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The incidence of painted bug, *Bagrada hilaris* (Burmeister) on *Brassica* spp. and *Eruca sativa* with respect to the date of sowing

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Abstract

Field experiments were conducted in order to study the seasonal incidence of painted bug, *Bagrada hilaris* at Crop Research Centre (CRC) of G.B. Pant University of Agriculture and Technology, Pantnagar (India) during *Rabi* seasons of 2015-16. *Brassica* spp. including *Brassica campestris* var. brown sarson (BSH-1), *Brassica campestris* var. yellow sarson (YST-151), *Brassica alba* var. PSB-I, *Brassica carinata* var. CCN-06-1, *Brassica nigra* var. PBR-I, *Brassica juncea* (Varuna), *Brassica napus* (GSC-6) and *Eruca sativa* (T-27) were sown on five dates starting from October 3 to December 3, 2015, at fifteen days interval. The results show that the infestation of the pest on the crop occurs in two distinct stages, one at the seedling stage and another at the crop maturity stage. *B. napus* harboured minimum population of *Bagrada hilaris* while it was higher in *B. alba*. Regarding sowing date, bug population was the minimum in the trail sown at October, 18 (second sowing) while it was the maximum in Oct 3 (first sowing). The maximum yield of different spp. was found up to third sowing date (Nov 3).

Keywords: Painted bug, sowing date, seasonal incidence, *Brassica* spp., mustard, taramira

Introduction

Rapeseed-mustard is a group of the major oilseed crops grown in India next only to soybean in terms of production and ranked first in terms of oil yield. It is grown on an area of about 6.4 m ha with a production of 8.02 mt and productivity is 1262 kg/ha. It has an oil content ranging from 35-45 %. In India, rapeseed-mustard crops include traditional indigenous species, namely toria (*Brassica campestris* L. var. toria), brown sarson (*Brassica campestris* L. var. brown sarson), yellow sarson (*Brassica campestris* L. var. yellow sarson), Indian mustard (*Brassica juncea*), black mustard (*Brassica nigra*) and taramira (*Eruca sativa*), which have been growing since about 3,500 BC together with non-traditional species such as gobhi sarson (*Brassica napus*) and karan rai (*Brassica carinata*). In India, rapeseed-mustard is grown in diverse agro-climatic conditions ranging from north-eastern/north-western hills to down south under irrigated/rainfed, timely/late sown and mixed cropping^[15]. Several biotic and abiotic factors are responsible for reducing the yield. Among them, insect pests cause a considerable loss. About 50 insect species have been found infesting rapeseed-mustard in India^[13]. Among which, the painted bug, *Bagrada hilaris* (Burmeister) (Hemiptera: Pentatomidae) is an important pest of crucifer crops in India^[8, 14] and abroad throughout world^[9]. It is a serious pest of rapeseed mustard and found active during seedling stage (October-November)^[19] and at harvest stage (March-April)^[16, 17]. The painted bug has been reported active throughout the year and infests various crucifers during winter where it causes considerable damage^[1, 10]. Both nymphs and adults suck cell sap from leaves at seedling stage and developing pods, which gradually wilt and dry up. Leaves of young plants develop white spots due to bugs feeding. The severe attack at seedling stage may even kill the plants and bear a brunt-up look. The loss attributed at seedling stage due to painted bug attack varied from 26.8 to 70.8 per cent. The attack at the pod formation and maturity stages are much more alarming as it results in losses to the tune of 30.1 per cent in yield and 3.4 per cent in oil content^[18]. Chemical control of insect pests causes insecticide resistance in insects and environmental problems^[12]. Moreover, it causes ecological imbalance and health hazard by residues in crop products^[7]. On the other hand, by altering sowing time, the incidence of insect pests can be minimized by reason of asynchrony between the host plant and insect pest. This can be used in pest control as an ecological way to protect crops, and far better than harmful pesticides. Thus, the present study was conducted to determine the incidence of painted bug on different *Brassica* spp. and

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taramira and the most suitable time of sowing to minimize the incidence of same.

