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# Influence of inter-cropping on the incidence of painted bug under untreated conditions

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**Abstract**
The experiment was conducted at Agriculture Research Station and Laboratory in the Department of Entomology, College of Agriculture, Bikaner during *rabi*, 2016-17. Maximum population of painted bug was observed in those plots where mustard was sown as sole crop, whereas, minimum population of painted bug was observed in the plots sown as mustard + gram intercrop. The intensity of painted bug was high in the mustard sole crop than the inter-crop.

**Keywords:** Inter-crop, mustard and painted bug

## Introduction
Rapeseed and mustard are important oilseed crops belong to the family Cruciferae and occupy prominent place among oilseed crop being next to soyabean in India. The word "rape" and "mustard" have been derived from the Latin word "*rapum"* meaning turnip and European practice of mixing the sweet "must" of old wine with crushed seeds of black mustard, *Brassica nigra* (L.) to form a hot paste, respectively (Hemingway, 1976) [3].

The oil content in mustard seed ranges from 32-42 per cent. Besides, uses as edible oil, the seeds and oil are also used as condiment in preparation of pickles, flavorings, curries and vegetables. The cake is usually used as cattle feed and to some extent it is also used as organic manure. The young plants and their leaves are often used as green vegetables.

In India, the factors responsible for low and unstable yield are poor plant population, inadequate fertilization and vulnerability to insect-pests and diseases. Amongst these, the incidence of insect-pests is of immense importance (Bakhetia and Sekhon, 1986 and Singh and Malik, 1993) [2, 7]. About 50 insect species have been found infesting rapeseed-mustard in India (Sharma and Singh, 2010) [5]. Among which, painted bug is a serious pest of rapeseed mustard and found active during seedling (October-November) (Vora *et al*., 1985) [13] to harvesting stage (March-April) (Singh and Malik, 1993 and Singh, 1996) [7, 9].

Cultural practice such as inter-cropping is an important tool for eco-friendly management of crop pests and adoption of inter-cropping has been advocated for the management of this pest on mustard (Verma *et al.* 2010) [12]. Use of resistant varieties is recognized as an important tool in bio-intensive pest management system. Certain varieties bears least losses caused by the pest that are resistant against painted bug, so screening of different mustard varieties for resistance against painted bug is also proposed

The painted bug has been reported active throughout the year and infest various crucifers during winter, where it causes considerable damage (Singh *et al.* 1993) [10]. The pest incidence at seedling stage resulted into complete failure of the mustard crop necessitating re-sowing (Bakhetia and Sekhon, 1986 and Singh *et al*., 1993) [2, 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. Severe attack at seedling stage may even kill the plants and bear a brunt-up look. Both nymphs and adults suck cell sap even in the threshing floor from seeds in the pods. Adult bugs excrete a resinous substance which spoils the pods. 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 is much more alarming as it results in losses to the tune of 18.50 to 19.62 per cent in yield (Singh, 2013) [6]. This needs a safer, economical and effective insect pest management system. As such no systematic study on the management of painted bug on mustard in this zone has been conducted.

## Materials and Methods

The experiment was laid out in a Randomized Block Design (R.B.D.). The seeds of sole and inter-crop (treatments) were sown on 27th October, 2016 and each replicated five times. The plot size was 4x 2.7 $m^2$ with row to row and plant to plant distance of 45 and 10 cm, respectively.

### Treatments

**(A) Crops**

Mustard varieties RGN-229 recommended for this zone, was sown as a sole and with wheat, barley and gram as inter-crops. The recommended varieties for the inter-crops were:

Wheat - Raj-3077
Barley - RD-2035
Gram - C-235 (Dahod yellow)

**(B) The main treatments as inter-crops**

**1. Mustard + Wheat**

The pattern of inter-cropping was 2 rows of wheat followed by 1 row of mustard in a plot size of 4 x 2.7 $m^2$. The row to row spacing was 45 cm for mustard and 22.5 cm for wheat. The plant to plant distances for both crops were maintained at 10 cm.

**2. Mustard + Barley**

The pattern of inter-cropping was 2 row of barley followed by 1 row of mustard in a plot size of 4 x 2.7 $m^2$. The row to row spacing was 45 cm for mustard and 22.5 cm for barley. The plant to plant distances for both crops were maintained at 10 cm.

**3. Mustard + Gram**

The pattern of inter-cropping was 2 row of gram followed by 1 row of mustard in a plot size of 4 x 2.7 $m^2$. The row to row spacing was 45 cm for mustard and gram. The plant to plant distances for both crops were maintained at 10 cm.

**4. Mustard sole**

Sowing of sole mustard was done as per recommended practices in lines maintaining a row to row spacing of 45 cm and plant to plant distance of 10 cm. Five plants per plot were randomly selected and tagged. Population of painted bug (nymph and adult) was taken on whole plant of mustard at weekly intervals.

**Table 1:** Details of intercrops combinations with mustard

| S. No. | Intercrop combination | Row combination |
|---|---|---|
| 1. | Mustard + wheat | 1:2 (One row of mustard before two row of intercrop) |
| 2. | Mustard + barley | 1:2 |
| 3. | Mustard + gram | 1:2 |
| 4. | Sole mustard crop | - |

## Results and Discussion

An experiment was under taken to record the painted bug population on mustard sown as sole and inter-crop.

