

Original Research Article

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Effect of Leaf Characteristics on Different Brinjal Genotypes and their Correlation on Insects Pests Infestation

S.P. Bindu* and A. Pramanik

Department of Agricultural Entomology, Bidhan Chandra Krishi Viswavidyalaya,
Mohanpur - 741 252, West Bengal, India

*Corresponding author

ABSTRACT

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The field and laboratory experiments were carried out with twenty-two brinjal varieties during *post-kharif* season of 2013-2015 in the Central Research Farm, Gayeshpur, Bidhan Chandra Krishi Viswavidyalaya. The morphological characteristics of brinjal leaves are associated with attraction, feeding and oviposition of the insect pests. In 2013-2015 investigation, interaction between jassids incidence and morphological characteristics on brinjal revealed that the population of jassids, whitefly, shoot and fruit borer, and epilachna beetles was negatively correlated with leaf thickness and trichomes. The jassids, whitefly, epilachna beetles population was negatively correlated with leaf area but the aphid and shoot and fruit borer were positively correlated. Jassids, whitefly and aphids was negatively correlated with coccinellids predators and spiders while, the population of shoot and fruit borer and epilachna beetles showed positive correlation.

Introduction

Brinjal or eggplant, *Solanum melongena* L. is one of the important vegetable crops grown in India and other parts of the world. Insect pests are the main constraint in the successful cultivation of brinjal. Among them, leafhopper and whitefly are cosmopolitan in distribution and are found wherever brinjal is grown. The use of resistance genotypes is familiar as the imperative tool for the bio-intensive pest management system. The morphological and physical characteristics of plants and fruits are associated with attraction, feeding and oviposition of the insect pests. Development of varieties resistant to the insect pests is an important strategy of integrated pest management (Bhatti *et al.*, 1976). The identification of biophysical

characteristics from insect resistant varieties is of most practical significance.

The degree of hair of trichome, on the leaves occurs in large numbers and plays a vital role in the plant defense particularly among phytophagous insects.

Uthamasamy (1985) found that the resistant varieties had more hairs than susceptible ones. Keeping in mind the seriousness of attack and the increasing incidence of the major insect pests on brinjal a humble attempt has been undertaken to find out the source of resistance and correlation of different morphological plant characteristics of different brinjal cultivars.

Materials and Methods

A fields experiment was carried out during 2013-2015 at Central Research Farm of Bidhan Chandra Krishi Viswavidyalaya, Gayeshpur, Nadia, West Bengal. Twenty two (22) cultivars of brinjal were screened for their relative susceptibility to major insect pests. The plot size was 3m × 2.5m with 60cm and 50cm spacing. The experiment was laid out in a Randomized block design with three replications. Ten leaves of almost similar age from each replication were plucked from each variety/genotype at peak infestation period of insect pests. The following observations were taken for morphological characteristics of different varieties/cultivars of brinjal: a) Leaf area (sq. cm) – measured by using graphpaper, b) Number of trichome on leaf lamina and midrib – the number of trichome per sq. cm of leaf of under surface (base, middle and tip portions) were counted with the aid of calibrated ocular grid under a dissecting microscope and c) Leaf thickness (mm) – the cross section of such leaves at three different parts of the lamina was taken and measured using stage and ocular micrometer. Several morphological characters of the twenty two varieties of brinjal were correlated each with the number of major insects.

Results and Discussion

The morphological characteristics of brinjal leaves are associated with attraction, feeding and oviposition of the insect pests. The effect of leaf morphological characters of brinjal on different varieties have been recorded during 2013-2015 and presented in Table 1. In the present study revealed that the mean leaf thickness in different varieties ranged between 0.26 to 0.80 mm. The varieties Sada Jhuri Begun (0.80 mm) was recorded highest leaf thickness followed by the varieties Punjab Sadabahar and Garia Begun (0.57

mm). While, the lowest leaf thickness was observed on the varieties BCB-50 (0.26 mm) followed by BCB-11(0.27 mm) and 13 BRL-2 (0.29 mm).

The mean leaf area on different brinjal varieties ranged from 32.35 to 64.20 cm². The highest leaf area was observed on the varieties Muktakeshi (64.20 cm²) at par with each varieties and followed by 13 BRL-6 (58.30 cm²) and on par with each other. The least leaf area was found on the varieties 13 BRL-2 (32.35 cm²) and 13 BRL-4 (33.00 cm²). The mean trichome density on different varieties ranged between 778.05 and 1138.40 per cm². The highest trichome density was recorded on the varieties 12 SPL-BL-7 (1138.40 per cm²) followed by the varieties 13 BRL-6 (114.63 per cm²) but the lowest trichomes density was observed on the varieties 13 BRL-4 (778.05 per cm²).

