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RD varieties for resistance against aphid, *Lipaphis erysimi*

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Abstract

The present research was carried out at College of Agriculture, Bikaner, India during 2013-2014 & 2014-2015 by sowing ten varieties of mustard crop in pots of 30 according to randomized block design. Observations on aphid population were recorded soon after appearance of the pest from 10 cm terminal portion of central shoot of the plants. Weekly observations were recorded from appearance of aphid to harvesting of the crop and depicted least mean aphid population on variety T-59 (11.98 aphids) followed by Bio-902 (16.22 aphids) and both were at par to each other. However, Bio-902 varieties had no significantly differed from RGN-73 (21.90 aphids), Pusa bold (23.26 aphids). The maximum infestation was recorded on RN-393 (43.37 aphids) followed by Parasmani-8 (42.40 aphids) and Dron (41.17 aphids). However, these varieties were statistically at par to each other. RGN-73 (21.90 aphid) was at par with Pusa bold (23.26 aphid), RGN-48 (25.12 aphid), Laxmi (27.12 aphid) and Asherwad (29.01 aphid). These varieties were at par to each other. Seed yield of different varieties were also recorded after harvesting of the crop and Based on pooled data of peak aphid population. Categorization of varieties were done on the basis of statistical formula $X \pm \sigma$, where the average value was ($X = 57.15$) and standard deviation ($\sigma = 23.91$). Thus, three distinct groups of aphid population were obtained i.e. below 33.25, between 33.26 to 81.06 and above 81.06. Taking into consideration the above parameter, the varieties T-59 and Bio-902 were categorized as least susceptible. The varieties Pusa Bold, Laxmi, RGN -48, RGN-73 and Asherwad were categorized as moderately susceptible while varieties Dron, Parasmani -8 and RN -393 were highly susceptible

Keywords: Screening, mustard, varieties, *Lipaphis erysimi*, categorization

Introduction

In India Rapeseed and Mustard is occupying an area of 64.54 lakh ha with an annual production of 72.82 lakh tonnes and 1128 kg per ha productivity during 2013-14 (Anonymous, 2015) [1]. Rajasthan ranks first in both area (29.27 lakh ha) and production (37.64 lakh tonnes) with productivity of 1286 kg per ha (Anonymous, 2015) [1]. The oil content in mustard seed ranges from 32-40 per cent. It also contains adequate amount of two essential fatty acids, linoleic and linolenic. The infestation of pests not only results in reduced yield of the seeds but also reduces the oil content up to 66.87 % (Singhvi *et al.* 1973) [9]. Mustard (*Brassica juncea* (L.) Czern and Coss) is damaged by a number of insect-pests. *viz.*, sawfly (*Athalia lugens*), aphid (*Lipaphis erysimi*), painted bug (*Bagrada hilaris* L.) and leaf miner (*Phytomyza horticola*). According to Sachan and Purwar (2007) [7], rapeseed and mustard is attacked by more than 43 insect species, out of which mustard aphid, *Lipaphis erysimi* (Kalt.) is the key pest of the crop in India. About 45 generations are completed in a year. The original name of this pest was *Aphis erysimi*, Kalt. later on it changes as *Lipaphis erysimi* (Kalt.) in 1843. This aphid is responsible to cause yield losses ranging from 35.4 to 73.3 percent, 30.09 percent seed weight loss and 2.75 per cent oil losses (Bakheta and Sekhon, 1989, and Sharma and Kashyap 1998) [2, 8]. Both nymph and adults suck the sap from tender leaves, buds and pods. Curling may occur in infested leaves and at advanced stage, plants may wither and die. Plants remain stunted and sooty molds grow on the honeydew excreted by the insects which affects the photosynthesis process. The infected field looks sick and blighted in appearance and finally affect the yield of the crop adversely. On the basis of economic point of view, mustard aphid is considered to be a key pest in order to prevent infestation of *L. erysimi* and to produce a quality crop, it is essential to manage the pest population at appropriate time with suitable control measures. Certain varieties bear least losses caused by the pest that are resistant against aphid and gives higher yield than other varieties and management of aphids utilizing resistant varieties is more

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effective without additional cost. So screening of different mustard varieties for resistance against aphid is also proposed.

