Research Article

Varietal Preference of Sucking Insect Pests on Mustard Varieties, Sindh, Pakistan

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Abstract | The experiment was conducted at experimental field of Entomology Section, Agriculture Research Institute, Tandojam during the season 2017-18. Using eight mustard varieties such as S-9, Sindh Raya, P-21, Early Raya, Bard-2, P-4, P-78 and Toria Selection to compare the resistance of varieties against sucking insect pests, and To compare the yield of Mustard varieties. The monitoring of sucking insect pests was started on 18th December 2017 and lasted on 05th March 2018. Weekly record of the insect pests (whitefly, thrips, jassid and aphid) infestation on mustard crop varieties was maintained. The population of whitefly (*Bemisia tabaci* Genn.), thrips (*Thrips tabaci* Lind.), jassid (*Amrasca devastans* Dist.) and aphid (*Lipaphis erysimi* Kalt.) varied significantly among varieties ($P<0.05$), observation dates ($P<0.01$) as well as varieties × observation dates interaction ($P<0.01$). The lowest whitefly population of 2.88±0.37/plant was monitored on mustard variety 'S-9'; while highest population of 4.36±0.42/plant was recorded on variety 'Bard-2'. Thrips showed that lowest thrips population of 7.30±1.81/plant was recorded on mustard variety 'S-9'; while the highest population of 10.63±2.84/plant was recorded on variety 'Bard-2'. Jassid population was lowest (12.03±2.93/plant) on mustard variety S-9; while the highest population of 14.95±3.39/plant was monitored on variety 'Bard-2'. Aphid was lowest (3.59±0.99/plant) on mustard variety S-9; while the highest population of 5.10±1.23/plant was monitored on variety 'Bard-2'. The crop yield was recorded as 2.36, 2.38, 2.41, 2.35, 2.21, 2.37, 2.22 and 2.4 kg/plot in variety S-9, Sindh Raya, P-21, Early Raya, Bard-2, P-4, P-78 and Toria selection, respectively.

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Introduction

Rapeseed (*Brassica* Spp.) falls under oilseed crop; produce seeds which contain 40% oil and its cake which is highly enriched in protein fed by animals. The taxonomists already have sequenced whole genome of rapeseed/canola (*Brassica napus*) and its constituent genomes presenat in *Brassica rapa* and *Brassica oleracea* in 2009 (Fekri, 2013).

Canola (*Brassica napus*) produces huge quantity of blossoms comparatively with other species. Canadian Scientists developed it particularly for oil production especially for the reduction of erucic acid, in which

they succeed by introducing mentioned variety. Its oil is highly enriched with mono-saturated fats and just 6% of saturated fats which is considered as lowest rate of saturated fats. Its oil contains 50% less saturated fat comparative to corn oil (Pradhan, 2012). As oil of Rapeseed mostly contains high level of erucic acid, which is considered as mid level toxic for human beings who consume in heavy doses. It is utilized in different ways i.e. soap making, lamp burning, for producing high temperature, as a tenacious high-erucic acid lubricator and for manufacturing the plastics. By introducing rapeseed in European Union; due to its lower erucic acid and particular fatty acid properties made it most favorable edible oil. Apart from the agronomic factors, the decrease in production was also contributed by insect pest infestation. Among insect pests infesting oilseeds, sucking complex cause is a major factor constrains increased yields.

Among several factors responsible for low production of mustard crop, infestation of sucking insect pests i.e. aphids, jassida, thrips, and white flies is considered as one of the important factor. It was observed that mustard crop is more susceptible to broad range of insect pests including sowing to harvesting comparatively with other oilseed crops (Verma *et al.*, 1993). Bemisia tabci Genn. (Whitefly) a tiny insect; considered as major threat to provide heavy losses in order to production of rapeseed and mustard crop (Pradhan, 2012). Whitefly possesses four white membranous wings, their light yellow, oval nymphs stay in bunches under surface of leaves. It breeds around the year, eggs hatch in 3-6 days. Its eggs are commonly laid underside of the leaves. Newly laid eggs are yellow/green in color which change into dark tan when they ready to be hatched. Damage is caused by both nymphs and adult which make plants week by sucking the sap which ultimately results low production. Nymphs also release secretions called honeydew which support the growth of sooty moulds (Jech and Husman, 2015).

