ months on the Palur agricultural station* G. E. B. 24 is taking a longer term in the circars than at Coimbatore or in the southern districts. The duration of some varieties however does not appear to be appreciably affected by the change, e. g. Garikasannavari.

The fertility of the soil is another factor which affects the duration to some extent. In a rich soil there grows vigorously, flowers and ripens slightly earlier than that in a poor soil, the difference noted being up to 4 days in some cases. When the soil is too rich however, or when an over dose of rich nitrogenous manure like ammonium sulphate is applied, the crop runs to vegetative growth and the flowering and ripening are somewhat delayed. Some varieties again appear to flower earlier and ripen off quicker on a poorer soil e. g., G. E. B. 24.

Light also influences duration. A crop affected by shade, such as of a tree, while growing taller flowers and ripens later than one the open.

THE COTTON PLANT—CERTAIN ASPECTS OF.‡

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Introduction. As we all know, cotton fabrics form the bulk of the clothing of the people of this country. Rice many take the place of wheat as an article of food, cholam and other minor millets might replace rice but so far nothing cheaper has been found suitable to replace cotton as an article of clothing. Being an economical crop, it is attracting the attention of both the breeder and the cultivator. The breeder's name is made if he succeeds in evolving a strain giving 5 bolls more per plant or having its lint longer by 5 mms. than the local one. It is rare to find a strain with high ginning percentage and long staple combined in high produce of a single plant. It should be the aim of the

* 1909—12, (Vide annual reports)

‡ Paper read before the Jubilee Conference July 1926.

breeder to evolve a type of cotton with long staple and high yield coupled with bigh lint weight and not one with high ginning percentage. How the breeder attains his end will be detailed in course of this paper.

The cultivator on the other hand puts his best foot forward in supplying best cotton with regard both to quality and quantity so as to make the maximum profit with minimum labour.

Varieties. Although the Botanist would classify all the cottons of the world under the broad class, Malvaceae, there are varieties in it, those are as varied and different in themselves as the nations of the world. Among the indigenous ones we have Gossypium indicum (Karunganni,) G. herbaceum (Uppam,) G. neglectum (var. Roseum,) G. obtusifolium (nadam) and many other types of annual and perennial cottons.

The importance of cotton has led to the importation of high yielding exotic varieties of which Gossypium hirsutum (Cambodia), G. Purpurescens (Bourbon) and G. Barbadensis (Sea Island) are important.

All these cottons have distinguishing characters of their own and need not be gone into in detail here.

Area. [1]—The areas under cotton are mainly sub-tropical including practically the whole extent of crops in U. S. A. Russia, China with portions of Mexican, Indian, Peruvian and Egyptian areas as well as limited cultivation of cotton in Mediterranean lands (Greece, Italy and Algeria). Among the lists of cotton growers within the tropics are Mexico, many West Indian Islands, Columbia, Brazil, Peru, French and British West Africa with Nigeria and the Sudan East Africa (Tanganyika and Uganda) Peninsula of India, Dutch East Indies and Queensland.

[1] International Institute of Agriculture (Statistical Bureau Rome 1922)

The aggregate area under cotton averaged during 3 years (1919—21), 58½ million acres, as compared with 59¾ millions during the 5 previous years and 59¾ million acres in pre-war period of 1909—13. The figures of the most recent period show therefore a decline in the apparent area amounting to 2·3 per cent as compared with the average 1914—18.

Of 58½ million acres under cotton, India contributes 21 million acres. The area devoted to cotton occur in almost all parts of India. in some portions of Central Provinces, United Provinces and Sind, cotton is grown over 30 per cent of total cultivated area but in many regions cotton does not exceed 10 per cent of the land under crop.

[2]Season and crop report for Madras for 1924–25.

Madras[2] has a total area of 2 million acres under cotton of which 247,468 acres are under Cambodia and over 2½ million acres under others.