Materials and Methods

The experiment was conducted at Research Farm, Department of Entomology, College of Agriculture, Bikaner in a simple randomized block design (RBD) with ten varieties of mustard crop in plots of 30 measuring $3 \times 2.4 \text{ m}^2$. Ten treatments/varieties each with three replications during 2013-14 and 2014-15. The land was prepared by ploughing with the help of desi plough 15 days before sowing the crop. The seeds were treated with Thiram and Bavistin in the ratio of 1:1 @ 2 g/kg seed before sowing and sowing was done by manually operated hand driven plough. One – third of nitrogen was applied as basal dose and remaining two-third nitrogen were applied in two equal splits at 25 and 45 days after sowing. Ten plants were selected randomly from each treatment and tagged them. After incidence of aphids, population of aphid was counted from 10 cm terminal portion of central shoot of the plants during morning hours at weekly interval using magnifying lens. The data obtained of aphid population from experimental field were transformed into square root and subjected to statistical analysis of variance from RBD and yield of different varieties were converted into q ha^{-1} . Categorization of varieties were done on the basis of statistical formula $X \pm \sigma$,

Results and Discussion

The incidence of aphid start from 6th Standard Meteorological Week. The aphid population after 6th SMW increased continuously and reached at the peak in 9th SMW and 8th SMW during 2013-14 and 2014-15 respectively. The aphid population after peak started to declined and finally reached

negligible at maturity of the crop. In pooled data, peak aphid population was at 8th SMW and in mean depicted least aphid population on variety T-59 (11.98 aphids) followed by Bio-902 (16.22 aphids) and both were at par to each other. However, Bio-902 varieties had no significantly differed from RGN-73 (21.90 aphids), Pusa bold (23.26 aphids). The maximum infestation was recorded on RN-393 (43.37 aphids) followed by Parasmani-8 (42.40 aphids) and Dron (41.17 aphids). However, these varieties were statistically at par to each other. RGN-73 (21.90 aphid) was at par with Pusa bold (23.26 aphid), RGN-48 (25.12 aphid), Laxmi (27.12 aphid) and Asherwad (29.01 aphid). These varieties were at par to each other. The variability of susceptibility recorded in mustard varieties was in the order T-59 < Bio-902 < RGN-73 < Pusa bold < RGN-48 < Laxmi < Asherwad < Dron < Parasmani-8 < RN-393. For the sake of convenience in interpreting the results, all varieties were not found completely resistant against the *Lipaphis erysimi*. Based on pooled data of peak aphid population (table 2 & Fig. 1) different mustard varieties were categorized into different categories as less susceptible, moderately susceptible and highly susceptible. Categorization of varieties were done on the basis of statistical formula $X \pm \sigma$, where the average value was ($X = 57.15$) and standard deviation ($\sigma = 23.91$). Thus, three distinct groups of aphid population were obtained i.e. below 33.25, between 33.26 to 81.06 and above 81.06 (Table 1). Taking into consideration the above parameter, the varieties T-59 and Bio-902 were categorized as least susceptible. The varieties Pusa Bold, Laxmi, RGN -48, RGN-73 and Asherwad were categorized as moderately susceptible while varieties Dron, Parasmani -8 and RN -393 were highly susceptible.

Table 1: Categorization of mustard varieties with respect to resistance during 2013-14 and 2014-15 (Pooled)

| S. No. | Peak aphid population/plant | Varieties | Category of varieties |
|--------|-----------------------------|---|-----------------------|
| | 2013-14 & 2014-15 (Pooled) | | |
| 1 | Below 33.25 | T -59, and Bio-902 | Less susceptible |
| 2 | 33.26 – 81.06 | Pusa Bold, Laxmi, RGN-48, RGN-73 and Asherwad | Moderate susceptible |
| 3 | Above 81.06 | Dron, Parasmani-8 and RN -393 | Highly susceptible |

Yield of different mustard varieties

The perusal of mean data of presented in table 2 indicated that yield was recorded maximum in T-59 (15.42 q ha^{-1}) followed by Bio-902 (14.75 q ha^{-1}). These two varieties were statistically at par to each other. The minimum mean yield was obtained in RN-393 (9.75 q ha^{-1}) followed by Parasmani-8 (9.94 q ha^{-1}) and Dron (10.36 q ha^{-1}) which were also found at par to each other.

