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A NOTE ON THE SUGARCANE LEAF HOPPER (*PYRILLA*) IN SOUTH ARCOT DISTRICT

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Introduction: This pest of sugarcane, though noted in the S. Arcot district for some years past, appeared in some appreciable numbers only last year and has this season for the first time reached the status of a major pest. It was suggested to the writer by Dr. T. V. Ramakrishna Ayyar, the Government Entomologist, Madras, that a connected record on the observations made and some work done during this year might be of some interest and this note is an attempt in that direction. It must however be emphasized that the paper has been prepared by one not specially qualified to observe from an entomological point of view, and that conclusions cannot safely be drawn until more knowledge of the pest and the damage caused by it is obtained.

CONDITIONS UNDER WHICH CANE IS GROWN IN THE S. ARCOT DISTRICT

Soil—Rotations—Manuring, etc. Cane is grown both in wet and garden lands, but this note is concerned solely with cane grown by the Nellikuppam factory in garden land under well irrigation. The soil is a sandy loam of alluvial origin. Sugarcane is grown in the following rotation ; irrigated sugarcane, rainfed cumbu (*Pennisetum typhoideum*), rainfed green manure (Sunnhemp), irrigated sugarcane. Cultivation is intensive, the full rotation taking only two years so that the land is under cane every alternate year. Manuring is heavy as in addition to the green crop which gives about 100 lbs. of nitrogen per acre, heavy applications are given of artificial fertilisers containing 150 to 200 lbs. of N. per acre. Thick varieties of cane are mainly grown, the chief of which is Fiji B (*Badila*). Harvesting extends from about the middle of January to the end of May and planting is done at the same time.

Weather: The shade temperature in the tract ranges from about 70 degrees F. in the months of December and January to about 110 degrees in the months of May and June. The average rainfall is about 48 inches. Normally about 5 inches come down in the first four months of the year, about 8 inches in the next four months which are the hottest months of the year and the rest comes down during the last four months which cover the North-East monsoon period. The rainfall figures for the present season with those of last season which was considered a good one, and also the average for the past ten years are given below :—

	Average for past ten years.	1932—33	1933—34
February	0·44″	...	...
March	0·97″	...	10·63″
April	1·40″	2·18″	0·20″
May	1·57″	2·14″	1·84″
June	1·35″	0·18″	1·31″
July	1·34″	0·35″	2·76″
August	3·93″	1·80″	3·34″
September	4·86″	6·77″	1·25″
October	10·47″	11·43″	4·29″
November	10·93″	13·42″	
December	8·70″	6·74″	
January	2·25″	...	
Total	48·21″	45·61″	

This season the weather was abnormal in that 10·50″ of rain fell during two days in the middle of March, and that September, usually a showery, humid month, was unusually hot and dry. The October rainfall was also much in defect.

Appearance and duration of the pest (Pyrilla). The pest appeared in fairly large numbers at the beginning of August, increased until early in September when the crop began to be severely damaged, and the peak was reached early in October. Since then, there has been a gradual decline, but at the time of writing (beginning of November) some blocks are still badly infested. The worst month was September when as stated above the weather was hot and dry.

Control: Control measures were initiated at the beginning of September and the following methods were tried ; spraying, light traps, bagging in handnets and egg destroying. In order to be able to get into the cane fields to carry out the control measures it was found necessary first of all to give a complete trashing.

(a) **Spraying.** The contact poison used was kerosine oil emulsion to the following formula ; one lb. of soap, one gallon water and two gallons kerosine oil, diluted with ten times water This mixture did not cause any damage to the leaves. Only a small area was sprayed but the quantity of solution calculated to be required per acre was 250 gallons. This method was not used on a large scale on the grounds of expense, difficulty of moving the sprayer about inside large blocks of cane, and because the hoppers' habit of sheltering on the undersides of the leaves made it difficult to reach them.

(b) **Light traps.** The traps consisted of small lanterns standing in trays 2 feet by 2 feet by 2 inches in which was a small quantity of oil and water. The cost of the traps was about Re. 1 each. 54 traps were in use every night for some time at a cost for oil and attention of Rs. 2—4—0 per diem, and the average number of flies caught nightly per trap was about 2,000. The traps were discontinued after a time on account of the very large number that would be required to make any appreciable reduction in the millions of flies infesting the fields. In

this connection it has been noticed that, whereas the adults are attracted to bungalows at night they do not fly close to the lights but merely sit on the white walls several feet away from the lamps.

(c) **Bagging in hand-nets.** Nets about 15 inches in diameter on rattan or bamboo frames with bamboo handles were used, the cost per net being about 6 annas. Thin gauze cloth was originally used but this was found to be unserviceable and later mull was substituted which was found satisfactory. This method of control was found to be very successful and large numbers of flies were caught and destroyed by emptying them from the nets into kerosene tins containing water and a little oil. The following figures give the number of coolies employed daily, and the daily collection of flies during the seven weeks ending 4th. November 1933.

Week ending	Coolies employed daily	Flies collected daily measured in Gallons
23— 9—1933	53	28
30— 9—1933	86	42
7—10—1933	83	44
14—10—1933	50	25
21—10—1933	48	28
28—10—1933	39	22
4—11—1933	48	32½
Average	58	31½

It is estimated that with an average of 58 coolies working daily for a period of 49 days the total number of flies accounted for was 1543 gallons or about 350 millions. The flies were buried or burned at the end of each day as the smell from them if kept longer was very bad.

