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COPTOSOMA OSTENSUM DIST.—A PENTATOMID PEST OF *PALAS* (*BUTEA MONOSPERMA*) WITH NOTES ON ITS COCCINELLID PREDATOR *SYNIA MELANARIA* VAR. *ROUGETI* MULS. AND EGG PARASITE *TELENOMUS* SPECIES

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Introduction

Species of the insects belonging to the genus *Coptosoma* (Family Pentatomidae, Sub-Family Plataspidinae) have been recorded as pests of agricultural crops and trees in various countries. In India *Coptosoma cribraria* Fabr. has been known as a pest of pulses particularly lablab, *Cajanus cajan* (Lefroy 1909, Ayyar 1913 and 1940, and Iyer, 1922). The other species known is *Coptosoma ostensum* Dist. which has been recorded as a pest of *palas* by Subramaniam (1925) who has described the egg, nymphal and the adult stages.

Coptosoma ostensum Dist. is a small-sized bug somewhat rounded and slightly tapering anteriorly. It has been noted as a fairly serious pest of the leaves, tender shoots and inflorescence of the *palas* tree. The adult bugs and nymphs cluster in large numbers on the tender shoots and inflorescence or on the under surface of the leaves and feed on the sap of the tree. Quite often the flower buds and the leaves dry up as a result and finally drop off from the tree.

Seasonal occurrence

Although the pest is present throughout the year it is most abundant in the months of February-March. Early in February eggs are laid in large numbers on the newly budding inflorescence of the *palas* trees. Towards the end of February or in early March when the inflorescence is in full bloom, the entire inflorescence is full of early stage nymphs of the bug. During March only nymphs in their different instars are met with, eggs and adults being found rarely on the tree. By April nymphs grow up and reach the adult stage and during this month the adult bugs predominate in the field. The adult females lay the second generation eggs towards the end of April and once again the nymphal population reaches a peak in May. This generation does more damage to the vegetative buds and leaves, unlike the first generation which is mostly confined to flower buds and inflorescence.

The breeding of the second generation adults is considerably hampered by the heavy monsoon rains that set in by June-July. Hence between the periods June-July to August-September, coinciding with the rainy months in Chotanagpur area, the pest activity remains at a low level, on the *palas* trees. Later on, the population of the bug falls further on the *palas* trees but simultaneously there is a gradual build up of the pest on *arhar* plants, suggesting the migration of the pest from *palas* to *arhar*. Some breeding is observed in the *arhar* fields where the winter months are passed; although the pest in all its stages may be found in very small numbers on the *palas* tree as well during the winter months. In February the pest migrates back from its alternate host to *palas* trees which put forth new inflorescence at that time, and starts breeding in large numbers again.

Life-history

The bug spends its entire life cycle on the plant itself. Copulation between adults takes place in apposition as is usual with bugs.

Egg:—

Subramaniam (1925) reported that eggs are laid singly, but during the present studies it was observed that this was very rare and by far the largest number of eggs were laid in two parallel rows, number ranging from 2-31. Eggs are cemented to the plant surface by a brown sticky fluid which on coming in contact with the air solidifies to anchor the egg. Eggs are creamy white in colour when freshly laid but gradually turn pinkish as they approach the time of eclosion. The egg on an average measures 0.70 mm along its long axis and 0.40 mm along its greatest width. The egg is circular at the anterior end with a smooth rim. It is covered by a circular lid which is pushed off by the emerging nymph at the time of hatching. Bugs under confinement in the laboratory, laid eggs indiscriminately, whereas in the field they are laid mainly on the under surface of the leaves or the inflorescence or the shoots of *palas*, and on the under surface of leaves of *arhar*. In a few instances, however, eggs were also found on the upper surface of the leaves as well.

On an average the egg stage during summer lasts for 7 days in March, 4.2 days in April-May, while in winter 11.3 days in December; 13 days in January-February and 10 days in February-March. The maximum period of egg stage lasted for 16 days in the month of January and minimum lasted for 3 days in the month of April (Table I).

Nymph:—

The newly hatched nymph is pinkish in colour. Eyes are red. The abdomen in the middle looks somewhat orange coloured. Dorsal and lateral portions are covered with black hair which are longer on the sides. The antennae are fairly long and have four segments. Legs terminate in claws. After hatching from a batch of eggs nymphs remain motionless in a group for sometime just near the empty egg cases and scatter immediately on slight disturbance. During winter months this period may even extend to one to two days.