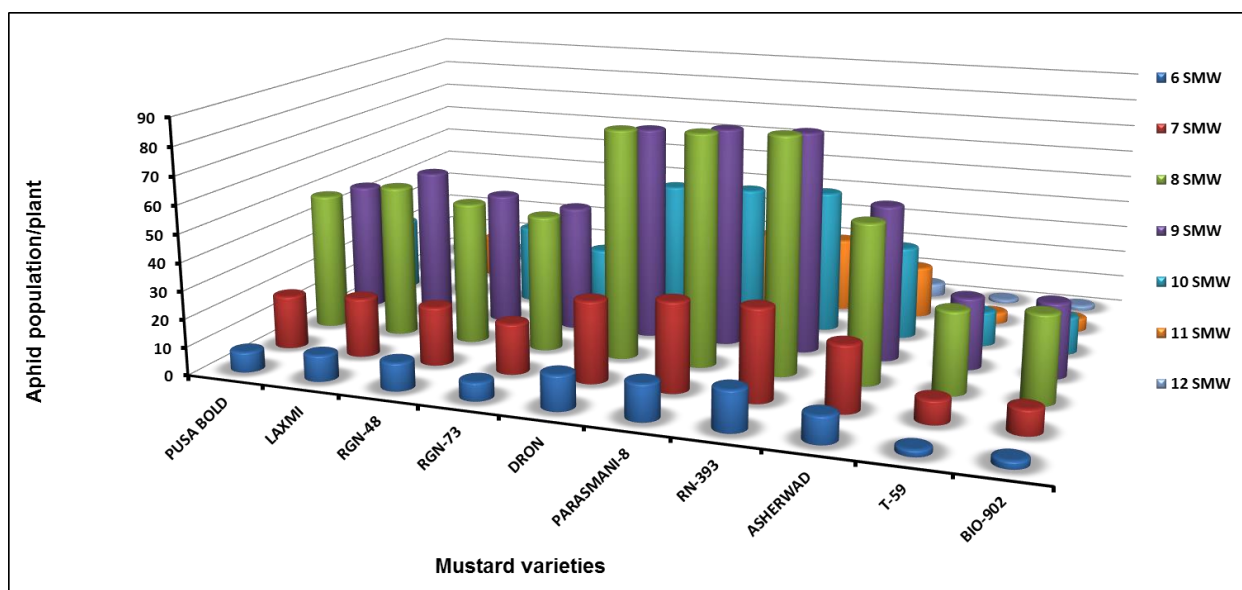
The infestation of aphid was started from first week of February and reached to its peak in the fourth and third week of February during 2013-14 and 2014-15 respectively and continued up to third week of March in both the years. The minimum mean aphid population was observed on variety T-59 and Bio-902 in the present investigation. The present findings got support from the findings of Vir *et al.*, (1990) [11], Takar *et al.*, (2004) [10] and Jat *et al.*, (2007) [3] who reported

variety T-59 and Bio-902 as least susceptible. Similarly Naga *et al.*, (1994) [5], Nathu *et al.*, (1999) [6] who recorded T-59 varieties as highly resistant against mustard aphid also corroborate the present result. The variety Pusa bold, Laxmi, RGN-48, RGN-73, Asherwad were ranked as moderately susceptible during both the years i.e. 2013-14 and 2014-15. These findings corroborate with the findings of Mishra (1999) [4] and Takar *et al.*, (2004) [10] who reported Pusa bold as moderately resistant against *L. erysimi* (Kalt.) on mustard. The difference may probably be due to the difference in climatic conditions, soil types and intensity of pest population in different locations. The work on the varieties Laxmi, RGN-48, RGN-73, Asherwad, Dron, Parasmani-8 and RN-393 screened in the present investigation have not been traced in available literature; therefore, the performance of these would not be compared and discussed.

