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Biology of painted bug (*Bagrada cruciferarum*)

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ABSTRACT

An experiment was conducted during July 1988–July 1990 to study the biology of painted bug (*Bagrada cruciferarum* Kirkaldy). The pest remained active throughout the year at Hisar (Haryana). Two peaks in its population were observed during October–November and March–April, coinciding with seedling and maturing stages of rapeseed (*Brassica napus* L.) and Indian mustard [*B. juncea* (L.) Czernj. & Cosson] crops. An average temperature of 22–25°C coupled with 54% relative humidity was optimum for its development. Out of 29 hosts observed, the pest was seen feeding on 8 plant species for the first time. The 5 nymphal instars were completed in 19.54, 17.67 and 33.65 days during April (average temperature 30.4°C), May (average temperature 35.8°C) and in the biological oxygen demand (BOD) incubator at 28 ± 2°C respectively. The female and male adults survived for 25.9 and 20.9 days during April, 16 and 15.6 days in incubator at 28 ± 2°C, and 10.9 and 7.8 days during May respectively. Average fecundity/day was almost equal, ie 10.7, 9.1 and 9.9 eggs per female in April, May and in the incubator respectively. The eggs hatched in 6.22 days in April, 3.28 days in May and 6.27 days in the incubator, with average viability of 90.5 – 96.1%.

Painted bug (*Bagrada cruciferarum* Kirkaldy), a polyphagous pest, often infests rapeseed (*Brassica napus* L.) and Indian mustard [*B. juncea* (L.) Czernj. & Cosson] (Rai 1976, Kumawat and Jain 1987). At harvest stage the pest causes 30.1% loss in seed weight and 3.4% reduction in oil content of Indian mustard (Singh *et al.* 1980). In view of the limited work done on the biology of the pest, the present experiment was undertaken to study its biology and host range under agro-climatic conditions of Hisar in Haryana.

MATERIALS AND METHODS

The biology of the pest was studied in laboratory during July 1988–July 1990 at Hisar. A stock culture of painted bug was maintained in glass-jars (25 cm x 15 cm) on the water-soaked seeds of 'RH 30' Indian mustard. Glass-vial (10 cm x 5 cm) filled with water and plugged with cotton was kept inside the jar in slanting position to provide continuous supply of water. Water-soaked seeds of Indian mustard were fed to the nymphs, replaced after every 5 days. One set on biology was carried out in a biological oxygen demand (BOD) incubator at 28 ± 2°C with 12 hr-photoperiod, whereas other 2 sets were carried out in laboratory during April (average temperature 30.4°C, range 25.5 – 34°C, relative humidity 43%) and May (average temperature 35.8°C, range 28–30°C, relative humidity 37%).

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RESULTS AND DISCUSSION

Seasonal abundance in field

The pest survived throughout the year in field around Hisar. It had 2 conspicuous peaks as also reported by Kumawat and Jain (1987),

coinciding with seedling stage (October–November) and at harvesting stage (March–April) of rapeseed and Indian mustard crops. The peak pest population at harvesting stage was more. The pest population remained very low during December – February. An average temperature of 22–25°C and relative humidity 54% was found congenial for rapid development of pest population. The result confirms the findings of Batra (1958) and Srivastava and Srivastava (1972).

Out of 29 hosts observed, the painted bug was found feeding and multiplying for the first time on 8 hosts, viz lambsquarters (*Chenopodium album* L.), *ashvagandha* (*Withania somnifera* Dunal), pill-pod spurge (*Euphorbia hirta* L.), corn-sow thistle (*Sonchus arvensis* L.), *macheti* (*Polygonum plebeiuni* R. Br.), wild jujube (*Ziziphus rotundifolia* Lamk), nut grass (*Cyperus rotandus* L.) and deer's foot (*Convolvulus arvensis* L.). These hosts (weeds) were growing in and around the fields where harvested Indian mustard and rapeseed were lying. The painted bug might have shifted from the main harvested crops to these hosts in search of green vegetation and moisture. This was more common toward the end of May, because the harvested crops were threshed and the crop residue left was devoid of moisture. Our finding is in agreement with that of Sandhu (1975). The nymphs and adults of painted bug were also observed congregating and feeding over the fallen seeds of Indian mustard on the threshing floor.

Biology of painted bug

The freshly laid eggs are dirty white, turning pink on 2–3 days after oviposition. In the laboratory, average incubation period is 6.22 days in April (average temperature 25.6°C) compared with 3.28 days in May (average 35.8°C), and 6.27 days in the incubator. It indicates that increased temperature reduces the duration of incubation. However, Bhai and Singh (1961) and Atwal (1986) reported an incubation period of 3–5 days in June and 20 days in December. The insect passes through 5 nyphal instars to become an adult. Total nymphal duration is shortest (17.67 days) in May, followed by 19.5 days in April, compared with the longest of 33.65 days in the incubator. Thus the nymphal duration is inversely related with the increase in temperature. The first- and second-stage nymphs are bright orange, whereas the third and fourth-stage nymphs are red. The antennae and legs are light black or smokey. Just after moulting, in any stage, head and thorax are reddish white, abdomen is red, and the antennae and legs are white. The colour of legs and antennae changes to black, whereas abdomen becomes bright red in 4–8 hr after moulting. Atwal (1986) reported that the 5 nymphal stages are completed in 16–22 days during summer and 25–34 days during winter. The average duration of the individual nymphal instars (in days) is comparable, ie first instar 2.93 days (2–3 days) in April and 2.90 days (2–3 days) in May; second instar 4.75 days (2–5 days) and 4.36 days (3–5 days); third instar 4.15 days (3–5 days) and 3.42 days (3–4 days); fourth instar 3.21 days (3–4 days) and 3.28 days (3–4 days); and fifth instar 4.50 days (4–5 days) and 3.71 days (3–4 days) respectively. But these durations increase markedly to 6.27 days (5–7 days), 4.1 days (4–5 days), 8.4 days (6–9 days), 6.5 days (6–7 days), and 8.25 days (8–9 days) respectively in different instars when reared at 28 ± 2°C in the incubator, indicating that the duration of all the nymphal stages was higher at low temperature. On an average 90.2% of the first-instar nymphs could not attain the second stage.

On an average 1.7, 1.2 and 1.4 days precoitus period of female adults is observed at 30.4°C (April), 35.8°C (May) and 28± 2°C in the incubator respectively. Pre-reproductive

period is almost the same, ie 4.2, 4.6 and 4.5 days respectively at these temperatures. The reproductive period decreases to 4.5 days in May but is more at 28 ± 2°C (9.1 days) and in April (18.6 days).

The female and male adults survive for 25.9 and 20.9 days in April, followed by 16.0 and 15.6 days at 28 ± 2°C and 10.9 and 7.8 days in May respectively. Our finding confirms that of Bhai and Singh (1961).

Often the females lay eggs individually but a cluster of 1–3 eggs is also observed in a few cases. The eggs are barrel-shaped, naked and glued to the surface of rearing jar and muslin. A single female lays up to 199.6 eggs (128–153 eggs) during April, followed by 85.25 eggs (59–153 eggs) in the incubator at 28 ± 2°C and 44.8 eggs (32–66 eggs) in May. The viability of eggs varies from 90.6 to 96.1%. Average fecundity/female/day is identical, ie 9.1 days in the incubator, 9.9 days in May and 10.7 eggs in April, which is at variance with that reported by Batra and Sarup (1962).

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