Indian Journal of Entomology, 82(1): 16-19 (2020) DoI No.: 10.5958/0974-8172.2020.00003.6

PLANT CHARACTERS OF BRINJAL GENOTYPES IN RELATION TO INCIDENCE OF JASSID *AMRASCA BIGUTTULA BIGUTTULA* (ISHIDA)

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ABSTRACT

Brinjal, *Solanum melongena* L. (Solanaceae) is attacked by jassid *Amrasca biguttula biguttula* (Ishida). At the University of Agriculture, Faisalabad the relationship of characters in brinjal genotypes to jassid incidence was evaluated under field conditions. Oval round, Purple Long, Green Long, Round Black and Purple cultivars were sown during June 2018 in nursery. Randomized Complete Block Design (RCBD) was followed with three replications. The plant characters were correlated with the jassid incidence and their effect was evaluated with simple and multiple linear regression. The results reveal that the hair density on the lamina showed the maximum effect, while height of plants and number of primary branches showed the least effect. The hair density and hair length on leaf lamina, midrib and vein are the most important characters. The moisture content and thickness of upper, middle and lower leaves showed positive but non-significant correlations.

Key words: *Amrasca biguttula biguttula,* brinjal, genotypes, host plant relationships, leaf lamina, thickness, hair density, length, moisture, content, multiple regression

Brinjal *Solanum melongena* L. is an important vegetable (Hui, 2006; Rai et al., 1995; Anonymous, 2010; Pugalendhi et al., 2010). It is cultivated in an area of 9,044 ha with a production of 88,148 mt in Pakistan (FAO, 2012), and 94% of the world production comes from Asia (FAO, 2007). Brinjal is subject to losses caused by insect pests to an extent of 70-92% (Ali et al., 2016). The losses are due to various chewing as well as sucking insect pests such as whitefly, aphid, mites, hadda beetle, and fruit and shoot borer. The production losses vary from region to region and it is more in South Asia (Thapa, 2010). Among all the sucking pests, brinjal jassid (*Amrasca biguttula biguttula* (Ishida) causes severe economic losses (Mahmood et al., 1990; Kalawte and Dethe, 2012; Khan et al., 2015). Continuous sucking of leaves causes wilting of leaves due to necrosis (Rahman et al., 2009) and >50% loss occurs (Bindra and Mahal, 1981; Nagia et al., 1993; Naik et al., 2009).

Using of insecticides is the strategy by farmers at small as well as large scale. But this will kill the beneficial fauna such as predators and parasitoids (Solangi et al., 2011), and cause other problems (Dadmal et al., 2004). Hence, development and use of resistant cultivar is an important part of IPM (Gaikwad et al., 1991). The plant morphological characters such as hair density and length, plant height and moisture % are important for this. The resistant cultivars had more trichomes and play key role as defensive mechanism (Taylo and Bernardo, 1995). Hence, keeping these in view, the current study was conducted to evaluate the relationship of plant characters of brinjal genotypes with jassid incidence.

MATERIALS AND METHODS

The seeds of five cultivars showing the response to the jassid incidence were received from the Ayub Agricultural Research Institute (AARI), Faisalabad. These include: Oval Round, Purple Long, Green Long, Round Black and Purple. These were sown on June 2018 in a nursery raising in plastic trays at the University of Agriculture, Faisalabad. After 50 days, these seedings were transplanted in the experimental area of the University. Randomized Complete Block Design

(RCBD) was followed with three replications, in plot size of 9 x 12 m with 30 x 30 cm plant to plant and row to row distance. All agronomic practices were followed.

Data on the incidence of adults and nymphs were collected immediately upon incidence starting from 45 days after planting. Fifteen plants were randomly selected upper, middle and lower leaves from first, second and third plant of each variety were observed. The mean incidence was calculated. At the crop maturity, the plant characters were recorded. For the laboratory analysis the leaves from selected plants were collected, sealed in white plastic bags. Five plants from each genotype were selected randomly, and data on hair density on lamina, midrib and leaf vein from upper, middle and lower leaves of first, second and third plant were observed in a stereozoom microscope and converted per cm². Ten plants were randomly selected for observing number of primary branches. Five plants were randomly selected and the area of the leaf lamina (cm²) was calculated from three leaves (top, middle and lower part). The area of leaf was calculated with the CI-202 portable laser leaf area meter (CID Bioscience). The height of plants from ground to top (canopy) of ten selected plants was measured with a meter rod. To measure the length of the hair on the leaf-lamina, vein and midrib (µm), five plants from each replication were selected and three full-grown leaves were taken randomly from top, middle and lower part. Length of the hair on the leaf lamina, vein and midrib (µm) was determined in a microscope fitted with ocular micrometer.

