

# Our position as to Cotton Pest Control in South India.

BY

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*Introduction:*—While the plant Breeder is engaged in evolving strains of Cotton that would give increased yields, and the Agriculturist in devising the best methods of tilth and nurture calculated to provide for them optimum conditions for growth, the Chemist supplies them with plant food best suited for producing the maximum yields. But the cotton plant, like many other crops, is subject to the attacks of various pests and diseases, which often take a heavy toll of the crop, so that the labours of the Breeder, the Chemist and the Agriculturist are liable to be greatly wasted thereby. It is the function of the Entomologist and the Mycologist to study the various pests and diseases and devise measures for counteracting their injuring effects in the most economical and efficient way. It is the purpose of this paper to give a short account of the present position of the Entomological Section of this Institute in regard to the control of the major pests of Cotton in South India.

2. *The Important pests of Cotton:*—The list of pests of cotton so far noted in this province is fairly long, but fortunately the really serious pests are not many. Some of them are being mentioned below, grouping them for the sake of convenience according to the damage caused to the cotton plant,

*Damage to the Seedlings:*—Plants as they germinate may be eaten up and destroyed. In the red soil tracts of the the Deccan Districts, the red Hairy Caterpillar is often responsible for such damage and whole fields may have to be resown. A ground weevil is known to cause similar

damage in the Tinnevely District, while surface grasshoppers are often responsible for a certain amount of such loss in most districts.

2. Damage to young plants :—Plants are liable to suffer from defoliation by various caterpillars, of which *Cosmophila erosa*, and *Laphygama exigua* are the important ones. They are also subject to attack by various plant lice, such as Aphids, Jassids and Mealybugs at this stage. The Spotted bollworm and the Shoot-roller (*Phycita infusella*) attack the shoots and bring about the effects of topping. This delays boll formation.

3. Damage to Flowers and bolls :—Bollworms, of which 5 different kinds are known to be present in South India, appear when flowers and bolls are formed. The Red Cotton Bug also makes its appearance at this stage on the bolls in some seasons.

4. Damage by Stem-borers :—The Stem weevil is a serious pest in the southern districts of the presidency, viz. Salem, Coimbatore, Madura, Trichinopoly and Tinnevely, but is not recorded either in Northern Circars or in the Deccan Districts. In the Ceded Districts *Sphenoptera gossypii* the stemborer beetle is sometimes present in serious numbers.

3. *Control Measures* :—A study of the habits and lifehistories of these insects has to precede the consideration of control measures for them. Much of this has been done now, but in the light of experience that has gradually been accumulating, it is becoming clearer year by year that a close local study of particular pests is necessary in order that practicable remedies may be devised. For, insects have been known to exhibit a great deal of variation in their habits in reaction to different environmental conditions.

Unfortunately, however, the work of the Entomologist is commonly identified with the use of sprayers. Every ill that plants are subject to is expected to be cured by the direct administration of some "medicine." While direct frontal attack is certainly both effective and profitable in particular cases, there are conditions where such methods

are neither practicable nor useful. In the case of crops cultivated on an extensive scale like cotton, spraying, even if efficient, is under present conditions neither practicable nor economical; and a remedy is no remedy unless it is also an economic possibility.

Sometimes spraying in bulk presents side-issues for which we had not bargained. An instance of this kind was experienced two years ago while trying dusting experiments against the Deccan Grasshopper pest of Cholan in Bellary District. While but few of the hoppers were affected by the dusts of Paris Green and Calcium arsenate used, more than 150 specimens of the common Ladybird were found dead in the small area under experimentation. Since the Ladybird is a potent factor in the control of Aphis, dusting on a large scale would undoubtedly have been followed by an epidemic of plant lice infestation. Such a case has recently been reported from the Southern States of the United States of America, where, as a check on the increase of the Cotton bollweevil, Calcium arsenate is being dusted with the aid of aeroplanes on a large scale. As a result it is stated that an epidemic of plant lice attack has in many instances followed. In this case the multiplication of the aphis is supposed to have been caused by the destruction of certain small wasps parasitic on the Aphis.

Outbreaks of Aphis and Jassids, which sometimes occur, can be controlled by spraying, as has often been done on the Central Farm in the past, but spraying is not practicable on a large scale; very often such attacks are, perhaps, symptomatic of some defect in the nutritional or physical properties of the soil concerned, and may possibly disappear when these are remedied.

Again, Climatic conditions have a great deal to do in the incidence of pests, and there is much scope for study in this matter and a more definite knowledge is desirable. For instance, the heaviest attack of Stem-weevil at Coimbatore during recent years, occurred in the season that followed the torrential monsoon rains of 1924, but it is not apparent how exactly the rains helped the increase of the pest. Again, Leaf Caterpillars appear in epidemic form on cotton in years when plants show an excess of vegetative growth owing to heavy rainfall.

