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Research Article

Screening of different mustard varieties against sucking insect pests

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Abstract

The experiment was conducted at the Oilseeds Section, Agriculture Research Institute Tandojam during 2017-18 to monitor the population dynamics of sucking insect pests on mustard. Five mustard varieties i.e. P-23-R2, NMT-8, P-25, UCD-1202, ER-22 was screened to evaluate the relative resistance against sucking insect pests. The results showed that overall population of thrip (3.20±0.780) was recorded for P-23-R2 followed by P-25 (3.08±0.75), NMT-8 (2.97±0.70), ER-22 (2.93±0.6), (2.50±0.57) was observed for UCD-1202. Overall mean highest population of whitefly (0.98±0.29) was recorded for P-23-R2 followed by P-25 (0.92±0.26), NMT-8 (0.89±0.25), ER-22 (0.82±0.22) and (0.77±0.21) was observed for UCD-1202. Overall mean highest population aphid (21.80±10.28) was recorded for P-23-R2 followed by P-25 (20.78±10.10), NMT-8 (20.48±9.64) and ER-22 (18.85±9.07) and (18.27±9.04) was observed for UCD-1202. Overall mean highest population of jassid (0.74±0.20) was recorded for P-23-R2 followed by P-25 (0.60±0.30), ER-22 (0.59±0.15), NMT-8 (0.56±0.16) and (0.19±0.05) was observed for UCD-1202. The maximum crop yield (1937.9 kg ha-1) was recorded for UCD-1202 followed by ER-22 (1659.6 kg ha-1), NMT-8 (1639.9 kg ha-1) and P-25 (1609.3 kg ha-1). It is concluded that maximum infestation of thrip, whitefly, aphid and jassid was observed for variety 'P-23-R2' and minimum was observed for variety 'UCD-1202'. The peak infestation of thrip was observed on 15th January, 2018 in all five mustard varieties. The population of thrips was linear decreased from 22nd January, 2018 to 12th March, 2018.

Keywords: Cultivars; Mustards; Sucking insect pests

Introduction

Oilseeds claim highest share in the world's economy after food grain crops and are cultivated for obtaining oils used for edible and non-edible purposes **[1]**. Mustard, botanically known as *Brassica juncea*L., is traditionally grown important oilseed crop cultivated for centuries almost in all parts of the world **[2]** Pakistan hardly produces 20 percent of edible oil meanwhile 80 percent

requirement of the local consumption is fulfilled by the imports.. The area under mustard cultivation during 2016-17 was 494 thousand tons with total production ofseed 190 thousand tons; while the oil production was thousand 61 tons, respectively [3]. There was reduction in mustard production; and apart from the reduction in area under mustard cultivation, the lower production was also associated with the insect pest infestation, particularly the sucking complex [2].

Whitefly (*Bemisia tabaci* Genn.) is minute insect which bears two consists of two pair of membranous wings. It has capacity to lay eggs throughout the year; which are mostly laid under beneath of leaves. Newly laid eggs are yellow or green colour and turns into dark tan gradually goes towards hatching, which takes 3-6 days to be hatched. Its oval and yellowish nymph lives in cluster under leaf surface. Crops are infested directly by both nymph and adults by sucking sap of plants which cause low strengthen as well low yield of crop; in order to indirectly damage nymph through producing secretions of honeydew which encourage growth of sooty mould [4].

Mustard aphid, L. erysimi is one of the most destructive insect which is responsible for causing severe reduction in seed yield varying from 15.0 to 73.3% [5-7]. The earlier reports revealed that its incidence began from November and lasted till the end of February with peak period of its activity in January [8-10]. The proposed study is mainly aimed at evaluating the varietal resistance of mustard against sucking insect pests under field conditions.

Materials and methods

The experiment was conducted at Oilseeds Section, ARI Tandojam in a Randomized Complete Block Design (RCBD) having net plot size of 70 ft x 100 ft with three replications to monitor the population dynamics of sucking insect pests on mustard. Five mustard varieties i.e. P-23-R2, NMT-8, P-25, UCD-1202, ER-22 was screened to evaluate the relative resistance against sucking insect pests. The monitoring of the sucking insect pests was started right from 25th December 2017 to 12th March 2018. The population buildup of each sucking insect pest was monitored at weekly interval. The observations regarding the sucking insect pest population was recorded on the basis of randomly selected five plants from top, middle and bottom for each mustard variety. The sucking insect pests were identified and recorded their population in separate data recording sheets weekly. Data was analysed using descriptive statistics (Statistix ver. 8.1). The significance of the differences in population level of the insect pests was evaluated using analysis of variance and least significant difference test.

Results

Thrips

Statistical analysis of the data showed significant difference in population flcutation of thrips among the mustard varieties. The data (Table 1) indicates that average highest infestation (3.20±0.78 nymph per plant) was noted for P-23-R2 followed by P-25 (3.08±0.75 nymph per plant), NMT-8 (2.97±0.70 nymphs per plant) and ER-22 (2.93±0.6 nymphs per plant), while lowest infestation (2.50±0.57 nymphs per plant) was observed for UCD-1202.