Ten gram weighed leaves were collected randomly from each tested plot to determine the moisture % after cleaning, drying and weighing. The collected fresh leaves were cleaned with a muslin cloth, weighed and then dried in oven at 60°C for 70 hr. After drying, leaves were again weighed and further dried for another 5 hr at 60°C before desicating for 5 min, then weighed and moisture % computed. Data obtained were statistically analyzed with ANOVA and Duncan's Multiple Range Test (DMRT) at $p \leq 0.05$. The correlation between jassid incidence and plant characters were determined using simple and multiple linear regression equations. Data analysis was done with M Stat Software (Steel et al., 1997). Least significance difference (LSD) was also computed.

RESULTS AND DISCUSSION

The results obtained on the incidence of adults and nymphs on the brinjal genotypes reveal that the incidence varies and it is related to the plant characters as depicted in Tables 1-3.

These results agree with those of Gaikwad et al. (1991), Naqvi et al. (2008), Qudsia et al. (2013) and Gaikwad et al. (1991). The corelation coefficients reveal that the moisture content showed positive relationship with a *A. biguttula biguttula* incidence while leaf area and thickness of lamina showed highly negative relationship. Similar observations had been made by Ali et al. (2016). Ali et al. (2012) revealed that thickness of lamina showed positive and significant impact and it is in contradiction with the present results. Hair density on midrib, vein and lamina of leaf with r values were 0.481, 0.866 and 0.54, respectively while hair length on midrib, vein and lamina of leaf with r values were 0.890, 0.845 and 0.784, respectively. The presence of hairs on veins, midrib and lamina interferes with oviposition and showed negative relationship with incidence.

It was reported that oviposition was reduced due to the hair density, number of branches and hair length (Lokesh and Singh, 2005; Taylo and Bernado, 1995). The hair length has a negative correlation with incidence similar to the findings of Singh et al. (1988). The number of primary branches, hair length and density of leaf hairs showed significant and negative correlation (Cassi-Lit and Bernardo, 1990). The most important plant character is the hair density on leaf lamina which has maximum effect of 52.1% while hair length on lamina was the second most important (27.88%). The number

Table 1. Incidence of *A. biguttula biguttula* on brinjal genotypes

Genotypes	1 Aug.	8 Aug.	15 Aug.	22 Aug.	29 Aug.	5 Sept.	12 Sept.	19 Sept.	26 Oct.	3 Oct.	10 Oct.
P	0.06c	0.55c	0.78b	1.24c	1.30d	1.67c	13.98a	2.07c	1.80	2.03d	2.04d
OR	0.43bc	1.07c	1.56b	1.24c	1.93cd	1.91c	2.78e	4.20b	2.42	2.09cd	2.92e
PL	2.40a	3.11a	2.85a	5.77a	7.20a	5.61a	6.89b	6.90a	3.53	2.38bc	7.40a
GL	1.31abc	2.35ab	2.89a	2.93bc	3.04bc	2.82bc	4.57c	5.29ab	3.73	4.71a	2.17a
RB	2.18a	1.39bc	3.82a	4.09ab	3.75b	3.89ab	3.08e	3.69bc	2.58	3.22b	2.177a
LSD	1.35	1.12	1.40	2.13	1.28	1.83	0.20	1.50	NS	0.89	1.13

P= Purple; OR= Oval Round; PL= Purple Long; GL= Green Long; RB= Round Black; LSD= Least Significance Difference

Table 2. Correlation coefficients- plant characters vs. *A. biguttula biguttula* incidence in brinjal genotypes

