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Further Studies on *Calocoris angustatus* Lett

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Introduction. The cholam earhead bug, as the *capsid* bug is appropriately termed, has been known as a pest of *Sorghum vulgare* for well over 25 years; it infests the earheads, damages the setting grains and thereby causes loss in yield of the grain. In the Madras Presidency, it is seen in pest form, as a rule, in tracts like, Bellary, Cuddapah, Anantapur, Kurnool, Guntur and Coimbatore. It is known to occur in other provinces as well. Nowhere has it ever been recorded as a serious pest except in Mysore where it was reported to have appeared for the first time as a pest in some 'jowar' growing villages in 1936. Punjab, Burmah, Central Provinces, United Provinces, Hyderabad, etc., do grow sorghum on an extensive scale but this insect has not been recorded as a pest so far.

Due to the periodic appearance of the pest and extensive damage caused to the irrigated sorghums raised in March-April, investigation was first started in 1914. Ballard (1916) published the results of preliminary investigations in the form of a bulletin. Subsequently, more detailed investigations were carried out from 1934 – 37 at Guntur and Coimbatore, the results of which are embodied in this paper.

Incidence of the pest in general. As previously stated, the insect appears in a pest form on sorghum earheads. At Coimbatore, there are two seasons in which the sorghum crops are raised – the irrigated *chitrai cholam* (April to June) and the rainfed *Periamanjal cholam* (August to January). It is established by counts that the severity of infestation is marked in the *chitrai cholam* and considerably less so in the rainfed *Periamanjal*.

The bugs first appear as soon as the earheads emerge out from the leaf sheath; there afterwards, within a short space of time, i. e., a week or a fortnight, the nymphal population mounts up considerably. In the worst years as in 1926 an earhead is likely to carry as many as 350 nymphs. After the grains are well set the population drops considerably. It is interesting to record that prior to the appearance of earheads, adult bugs are known to live inside the spindles of the rainfed sorghums from September but they are not known to breed till and after the earheads appear, i. e, in the middle of October.

Similarly, at Guntur, there are two seasons, the '*Punasa*' the early (June to September) and the '*Pyru*' the late (October-February); white (*Tella*) and red (*Yerra jonna*) are raised in the *Punasa* and the yellow (*Paccha*) in the '*Pyru*'. An intermediate crop of *Pedda jonna* is sometimes

taken from between August and November for fodder. Thus, with the exception of a few months, there is sorghum grown all through the year which makes it possible for the pest to thrive through and to assume pest proportions in a varying degree, year after year. The incidence of the pest follows much the same lines indicated under the Coimbatore conditions. There is an accelerated breeding resulting in a very high population of nymphs about the second week after the emergence of earheads and then a big drop a week after. In the case of *Punasa* sorghums, it has been observed that the middle of September or thereabouts is the period of maximum incidence and heaviest infestation. In Coimbatore, the proportion of adults to nymphs ranges somewhere between 1 : 10 at the time of peak infestation.

Incidence in relation to the shape of earheads and the type of seed. In Coimbatore, as well as Guntur, the close or compact type of earheads representing the *chitrai* and *Tella* and *Yerra* sorghums respectively show a higher infestation than the loose or less compact types. This must be due to the habits of the pest feeding on the swelling grains and developing in concealed situations which the compact types offer in a pre-eminent degree. At Coimbatore, certain types, *chitrai* sorghum (compact-A. S. 1095) and *chinnamanjal* (less compact) sown about the same period (May 1936) showed striking differences in the incidence of the bug. Whereas A. S. 1095 gave 128 adults and 872 nymphs, *chinnamanjal* gave 168 adults and 152 nymphs for 200 plants.

General incidence of the pest in Coimbatore from May 1936 to May 1937. The incidence of the pest for the three seasons is given for Coimbatore. Population counts taken once a week from 100 plants selected at random were as follows :—

1936 May (A. S. 1095)—92 adults and 950 nymphs.
1936 November-December (Periamanjal)—24 adults and 172 nymphs.
1937 May (A. S. 1095)—136 adults and 408 nymphs.

In all these three seasons the yield was average and hence the incidence must be held to be mild and light.

Nature and extent of damage. Both the adults and nymphs are sap-feeders. The severity of attack varies with the stage of growth of the earhead at which it is attacked. If the earhead is attacked just before it emerges from the sheath by a large number of nymphs there will be no grain formation. The whole head then takes a red and unhealthy appearance and is swathed in a gummy or resinous exudation. If the infestation starts after the head emerges out, damage is somewhat less severe. There is not much of damage if the pest attacks after the flowers are well set and the grains have begun to harden. A few laboratory trials with potted plants indicated likewise.