The results presented in Table 2 indicated that the incidence of painted bug started in the 46th standard week of year. However, the effect of inter-cropping on the painted bug population was non- significant on 46th and 47th standard week. Thereafter, population increased being maximum on 48th standard week, where lowest population (0.60 per plant) of painted bug was recorded on mustard intercropped with chick pea followed by mustard + wheat (0.80 per plant) inter-cropping. Both these two treatments were statistically at par and significantly superior to inter-cropping of mustard + barley (1.60 per plant) and mustard sole crop (1.80 per plant). Thereafter, pest population decreased gradually and disappeared during 51th standard week of 2016 to 3rd standard week of 2017. Painted bug population reappeared from 4th standard week and continued up to 10th standard week where harvesting of the crop was done.

Mean of the painted bug population of total crop duration indicated that mustard intercropped with chick pea significantly lowered down the population of painted bug. Inter-cropping with wheat and barley also minimized the population of painted bug in comparison to sole mustard crop. However, population recorded on mustard in all inter-crops plots differed significantly to each other. The mean incidence of painted bug was minimum (2.45 per plant) in chickpea followed by mustard + wheat (3.08 per plant), mustard + barley (3.47 per plant) and mustard sole crop (4.12 per plant).

Based on mean incidence data of painted bug population on sole crop, maximum reduction (40.53 per cent) was found in plots where mustard inter-cropped with chickpea followed by mustard + wheat (25.24 per cent) and mustard + barley (15.78 per cent).

Different workers have assessed different combinations of inter-cropping in their experiments. The present investigation is in accordance with the observations of Singh and Singh (2000) [8], Mishra *et al.* (2001) [4] and Ali and Ansari (2008) [1], who reported that among the different intercropping systems, Indian mustard + gram registered lower mean incidence of aphid than the sole Indian mustard crop.

The finding of Singh and Shankar (2010) [11] and Verma *et al.* (2010) [12] who reported minimum aphid population in mustard + barley inter-crop as compared to mustard + wheat and mustard + chick pea, all were significantly superior than mustard sole crop partially confirm the present results.

**Table 2:** Incidence of the painted bug in different crop combinations during *rabi* 2016-17

| Inter-crop combination | Mean painted bug population (per plant) at different standard weeks | | | | | | | | | | | | | | | | | Mean | Mean per cent incidence sole crop as base | Mean per cent reduction over sole crop |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 46th | 47th | 48th | 49th | 50th | 51st | 52nd | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th | | | |
| Mustard + Chickpea | 0.00 (0.71) | 0.60 (1.02) | 0.60 (1.02) | 0.40 (0.91) | 0.20 (0.81) | 0.00 (0.71) | 0.00 (0.71) | 0.00 (0.71) | 0.00 (0.71) | 0.00 (0.71) | 0.80 (1.12) | 2.00 (1.57) | 3.20 (1.92) | 5.40 (2.43) | 7.80 (2.88) | 9.20 (3.11) | 12.40 (3.59) | 2.45 (1.73) | 59.47 | 40.53 |
| Mustard + Wheat | 0.20 (0.81) | 0.80 (1.12) | 0.80 (1.12) | 0.60 (1.02) | 0.40 (0.91) | 0.00 (0.71) | 0.00 (0.71) | 0.00 (0.71) | 0.00 (0.71) | 0.00 (0.71) | 1.40 (1.37) | 3.20 (1.92) | 5.60 (2.45) | 7.20 (2.77) | 8.60 (3.01) | 10.40 (3.30) | 13.60 (3.74) | 3.08 (1.90) | 74.76 | 25.24 |
| Mustard + Barley | 0.40 (0.91) | 1.00 (1.22) | 1.60 (1.44) | 1.00 (1.22) | 0.60 (1.02) | 0.00 (0.71) | 0.00 (0.71) | 0.00 (0.71) | 0.00 (0.71) | 0.00 (0.71) | 1.60 (1.44) | 3.40 (1.97) | 4.80 (2.30) | 8.20 (2.93) | 10.80 (3.36) | 12.40 (3.58) | 14.60 (3.87) | 3.47 (2.01) | 84.22 | 15.78 |
| Mustard Sole | 0.60 (1.02) | 1.20 (1.30) | 1.80 (1.51) | 1.40 (1.37) | 0.80 (1.09) | 0.00 (0.71) | 0.00 (0.71) | 0.00 (0.71) | 0.00 (0.71) | 0.00 (0.71) | 1.80 (1.51) | 4.20 (2.14) | 6.60 (2.66) | 9.60 (3.17) | 12.40 (3.59) | 14.20 (3.82) | 16.40 (4.11) | 4.12 (2.16) | 100 | - |
| SE m± | - | - | 0.09 | 0.07 | - | - | - | - | - | - | 0.06 | 0.09 | 0.10 | 0.12 | 0.07 | 0.11 | 0.08 | 0.02 | - | - |
| CD at 5 % | NS | NS | 0.27 | 0.22 | NS | NS | NS | NS | NS | NS | 0.17 | 0.28 | 0.32 | 0.36 | 0.21 | 0.33 | 0.25 | 0.06 | - | - |

Figures in parentheses are square root transformed values, NS=Non-significant

## Conclusion

The results on inter-cropping revealed that there was least incidence of painted bug on inter-crop sown as compared to the mustard sole crop. The mustard + gram was found best combination registering an incidence of 2.45per plant followed by mustard + wheat (3.08 per plant), mustard + barley (3.47 per plant) and mustard sole (4.12 per plant) crop.

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