



HOST SPECIFICITY AND ORIENTATION TOWARDS FOOD OF *ODONTOPUS NIGRICORNIS* STAL. (HETEROPTERA – PYRRHOCOROIDEA), A PEST OF *PTERYGOTA ALATA* ROXB.

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Abstract :- Food preference and orientation towards food of a pyrrhocorid bug, *O. nigricornis* is observed in lab. which in turn is a pest of *P. alata*. The bug is a polyphagous phytosuccivorous insect. Among its various food plants, preferential feeding has been observed as *P. alata* – *B. paniculata* – *M. coromandelianum* – *D. repens*. However, among the leaves first preference is given to *M. coromandelianum*. *P. alata* has been observed its main food plant and gregarious feeding is observed on its seeds. Occasionally bugs are observed feeding on its dead members as well as on the birds excreta probably to meet the demand of amino acids. First and second instars directly move towards the food source while 3rd to 5th instars indirectly involve to get the food. For some time, they move here and there near to the food and then reach to the food for feeding. The adult bugs did not next directly orient towards the food but they took turn to their right side and then reached towards food. Antennal Sensillae helps in locating food while rostral tips sensillae help in locating proper feeding site. Gustatory organs of cibarium detect the taste of food. Feeding duration by a bug has been observed of 20-60 minutes, average being 30 minutes.

Key words :- Host specificity, orientation towards food source, *O. nigricornis* *P. alata*, preferential feeding.

Introduction

Phytosuccivorous heteropteran bugs are generally pests of agriculture and forest trees and causes extensive damage due to seed feeding habit. *Odontopus nigricornis* (Heteroptera – Pyrrhocoroidea Pyrrhocoridae) is a bright red coloured, medium sized, polyphagous bug found in good number in Saharanpur and adjacent districts of Western U.P. and Uttrakhand, infesting Jungli Badam tree, *Pterygota alata* Roxb. (Sterculaceae) (Dhiman,1986). Besides these it has also been reported on *Bombyx ceiba*, *Tropaoleum majus*, *Gossypium*

indidium, *Duranta repens*, *Buddleia paniculata* and *Malvastrum coromandelinum* by Archna Rani et.al., (2021). The population occurs solitary or gregariously in field (Archna et.al., 2022) various aspects of this pyrrhocorid bugs are studied time to time by Kumar (1961), Rastogi and Dutta Gupta (1961), Sharma (1973), Sharma and living stone (1977,1978), Vaidya and Rande (1984), Dhiman (1986), Ram and Madhvandra (1995) and Archra(2020). Food preferential experiement of insect pest helps in finding trap host plant from control point of view. Hence, in view of this, in present paper an endeavour is made to study food preference and orientation towards food of this bug.

Material and Methods

Field studies are mainly carried out in HRI and training center Saharanpur where *P. alata* trees, the host of *O. nigricornis*, are planted in good number. Extensive surveys were carried out for two consecutive years 2022 and 2023. Lab. studies on food preference and orientation food are conducted in Entomology research lab. of M.S. College, Saharanpur, the methodology of which is described in Results and Discussions.

Result

From the control print of view, study of the food preference of insect pests in essential. Hence for same keen observations were taken in the field as well as in the laboratory experiments when all the hort plants are available in nature. *O. nigricornis*, a phytosuccivorous bug drain out the sap from the leaves of other plant family member has *D. repens* (Verbenaceae), *B. paniculata* (Loganiaceae), *M. coromandilianum* (Malvaceae) *Bombyx ceiba* (Malvaceae) etc. It sucks the fatty contents of the seeds of main host plant *P. alata*, which is necessary for vitellogenesis in ovary during breeding season.

Experience were carried out in Entomology lab. of M.S. College, Saharanpur in three steps. At first leaves, seed and bark of the main host plant, *P. alata*, were taken for food prefrence. In second, leaves of different host plant were used and in third bark of these plants were taken. The data are presented in tables 1 to 3 .