Whitefly

Statistical analysis of the data showed significant difference in population flcutation of whitefly among the mustard varieties. The data (Table 1) indicates that average highest infestation (0.98±0.29 nymphs per plant) was noted for P-23-R2 followed by P-25 (0.92±0.26 nymphs per plant), NMT-8 (0.89±0.25 nymphs per plant) and ER-22 (0.82±0.22 nymphs per plant), while lowest infestation (0.77±0.21

nymphs per plant) was observed for UCD-1202.

Aphids

Statistical analysis of the data showed significant difference in populationflcutation of aphids among the mustard varieties. The data (Table 1) indicates that average highest infestation (21.80±10.28nymphs per plant) was noted for P-23-R2 followed by P-25 (20.78±10.10 nymphs per plant), NMT-8 (20.48±9.64 nymphs per plant) and ER-22 (18.85±9.07nymphs per plant), while lowest infestation (18.27±9.04 nymphs per plant) was observed for UCD-1202.

Jassid

Statistical analysis of the data showed significant difference in population flcutation of jassid among the mustard varieties. The data (Table 1) indicates that average highest infestation (0.74±0.20nymphs per plant) was noted for P-23-R2 followed by P-25 (0.60±0.30 nymphs per plant), ER-22 (0.59±0.15 nymphs per plant) and NMT-8 (0.56±0.16nymphs per plant), while lowest infestation (0.19±0.05 nymphs per plant) was observed for UCD-1202.

Crop yield (kg ha^{-1})

Results in regards to crop yield is presented in (Fig. 1). Statistical analysis of the obtained data indicated that there was significant difference in crop yield between all the five mustard varieties. On the basis of average, the maximum crop yield (1937.9 kg ha-1) was recorded for UCD-1202 followed by ER-22 (1659.6 kg ha-1), NMT-8 (1639.9 kg ha^{-1}) and P-25 (1609.3 kg ha^{-1}) and the minimum crop yield (1357 kg ha^{-1}) was noted for P-23-R2 mustard variety.

Table 1. Population fluctuation of insect pests in different mustard varieties

Insect pests	Varieties				
	P-23-R2	NMT-8	P-25	UCD-1202	ER-22
Thrips	3.20±0.78	2.97±0.70	3.08±0.75	2.50±0.57	2.93±0.69
Whitefly	0.98±0.29	0.89±0.25	0.92±0.26	0.77±0.21	0.82±0.22
Aphid	21.80±10.28	20.48±9.64	20.78±10.10	18.27±9.04	18.85±9.07
Jassid	0.74±0.20	0.56±0.16	0.60±0.30	0.19±0.05	0.59±0.15