Materials and methods

Field trials were conducted in Randomized block design (R.B.D.) to record the incidence of *Bagrada hilaris* on *Brassica* spp. including *Brassica campestris* var. brown sarson (BSH-1), *Brassica campestris* var. yellow sarson (YST-151), *Brassica alba* (PSB-I), *Brassica carinata* (CCN-06-1), *Brassica nigra* (PBR-I), *Brassica juncea* (Varuna), *Brassica napus* (GSC-6) and *Eruca sativa* (T-27) at Crop Research Centre (CRC) of G.B. Pant University of Agriculture and Technology, Pantnagar (India) during Rabi seasons of 2015-16. Five sowing dates viz., October 3 (First sowing), October 18 (Second sowing), November 3 (Third sowing), November 18 (Fourth sowing) and December 3 (Fifth sowing) were selected for raising the crop. The recommended agronomic practices were followed. The plot size was 4.2m x 3m and, the row to row and plant to plant distances as 30 cm and 10 cm, respectively. Each treatment was replicated thrice. The observations on a number of nymphs and adults were made weekly from five sites of one meter square area in each treatment.

The data were subjected to the analysis of variance using simple Randomized block design (R.B.D.) program. The data recorded for insect population were transformed to square root transformation.

Result

The pest remained active on the crop at the seedling and maturity stage of the crop during the period of study. The activity of the pest was observed between 41th and 52nd SW (standard week) with a peak population in 46th SW during the

first phase of infestation while it appeared in 7th SW and reached to the maximum in 9th SW during second phase of infestation. In first sowing (Oct 3), the maximum mean population of *Bagrada hilaris* was recorded on *B. alba* (3.42/m²). It was followed by *B. juncea* (1.43/m²) and *B. nigra* (1.42/m²) while least population was recorded on *B. carinata* (0.31/m²). The population of *Bagrada hilaris* was considerably lower in second sowing (Oct 18) than the first sowing except for *B. carinata*. The maximum population was found in *B. campestris* (BSH-1) (0.71/m²). *B. alba* (0.58/m²) and *B. campestris* (YST-151) (0.55/m²) ranked next to *B. campestris* (BSH-1) while minimum population was in *B. napus* (0.13/m²). The population of *Bagrada hilaris* was found slightly higher in third sowing (Nov 3) than the second sowing except *B. campestris* (BSH-1) and *E. sativa*. The maximum population was found in *B. nigra* (1.65/m²). *B. carinata* (1.10/m²) and *B. campestris* (YST-151) (1.07/m²) were next in having the higher population while least population was in *E. sativa* (0.15/m²). In fourth sowing (Nov 18), bug population began to decline up to zero in *B. campestris* (BSH-1), *B. campestris* (YST-151) and *B. juncea*. However, it was higher in *E. sativa* (1.97/m²) and *B. nigra* (1.72/m²). In fifth sowing (Dec 3), the population was found zero in *B. campestris* (BSH-1), *B. juncea*, *B. napus* and *B. nigra*. However, the bug population was considerably higher in *B. alba* (2.22/m²), *B. campestris* (YST-151) (1.11/m²) and *B. carinata* (0.44/m²) as compared to the previous sowing.

On the basis of overall mean, *B. napus* harboured minimum population of *Bagrada hilaris* while it was higher in *B. alba*. Regarding the date of sowing, overall means population was found the minimum in Oct 18 sowing (second sowing) while it was the maximum in Oct 3 sowing (first sowing).

Table 1: Incidence of *Bagrada hilaris* on *Brassica* spp. and *Eruca sativa* at different dates of sowing