The research is carried out worldwide to examine the varietal resistance and management of the sucking complex on oilseed crops. Rohilla *et al.* (1990) reported that *L. erysimi* is most destructive insect causing severe reduction in seed yield varying from 15.0 to 73.3%; while Verma (1993) found mustard aphid *L. erysimi* (Kalt.), Thrip *T. tabaci* and whitefly *B. tabaci* (Gennedius) as the major insect pests of mustard. Panda and Khush (1995) found that varieties with thicker pods suppressed insect pest infestation and showed resistance in diseases transmitted by insects; while Karmakar (2003) compared mustard cultivars B-9, NC-1, RW-351 and PGS-1004 for resistance to *Lipaphis erysimi* and found that lowest aphid population was recorded on PGS-1004 and this cultivar also showed higher yield than rest of the cultivars. Singh (2011) reported that Indian mustard (cv. Pusa Jai Kisan) showed relative resistance to *L. erysimi*; while Saljoqi (2011) reported that most of the hybrid mustard cultivars with thicker stems were resistant to *L. erysimi* and mustard sawfly. Sahito *et al.* (2010) indicated that white fly *B. tabaci*, (Genn). mustard aphid *L. erysimi* (Kalt) and *Bagrada picta* (F) were major mustard insect pests and their population buildup was higher recorded on variety Yellow sarsoon 'Brown sarsoon' Das (2013) showed that relative humidity and rainfall had negative influence on pests and natural enemies during the study period. Bhati *et al.* (2015) examined varietal resistance in rape-seed mustard and reported that mustard aphid, mustard sawfly, painted bug and cabbage butterfly were found attacking the mustard crop; while varieties BSH-1 and YST-151 showed higher susceptibility to mustard aphids as compared with brassica varieties Narendra Rai, GSC-6 and T-27. Singh (2015) reported that on variety YST-151 the aphid population was 2.9 larvae/10 plants showing susceptibility to sawfly. Keeping in view the facts stated above therefore this study has been planned to study the varietal preference of sucking pests on mustard varieties.

Materials and Methods

The experiment was conduct at experimental field of Entomology Section, Agriculture Research Institute, Tandojam during the season 2017-18. The following eight mustard varieties were used in the study i.e. S-9, Sindh Raya, P-21, Early Raya, Bard-2, P-4, P-78 and Toria Selection. Experiment was arranged in Randomized Complete Block Design (RCBD) with eight treatments and three replications. The size of each replicated plot was 264 ft^2. Five plants were randomly selected from each treatment and 5 leaves (two each from top, middle and one from bottom) were observed to record the population of sucking insect pests. The data was collected on weekly basis from appearance of pests till the harvesting of crop. All the collected data were averaged for each replication of three mustard varieties and statistically analysed. The ANOVA (Analysis of variance) was performed

through Statistix (version 8.1) Statistical Software Package to examine the significance of varietal resistance and L.S.D. (Least Significant Difference) test was performed to compare mustard varieties and observation dates for insect population differences as suggested by Gomez (1984).

Results and Discussions

Whitefly bemisia tabaci genn

It was observed (Table 1) that the lowest whitefly population of 2.88±0.37/plant was monitored on mustard variety 'S-9'; while highest population of 4.36±0.42/plant was recorded on variety 'Bard-2'. It was observed that mustard variety 'S-9' was relatively resistant to whitefly in comparison with rest of the varieties. The LSD test suggested that the differences in whitefly population among mustard varieties were statistically significant (P<0.05).

Thrips thrips tabaci lind.

The data (Table 1) indicating the resistance level of mustard varieties against thrips showed that lowest thrips population of 7.30±1.81/plant was recorded on mustard variety 'S-9'; while the highest population of 10.63±2.84/plant was recorded on variety 'Bard-2'. This indicates that variety 'S-9' showed higher relative resistance to thrips when compared with rest of the varieties. The LSD test indicated that the differences in thrips population among mustard varieties were statistically significant (P<0.05).

Jassid Amrasca devastans dist

It is evident from the data (Table 1) showing jassid population on mustard varieties and their relative resistance against the insect that population of target insect was lowest (12.03±2.93/plant) on mustard variety S-9; while the highest population of 14.95±3.39/plant was monitored on variety 'Bard-2'. This indicates that varieties S-9 showed some resistance to jassid when compared with rest of thee varieties. The LSD test indicated that the differences in jassid population between varieties were significant (P<0.05).