The utilisation of natural enemies is a method which would appear to be of distinct promise in certain cases. For instance, in the case of plant lice infestation of young cotton, it may be possible to check it by the introduction in bulk of ladybirds collected by means of hand nets from some other older crops. Possibilities of such biological control may come to light when each pest is subjected to a more intensive ecological study.

In other cases, it is possible to avoid insect damage by simply changing the date of sowing. The prevalence of irregular sowings in the same neighbourhood is often a serious factor that favours insect multiplication. While in case a more or less uniform date of sowing is adopted in a locality, the insect even if present will be uniformly distributed among the crops, but where irregular sowings are prevalent, the insect will have opportunities of passing through two or more generations during the same season to the detriment of the late sown and the succeeding crops. If uniformity of sowings can be made possible, incidence of pests may to a great extent be obviated.

4. *The Pest Act and Cotton Pest control* :—While it is certainly desirable that the factor of damage by insects should be entirely eliminated in the interests of the crops, it has to be admitted that absolute protection is an almost impossible feat and, if at all it is made possible, it would be only at a prohibitive cost. However, what is really wanted is protection from heavy loss. If, for instance, by adopting certain remedial measures, losses can be reduced from 50% to 5% or even to 10% subject to considerations of economy, the relief obtained would be appreciated by the cultivator.

In the case of bollworms, the relative heaviness of loss would be dependent on the comparative proportions of the insect population to the number of bolls produced. If at the beginning of boll production, large numbers of bollworm moths are present, the crop will start with a heavy handicap and as the crop grows the insect population also increases and great losses will ensue. If, on the other hand, the crop can start with the minimum of infestation, there will be comparatively little damage. The object of the Pest Act,

as enforced against Cambodia cotton pests has been to enforce the removal of cotton by a fixed date so as to arrange for a period of at least six weeks when there should be no cotton on the field, in order that the insects may be starved out, before the new crop comes in.

The Cambodia cotton was introduced two decades ago into the Coimbatore District and owing to the suitability of some of its soils to the cultivation of this cotton and also on account of the evident superiority of its *kapas*, this variety became very soon popular. As, however, on account of its robust growth, it was found to be able to stand on the ground continuously for two or three consecutive seasons, the ryots began to keep it as a perennial crop on the same field for two or more years whereas the country cottons are uprooted after one season. It became apparent very soon, however, that the *kapas* fell off rapidly in quality, and the Tiruppur Cotton, which had won for itself a name and reputation in the Bombay market during the previous 4 or 5 years, was in danger of losing it permanently. At this stage, the question was gone into by the Agricultural Department, and it was found that the cause of such falling off of quality was due in great measure to the facilities unconsciously provided by the ryot for the continued propagation of various cotton pests, especially the bollworms and the stem-weevil by his system of cultivation. Not only did the yields decrease, but also owing to heavy damage by the bollworms the *kapas* became deteriorated in quality. In seeking to remedy the situation, it was plain that a frontal attack on the pest by way of spraying with chemicals, was impracticable and costly. Since, however, it was more or less evident that the deterioration in the quality of the *kapas* was due to the continuous keeping of the crop on the same field for several seasons together, it was sought to remedy the situation by making it compulsory on the part of the cultivator to eradicate his crop by a certain fixed time, so as to create a definite "dead" season for cotton, when there should be no Cambodia cotton on the field serving as a food plant to any of the cotton pests. The pest act has been under enforcement in the Coimbatore District since 1919, and in the Salem, Madura, and Trichinopoly Districts since 1921. Till 1923 the date of enforcement was August, 1st;

but from 1924 it was changed to September 1st, in response to popular representation. It may, however, be observed that, in spite of the act being in force, in no year had all fields been cleared of cotton by the date notified; very often it was the second or the third week after the date fixed that the Pest Act Staff could send in their completion report. Consequently, the full period of six weeks, during which it was hoped that it could be arranged to have no growing plant left in the field, was never obtainable in most places. On the whole, it may be stated that the Pest Act has nowhere been given a fair chance to show its beneficial results; notwithstanding all these handicaps, however, there is ample proof that the enforcement has not altogether been without some effect. It has generally been acknowledged that within a year or so of its enforcement the quality of Cambodia cotton at the Thiruppur market showed improvement.

On the Central Farm, Coimbatore, the incidence of Cambodia cotton to attack by pests has been under very close observation since 1920. A field of Cambodia is kept under observation during the whole season and weekly records of the degree of infestation of both green and dry bolls made. It has been noted that while the peak of infestation was noted to be about 90% in 1919, it became progressively lower year by year, until in the year 1925 it was only 20% and though it has somewhat increased since then it has not gone much above 30% (barring 44% in 1928 an exceptional case). While in the ryots' fields cotton is removed only at the end of August, it has been the general practice in the Central Farm during the last four or five years to have the cotton crop completely uprooted by the end of May or the beginning of June, but since the area of the Farm is comparatively but a drop in the ocean, considering the huge area of ryots' crops by which it is surrounded, striking results have not been noticeable.