Table 2: Screening of different mustard varieties for resistance against aphid, *L. erysimi* during Rabi 2013-14 & 2014-15 (Pooled)

| Varieties | Aphid population /plant at different SMW | | | | | | | Mean | Yield (q ha ⁻¹) |
|-------------|--|-----------------|-----------------|-----------------|------------------|------------------|------------------|-----------------|-----------------------------|
| | 6 th | 7 th | 8 th | 9 th | 10 th | 11 th | 12 th | | |
| PUSA BOLD | 7.30 (2.86)* | 19.25 (4.50) | 49.65 (7.12) | 46.92 (6.88) | 26.70 (5.24) | 10.51 (3.38) | 2.46 (1.85) | 23.26 (4.86) | 12.59 |
| LAXMI | 9.32 (3.19) | 21.26 (4.72) | 55.01 (7.47) | 54.50 (7.45) | 30.53 (5.61) | 15.68 (4.08) | 3.53 (2.13) | 27.12 (5.28) | 11.97 |
| RGN-48 | 9.97 (3.28) | 21.00 (4.68) | 51.29 (7.22) | 48.06 (6.99) | 28.79 (5.45) | 13.56 (3.81) | 3.19 (2.03) | 25.12 (5.04) | 10.80 |
| RGN-73 | 6.57 (2.71) | 18.10 (4.37) | 48.99 (7.03) | 45.60 (6.80) | 22.50 (4.84) | 9.24 (3.19) | 2.35 (1.82) | 21.90 (4.76) | 11.85 |
| DRON | 12.49 (3.63) | 29.14 (5.45) | 82.13 (9.10) | 77.04 (8.83) | 49.85 (7.12) | 25.56 (5.05) | 11.99 (3.54) | 41.17 (6.49) | 10.98 |
| PARASMANI-8 | 13.01 (3.71) | 31.94 (5.73) | 82.90 (9.16) | 79.06 (8.93) | 50.75 (7.19) | 26.60 (5.24) | 12.53 (3.66) | 42.40 (6.56) | 10.48 |
| RN-393 | 14.43 (3.90) | 32.75 (5.80) | 84.15 (9.19) | 79.78 (8.99) | 51.92 (7.27) | 27.19 (5.31) | 13.39 (3.79) | 43.37 (6.63) | 10.37 |
| ASHERWAD | 9.57 (3.20) | 23.49 (4.95) | 56.68 (7.58) | 55.83 (7.51) | 33.76 (5.89) | 18.88 (4.46) | 4.88 (2.42) | 29.01 (5.42) | 11.47 |
| T-59 | 2.33 (1.79) | 8.35 (3.04) | 29.38 (5.49) | 25.78 (5.13) | 12.49 (3.66) | 4.14 (2.26) | 1.40 (1.55) | 11.98 (3.50) | 13.43 |
| BIO-902 | 2.69 (1.87) | 8.87 (3.13) | 31.36 (5.66) | 27.00 (5.21) | 13.52 (3.78) | 4.86 (2.42) | 1.88 (1.69) | 16.22 (4.12) | 13.19 |
| S.Em.± | 0.30 | 0.23 | 0.36 | 0.41 | 0.23 | 0.23 | 0.16 | 0.27 | 0.60 |
| CD (P=0.05) | 0.90 | 0.69 | 1.08 | 1.23 | 0.67 | 0.67 | 0.48 | 0.82 | 1.80 |

*Figures in parenthesis are square root transformed values, SMW - Standard Meteorological Weeks

**Fig 1:** Screening of different mustard varieties for resistance against aphid, *L. erysimi* Rabi, 2013-14 & 2014-15 (Pooled)

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