Aphid Lipaphis erysimi Kalt

The data (Table 1) showing aphid population on mustard varieties and their relative resistance against aphid that population of target insect was lowest (3.59±0.99/plant) on mustard variety S-9; while the highest population of 5.10±1.23/plant was monitored on variety 'Bard-2'. This indicates that varieties S-9 had relative resistance to aphid while other varieties showed some susceptibility to aphid infestation. The LSD test indicated that the differences in aphid population between varieties significant (P<0.05) when these varieties were compared for resistance to aphid.

Crop yield: The data (Figure 1) indicates that the crop yield was recorded as 2.36, 2.38, 2.41, 2.35, 2.21, 2.37, 2.22 and 2.4 kg/plot in variety S-9, Sindh Raya, P-21, Early rara, Bard-2, P-4, P-78 and Toria selection, respectively.

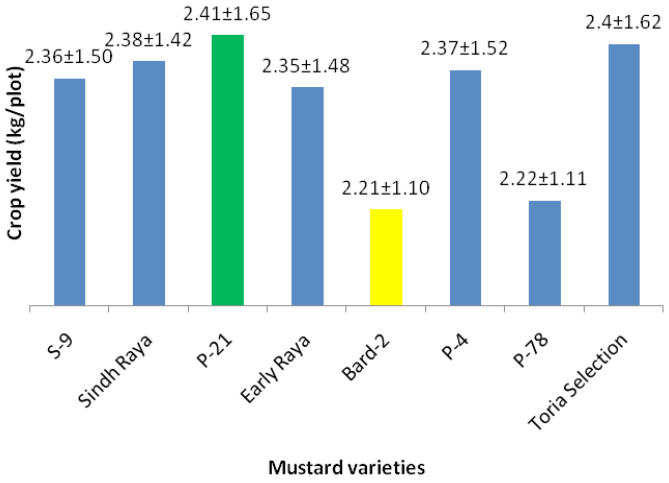

Figure 1: *Crop yield (kg/plot) in mustard varieties.*

The findings of the study indicated that the lowest whitefly population (2.88±0.37/plant) was recorded on variety S-9 and highest (4.36±0.42/plant) on Bard-2. It was observed that mustard variety 'S-9' was relatively resistant to whitefly in comparison with rest of the varieties. The LSD test suggested that the differences in whitefly population among mustard varieties were statistically significant (P<0.05). These results are further supported by Rohilla (1990) who reported that whitefly population varied significantly among mustard varieties; while Bhatti and Soomro (2015) showed that mustard varieties with tricons showed resistance to whitefly; while varieties having leaves without tricons suffered with more infestation of sucking insect pests. In another study, Panda and Khush (1995) observed that development of mustard varieties resistant to sucking complex could increase the seed yield manifold; while Fekri (2013) reported varied response of mustard varieties to whitefly infestation. Bhati (2015) examined varietal resistance in rape-seed mustard and reported that mustard aphid, mustard sawfly, painted bug and

Table 1: *Comparative population of sucking insect pests on different mustard varieties.*

Sucking insect pests	Varieties							
	S-9	Sindh Raya	P-21	Early Raya	Bard-2	P-4	P-78	Toria selection
Whitefly	2.88±0.37b	3.23±0.42b	3.35±0.35ab	3.53±0.44ab	4.36±0.42a	3.05±0.37b	3.51±0.35ab	3.70±0.44ab
Thrips	7.30±1.81c	8.03±2.45b	8.14±2.61b	9.66±2.68a	10.63±2.84a	8.34±2.63b	8.35±2.48b	10.16±2.77a
Jassid	12.03±2.93c	12.28±2.77c	13.95±3.33b	12.77±2.84c	14.95±3.39a	14.24±3.33a	12.95±2.97c	12.39±2.85c
Mustard aphid	3.59±0.99c	3.67±0.94c	4.14±1.13b	3.99±0.98c	5.10±1.23a	4.37±1.11b	3.88±0.98c	4.48±0.99b

Mean with different superscripts shows significant difference (P<0.05).

cabbage butterfly were found attacking the mustard crop; while varieties BSH-1 and YST-151 showed higher susceptibility to mustard aphids as compared with brassica varieties Narendra Rai, GSC-6 and T-27. Singh (2015) reported that on variety YST-151 the aphid population was 2.9 larvae/10 plants showing susceptibility to sawfly. Sahito *et al.* (2010) indicated that *Bemisia tabaci*, (Genn) was one of the major mustard insect pests and showed that higher (6.71±0.98/leaf) population of *B. tabaci* was recorded on Yellow sarsoon than Dark green leaves (6.30±0.61), Brown sarsoon (6.19±0.63), Raya Anmol (5.40±0.55),

Torya Early (5.38±0.57) and Rai S-9 (3.79±0.50). Das (2013) showed that rainfall and relative humidity had negative influence on pests and natural enemies during the study period.