In netting the flies it is necessary to beat the cane in order to make the hoppers leave the plant and this caused slight damage to the tuft if done very frequently.

(d) **Destroying egg-masses.** The egg-masses of the insect are easily visible and children have no difficulty in squashing them between the fingers. Women have to be employed if the cane is tall. The children counted the masses upto each 100 as they were destroyed and a cooly in charge of each group of about 10 children marked each 100 against each child's name. In this way an easy check was kept on the number of masses destroyed. Figures for the seven weeks mentioned above were as follows.—

Egg destruction week ending	Women & children employed daily	Egmasses destroyed daily
23— 9—33.	155	603·645
30— 9—33.	123	405·408
7—10—33.	118	381·528
14—10—33.	34	89 001
21—10—33.	14	68·238
28—10—33.	14	22·414
4—11—33.	48	111·521
Average	73	240·251

During the 49 days referred to an average of 73 women and children destroyed a total of nearly 12 million eggmasses and as each mass consists of about 35 eggs, the total number of eggs destroyed is about 412 millions. The reduction in the amount of work done towards the end of the period was due to a lessening in the amount of egglaying, to an increase in parasitisation of the eggs, and the case of two weeks to showery weather and the Dipavali holidays.

Egg parasites. Two parasites have been identified by Dr. T. V. Ramakrishna Ayyar in the area, (a) Dryinid wasp (*Dryinus pyrillae*) which lays an egg in the body of the nymph, and (b) a species of small Chalcididae which parasitises the egg. The Dryinus is not present in large numbers and no detailed observations have so far been made regarding it. The egg parasite was not greatly in evidence at the beginning of the control, but increased later, and masses examined at random throughout the cane area showed the following percentage of parasitisation.

Week ending	Massess Examined	Parasitised	Not parasitised	%age of parasitation.
14—10—33.	712	526	186	73·85
21—10—33.	1486	1126	363	75·77
28—10—33.	1020	667	353	65·39
4—11—33.	3275	1615	1660	49·42

The reduction shown by the figures for the last two weeks was not unexpected as fewer parasites were seen in the fields. At this time large number of dragon flies were seen darting about over the cane, but it is not known if they were feeding on the egg parasites. Parasite breeding cages have not yet been tried but it is proposed to do so.

Effects of a severe infestation. In the case of the variety Fiji B, there is a yellowing of the foliage and a stunting of growth giving the crop a very unhealthy appearance. The upper surface of the leaves becomes covered with the sweet excretion (honey dew) of the hoppers which is later covered by the fungus *Capnodium sp.* so that the older leaves appear completely 'sooty'. In the case of Co. 213 and to a lesser extent Co. 281 there was this season a marked "browning" of the older leaves, commencing at the leaf tips, which may be associated with the infestation. The effect on the quality of the attacked cane has not yet been ascertained.

Comparative effect on different varieties. The thick cane Fiji B (Badila) has suffered the most. Co. 213 appears to be attractive to the pest but is apparently less damaged than Fiji B. Co. 281 is comparatively little attacked and E. K. 28 is even less so. The POJ varieties of which several are under trial appear to be attractive and large numbers of eggmasses can be seen on them, but in most cases the plants do not appear to be affected to any appreciable extent.

Value of the control measures. An improvement in the position, probably more due to the weather conditions than the control

measures has taken place. The control work has however been done in scattered blocks surrounded by ryots' plots in which no control has been attempted, and in spite of the large number of hoppers and eggs destroyed the total population of the pest cannot have been reduced to any extent. It is realised that co-operative effort on a large scale is required to prevent plots on which control measures have been tried from being re-infested, especially as the adults are very active and at night are found flying considerable distances. It is probable therefore that the intrinsic value of the control work done this season is practically nil. The local ryots are inclined to put down an insect attack of this sort to their bad luck and to accept the position with resignation and the main idea in attempting control work was to give them a lead and show them that something can be done to fight the pest. If the work done this season results in a less apathetic attitude being taken in the case of future attacks it will have been worth while.

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THE PERIOD OF RECEPTIVITY OF RICE STIGMA *

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Introduction. A knowledge of the natural pollination and fertilisation in cultivated crops is of extreme importance to the plant breeder in the matter of evolving successful techniques of artificial hybridisation for crop improvement. In most of the crop plants, which are self fertilised, natural pollination occurs at the time of flower opening, when the anthers dehisce and shed their pollen on the stigma, which is receptive then, enabling the pollen to germinate and fertilise the ovule. In plants where cross fertilisation is the rule, self fertilisation is prevented in nature by the different times of maturity of the anther and the stigma i. e., the pollen is shed either long before (protandry) or long after the stigma is receptive (protogyny). In grasses protandry is more common than protogyny. A study of the period of pollen viability and the receptivity of the stigma forms an important preliminary work in crop improvement. The present paper deals with the studies on the period of receptivity of the rice stigma.

Review of Literature. Biffen (1905) mentions about emasculating wheat flowers and successfully pollinating the stigma a week after,

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