

STUDIES ON THE PASSAGE OF FOOD MATERIAL IN THE DIGESTIVE TRACT OF *Nezara viridula* Linn. (HETEROPTERA : PENTATOMIDE)

Jitendra Rajak*

Key words : *Nezara viridula* Linn, host plant, diet, gut.

Nezara viridula Linn, is a polyphagous green stink bug that feeds on crops of economic importance and having worldwide distribution. Host plants of bug are *Glycine max.* (Soybean), *Pennisetum typhoides* (Pearl millet, Bajra), *Cannabis sativa* (Indian Hemp.), *Trifolium-alexandrium* (Berseem), green bean and other important wild plants. Bug infestation is maximum during milky stage of the young host plants. The alimentary canal of the bug is divisible into foregut and associated gland, midgut I, midgut II, midgut III, midgut IV and hindgut. The bug is dissected to expose out the digestive tract and incised length wise to see the passage of liquid through the gut. During the study of the gut, it has been observed that the passage of food takes time one hour 30 to 35 minutes. Intestinal transit of food was investigated in both feeding and starved bug on coloured methyl blue solution.

INTRODUCTION

Nezara viridula Linn, is a cosmopolitan polyphagous green stink bug that feeds on the seeds and fruits of more than 100 plant species in approximately 30 different families (Todd, 1989). Most of these plants include crops of high economic importance such as soybean, cotton, corn and wild plants (Tillman, 2010). *Nezara viridula* desaps many host plants at the time of flowering and ripe crop season. Crop damage resulting from bug is a primary source of economic loss in agriculture. It is uniformly leaf green in colour belonging to the family Pentatomidae. It is an important major pest of soybean (*Glycine max.*) in America (Panizzi & Slansky, 1985) and also reported by Jenson and Newson, (1972). Its distribution has been recorded in India and also found on potato helms in Bangalore and in Maharashtra near Mumbai on the leaves of *Gynandropsis pentaphylla* (Distant, 1910).

The host plants of stink bug include:-

- Glycine max.* (Soybean)
- Pennisetum typhoides* (Pearl millet Bajra)
- Trifolium alexandrium* (Berseem)
- Cannabis sativa* (Indian Hemp), green bean important wild plants.

In polyphagous insects the ingested food passes through the digestive tract quickly compared to other insects. In the digestive tract of insect, the rate of passage of food has been studied by Bhardwaj (2001), Champman, *et al.* (2013), Goel (2004), Mathur (1967), Mishra and Sen Sarma (1986), Rajvanshi (1993), Saxena (1955), Sinha (1958) and Singh and Sharma (1988). Therefore, in the present research study the rate of flow of food in the alimentary canal of *N. viridula* has been taken up.

MATERIALS AND METHODS

In the present study for dissection *N. viridula* has been collected from the different areas of Bihar in Patna district near Punpun, Parsa Bazar and Masaurhi area. Insects are well fed either in the field or laboratory. For the study of the rate of flow of food material in the digestive tract, the insect was starved for 24 hrs. to 36 hrs. in laboratory, then fed distilled water for approximately 2 hrs. to clear their alimentary canal. In the laboratory color methyl blue solution is fed to a tied insect by immersing its beak in the dyed fluid to observe movement of the liquid in the different gut part. After feeding for 20 minutes to 30 minutes the bug is dissected so as to expose out gut and incised length wise to observe the movement of liquid in the gut.

RESULTS AND DISCUSSION

The alimentary canal of *N. viridula* is morphologically divided into foregut, midgut and hindgut, which is a coiled tube and when stretched the gut it measures 5.2 cm in adult male and 6.5 cm in adult female. At the hinder end, the gut opens outside by anus. Foregut comprises pharynx and oesophagus. Midgut is divided into four regions i.e. Midgut-I, Midgut-II, Midgut-III and Midgut-IV, is longest coiled part of the gut. Rectum is the hinder most position of the alimentary canal which is a large bladder like structure and rectum is lined internally by intirna. The passage of food material in the alimentary is completed within a period of 1.35 hours.

