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Germplasm screening of brinjal *(Solanum melongena* L.) cultivars for resistance to sucking insect pests

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Abstract
A field experiment was conducted to study the response of cultivars/ hybrids/ germplasm of brinjal to major insect pests. The study revealed that the germplasm ADVANTA-314 was the best in reducing the damage of brinjal aphid *Myzus persicae (Sulzer)* while the germ plasm TWINKLE STAR is resistant to leafhopper, *Amrasca devastans* and TWINKLE STAR, DILL and ADVANTA-314 showed significant resistance against whitefly, *Bemisia tabaci* (Gennadius). Furthermore, the cultivar KHBR-202 is recorded deterrent to thrips *Frankliniella occidentalis.*

Keywords: brinjal screening, cultivar resistance, brinjal germplasm, sucking pestresistance

Introduction
Solanum melongena L., commonly known as Brinjal, is an important vegetable. It is widely grown in tropical and sub-tropical areas of the world including Pakistan [1]. It is a best source of a number of nutrients, vitamins, proteins, minerals and antioxidant [2-3]. In Pakistan, it is grown on 9,044 hactares area and the average yield is about 97,466 kg/ ha [4]. Insect pests are the limiting factor which affects the growth and yield of eggplant. Various types of insects damage the eggplant from sowing till harvesting. Some major pests of brinjal crop in Pakistan are brinjal fruit borer, Brinjal stem borer, leaf roller beetles, aphids, jassid, thrips, mites and white fly [5]. At the preliminary stage, the key constraints in successful crop propagation are the sucking pests. The only method utilized for these pests is the Chemical control. Repeated use of these pesticides not only poses the environmental hazards, but also the development of resistance in targeted pests as well as disturb the ecological balance [6]. Therefore, it is mandatory to develop an approach which not only cheap but also provides the environmental safety.

Integrated Pest Management (IPM) involves various tactics for the better management of insect pests and the vital as well as initial component is to grow the cultivars that has resistance against insect pests. This approach has two major benefits. It not only reduces the chances of target pest infestation but also provide favorable circumstances for beneficial insects. Even a low level of tolerance in plants has a dramatic effect, which in fact reduces the need of insecticides [7]. Screening of brinjal cultivars against insect pests has been attempted by several workers [8] in Pakistan. However, the cultivars available in particular region need to be screened and efforts were made to determine the biochemical basis of resistance in selected brinjal entries, against sucking insect pests including whitefly, jassid and others. Therefore, it was needed to conduct the present investigations.

Materials and Methods
The present investigation was carried out to evaluate the susceptibility and resistance of different thirteen genotypes of brinjal against sucking pests at Vegetable Research Institute, AARI, Faisalabad, Pakistan in randomized block designed with three replications in the plot size of 2 kanal with spacing of 90 x 50 cm during *rabi* season of the year 2014. Brinjal seedlings of respective genotypes (*CHHOTU, JHANSI F1, GALINE F1, AB-317, SHAMLI, BLACK PEARL, TWINKLE STAR, DIL, VRIB-2013, ADVANTA-314, KHBR-201A, KHBR-*

202B and AD F1-320) were transplanted during the last week of March 2014 and raised successfully by adopting recommended suitable agronomical practices. Seeds of cultivars were obtained from the Ayub Agricultural Research Institute, Faisalabad. Seeds of all the varieties were sown on February 12, 2011. Plant to plant distance was maintained at 50cm while bed width was 90cm and bed length was 5.5m. For recording observations, five plants were selected randomly. For recording observations on sucking pests *viz.*, aphid, jassid, thrips, mites, and whitefly, leaf per plant of selected 5 plants were carefully examined for the presence of nymphs and adults during early morning hours when the pests were less active. The three leaves chosen were; one from the upper one third, one from the middle one third and one from the lower one third of each plant. The observations were made at three-day interval starting from the one week after transplanting. The whole experimental plot was kept free from any insecticide application. The periodical data on number of sucking pests *viz.*, aphid, jassid, thrips, mites and whitefly population recorded at three days interval were subjected to analysis of variance (ANOVA) by standard statistical procedure [9] after transforming them to square root. However, the data on yield were analyzed without any transformations. Also, the least significant difference (LSD) was calculated, for comparisons of means, using MSTAT-C [10] statistical package. The data were analyzed periodically as well as pooled over periods.