Alternate host plants. Fletcher (1917) has recorded *Calocoris* as a pest of *cumbu* (*Pennisetm typhoideum*) but not mentioned the locality. The

authors have not found it as a pest on *cumbu* at a time when there was sorghum in the field. It was stated to breed on the male inflorescence of maize but the fact has yet to be confirmed. Apparently, the adult bug keeps on feeding on the green grasses and starts breeding in sorgum earheads alone.

General life history studies. Ballard's studies (1916) have shown that the bug takes 15—17 days to complete its life cycle. Mr. Krishnamurti's studies at Guntur (1935) show that the life cycle is shorter by 2 to 3 days. Attempts by the second author to follow up the life history at Coimbatore have met with little success so far. Though identical conditions were given, the bugs refused to breed and lay eggs even though each female had 12 to 16 eggs inside its abdomen. It would appear that the weather had got something to do in inhibiting or accelerating the tendency for egglaying. The pest ordinarily gets through only one generation on the earhead; by the time a second generation is reached the grains become well matured and stony hard so that they are unfit for them to feed on; in such cases, the nymphs appear to be content to feed on the main stalk.

Control Experiments. The treatments consisted in the use of 'Cooper's special spreading sulphur' as a dust. The first part of the experiment was to ascertain if one dusting alone is sufficient or two dustings were essential; the second part of the experiment was to find out at what stage of the growth of the earhead dusting should be given to secure good results. Dusting was done in the morning with a bellows hand duster; the earheads and the flag leaf got a good coverage of the dust. In no case was there any interference with the setting and formation of grains as a result of the above dusting.

In 1936 population counts were taken once a week for four weeks both from the control and treated plots from 200 plants selected at random; the first count was taken just a week after the earheads had emerged out. Table I gives the population counts.

TABLE I. Population counts of *Calocoris angustatus*.

Date of emergence of earhead—3-5-1936.
No. of plants under observation—200.

Treatments.	Dates on which counts were taken.	No. of insects counted.		Remarks.
		Adults.	Nymphs.	
1. Bulk (before treatment)	11—5—36	14	137	The fourth count was not taken into consideration owing to interference by Ragmus (capsid bug).
2. Sulphur dusting	15—5—36	116	730	
	25—5—36	154	706	
3. Control	15—5—36	168	1512	
	25—5—36	114	1900	

It will be seen from the table that the infestation has reached the peak in about a fortnight to three weeks after the emergence of the earheads and

that the treated plots have given considerably lower populations of nymphs as against the controls.

Another series of experiments was conducted in 1937. There were 7 treatments replicated 4 times in plots of one cent each. The population counts of the bugs were taken at random from 100 plants from each plot. The yields were also taken to note if there was an enhanced yield in the treated plots on account of the reduction of the pest due to treatment. Table II gives the averages of population of the four replicated plots under each treatment.

TABLE II. Averages of population counts of *Calocoris angustatus*.

Counts	A	B	C	D	E	F	G	Date
1	10—72	13—73	12—93	10—63	18—86	9—74	10—83	1-6-37
2	19-135	32-119	25—97	40-169	39-157	18—97	34-102	11-6-37
Total	29-207	45-192	37-190	50-232	57-243	27-171	44-185	

TABLE III. Plot yield of grains in pounds.

Replication.	A	B	C	D	E	F	G
1	32·5	45·5	43·0	31·5	33 0	44·0	35·0
2	40·5	40·5	40 0	31·0	46·5	39 5	45·0
3	39·0	44·5	54;0	43·5	50·5	47·5	29 0
4	36 5	48·0	43·5	40·5	36·5	46·5	38·5
Total	148·5	178·5	180·5	146·5	166·5	177·5	147·5

A. Dusting immediately after emergence of earheads.
B. do. on the 4th day do. do.
C. do. on the 8th day do. do.
D. Same as A with second dusting at 6 days interval.
E. do. B do. do.
F. do. C do. do.
G. Control.

From the statistical analysis of the data given above it is found that the differences in population and yield due to the treatments are not significant. However, the observations made in the course of the experiments indicate the trend of numerically lower populations and higher yields in the treatments C. and F. It was found that one good dusting is quite sufficient and that the dusting given on the 8th day after emergence of earheads is about the best. About 35 lb. of sulphur were found necessary for dusting an acre; inclusive of labour charges the cost of dusting comes to about Rs. 5.

References.

1. Ballard, E. (1916) *Calocoris angustatus*: Pusa Bull. 58.
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