The total output is 562, 710 bales of 400 lbs each of cotton.

It may not be out of place here to mention that Indian cotton is of short staple, the great majority of crop yields a length not more than ¾," Cambodia (brought originally from Indo-China attains 1" and more and Tinnevelly ⅞ inch with a ginning percentage of 32, and Cambodia cotton grown in Madras Presidency is already considered as best varieties of Indian cotton.

Method of branching.—The cotton plant is peculiar inas far as it produces two types of branches. The vegetative or monopodial branches are produced in the early stages of plant growth while the fruiting or sympodial branches appear along with flowers. In each axil there is a main and a secondary bud. Vegetative growth is affected by the development of a monopodial growth from either of the buds. Reproductive growth is affected by development of a sympodium from the former bud only. The length of vegetative growth is controlled by formation of secondary branches. If all these branches are monopodial, the appearance of the first flower will be delayed until a tertiary branch appears. The fruiting branches can be easily made out from the monopodials by their zig-zag appearance and the presence of a flower, flowerscar or boll opposite to the leaf. The first sympodial node varies from 8 iu Gossypium hirsutum and Roseum to 30 in Nadam.

It is therefore evident that the sympodial branches should be numerous and early if we want to have a heavy and early crop. In Indian cottons monopodials follow sympodials while in exotic ones few or no vegetative branches are produced after the first sympodial node.

Secondary sympodials are marked in plants which are top bored. Even if the plant is bored after producing sympodials, secondary sympodials are produced at a quick rate to compensate for the inability to produce more primary fruiting branches and eventually the yield of such plants is found to be very high. This suggests the idea whether topping cannot be resorted to as a means of increasing the yield. We are not unfamiliar with the practice of topping Tobacco to increase the weight of leaves and consequently to increase the yield.

(i) Germination

Duration.—Cotton seeds sown under normal conditions of tilth, moisture and temperature germinate in 4 days. Under our conditions the germination period can be considered as varying from 4 days to one week.

Leake and Kulkarni[3] experimenting with seeds in different positions while planting, found that seeds planted with apex upwards germinated earlier than others while those with apex downwards germinated later, and those with apex sideways came up last. But Kottur[4] after complete experiment concludes that there is no position which has an appreciable influence on the germination of seed, vigour of seeding or yield of individual plants. The latter is the generally accepted view.

[3]Agri. J1: Vol. XIII.

[4]Agri. J1: Vol. XV.

(ii) "Square" formation.

Squares or flower buds begin to appear nearly 90 days after the date of sowing. Not all these develop into flowers. It has been observed by Hilson[5] that the early formed flowers take longer time to mature into a boll than the late formed ones. Shedding is more in late formed buds. On an average the squares take 25 days to develop into a flower. The causes of bud and boll shedding in cotton which have attracted and are attracting the attention of the eminent Botanists working in this direction, are beyond the scope of this paper. Mr. Hilson's conclusion that insects play but a minor part in shedding, is generally the accepted view of the case and the problem is patiently awaiting solution.

[5]"Bud and Boll shedding."

(iii) Maturation period.

Observations with Cambodia cotton go to show that it takes 45-55 days for the flower to grow up into a boll and burst. Early formed flowers have longer maturation period than later formed ones. The bursting is loculicidal and each lock is held between two carpels.

Flower.—The inflorescence is a cyme and flowers are solitary and leaf opposed. Cotton flower is hermaphrodite capable of cross-fertilisation soon after opening. Self fertilization is effective. Members of the old and new world groups are fertile *interse* but exhibit complete sterility when attempts are made to effect a cross between the two groups.