Results and Discussion

Our results shows that the maximum population of aphid (0.4769) was observed on April 02, 2014, while minimum population of aphid (0.0000) was recorded on April 21, 2014.In the mid of April, intermediate populations were recorded. The reason between decreasing trend in population was the fluctuation in temperature. As the temperature increased the population of aphid were decreased. The maximum population of jassid was recorded on April 21, 2014 and minimum population were recorded on April 18, 2014.We observed that the population of jassid recorded variations. The reason behind the non-significant difference in jassid population was weather condition. In our experiment, there was no significant difference of mite population recorded during April 02, 2014 to April 21, 2014. The results of our experiment show that the maximum population of white fly recorded was 0.3769) on April 21, 2014 while the minimum population was on April 08, 2014. Between these dates the populations increase as the temperature increase.

Table 1: Means comparison of data regarding the population of sucking insect pest during different dates of observation on brinjal *Solanum melongina L.* at Faisalabad during 2014.

Dates	Aphd	Jassid	Thrips	Mites	White Fly
02/04/2014	0.4769 A	0.1026 CD	0.1487 A	0.0154 A	5.13
08/04/2014	0.1282 B	0.2205 BCD	0.1231 A	0.0103 A	0.0000 B
11/04/2014	0.0821 BC	0.2769 AB	0.0513 A	0.0359 A	5.13E-03 B
14/04/2014	0.1077 BC	0.2462 BC	0.1179 A	0.0051 A	0.0872 B
18/04/2014	0.0000 C	0.0923 D	0.0462 A	0.0410 A	0.2679 A
21/04/2014	0.0000 C	0.4256 A	0.0462 A	0.0051 A	0.3769 A

Means followed by the same letter in columns are non-significantly different (LSD at P= 0.05).

When population of aphid on different genotypes of brinjal was recorded it was observed that the population varies the number of aphid per leaf on different varieties was in the order of AB-317 > CHOTU > BLACKPEARL >DIL > TWINKALESTAR = KHBR-201A=KHBR2028 > JHANSI F1> GALINE F1 >VBR-2013>ADVANTA-314>ADF1-320 (Fig.1)

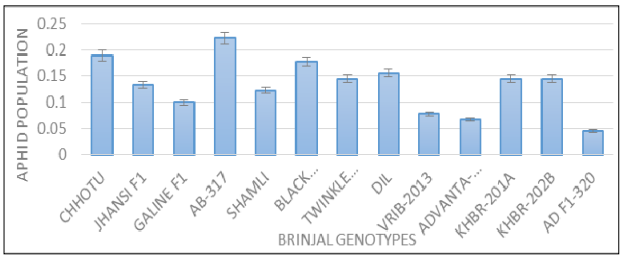

Fig 1: Mean Population of Aphid on Different Genotypes of Brinjal per leaf on different brinjal varieties at Faisalabad during 2014.

Different genotypes of brinjal have significant effect against aphid.Maximum population of aphid was observed on genotype "AB-317" which was 0.2222 and minimum population of aphid was observed on genotype "AD F1-320" which was 0.0444 .So the genotype "ADVANTA-314" show significant resistance against aphid. Other genotype who shows significant resistance was "VRIB-2013" Which was less resistance than "ADVANTA-314" and more resistance than "GALINE F1, SHAMLI. According to our results AB-317 was susceptible against aphid. Results of the present study indicated that at least two varieties can be considered as resistant based on the seasonal mean number of aphid per leaf which can be AD F1-320 and ADVANTA-314

According to our results the population of jassid was in the order AB-317 > VBR-2013 > ADF1-320= GALINE F1= SHAMLI> KHBR-201A=KHBR2028=DIL>ADVANTA-314>JHANSI F1>BLACKPEARL >CHOTU > TWINKALESTAR (Fig.2)

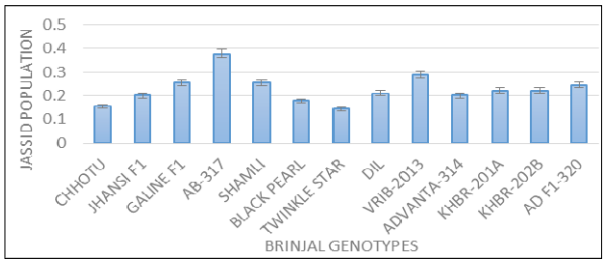

Fig 2: Mean Population of Jassid on Different Genotypes of Brinjal per leaf on different brinjal varieties at Faisalabad during 2014.