The present investigations are in partial agreement with the finding by Amin *et al.*, (2014) who reported that the higher leaf area (63.53cm²/leaf) and leaf trichome (256.7/25 mm²) had lower shoot and fruit infestation. Wagh *et al.*, (2012) also reported that the mean trichome density of leaf surface recorded in different brinjal genotypes ranged from 458.67 to 1192.67 per cm² and maximum trichome density was found in less susceptible genotypes. The earlier results reported by Naqvi *et al.*, (2008) specify the trichome density in the range of 550.5 to 1068.5 per cm², the leaf area ranged 68.8-22.9 cm² and leaf thickness ranged 0.343-0.157 mm from thirteen (13) brinjal varieties.

Correlation between insect pests of brinjal with leaf morphological characteristics of brinjal

In the present studies, the leaf characters *viz.*, leaf thickness, leaf area and trichomes density of leaves of 22 brinjal varieties were

correlated with insect pests population, so that the promising brinjal varieties can be identified for future benefit. Weekly average of the screening incidence of insect pests population during 2013-2014 were analyzed and correlated on Table 2.

Jassid, *Amarasca biguttula biguttula*

Interaction between jassids incidence and morphological characteristics on brinjal revealed the population of jassids showed significantly negatively correlated with leaf thickness (-0.431), while the leaf area (-0.703) and trichomes density (-0.569) showed significantly negative correlation. The

variation in population of jassids observed about 79 % was due to all the leaf morphological characteristics (Table 2).

According to Naqvi *et al.*, (2008) who reported that the leaf area, leaf thickness exerted no effect on leafhopper population, while trichome density had negative correlation. However, Giekwad *et al.*, (1991) reported positive correlation between thickness of leaf and leaf area with leafhopper infestation. The most resistant varieties with longer more numerous and more branched trichomes and significantly correlated with leafhopper (Lit and Bernardo, 1990).

Table.1 Morphological leaf characters in different brinjal varieties/ genotypes

Varieties	Leaf thickness (mm)	Leaf area (cm ²)	Trichomes (density/cm ²)
13BRL-1	0.45	48.20	788.45
13BRL-2	0.29	32.35	942.10
13BRL-3	0.46	43.80	852.35
13BRL-4	0.31	33.00	778.05
13BRL-5	0.44	43.80	880.00
13BRL-6	0.51	58.30	1104.63
Punjab Sadabahar	0.57	46.90	993.05
Kashi Taru	0.41	40.00	825.35
12SPL-BL-1	0.31	47.25	877.20
12SPL-BL-2	0.34	41.65	873.50
12SPL-BL-4	0.41	45.70	951.65
12SPL-BL-5	0.48	40.00	871.85
12 SPL-BL-7	0.46	57.95	1138.40
BCB-11	0.27	49.90	793.70
BCB-30	0.49	52.15	874.95
BCB-50	0.26	56.40	832.40
Garia Begun	0.57	44.00	964.80
Sada Jhuri Begun	0.80	43.00	878.60
Muktakeshi	0.52	64.20	814.55
Punjab Round	0.36	40.95	863.20
Punjab Barshati	0.29	40.10	933.45
Makra	0.48	49.25	895.10
SE.m	0.06	5.39	67.98
CD at 5%	0.18	15.40	194.04

Table.2 Correlations between insect pests with leaf morphological characteristics of brinjal

Insect pests/ Natural enemies	Leaf thick	Leaf area	Trichomes	R ²	Regression equation
Jassids	-.431*	-.703**	-.569**	0.791	Y=7.88 -.01X ₁ -.05X ₂ - 1.21X ₃
Whitefly	-.352	-.051	-.356	0.696	Y=-4.11 -.02X ₁ -.81X ₂ - 4.82X ₃
Aphid	-.371	.041	-.019	0.825	Y=-1.29 -.51X ₁ - 1.09X ₂ - 2.81X ₃
Shoot and fruit borer	-.190	.033	-.204	0.703	Y=-3.21 - 2.01X ₁ -.85X ₂ - 2.19X ₃
Leafrollers	-.101	.030	-.304	0.731	Y=-2.82 - 1.08X ₁ - 2.19X ₂ -1.81X ₃
Epilachna beetles	-.307	-.086	-.447*	0.400	Y=.85 - 0.29X ₁ - 0.14X ₂ - 2.81X ₃

* Significant at the 0.05 level (2-tailed), **significant at the 0.01 level (2-tailed).