Experiments- 1:- A wooden wire gauze cage was taken to know the food preference of the bug on different vegetative parts of main host plant, *P. alata*, viz., leaves, bark and seeds. In cage, these host parts were kept at a distance of 10cms from one another and 20 adults and 20 nymphal instars of this bug were released in the cage. Preferential feeding observation of *O. nigricornis* were recorded at an interval of two hour by noting down the number of bug on each variety of host parts. This experiment was repeated and observations were recorded and presented in table- 1. The table clearly indicates that the bug gives preferential order of feeding in the sequence of leaves, seeds and bark.

Experiment- 2:- Different host plants of *O. nigricornis*, were used and like that of previous experiment, 20 adults and 20 nymphal instars were released in the cage. Observations of preferential feeding were recorded after 8 hours with 2 hours intermittently and data are pooled in the table- 2.

A persual of the aforesaid table shows that *O. nigricornis* prefers to feed first on the leaves of *M. coromandelianum* and then on *P. alata*, leaves of *B. paniculata* and *D. repens* were given least preference.

Experiment- 3:- In this experiment, only barks of different host plants of the bug were used and same number of bugs as in experiment- 2 were released in the cage. The preferential feeding of bug was recorded after 8 hours with an interval of 2 hours. The data are recoreded in the table – 3, which depicts that preferential order of bark feeding of *O. nigricornis* is on *P. alata*, *B. panaiculata*, *M. coromdelianum* and *D. repens*. The field study has revealed that, the first to thirs nymphal instars feed on *M. coromandelianum* bark which is thin and soft and easy for penetration by the stylets of the instars.

However, during breeding season (December to mid May) female bugs feed mainly on the seed of *P. alata*, which is rich in fatty contents and carbohydrate. This fatty substance, perhaps helps in vitellogenesis and maturation of ovaries as large number of eggs are laid during oviposition (upto 144 eggs).

Orientation towards food:- This behaviour of *O. nigricornis* was studied in laboratory in rearing cage. Twenty adluts and Twenty nymphs were released in the cage and water was kept in watch glass for quenching their thirst. To keep them Starve, food was not supplied on them for two days. After this period, crushed seeds of *P. alata* were placed in the centre of cage. Now orientation of starved bugs towardsds food source was keenly observed and their movement route was marked and sketched on a paper (Fig.-1). The experiment was repeated several times. Observations revealed that the adult bugs not directly oriented towards food, but first they took turn to their right side and then reached towards food or turned to their left moved a little distance and then turned to right so as to reach towards food source. During orientation, both the antennae continuously perform up and down movements. It is the fourth clavate segment which takes active part in the olfaction of food. It is, further, noticed that whenever the sensation is perceived by antennae, the rostrum also attains erected position moving in search of food. The taste of food is testified by the setae, presented at the tip of terminal segment of rostrum and gustatory organs present in buccal cavity or cibarium.

The most important thing which is noticed about the nymphal instars. First and second instars directly move towards the food, while third to fifth indirectly involve to get the food. First of all, they move here and there near to the food and then reach to the seeds for feeding.

After approaching the appropriate food, the bugs first probe suitable feeding site with the help of rostrum and then pierces the testa of seed by maxillary and mandibular stylets. Several thrusts are made to reach the stylet up to suitable feeding point of seed cotyledon. Then saliva is poured into the food, which dissolves food content. This saliva mixed sap is sucked-up by bug through food canal of stylet into cibarium and then passed back to the pharynx, oesophagus and then to crop. When the feeding is over, the bug withdraw its stylets and move away from the food source.

Generally feeding lasts for 20 to 60 minutes with an average of 30 minutes. Fully satisfied bugs disperse away from the seeds in any direction haphazard.

Discussion

From the control point of view, study of the food preference of insect pests is essential. *O. nigricornis* is polyphagous phyto succivorous bugs and among the different food plants (*D. repens*, *B. paniculata* and *M. coromandelianum*), it prefers to feed on different vegetative parts of *P. alata*. Seeds of this plant are most preferred. It has been concluded that it mainly feeds on Sterculaceae plant, gregariously on the mature fallen seeds of *P. alata*. Rastogi and Dutta Gupta (1961) observed that this bug feeds on *Bombax malbaricum*, *Hibiscus rosasinesis* and a few species of Sterculaceae plants. However, no single bug has been seen on *Bombax* and *Hibiscus* in this locality.