It has to be stated, however, the results so far obtained under the defective enforcement of the Pest Act refer only to one of the pests, viz., the Pink Bollworm *Platyedra gossypiella* for, this insect lives only in the bolls of cotton, and since cotton produces its bolls only about two months

after sowing, it gets a fairly sufficient close period in spite of defective enforcement. But in the case of the Spotted Bollworm—*Earias* spp—and the Stemweevil—*Pempheres affinis*—the length of the dead season is absolutely insufficient. For, while the Pink bollworm functions only as a borer of fairly grown up bolls, and does not, moreover, attack any plants other than cotton, the Spotted bollworm is able not only to breed on numerous other Malvaceous plants, such as Hibiscus and Sida, but also attacks the shoots of young Cotton, on which it has the effect of stopping bringing about a set-back in growth and causing a considerable delay in the production of bolls. Again, the Pink bollworm, attacking as it does the seeds only of the more mature bolls, is a clean feeder which does not discolour or damage the lint, while the Spotted Bollworm is pre-eminently a gross feeder. It usually prefers the younger bolls, and not only are the tender tissues of the developing seed and lint eaten into, soiled and discoloured, but entry of the spores of various moulds is favoured bringing about boll-rot. Altogether, the spotted worm would appear to be the more serious of the two, though the Pink one is, perhaps, the more prolific. The Stem weevil is known to be able to live as an adult for over 5 weeks, and can breed even in young cotton, so that in the case of both this insect and the spotted bollworm, the present type of enforcement is evidently ineffective. There might be some effect if the close season could, instead of it being a mere make believe, be an actual reality and cover at least two months, but it has never been so as a matter of fact. While eradication has tended to extend to at least 2 weeks beyond the date fixed, there has been no provision to restrict the date of sowing, so that the duration of the dead season has been tending to become a vanishing quantity. But prohibition of the time of sowing before a fixed date is not under the present conditions quite feasible since for instance, as in the case of tracts dependent on rainfall the time of sowing must evidently depend on the actual receipt of rain of course, an uncertain factor. Experience on the Cotton Breeding Station, Coimbatore on the other hand, would appear to emphasise the importance of early sowing, for, during the past 2 seasons cotton sown by the first week of September was free from diseases,

such as black-arm, as compared with fields sown a month later, and gave about double their yields." The inference would appear to be that it is not wise to put a time-limit as to the time of sowing, and if it is desired to have a really long "dead period" the only thing to do would be to stop with the first picking and pull all cottons up, so as to prepare the land for a second crop. In fact, in the Avanashi area the more advanced ryots generally pull out their cotton soon after the first picking and prepare the land for raising a cereal; apparently they find it really profitable to do so. Statistics carefully taken in the Cotton Station show that the kapas of the second or "kar" picking is mostly of inferior quality, since the plants are during this season specially subject to various pests and diseases, and being dependent on the receipt of good summer showers—always an uncertain factor the yields too are neither as heavy as the first season picking nor by any means certain. In these circumstances, therefore, it looks as if the procedure of the Avanashi ryot is based on hard commonsense and if his action could generally be followed, not only would the principle of providing for a definite "close" period for cotton be given a fair chance to show its results, but the ryot would have substantial advantages therefrom. For, if he gives a careful cultivation to his land, and sows the crop fairly early, he is sure to have a healthier and more vigorous crop, which even during the first picking will give yields that by reason of the superiority in the quality and the quantity of the kapas picked will counterbalance the loss of what may be reasonably expected to be secured in the second picking.

5. *Suggestions for Future Work* :—Although much of the pioneer work is now over, and a fairly comprehensive knowledge of the general conditions governing the increase of cotton pests has been obtained, there is still a great deal of ground to be covered before cheap, efficient and practicable methods of control for all the pests can be evolved. Each individual insect pest can yet bear a much more close and intensive study, not only from the purely entomological point of view, but also from that of the Botanist, the Chemist and the Breeder. An instance in point is the Cotton Stem weevil, on which very interes-



ting light has been thrown by the recent work of the Cotton Specialist and the Agricultural Chemist at Coimbatore. If further attention could be focussed on it from all points of view, I am quite hopeful that some practical results will be obtained before long.

Owing to the demands for emergent attention from other crop pests it has not been possible, during the past four or five years, to set apart hands for the intensive study of cotton pests. All that has been possible to do is the continuation of the weekly observations regarding bollworm attack on the Central Farm year by year, in order to check the actual effect of the enforcement of the pest act. In case hands can be set apart from the Cotton Committee's funds for entomological work at Coimbatore, as contemplated a few years ago, and an intensive study of the various pests undertaken, I am full of hope that results of value will soon emerge.

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