Table.3 Correlations between insect pests with their natural enemies of brinjal

Insect pests/ Natural enemies	Coccinellid	Spider	R ²	Regression equation
Jassids	-0.208	-0.409*	0.780	Y= 7.88 -.05X ₁ - 2.02X ₂
Whitefly	-0.032	-0.197	0.705	Y= -4.11 -.08X ₁ - 3.05X ₂
Aphid	-0.061	-0.202	0.830	Y= -1.29 -.05X ₁ - 1.15X ₂
Shoot and fruit borer	.439*	-0.026	0.690	Y= -3.21 -.09X ₁ -.04X ₂
Leafrollers	0.421	-0.097	0.721	Y= -2.82 - 2.03X ₁ -.09X ₂
Epilachna beetles	.616**	0.154	0.390	Y=.85 - 3.12X ₁ -.07X ₂

* Significant at the 0.05 level (2-tailed), **significant at the 0.01 level (2-tailed).

Whiteflies, *Bemisia tabaci*

In 2013-2014, interaction studies between the whiteflies incidence and morphological characteristics on brinjal showed that the leaf thickness, leaf area and trichomes density had negatively non-significant correlation with whiteflies population.

The variation in population of whiteflies observed about 69 % was due to all the leaf morphological characteristics (Table 2). The present findings are in agreement with Naqvi *et al.*, (2008) who reported that the leaf area had positive significant effect on whitefly population, whereas leaf thickness, trichome density had no significant effect. Soundarajan and Baskaran (2001) reported negative significant correlation between trichome

density and whitefly population are in supportive with the present findings.

Aphids, *Aphis gossypii*

The population of aphids revealed a negatively non- significant correlation with leaf thickness and trichomes density. But, showed positively non-significant correlation with leaf area. The variation in population of aphids observed about 82 % was due to all the leaf morphological characteristics (Table 2).

Ishaque and Choudhuri (1984) reported that they had high positive correlation between the leaf area of the varieties and the degree of susceptibility. They also found less susceptible varieties had thick and closely placed leaf trichome.

Brinjal shoot and fruit borer, *Leucinodes orbonalis*

The population of brinjal shoots and fruit borer revealed that the leaf thickness (-0.190) and trichomes density (-0.204) was negatively non-significant correlation but the leaf area (+0.033) was found positively non-significant correlated. The variation in population of shoot and fruit borer observed about 70 % was due to all the leaf morphological characteristics (Table 2). Wagh *et al.*, (2012) observed that the shoot thickness showed strong and positive correlation ($r = 0.632$) in relation to incidence of shoot borer. Javed *et al.*, (2011) reported that strong and negative correlation between trichome density and infestation of *L. orbonalis* which are in agreement with present study.

Leaf roller, *Eublemma olivacea*

During 2013-2014, the leaf roller population showed negatively non-significant correlation with the leaf thickness and trichomes density. While, the leaf area was positive correlated. The variation in population of leaf roller observed about 73 % was due to all the leaf morphological characteristics (Table 2).

Epilachna beetles, *Epilachna vigintioctopunctata*

The epilachna beetles population was negatively non-significant correlated with the leaf thickness (-0.307) and leaf area (-0.086) but negatively significantly correlated with trichomes density (-0.447). The variation in population of epilachna beetles observed about 40 % was due to all the leaf morphological characteristics (Table 2). Wagh *et al.*, (2012) reported that the maximum trichome density was found in less susceptible genotypes. Ishaque and Chowdahary's (1984) supported that they had high positive correlation between the leaf area of the

varieties and the degree of susceptibility. They also found less susceptible varieties had thick and closely placed leaf trichome.

Correlation between insect pests with their natural enemies of brinjal

Coccinellid predators

The population of coccinellid predators was negatively correlated with the population of jassids (-0.208), whiteflies (-0.032) and aphid incidence (-0.061). While brinjal shoot and fruit borer (+0.439) and epilachna beetle (+0.616) were significantly positively correlated. But, the population of leafroller (+0.421) was positively non-significant correlated (Table 3).

Spider

In 2013-2014, the spiders showed negatively significant correlation with jassids but the whiteflies, aphids, brinjal shoot and fruit borer and leafroller incidences was negatively non-significant correlated. While, epilachna incidence (+0.154) was positively non-significantly correlation with the population of spiders (Table 3).

The variation in population of insect pests of brinjal observed about 39% to 83% was due to their natural enemies. According to Vishav *et al.*, (2014) supported that the conservation of natural enemies will help in suppressing the *E. vigintioctopunctata* population in brinjal. Kalaichelvi (2008) reported that the natural enemies population was found to have direct correlation with sucking pest population.

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