Plant characters		Correction coefficient (r)	Covariance	Standard Error (SE)
Hair density	Upper	-0.138ns	-0.12	0.22
on midrib (cm)	Middle	-0.723**	-0.10	0.21
	Lower	-0.1473ns	-0.11	0.22
Hair density	Upper	-0.8234**	-0.11	0.22
on vein (cm)	Middle	-0.413**	-0.12	0.11
	Lower	-0.135ns	-0.01	0.11
Hair density	Upper	-0.8245**	-0.01	0.11
on lamina (cm^2)	Middle	-0.542**	-0.10	0.01
	Lower	-0.124ns	-0.01	0.01
Hair length	Upper	-0.300ns	-0.01	0.11
on midrib (µm)	Middle	-0.7253**	-0.02	0.12
	Lower	-0.424**	-0.01	0.12
Hair length	Upper	0.512**	-0.04	0.01
on vein (µm)	Middle	0.311ns	-0.05	0.02
	Lower	-0.557*	-0.02	0.01
Hair length	Upper	-0.576*	-0.01	0.02
on lamina (µm)	Middle	-0.5775*	-0.01	0.04
	Lower	0.168ns	-0.02	0.03
Leaf area (cm^2)	Upper	0.126ns	0.01	0.21
	Middle	-0.534**	0.01	0.10
	Lower	-0.712**	0.02	0.10
Thickness of lamina (µm)	Upper	0.189ns	0.00	0.01
	Middle	0.259ns	0.01	0.21
	Lower	0.290ns	0.01	0.03
Stem hair density	Upper	-0.815**	0.21	0.34
	Middle	-0.760**	0.10	0.22
	Lower	-0.503*	0.00	0.11
Moisture (%)	Upper	0.356ns	0.00	0.21
	Middle	0.266ns	0.02	0.06
	Lower	0.287ns	0.01	0.10
Plant height (cm)		0.07ns	-0.10	0.21
No. of primary branches		0.065ns	-0.01	0.025

Mean population/ leaf ; *Significant at $p \leq 0.05$, ** $p \leq 0.01$; ns, non-significant.

Table 3. Multiple regression- plant characters vs. *A. biguttula biguttula* incidence in brinjal genotypes

Regression Equation	R^2 Effect	F. Value	$\bar{x} \pm SE$
Y= 4.93-0.002X1	0.541	52.12	16.44±0.501
Y= 5.39-0.003X1+1.541X2	0.481	11.52	10.39±0.487
Y= 6.29-0.002X1+2.101 X2*-0.005X3	0.866	27.88	15.15±0.461
Y= 6.327-6.335X1+2.831X2*-0.005X3-0.032X4	0.784	2.35	11.85±0.437
**Y= 6.29-0.002X1+3.220X2*-0.005X3*-0.065X4+0.060X5	0.890	2.04	10.63±0.498
**Y= 5.985-0.001X1+2.356X2-0.017X3*-0.090X4+0.006X5+0.101X6	0.845	1.87	9.99±0.521
**Y= -1.025-7.753X1+2.125X2-0.007X3*-0.076X4-0.005X5+0.098X6+0.093X7	0.757	5.15	7.57±4.313
**Y= -0.877-7.791X1+2.265X2-0.007X3-0.083X4-0.002X5+0.094X6+0.086X7+0.008X8	0.657	0.00	5.96±4.969
= -0.973-7.715X1+2.231X2-0.007X3-0.043X4-0.002X5+0.095X6+0.096X7+0.008X8-0.003X9	0.857	0.00	5.34±5.249

X1, hair density on lamina; X2, hair density on midrib; X3, hair density on vein, X4, hair length on lamina; X5, hair length on midrib; X6, hair length on vein; X7, moisture (%); X8, plant height; X9, No. of primary branches; R 2 , coefficient of determination; SE, standard error.

of primary branches and plant height have no impact. Hair density at vein, lamina and midrib have negative and significant effects on jassid incidence.

These findings are contrary to the earlier observations (Dhamdhera et al., 1984; Singh and Agarwal, 1988; Taylo and Bernardo, 1995). Ali et al. (2012) reported that moisture and number of primary branches had no effect on jassid population. The incidence was more with greater leaf area (Ali et al., 2012; Uthamasamy, 1985) and in contrast leaf area was observed to be with no effect (Naqvi et al., 2008). Thus, the present study

reveals that the hair density on vein and midrib, hair length, leaf lamina and moisture content might cause fluctuations in jassid incidence in brinjal.

ACKNOWLEDGEMENTS

Authors thank the MNS-University of Agriculture Multan and University of Agriculture Faisalabad for facilitating the work.

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(Manuscript Received: September, 2019; Revised: November, 2019;
Accepted: November, 2019; Online Published: December, 2019)
Online published (Preview) in www.entosocindia.org Ref. No. 19163