NOTES ON THE INCIDENCE OF THE SWARMING CATERPILLAR OF PADDY

By M. C. CHERIAN B. A., B. Sc., D. I. C.

and

K. P. ANANTANARAYANAN B. A. (Hons).

(*Madras Agricultural Department*)

Introduction. *Spodoptera mauritia*, the swarming caterpillar or the army worm of paddy is long known to be one of the worst insect pests of young paddy in South India. The insect appears in such vast numbers, that it devastates field after field of young growing paddy in incredibly short intervals, marching over fields in regular swarms. In ordinary circumstances, this insect in pest form is known only by the damage done to the crop in large areas simultaneously. The pest usually occurs in crops sown broadcast or in wet nursery. Visible damage is done only when it is in the fairly grown up caterpillar stage and since the pest appears sporadically all over a large tract, its presence is known, and control measures attempted in most cases, only when the caterpillar has finished almost its career of destruction of crop.

It is known that the life cycle is completed in the course of 40 to 50 days, and that under certain conditions the period may be as low as 28 to 30 days. The parent moth lays its eggs in masses on the host plant. The eggs hatch in about 3 to 5 days and the larvae begin to feed. The larval period lasts for about 3 to 5 weeks and the full grown larvae pupate in the soil. In about 10 days adult moths come out. These moths again find out suitable food plants for further infestation, and breeding. The most important point is the insect's instinctive powers to reach suitable breeding places during different parts of the year, and selecting cultivated crops only occasionally.

Distribution of the Pest. In the Madras Presidency, the occurrence of the pest is reported every year in some part or other. In South Malabar, the earliest sown first crop is sometimes subject in May to severe attacks often necessitating a resowing. The insect is found in abundance on hill grasses during October–November, in North Malabar and elsewhere during some years. It is very conspicuous regularly every year during January and February, often in pest scale, in the summer crop grown in the Kole areas of Malabar. Our observations during the past two years have shown that the insect is found even during the other parts of the year, in small numbers in several places at Coimbatore and parts of Malabar and it is thus evident that the insect is present almost throughout the year

in paddy growing areas, ready to appear in pest form under favourable conditions of weather and crop.

Incidence of the Pest. The first condition for the appearance of the pest is the existence of the suitable stage of the crop. The moth generally lays its eggs on tender paddy and only rarely it visits crops over 20 days old for egglaying. In the course of observations made in the Kole area in Malabar, it has been observed that the moth appears almost immediately after sowing, and start laying eggs when the plants just put forth the needle-like small white shoots. The eggs are laid piece-meal, 15 to 20 in a mass on each plant covering the white shoot, the stem or even the seed itself, unlike in the laboratory where they are found in bigger masses, invariably exceeding 100 in number. The preference shown by the moths to lay their eggs on tender paddy shoots is seen even under laboratory conditions when paddy seedlings of different ages and grasses on which the larvae are known to feed are supplied simultaneously. Apart from the existence of suitable stage of crop for food supply, there appears to be also many other factors influencing the severity of attack under field conditions.

The Conditions of Soil and other Physical Factors. Taking into consideration the infestation in cultivated crop of paddy, there are mainly two periods of outbreaks—one during May in the tracts where usually 'dry sowing' is the rule, and another during January—February in the Kole paddy where 'sowing in puddle' is the practice. While in the former case severe infestations are less frequent and less widespread, in the latter case the infestation is more or less a regular feature every year on a smaller or larger scale. In both these cases, the circumstances which favour the incidence appear to be more or less the same.

From our observations of the pest in the 'dry sowing' areas, it would appear that the pest outbreaks are not of annual occurrence. In some years the first summer rains come in heavy downpours and the fields are flooded. When a dry spell intervenes the water in the fields dries up, or is drained away for facilitating the sowing operations. Army of caterpillars appear in such areas and spread rapidly to all plots in the neighbourhood. The infestation generally stops with the single brood, though sowing is protracted over a longer period and a second crop is also raised during monsoon in the same locality. The occurrence of a host of moths to start a heavy infestation just in time the first crop is started, is a remarkable feature. All that one can perceive, is that a striking change in the atmospheric conditions has been brought about by the first heavy downpour after a long spell of continuous hot weather and the almost immediate exposure of the flooded areas to the hot sun. It would appear that the moths either enlivened from their summer stupour or stimulated to a stronger impulse of breeding activity by the abrupt change in

weather, precociously reach such areas either through tracing the smell emanating from the newly wetted and fast drying soil or rather drifting along the moisture currents that are now set up in the air. The original foci of infestation are invariably lowlying flooded fields from which the growing larvae march in all convenient directions.

The habits of the moths and their occurrence in relation to soil conditions and weather in a typical Kole area in Malabar, viz., the Enamakkal lake, have been studied in greater detail during two successive seasons. The whole lake is first drained off and the seeds are sown in puddle. The soil is soon exposed to the action of the sun. The moths appear soon from the far away hilly tracts in the North and North East. The following characteristic features seem to announce the arrival of moths to the area (1) reduction in the velocity of the winds and their gradual cessation followed by a period of calm and then a change in the direction, (2) hot and sunny weather during day, and humid and sultry condition during nights with cloudy sky, and (3) absence of any continuous and strong breeze. The moths are active during nights only. Now with the change in the atmospheric condition and with the sudden exposure of the soil surface, air movements are initiated. These link the rising mass of air of this region with that of the hill region farther off. Owing to the natural tendency of the moths to move to the region of greater comfort the winged ones get along a more or less continuous belt of moisture laden atmosphere, against the current. Having reached the area, the natural instincts of the moths come into play in the matter of selection of suitable habitat for egglaying. In fields where the water dries up completely and the soil surface cracks, the egg-masses are rare, while in adjacent lowlying fields where the soil is swampy and the seedlings are more succulent, the moths gather more often for laying eggs.