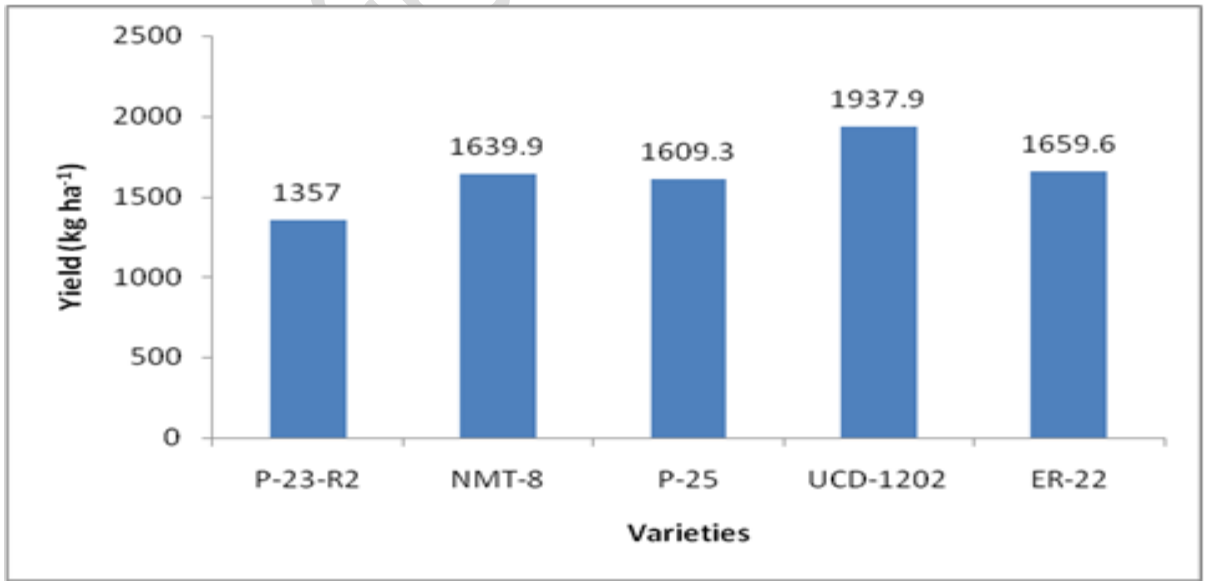

Figure 1. Yield (kg ha^{-1}) of different mustard varieties

Discussion

The study showed that the thrips population was highest on variety P-23-R2 variety and lowest thrips population was observed on UCD-1202 variety. This indicates that variety 'UCD-1202' 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 reported that thrips population apart from the environmental factors varied significantly on mustard varieties of diversified origin. Verma *et al*. [11] found thrip, *Thrip tabaci* as the major insect pest of mustard. Panda and Khush [12] found that varieties with thicker pods suppressed insect pest infestation and showed resistance in diseases transmitted by insects found that thrip population on mustard varieties with thicker stems was lower than thin stemmed varieties. Verma *et al.* [11] experienced a great variation in the thrip population among different mustard cultivars. Similar results have also been reported by Malik *et al.* [13] argued that mustard varieties with rsistance against sucking complex, particularly jassid is of great economic importance.

The results of the study show that maximum population of whitefly was reported on P-23-R2 variety and the minimum populations of whitefly reported on variety UCD-1202. By conducting LSD test it was suggested that variation in population of whitefly among varities of mustard were statistically significant ($P<0.05$). The findings arefurther supported by Rohilla *et al.* [6] who reported that whitefly population varied significantly among mustard varieties; while 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 [12] observed that development of mustard varieties resistant to sucking complex could increase the seed yield manifold; while reported varied response of mustard varieties to whitefly infestation.

Those varieties of crops which are favorite for insect pests; causes serious economic losses to farmers as the varieties of crop are most important to attract and allow pests for infestation. In this regard cultivation of crop varieties which are highly resistant against insect pests may play vital role to suppress infestation and diseases caused or transmitted by insects. If there are persistent viruses, plant resistance to their transmitters usually reduce virus-spread by slowing down their replication [12]. By encouraging pest resistance varieties; the issues related to chemical control as well as expenditure regarding inputs can be minimized; in result nature friendly and polluted free atmosphere will also be augmented. There are some factors which may enhance capacity of resistance of plants against major insect pest species [14]. Plant age, different parts of plants and the leaves with hairy characteristics [15] found effective regarding survival and reproduction of insect pests in aspect of selection and changes in the *B. tabaci* populations on rapeseed-mustard [16]. Hairs and furs may be acts as physical barrier responsible to provide micro climate for vegetarians [17]. There are many protections measures which play vital role against pests i.e. the quantity and kind of trichoms [18, 19] and chemical substances as well as the thickness of pod 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 reported that

on variety YST-151 the aphid population was 2.9 larvae/10 plants showing susceptibility to sawfly. Sahito *et al*. [20] indicated that *Bemisiatabaci*, (Genn) was one of themajor 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 *et al.* [21] showed that relative humidity and rainfall had negative influence on pests and natural enemies during the study period.

The findings of the study indicated that highest aphid population was recorded on P-23-R2 variety and the lowest aphid population was recorded on variety UCD-1202. The LSD test suggested that the differences in whitefly population among mustard varieties were statistically significant ($P<0.05$). The sucking insect pest resistance trend suggested that UCD-1202 may preferably be cultivated having some resistance to sucking insect pests. These results are in accordance with those of Rohilla *et al.* [6] who reported that L. erysimi is most destructive insect causing severe reduction in seed yield varying from 15.0 to 73.3%; while Verma *et al.* [11] found mustard aphid, Lipaphiserysimi (Kalt.), as the major insect pest of mustard. Panda and Khush [12] found that varieties with thicker pods suppressed insect pest infestation and showed resistance in diseases transmitted by insects; while Karmakar [22] compared mustard cultivars B-9, NC-1, RW-351 and PGS-1004 for resistance to Lipaphiserysimi and found that lowest aphid population was recorded on PGS-1004 and this cultivar also showed higher yield than rest of the cultivars. While Saljoqi *et al*. [10] reported that most of the hybrid mustard cultivars with thicker stems were resistant to *Lipaphiserysimi* and mustard sawfly. Sahito *et al*. [20] indicated that *Lipaphiserysimi* (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 *et al.* [21] showed that environmental factors had also significant impact on the insect pest population.

Conclusion

It is concluded that maximum infestation of thrip, whitefly, aphid and jassid was observed for variety 'P-23-R2' and minimum was observed for variety 'UCD-1202'. The peak infestation of thrip, whitefly and aphid was observed on 15th January, 2018 in all five mustard varieties. The population was linear decreased from 22nd January, 2018 to 12th March, 2018. Peak population of jassid was recorded on 12th March 2018.

Authors' contributions

Conceived and designed the experiments: ZH Bhand, IA Nizamani, BK Solangi & MA Lashari, Performed the experiments: ZH Bhand, IA Nizamani & BK Solangi, Analyzed the data: V Suthar, M Khan, M Pathan & B Qureshi, Contributed reagents/materials/analysis tools: ZH Bhand & Solangi, Wrote the paper: ZH Bhand, IA Nizamani & BK Solangi.

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