Different genotypes of brinjal have significant effect against jassid. Maximum population of jassid was observed on genotype "AB-317" which was 0.3778 and minimum population of jassid was observed on genotype "TWINKLE STAR" which was 0.1444. In our study, the variety "TWINKLE STAR" had the lowest population. Similar results, but for different varieties, have been reported by Mahmood *et al.*, [11]. According to them Violetta Lunga and Prospara brinjal varieties had consistently higher and Nepali and Purple Long lower jassid population. In accordance to our

results two varieties were observed to be resistant "TWINKLE STAR" and "CHOTU". According to Rashid *et al.*, [12] verieties can be grouped into resistant and highly resistant. In case of thrips all the genotypes maximum population of thrips was recorded on brinjal genotype "KHBR-202B" and minimum population was recorded on "Black pearl". So" Black Pearl" is best genotype which shows the resistance against thrips. All other shows intermediate significant effect against thrips. Development of varieties resistant to the insect pests is an important strategy of integrated pest management [13]. Our results are also different from those of Elanchezhyan *et al.*, [14], who reported that 25 brinjal varieties were screened for resistance.

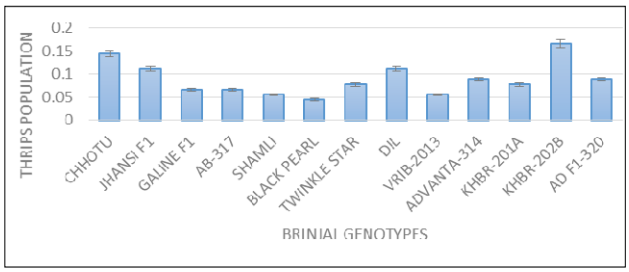

Fig 3: Mean Population of Thrips on Different Genotypes of Brinjal per leaf on different brinjal varieties at Faisalabad during 2014.

As for as whitefly population is concerned the maximum population of white fly was recorded on genotype" GALINE F1". While minimum population was recorded on" TWINKLE STAR". According to results three verities can be considered as resistant to whitefly TWINKLE STAR, DILL and ADVANTA-314. Same results with different varieties were observed by Lee *et al.*, [15].

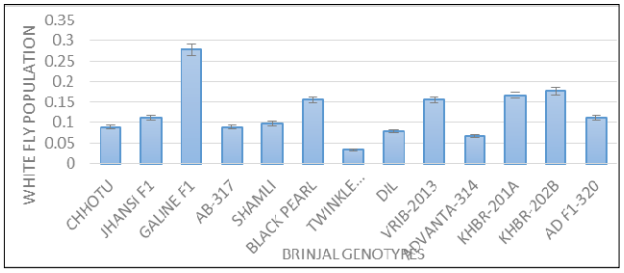

Fig 4: Mean Population of White fly on Different Genotypes of Brinjal per leaf on different brinjal varieties at Faisalabad during 2014

As well as population of mite is concerned, the maximum population of mite was found on AB-371 followed by CHHOTU and minimum population was found on "SHAMLI, TWINKLE STAR, VRIB-2013, ADVANTA-314 and AD F1-320 which showed the resistant behavior against mite population.

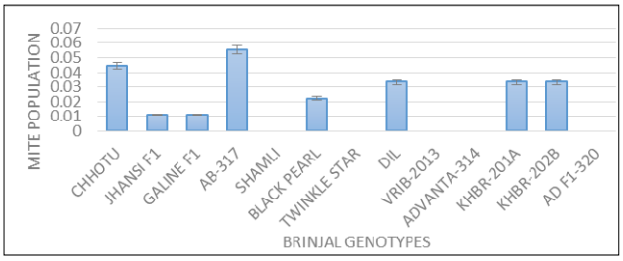

Fig 5: Mean Population of Mite on Different Genotypes of Brinjal per leaf on different brinjal varieties at Faisalabad during 2014

After comprehensive studies on screening of Brinjal cultivars it was concluded that screening studies cannot be compared because different researchers used different varieties under different environmental conditions [16, 11, 12, 17].

Conclusion

It has been observed that the ADF1-320 is comparatively resistant cultivar to aphid and Twinkale Star is resistant to jassid as well as for whitefly.

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