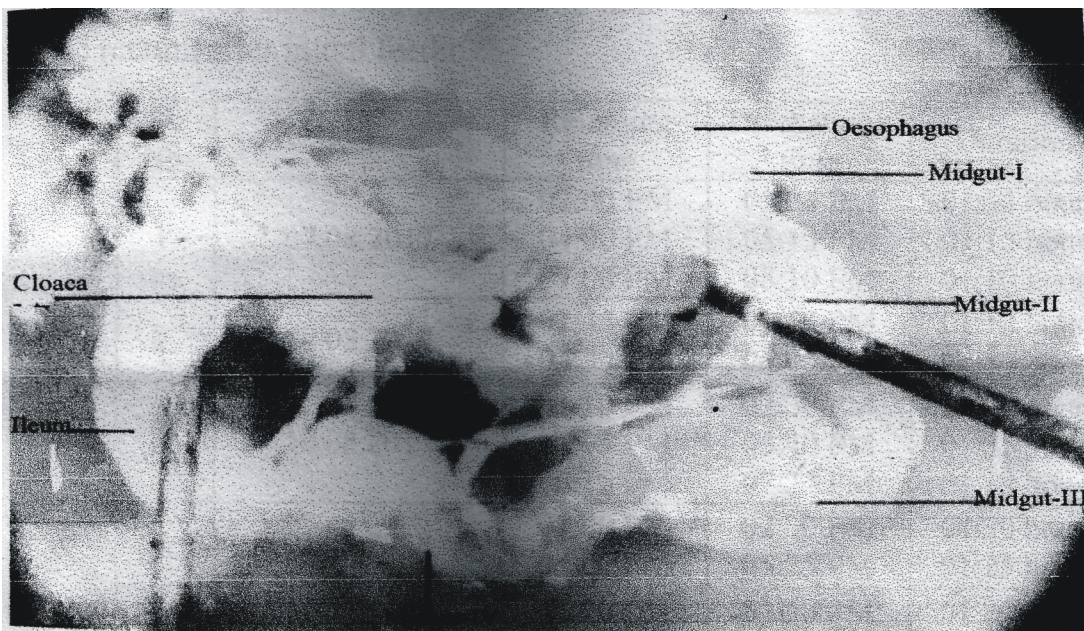


Figure-1. Figure showing parts of digestive tract of *Nezara viridula* Linn. (In situ)

The liquid dye is ingested by the gut through its beak, travels quickly through the foregut and passes to fill midgut-I and up to midgut-II and III takes time about 30 to 45 minutes. From midgut-III or the retention chamber, the food enters in the midgut-IV. Then the food finally entered in the rectal region and passes slowly to the rectal region and food stayed in the rectum for short period. First food to reach hindgut took about one hour to one hour 10 minutes approximate. Midgut is not completely emptied and a part of food sap is retained in to so called retention chamber.

The last evacuation took about one hour, Bug takes time minimum one hour to maximum one hour 35 minutes approximate for movement of sap (Mathur and Thakur, 1969, Rajvanshi, 1993 and Goel, 2004). In both cases the excretory waste discharged by bug is noted from time to time (Table-1). The food passes quickly through the alimentary canal in phytophagus and Polyphagus insects (Saxena, 1955) in *Dysdercus-koenigii*, Singh and Sharma., (1988) in *Spilostethus macilentus* and *Riptoratus*, Mishra and Sen-Sharma, 1986) in *Stromatium barbatum*. In the present study it takes about one hour to one hour 35 minutes to finally evacuate the rectum after initial feeding.

| SI. No. | Date | Releasing time | Discharging time | Duration |
|---------|------------|----------------------------|---------------------------|--------------------------------------|
| 1 | 07.08.2017 | 02:00 PM 04:00 PM 07:00 PM | 03:04PM 05: 15PM 08: 10PM | 0 1:04 hour 01: 15 hour 0 1, TO hour |
| 2 | 08.08.2017 | 02:45 PM 04:30 PM | 03:57 PM 06:00 PM | 01:12 hour 01:30hour |
| 3 | 10.08.2017 | 01:10 PM 04:05 PM 06: 15PM | 02:30 PM 05:40PM 07:34 PM | 01:20hour 01:35hour 01: 19 hour |
| 4 | 04.09.2018 | 01:00PM 04:00 PM | 02:30PM 05:25 PM | 01:30 hour 01:25 hour |
| 5 | 05.09.2018 | 01:30PM 03:45 PM | 02:50 PM 05:09PM | 01:20 hour 01:24 hour |
| 6 | 06.09.2018 | 02:25 PM 05:00 PM | 03:47 PM 06:21 PM | 01:22 hour 01:21 hour |

Table-1: - Record of release of Excreted Discharge by *Nezara viridula* Linn,

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