The study showed that the thrips population was lowest (7.30±1.81/plant) on variety S-9 and highest (10.63±2.84/plant) on variety Bard-2. This indicates that variety 'S-9' showed higher relative resistance to thrips when compared with rest of the varieties. The LSD test indicated that the differences in thrips population among mustard varieties were statistically significant (P<0.05). The validity of varietal resistance to insect pests in oilseeds has also been argued by Karmakar (2003) reported that thrips population apart from the environmental factors varied significantly on mustard varieties of diversified origin. Verma (1993) found thrip, *Thrip tabaci* as the major insect pest of mustard. Panda and Khush (1995) found that varieties with thicker pods suppressed insect pest infestation and showed resistance in diseases transmitted by insects.

The jassid population was lowest (12.03±2.93/plant) on variety S-9 and the highest (14.95±3.39/plant) on Bard-2. This indicates that varieties S-9 showed resistance to jassid when compared with rest of the muard varieties. The LSD test indicated that the differences in jassid population between varieties significant (P<0.05) when these varieties were compared for resistance to jassid. Panda and Khush (1995) found that jassid population on mustard varieties with thicker stems was lower than thin stemmed varieties. Verma (1993) experienced a great variation in the jassid population among different mustard cultivars. Malik *et al.* (2012) argued that mustard varieties with resistance against sucking complex, particularly jassid is of great economic importance.

The findings of the study showed that the aphid population was lowest (3.59±0.99/plant) on S-9 and highest (5.10±1.23/plant) on Bard-2. Mustard variety S-9 showed relative resistant to aphid when compared with rest of the mustard varieties. The sucking insect pest resistance trend suggested that S-9 may preferably be cultivated having some resistance to sucking insect pests. The LSD test indicated that the differences in aphid population between varieties significant (P<0.05) when these varieties were compared for resistance to aphid. These results are in accordance with those of Rohilla (1990) who reported that *L. erysimi* is most destructive insect causing severe reduction in seed yield varying from 15.0 to 73.3%; while Verma (1993) found mustard aphid, *Lipaphis erysimi* (Kalt.), as the major insect pest of mustard. Panda and Khush (1995) found that varieties with thicker pods suppressed insect pest infestation and showed resistance in diseases transmitted by insects; while Karmakar (2003) compared mustard cultivars B-9, NC-1, RW-351 and PGS-1004 for resistance to *Lipaphis erysimi* and found that lowest aphid population was recorded on PGS-1004 and this cultivar also showed higher yield than rest of the cultivars. Singh (2011) reported that Indian mustard (cv. Pusa Jai Kisan) showed relative resistance to *Lipaphis erysimi*; while Saljoqi (2011) reported that most of the hybrid mustard cultivars with thicker stems were resistant to *Lipaphis erysimi* and mustard

sawfly. Sahito *et al.* (2010) indicated that *Lipaphis erysimi* (Kalt) was the major mustard insect pest and showed that higher aphid population was recorded on Yellow sarsoon than Dark green leaves, Brown sarsoon, Raya Anmol, Torya Early and Rai S-9. Das (2013) showed that environmental factors had also significant impact on the insect pest population.

Conclusions and Recommendations

It was concluded that whitefly, thrips, jassid and aphid population showed significant variation among mustard varieties, observation dates and their interaction. Mustard variety S-9 showed relative resistant to sucking complex when compared with rest of the mustard varieties.

Novelty Statement

This research will provide baseline information about different varieties of mustard which is resistant against sucking insect pests.

Author's Contribution

Talib Hussain Solangi, Bhai Khan Solangi and Muhammad Saleem Sarki conceived the idea. Talib Hussain Solangi and Muhammad Akbar Lashari wrote abstract. Talib Hussain Solangi, Bhai Khan Solani, Mubeena Pathan, Velo Suthar and Mitha Khan methodology, did SPSS analysis and conclusion. Talib Hussain Solangi, Bhai Khan Solani, Barkatullah Qureshi, Razzak Amin Shah and Aeman Afzal technical input at every step, overall management of the article, data collection, data entry in SPSS and analysis. Talib Hussain Solangi, Bhai Khan Solani and Barkatullah Qureshi result and discussion, introduction and references.

Conflict of interest

The authors have declared no conflict of interest.

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