Nymphs in their various instars were collected from the field for measurement of their sizes and the average measurements of these (based on measurements of 20 individuals each) are given below:

Number of the instar.	Average length.	Average breadth.
I	0.75 mm	0.50 mm
II	1.2 mm	0.75 mm
III	2.6 mm	1.70 mm
IV	3.4 mm	2.40 mm
V	5.2 mm	3.90 mm

In general the body of the nymphs is setaceous. As the development of the nymphs proceeds, the colour which is orange in the 1st instar, changes to pale brown, and finally dark brown. Colour of the nymphs seems also to vary with the host plant to a certain degree as the nymphs collected from *arhar* were somewhat greenish in colour. Eyes in all the instars were orange coloured. Hairs are more prominent on the head, the thorax and the sides. Each abdominal segment has a pair of marginal plates at the sides from which arise a bunch of thick hairs. Legs end in claws.

In the laboratory nymphs were observed to moult from three to five times although in majority of cases they moulted only four times for reaching the adult stage. The total nymphal period at a particular time of the year appeared to be almost the same irrespective of the number of moults, namely, whether the nymphs pass through only three moults or upto five moults. Only the durations of the various instars decreased or increased correspondingly to maintain the total nymphal period fairly constant. As a result, the different instars were observed to vary very widely in their durations. The ranges observed for the various instars from first to fifth were 2-28 days, 6-20 days, 5-19 days, 3-32 days and 6-10 days respectively (Table I).

Table I

Life history of Coptosoma ostensum (1956-57)

Month & Year	Egg period (days)			No. of observations	NYMPHAL PERIOD										DAYS		Total average Life history (days)
					1st stage		2nd stage		3rd stage		4th stage		5th stage		Total nymphal period		
	No. of observations	Var.	Avg.		Var.	Avg.	Var.	Avg.	Var.	Avg.	Var.	Avg.	Var.	Avg.	Var.	Avg.	
End March-May 1956	4	6-8	7	5	20–28	23.8	6–10	8.0	5–9	6.4					35–41	38.2	45.2
End April-June 1956	6	3-6	4.2	12	2–7	5.5	7–11	8.5	5–10	7.0	3–9	5.4			24–32	27.3	31.5
May-July 1956	9	6–10	8.1		9–14	12.6	16–18	13.7	10–17	14.2	9–10	9.5			49–53	51.2	
Dec. 56-Jan. 57	12	10–13	11.5														
Jan.-Feb. 57	29	11–16	13.8	11	13–24	19.0	5–20	10.0	7–19	13.0	7–22	12.4	nil	6.0	41–63	50.2	61.7
Feb.-March 57	14	7–13	10.0														

The tolal nymphal period during January-March lasted for 41-63 days, with an average of 50.2 days. In April-May the duration was 35-41 days with an average of 38.2 days. From late April to June the period ranged from 24 to 32 days, the average being 27.3 days. For the hottest period May to July, the life cycle was found to extend for 49-53 days, the average being 51.2 days. The maximum and minimum periods for all the observations made were 63 and 24 days respectively.

Adults:—

The adult bugs are highly susceptible to heat and survive only for short periods under confinement in the laboratory, particularly during the summer. Even under field conditions, the adults appeared to be sensitive to the extreme summer heat which at times touches 120°F at Kundri, in Palamau district of Bihar.

Predators and Parasites

This pest, *Coptosoma ostensum*, is attacked in the field by two enemy insects, namely, a Coccinellid predator, *Synia melanaria* Muls. and an egg parasite, *Telenomus* sp. As the population of the pest increases in the field, the population of these beneficial insects is also found to increase and these agencies seem to exercise some effective check on the pest in the field.

Synia melanaria var. *rougeti* Muls.

Subramaniam (1925) recorded the feeding of *Synia melanaria* var. *rougeti* Muls. on *Coptosoma ostensum* as one of the rare and probably the first instance of a Coccinellid preying upon a Pentatomid bug. Both the adults and grubs feed voraciously on the nymphs of the pest and help to keep it under check. The adult bettle is black and almost round in outline. The prothorax, head and the clubbed antennae are orange yellow and the eyes are black and prominent. The predator appears on the pest-infested portions of the *palas* tree in the second week of March and starts breeding by feeding on the nymphs.

Life-history

Egg stage:—

Eggs are pale in colour when freshly laid but turn blackish as they approach the time of hatching. Eggs are laid on ends in groups of 8-25 each. Occasionally they are also laid singly. During March to August the egg stage lasts for 2-5 days only (Table II).

Larval stage:—

Grubs newly hatched from the eggs are quite active and keep moving constantly in search of their prey. On finding the nymphs of *Coptosoma*, they catch them by their mouth with the aid of the first pair of legs. Later they bury their mandibles into the body of the prey and suck the body contents. In this process of feeding the larvae lift up their prey. After feeding, the outer skin of the prey is thrown off. During the period March to May, larval stage was found to last for 8-15 days (Table II).

Moultings:—

The predator was observed to moult three to four times during its larval period, although three moults were more frequently met with. The total larval period lasted on an average for 10 days in March-April, 7-8 days in April-May and 11 days in June (Table II). Subramaniam (1925) has recorded four moultings in a larval period of 9 days. Records on the number of medium sized nymphs consumed by the larva during its growth were also kept and it was observed that the larva consumed on an average about 50 nymphs in March-April, 34 nymphs in April, 29 in May and as many as 72 in June (Table III).