It is a common experience that though the moths appear all on a sudden in swarms they halt and lay eggs only in certain fields. On close observation it has been noted that they appear in successive batches in the locality whenever the ideal conditions for their egg-laying are prevalent. The most surprising phenomenon is the appearance of broods of adult insects in quick succession though no pupal or larval stages of the insect are noted in the near vicinity. During the year 1935, within an interval of about one month, no less than five batches of moths appeared, and in 1936, during the same period, four such intermittent arrivals were traced in the same locality at very short intervals. It was also noted that when the conditions of weather changed almost all the late sowings in the very same locality escaped fresh egglayings though moths could be had in numbers due to the emergences from the earliest brood completing their life cycle. A second infestation in the same crop and place did not take place owing to the aging of crop and to the change in the atmospheric

conditions. The larvae completed their life cycle in one locality and the emerging moths marched out instinctively to distant situations suitable for further breeding. From the data so far collected it appears that they are more directed by the prevailing moisture conditions of the atmosphere and the nature of the air movements than anything else. The appearance of large numbers of caterpillars in an area all on a sudden is brought about by the early arrival of a large number of moths to the area during the early stage of the crop.

The Moths' egglaying activities. Soon after dusk the moths move out of their temporary shelters and distribute themselves over large areas for laying eggs on suitable plants, and hide before morning and remain at rest during the day under cover of dry leaves and cracks in the soil, thatches or other material in the vicinity of plants and bunds. The egglaying in any one field or fields is completed in the course of three to five days and ordinarily no further egglaying takes place in the locality, unless in rare cases, by the recurrence of the same soil conditions, fresh brood of moths is attracted to the same plots before the crop is about 3 weeks old. During the period of moth abundance, it has been possible to see the moths active in flying and laying eggs in different portions of the field during nights. One can easily see the moths disturbed from their resting places, while walking slowly through the fields with a 200 candle power light an hour after dusk. The moths take to flight from a distance at the approach of the light and dart with great speed in different directions. The moths in actual egglaying are, however, not so easily disturbed. During January last, based on previous year's observations, probable affected plots were located and the moths were looked for on certain days as previsaged by the prevailing weather conditions; and this proved the first recorded instance of the operation of egglaying by this moth in the field on a large scale, having been observed. It is interesting to note that in fields of suitable conditions for laying eggs if the soil conditions appear too swampy for the moths to wade in their efforts to lay eggs piecemeal over several tender plants, they have been found to congregate in small numbers on twigs of plants casually planted on the bunds and on these eggs are laid in very large masses. The newly hatching larvae drop down by means of their silken threads right over the growing seedlings to disperse themselves later on to other plants all round. This observation is suggestive of a further and novel means of destruction of large numbers of moths and eggmasses in a collected form. During the last season, in this manner, no less than 60 to 70 large sized eggmasses were collected and destroyed from each plant twig employed for the purpose.

Summary and Conclusion. From a detailed study of the incidence of the pest (*Spodoptera mauritia*) at the Kole and other areas, it is noticed that the infestation always takes place in newly sown crop and

in plots where there has been no crop previous for a fairly long period. In such cases moths appear all on a sudden, probably attracted by young crop combined with favourable changes in the micro-climate of the locality in question. If the area is sufficiently large and if the sowing is in progress for a longer interval with repetitions of conditions of high humidity and hot sunny whether, successive batches of moths arrive in the locality and all the sowings are serially infested. As a rule, larvae are all of the same age in the same plot or plots and the moths arising out of these larvae do not infest the same crop again. The moths march far before they find suitable material for continuing their brood. In this endeavour, they seem to be guided mostly by certain conditions of weather. In most cases it is fruitless to watch for a second generation in the same crop, as the conditions under which the moths first appear change entirely by the time they complete one life cycle. The actual shifting of the breeding place from one centre to another is guided partly by the insects' instinctive powers and partly by the atmospheric movements. The moths appear to move from one region to another against a drifting current of moisture laden air.

The moth seems to be present even in localities where it is not known to be a serious pest for years together. It is only the paddy crop sown in puddle before the break of the regular monsoon that is likely to suffer. Here again the moths prefer to infest the crop in fields where the swampy conditions of soil persist for a longer period. If on the other hand, the soil dries up quickly and water is let into the fields only after an interval of about 15 to 20 days without any further chance of the land drying up, the infestation is fairly thwarted. A dry sown nursery and the transplanted crop are least attacked. In places of annual recurrence of the pest, resort to transplanting instead of sowing in puddle minimises injury to a great extent. The habit of the moths to lay eggs in masses on twigs planted for trapping offers another easy means of control.

The study so far made is by no means complete. The conditions favourable for their development in plants other than cultivated paddy have to be thoroughly examined, and a climograph showing favourable places for their successful breeding during different parts of the year have to be prepared. Information on such lines will naturally lead us to a better understanding of the causes leading to the moths' sudden invasions to cultivated crops. Observation on this pest are also likely to help us considerably in tackling other allied insects like cutworms in general such as Agrotis, Prodenia, Laphygma, Chloridea, etc., which appear sporadically as severe outbreaks among cultivated crops and which seem to respond to changes in weather in much the same way as the swarming caterpillar of paddy.