The persistent bracts which envelop the young flower and which later on enclose the growing boll may be one whorl of 3 or more than one whorl of three each in which case every whorl alternates with the other. Although the bracts are generally green, in Arboreum, they are pink. The teeth on the bracts vary both in number and length. From observations made in West Indies by Dr. S. C. [6] Harland it has been shown that the number of teeth in bracts vary from 3—20 and each species has a definite value for the number of teeth to which it breeds true. As the plant becomes older, the number of teeth becomes fewer and hence it is preferable to count the plants which have just commenced to flower. Bracts of secondary sympodia have lower teeth numbers than those from main fruiting branches. When crosses were made between types differing in the number of teeth F_1, in two cases showed complete dominace of larger number of teeth but in the third case F_1 showed intensification and has a larger number of teeth than either of the parents.

[6] W. I. Bull Vol. XVI.

Cotton flower opens in the mornings between 8 and 11 a. m. On the Cotton Breeding Station at Coimbatore it has been observed that on days when the temperature was low or when the sky was overcast and cloudy hardly a flower opened before 11 a. M. This shows that a certain optimum temperature and sunshine are essential for the opening of the flower.

The colour and size of corolla varies with each species. The colour varies from creamy white in Cambodia to dark yellow in

Sea Island and many indigenous species, but it is purple in Arboreum. The red colour of Arboreum is due to the sap being coloured red by the presence of red anthocyanic colouring matter in it, Red is dominant to yellow and breeds true.

All indigenous varieties of cotton and also Sea Island possess eye at the base of the petal which varies in size and shade of colour. Cambodia is without eye. It has been observed on the Cotton Breeding Station that the eye is dominant over no eye and breeds true with regard to a natural cross between Cambodia and Sea Island. It behaves as a simple Mendelian factor.

The stigma is 3–5 fid according as the ovary is 3–5 carpelled. It has been observed with Cambodia cotton (col) on the Cotton Breeding Station that 5 locked bolls are produced in larger numbers in early stages with practically no 3 locked ones; as the season advances 5 locked ones diminish. During the second flush most of the flowers produced are all 3-fid and most of them shed before setting into boll.

Calyx is gamosepalous, cup shaped with 5 teeth showing the fusion of the 5 sepals and is persistent. Resin glands in shape of dark dots are studded all over the calyx.

The number of ovules varies from 5–17 per lock. In Cambodia it is generally varying from 5–12 while in Cernum it goes up as high as 17. The weight of ovules is found to increase from Ist to 3rd. There is an equality of weight as we go from 4–7 and then again there is a gradual fall but the last one generally weighs more than the first. The variation as observed on the Cotton Breeding Station continues till the ovules develop into seeds. That this is a provision of nature and not an accident is shown by the fact similar observations were recorded by Professor D. B. Halsted[7] in the case of pulses. The number of ovules per lock is not directly proportional to the number of locks per boll. Usually a three locked boll has larger number of ovules per lock than a 4 locked one and that in its own turn has a larger number of ovules than a 5 locked boll. But on the whole a 5 locked boll contains the largest number of ovules. It has also been observed that although a 5 locked boll weighs more than a 4 locked or a 3 locked one, the average seed weight increases from 5 to 3 locked bolls.

[7] Botanical Gazette Vol. IXVII.

Factors that increase the yield. Cotton is one of the important crops that readily respond to good cultivation. The germination has been noted to be very poor in ill-prepared lands and the effect of bad preparation of the land manifests itself in very poor yield. Therefore, it is well worth the trouble to give good preparatory and after cultivation to a cotton field. Both drill sowing and planting on ridges result in higher yield than broadcasting.

(i) Cultivation

Every ryot would bear testimony to the fact that a manured field of cotton gives more yield than an unmanured one and experiments conducted at the Goverenment Farm, Koilpatti go to corroborate this fact.

(ii) Manuring

Likewise good and frequent irrigations go a long way in big and healthy boll production. The high yield and good quality of cotton grown in Avanashi Taluq is a point in favour of high manuring, copious irrigation, coupled with good cultivation.

(iii) Irrigation

Consistent with the minimum amount of spacing the output is increased by increasing the number of plants per acre. Therefore a judicious seed rate should be adopted.