Table II

Life history of Synia melanaria var. *rougeti* Muls.

Month & year	Egg period (days)			No. of observations	NYMPHAL PERIOD										DAYS*		Total average Life history (days)		
					1st stage		2nd stage		3rd stage		4th stage		5th stage		Total nymphal period				
	No. of observations	Var.	Avg.		Var.	Avg.	Var.	Avg.	Var.	Avg.	Var.	Avg.	Var.	Avg.	Var.	Avg.			
																	* Pupal period (days)		
																	3-6	4.75	
March '56	8	3-4	3.5																
April '56	4	nil	4																
May '56	—	—	—	4	nil	2	nil	1	nil	1	1-3	1.5	2-3	2.6	7-8	7.4	nil	4	15.4
June '56	9	2-4	2.6	4	2-3	2.7	3-4	3.2	nil	3	nil	2	—	—	nil	11	nil	4	19
July to August '56	7	2-4	3.3																
March '57	4	4-5	4.5	5	1-4	2.2	1-4	2.6	2-3	2.4	nil	4	—	—	10-11	10.2	4-7	5	20.2
April '57	9	nil	3	10	2-4	2.6	1-3	1.8	2-3	2.3	2-4	2.8	—	—	7-10	8.7	5-6	5.5	17.2
April '58	6	3-5	3.6	6	—	—	—	—	—	—	—	—	—	—	10-16	11.3	4-8	6.5	23.8

Table III

Larval Feeding Records of Synia melanaria var. *rougeti* Muls.

Month and year	No. of observations	No. of medium sized nymphs consumed during larval stage		Total larval period (days)
		Variation	Average	
May '56	4	25—34	29.2	8
June '56	4	69—77	72.2	11
March to April '57	10	47—54	50	10
April '57	5	31—37	34.2	7

Prepupal stage:—

As the larva reaches maturity it stops feeding, attaches itself by its tail end to some support and stays there motionless. This is the prepupal stage and lasts for one day only.

Pupal stage:—

Prepupa casts off its larval moult and this exuvia remains sticking to the posterior end due to the tail being already fixed and thus pupa is formed. Pupal stage lasts for 4-7 days during the period March to May (Table II).

Adult stage:—

The newly emerged adult is pinkish in colour but it attains its normal colour within 2-3 hours. Subramaniam (1925) did not observe adults feeding on the bugs but the writers have found them voraciously feeding on *Coptosoma* nymphs, and on an average an adult in confinement consumes about 5-7 medium sized *Coptosoma* nymphs per day.

A single observation of copulating pair collected from field showed that the female laid upto 318 eggs in 45 days.

The predator takes in all 16 to 24 days during March to May to complete its life cycle. It has been possible to keep the adults living only on sugar solution (3%) for 66-101 days.

***Telenomus* species (Egg parasite of *Coptosoma ostensum*)**

The egg parasite is also found throughout the year and its incidence corresponds to the incidence of the pest. The parasitization starts right from the month of January when the pest is still in *arhar* fields. A count of a few batches of eggs collected at random from the *arhar* fields indicated that the percentage parasitization of the eggs in January was 33. In February the percentage parasitization of the eggs collected from *palas* was 27.2, while during the months of March to June it was observed to be as high as over 90%. Thus the parasite appears to be a very effectivc natural agent in the control of the pest.

Oviposition:—

Observations on the oviposition by the parasite were made in the laboratory. Freshly laid eggs of the bug were presented for oviposition by the parasite in 3″x½″ specimen tubes. The female parasite easily detects the presence of eggs and on reaching the egg vibrates its antennae vigorously and takes a position on the egg in such a way as to strike the lateral aspect

of the egg with its ovipositor. Strokes with the ovipositor are given by moving the body forwards and backwards. After a few strokes, the female becomes motionless and stays on the egg motionless for 3-5 minutes, by which time the egg is laid. Later it leaves the egg and before it turns to another egg for oviposition, it gives a few more strokes with its ovipositor to the wall of the tube.

Parasitised eggs may be revisited by the same individual or other females for egg laying. But only one parasite developes and emerges ultimately by breaking open the operculum usually. Occasionally the parasite was also noticed to emerge through the side of the egg after cutting a hole. The parasite is capable of breeding freely parthenogenetically also. It appeared that freshly laid eggs were more easily parasitized. The life cycle of the parasite extends for 9-25 days during February to June (Table IV).

Table IV

Life history of Telenomus sp. (*Egg parasite to Coptosoma ostensum*)

Month and year	No. of observations	Life history (days)	
		Variation	Average
May-June '55	3	9—10	9.3
April-May '56	5	9—11	9.8
February '57	3	19—25	23
March '57	2	nil	11
February '58	5	11—15	12.4
March '58	3	15—16	15

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