Variety	Mean population of <i>B. hilaris</i> (per m ²)					Mean
	Oct 3	Oct 18	Nov 3	Nov 18	Dec 3	
<i>B. campestris</i> (BSH-1)	1.39 (1.07)*	0.71 (0.82)	0.54 (0.73)	0.00 (0.00)	0.00 (0.00)	0.52 (0.52)
<i>B. campestris</i> (YST-151)	1.25 (1.11)	0.55 (0.73)	1.07 (1.02)	0.00 (0.00)	1.11 (1.03)	0.79 (0.77)
<i>B. juncea</i> (Varuna)	1.43 (1.14)	0.38 (0.61)	0.74 (0.83)	0.00 (0.00)	0.00 (0.00)	0.51 (0.51)
<i>B. napus</i> (GSC-6)	0.46 (0.64)	0.13 (0.21)	0.63 (0.76)	0.52 (0.55)	0.00 (0.00)	0.34 (0.43)
<i>B. carinata</i> (CCN-06-1)	0.31 (0.53)	0.53 (0.71)	1.10 (1.04)	0.27 (0.42)	0.44 (0.52)	0.53 (0.64)
<i>B. nigra</i> (PBR-1)	1.42 (1.12)	0.53 (0.59)	1.65 (1.26)	1.72 (1.29)	0.00 (0.00)	1.06 (0.85)
<i>B. alba</i> (PSB-1)	3.42 (1.53)	0.58 (0.73)	0.96 (0.94)	0.89 (0.93)	2.22 (1.47)	1.61 (1.12)
<i>E. sativa</i> (T-27)	1.14 (1.02)	0.41 (0.50)	0.15 (0.31)	1.97 (1.39)	1.67 (1.26)	1.06 (0.89)
Mean	1.35 (1.02)	0.48 (0.61)	0.85 (0.86)	0.67 (0.57)	0.68 (0.53)	-
Sem	1.04 (0.31)	0.19 (0.18)	0.23 (0.13)	0.24 (0.16)	0.29 (0.15)	-
Cd at 5%	3.17 (0.96)	0.58 (0.55)	0.72 (0.40)	0.73 (0.49)	0.89 (0.45)	-
cv	133.81 (53.52)	68.91 (51.64)	48.17 (26.96)	62.33 (49.19)	75.30 (48.38)	-
F-value	ns	ns	*	**	**	-

*Figures in the parentheses are (n+0.5)^{1/2} transformed values

Table 2: Grain yield of *Brassica* spp. and *Eruca sativa* at different dates of sowing

Variety	Yield/ha (q)				
	Oct 3	Oct 18	Nov 3	Nov 18	Dec 3
<i>B. campestris</i> (BSH-1)	6.74	9.2	6.07	6.8	3.03
<i>B. campestris</i> (YST-151)	9.91	9.32	3.36	3.23	1.58
<i>B. juncea</i> (Varuna)	13.42	16.1	6.74	11.04	10.38
<i>B. napus</i> (GSC-6)	15.53	13.42	12.03	10.59	11.96
<i>B. carinata</i> (CCN-06-1)	33.99	26.32	24.86	19.96	8.98
<i>B. nigra</i> (PBR-1)	8.00	9.51	9.71	7.8	6.27
<i>B. alba</i> (PSB-1)	8.13	7.6	5.35	4.26	2.04
<i>E. sativa</i> (T-27)	6.14	5.68	7.60	7.13	3.5
Mean	12.73	12.14	9.46	8.85	5.97
Sem	0.5	0.64	0.6	0.5	0.59
Cd at 5%	1.53	1.95	1.84	1.53	1.79
cv	6.89	9.19	11.14	9.93	17.17
F-value	**	**	**	**	**

The data on yield revealed very different results. For example, the maximum yield of different spp. was found up to third sowing date. The maximum yield of different spp. was as *B. campestris* (BSH-1) (9.2q/ha) in Oct 18 sowing, *B. campestris* (YST-151) (9.91q/ha) in Oct 3 sowing, *B. juncea* (16.1q/ha) in Oct 18 sowing, *B. napus* (15.53q/ha) in Oct 3 sowing, *B. carinata* (33.99q/ha) in Oct 3 sowing, *B. nigra* (9.71q/ha) in Nov 3, *B. alba* (8.13q/ha) in Oct 3 and *E. sativa* (7.6q/ha) in Nov 3 sowing.

Discussion

The infestation of the pest on the crop occurs in two distinct stages of crop *i.e.* one at the seedling stage and other at the crop maturity stage [2]. The activity of the pest at the seedling stage was observed between 41th and 52nd SW with its peak population during 46th SW. The bug population again appeared on the crop at the maturity stage in 7th SW and reached its maximum population in 9th SW. [6] also reported the occurrence of painted bug population in two peaks, first in the 49th standard week and second in a 12th standard week. *Bagrada hilaris* prefers dry weather and causes severely damage in germinating crop but reduction in population does not always reveal itself in the increased yield of the crop [11]. A greater number of the adult bugs are found at 4-leaf stage of crop growth but plant mortality is more at cotyledon stage [4]. *Bagrada hilaris* also appears again as a crop grown toward maturity with an abundant number [3]. In contrast, [5] reported the bug population to be present in higher densities on the crop sown at 1st Nov and 15th Nov.

From the present study, it could be concluded that rapeseed-mustard can be sown during the first fortnight of October to minimize the infestation of painted bug with a better yield.

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