(iv) No. of plants

Another factor is the number of bolls per plant. The variation in yield of a single plant in pure strains varies from 5–50 in Cambodia, hence if all the plants in a field are vigorous and high yielding the total out-turn will really be appreciably high.

(v) Bolls per plant

It is the bounden duty of the breeder to see that his strain produces the maximum number of locks per boll, as a boll with a larger number of locks weighs more than one with a lesser number. It has been observed that this is beset with a serious handicap of larger percentage of shedding in bolls with larger number of locks. It is therefore of the highest importance to get a strain which while giving the maximum boll per plant and larger number of locks per boll, will exhibit the shedding tendency to the minimum.

(vi) No. of locks per boll.

Bolls with multiples of 3 or 4 locks have often been found but they are as a rule immature or ill developed.

(vii) Selection & acclimatisation.

This is one of the 2 lines of work of a breeder. Starting with a ryot's crop, the breeder evolves a strain which is more uniform and high yielding than the local one. This is one of the main lines of work of the Agricultural Department. As a result we have 295 (CO1), 440 and 864 in Cambodias and N14, CO numbers of the South and Sircar numbers of the North.

(viii) Hybridisation or Crossing.

This line of work is more difficult and less sure than the former and involves the judicious rejection of the heterozygous selections. This work is still in its infancy and we are glad to boast of one successful cross between the Roseum and Indicum and we are on the eve of making some more out of the Cambodia and Sea Island and also Cernum and Indicum crosses.

This chapter brings us to the hereditary characters of Cotton.

Some hereditary characters.—As early as 1908, Fyson observed that the red colour of the leaf stalk and pink spot at the base of the leaf, pink spot at the base of the petals, and nakedness of seed were dominant characters. He also studied the behaviour of 3 unit characters, *viz.*, rounded vs. pointed shape of leaf, white or yellow colour of flower, white fuzzy vs. naked seed for 5 years and concluded that these segregate on Mendelian lines. He further found that red colour of flower was dominant to yellow. Microscopic examination showed him that yellow colour which is dominant is a sap colour. He also observed that length and fineness of lint were dominant over short and wooly nature, habit of bolls opening widely dominant over that of opening only a little. He inferred that narrow lobing is dominant over broad.

[1] Bot, Memoirs Vol. II No. 6.

Kottur[2] working on Kumpta cottons contradicts Fyson and and says that a broad midlobe is dominant over narrow and a long midlobe dominant over a short one. He found that length and breadth of bracteole seem to behave as simple Mendelian factors.

[2]Bot Memoirs Vol. X No. 6.

Experiments conducted in the West Indies[3] go to show that strength of staple is not a character transmitted by means of seed but it depends very largely on external conditions which prevail during the growing season. The length of lint produced is a function of the parent plant which it transmits as a whole to its off spring, the differing length of the lint attached to the individual seeds bearing only a secondary relation to the lint of the offspring. The length to which cotton lint will attain in any season is dependent on the water supply of the plant at the critical period of the development of the boll. Hence in making comparisons of length of cotton lint grown in different seasons or in different lands the results will be 'erroneous' if the rainfall is in no way comparable.

[3]W. I. Bulletin No. X.

In concluding I have to thank Mr. R. C. Broadfoot, Cotton Specialist, for the very kind impetus and encouragement given to me in the course of the preparation of this paper and for the ready consent which he gave for perusal of the records at the Cotton Breeding Station. I have to thank the ladies and gentlemen present for the opportunity given to me this day for speaking on this subject.

Conclusion.

VETERINARY FIRST AID.

Wounds and Antiseptics

An Address by

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As every stock-owner knows, all animals are liable to sustain injuries; often, may be, serious enough to cause him some concern, particularly in the case of valuable animals. Common against injuries are wounds of various kinds. It is, therefore proposed to give you a little first aid instruction regarding wounds and their