Besides phytophagous diet, *O. nigricornis* also feeds on the dead family members and on the excreta of birds and animal carcass probably due to the deficiency of amino acids in natural food. Myer (1927) described that it is possible that *Dysdercus* which tends to be omnivorous may throw some light on the origin of carnivorous habit, recently acquired among mirids and Pyrrhocoridae. By examining the feeding habit of *O. nigricornis*, the aforesaid statement of Myer (1927) seems to be true.

Ballard and Evans (1927) observed that in *D. sidae*, both nymphs and adults are able to live on the crude seed oil. It is very favourite habit of both nymphs and adults to carry seeds to feed on their leisure. Dhiman (1989) in *L. grandis*, Booth (1990) in *L. californicus* and also Sharma (1993) in *P. schlanbuschi* observed that besides phytophagous feeding habit these also feed on dead insects, faeces of lizards, birds and dogs.

First and second instars directly move towards food, while third to fifth nymphs move indirectly to food source. It is further noted that sense of smell is perceived by antennae and the rostrum attains erected position while moving in search of food. Generally, feeding lasts for 20 to 60 minutes with an average of 30 minutes. Fully satisfied bugs disperse away from the food source in any direction. Golding (1927) said that *Dysdercus* sp. feed on Malvaceous plants, as well as on the seeds of guinea corn and various grass. *O. nigricornis* also feeds on Malvaceous plant. Shukla and Upadhyaya (1972) observed the relative feeding preference of *D. koenigii* for three Malvaceae plants, namely – *Althea rosea*, *Hibiscus rosasinensis* and *Gossypium hirsutum*. Among these, *A. rosea* was the most attractive, followed by *H. rosasinensis* and *G. hirsutum*. Melber (1980) studied the visual orientation of nymphal *D. cardinalis* which revealed a tendency to move straight towards any striking object that stood out from its surroundings. Saxena and Yadav (1982) reported that the feeding of *D. similis* was longest on the fruits (17 min.), followed by seeds (9 min.) flowers (2 min.) and leaves (0.5 min.). Orientation was also greater towards fruits and seeds. Dhiman (1989) stated that *L. grandis* does not feed on malvaceous plant but chooses to feed on euphorbaceous plants and bugs do not orient directly towards food source. Sharma (1993) mentioned that *P. schlanbuschi* also feeds on Malvaceous plant. Thus, different Pyrrhocoroid bugs have some common and few different plants for feeding.

TABLE-1

PREFERENTIAL FEEDING OF *O. NIGRICORNIS* ON THE VEGETATIVE PARTS (LEAVES, BARK & SEEDS) OF THE MOST PLANT *P. ALATA*

Date of Commencement of experiment	Total No. of insect released AT 8:00am	Name of the vegetative parts	No. of insects feeding on various vegetative parts of host plant								Percentage of feeding
			10:00am		12:00noon		2:00pm		4:00pm		
			A	N	A	N	A	N	A	N	
24 APRIL 2022	(20A+20N) 40	LEAVES	2	4	5	7	8	10	6	13	34.38
		SEEDS	3	5	2	8	4	3	7	4	22.50
		BARK	---	4	1	5	7	4	5	2	17.50

A = ADULT, N = NYMPH

**TABLE-2
PREFERENTIAL FEEDING OF *O. NIGRICORNIS* ON THE LEAVES OF DIFFERENT HOST PLANTS.**

Date of Commencement of experiment	Total No. of insect released AT 8:00am	Name of the plants whose leaves were used	No. of insects feeding on leaves of different host plants								Percentage of feeding
			10:00am		12:00noon		2:00pm		4:00pm		
			A	N	A	N	A	N	A	N	
16 May 2022	(20A+20N) 40	<i>M. Coromandelianum</i>	8	6	7	10	7	8	8	10	40.00
		<i>P. alata</i>	---	6	2	5	6	4	4	5	20.63
		<i>B. Paniculata</i>	---	3	1	3	3	3	5	3	13.13
		<i>D. repens</i>	---	1	2	1	1	2	3	2	7.50

A = ADULT, N = NYMPH

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