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Field screening of brinjal varities on major pests and their natural enemies

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ABSTRACT

A field experiment was conducted to study the response of cultivars/ hybrids/ germplasm of brinjal to major insect pests and their natural enemies. The study revealed that the hybrid, Sweta was the best in reducing the shoot and fruit damage by *Leucinodes orbonalis* Guen. recording the mean shoot and fruit damage of 8.0 and 8.7 per cent (number basis) and population of spotted leaf beetle, *Henosepilachna vigintioctopunctata* Fab., ash weevil, *Myllocerus* spp. Guerin, mealybug, *Coccidohystrix insolitus* Green, aphid, *Aphis gossypii* Glover, leafhopper, *Amrasca devastans* Ishida and whitefly, *Bemisia tabaci* (Gennadius) recording 8.0, 0.0, 6.5, 6.3, 0.0 and 0.0 nos./ three leaves, respectively. The hybrids, Bejo Sheetal and Pusa hybrid-6 recorded high population of coccinellids, syrphids and spiders. The biochemical characters such as total sugars, total chlorophyll and moisture content were positively correlated with shoot damage while total phenols and ash content have negative correlation.

Keywords: Brinjal cultivars, insect pests, natural enemies, resistance, biochemical factors

INTRODUCTION

Brinjal, *Solanum melongena* Linnaeus is highly cosmopolitan and popular vegetable grown as poor man's crop in India. It is the most-consumed and most-sprayed vegetable in India, where it is grown on more than 5,00,000 hectares, making it one of the main sources of cash for many farmers (Daniel Miller, 2007). The average yields of brinjal in India are reported to be around 200 to 350 quintals per hectare (AICRP Annual Report, 2006). Among the major constraints in economic cultivation of brinjal, pest infestation causes heavy losses. Chemical control is widely used means of managing insect pests in brinjal. Repeated use of broad spectrum synthetic chemicals also result in environmental contamination, bioaccumulation and biomagnification of toxic residues and disturbance in ecological balance (Dadmal *et al*., 2004 a). Hence, there is an urgent need to look alternate and safer method.

Insect resistance in crop plants is an important component of Integrated Pest Management (IPM) and it is considered as non-monetary input at farmers end. Resistant and tolerant cultivars form the basic component of Integrated Pest Management (IPM) over which other components are to be built up. It contributes helpfully in IPM in two ways: reduces the quantum of insecticides and improves performance of natural enemies in plants. Even a low level of tolerance in plants has a dramatic effect, which in fact reduces the need of insecticides (Srivastava, 2003). Screening of brinjal cultivars against insect pests has been attempted by several workers elsewhere in India. 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 shoot and fruit borer, *Leucinodes orbonalis* Guen. Therefore, it was envisaged to conduct the present investigations.

MATERIALS AND METHODS

A field experiment was conducted in a randomized block design (RABD) with three replications in an area of 10 cents. The accessions of 25 brinjal varieties screened against major pests and their natural enemies is presented in table 1. Thirty-days old seedlings were transplanted with a spacing of 60 x 60 cm during July to December 2006 in the weather condition of 26 ± 2^{0}C and 61 ± 7 per cent RH at Modern orchard, Agricultural College and Research Institute, Madurai. The cultural practices except plant protection measures were followed as per the crop production guide for horticultural crops. They were planted by maintaining eight plants per replication and a total of 24 plants per entry. Five plants per replication were tagged at random and observed for the incidence of major pests and their natural enemies in each brinjal varieties at weekly interval starting from transplanting to harvest (David Abilash, 2000). The pest population/

damage was recorded at weekly interval commencing from seventh day after transplanting (DAT). The percentage data obtained from the field experiment were subjected to arcsine (angular) transformation (Gomez and Gomez, 1984). The data on the number of spotted leaf beetles, leafhoppers, aphids, whitefly, ash weevils and mealy bugs were analysed after following square root transformation. Biochemical contents and incidence of pests were correlated by simple regression analysis using IRRISTAT package.

Healthy and damaged shoots by *L. orbonalis* were recorded on five randomly selected plants and per cent damage was worked out. After each observation, the damaged shoots were removed. In case of fruit infestation, number and weight of healthy and damaged fruits were recorded and per cent damage was calculated. Grades (1-Immune - 0% fruit infestation; 2- Highly resistant - 1-10% fruit infestation; 3-Moderately resistant - 11-20; 4-Tolerant - 21-30; 5-Susceptible - 31-40; 6-Highly susceptible - above 40) were also assigned for the fruit damage based on the rating given by Mishra *et al*. (1988).

The number of grubs and adults of *H. vigintioctopunctata* were recorded from three leaves, one each from top, middle and bottom part of five randomly selected plants. Mean was worked out and expressed as number per three leaves (Murugesh, 1997). The number of adults of *Myllocerus* spp. were recorded from three leaves, one each from top, middle and bottom part of five randomly selected plants. Mean was worked out and expressed as number per three leaves (David Abilash, 2000).

The number of nymphs and adults of leafhopper, *Amrasca devastans* were assessed on three leaves (one from bottom, middle and top) in five selected plants by examining each leaf carefully during early morning hours, when the pest was less active. To begin with, leafhoppers on upper surface of the leaves were counted and then the leaf was tilted carefully to count population on the lower surface. The population was expressed as number per three leaves (Muthukumar, 2002). Three leaves (one from top, middle and bottom) in five randomly selected plants were carefully examined for the presence of nymphs and adults of aphids, *Aphis gossypii*, mealy bug, *Coccidohystrix insolitus* and whitefly, *Bemisia tabaci* and the population was expressed as number per three leaves. Similarly natural enemies like coccinellid, syrphid and spider populations were also recorded. The population was expressed as number per plant.

Out of 24 varities five were selected from each category *i.e.*, resistant, fairly resistant, tolerant, susceptible and highly susceptible for biochemical analysis. Moisture percentage and ash was estimated as per the method described by Motiramani and Wankhade (1971). Total phenols (Malick and Singh, 1980), sugars and chlorophyll contents (Mahadevan and Sridhar, 1986) were determined using standard methods.

RESULTS AND DISCUSSION

Shoot and fruit of all the entries of brinjal screened, were prone to the attack by *L. orbonalis*. Among 25 varities of brinjal tested, none of them was immune to shoot and fruit borer (Table 1). Immunity to *L. orbonalis* was reported only either in wild species of brinjal like *Solanum khasianum* (Lal *et al*., 1976) and *S. anomalum* and *S. incanum* (Behera *et al*., 1999) or in the derivatives of wild species like Arka Mahima and Arka Sanjivans (Kale et *al*., 1986). But in the present study, none was immune to *L. orbonalis* as only varieties and hybrids of brinjal were screened.

The hybrids, Ravaiya and Sweta were designated as resistant to *L. orbonalis*, recording the shoot and fruit damage between 1.0 and 10.0 per cent (Table 1 & 2). The resistant reaction of above two hybrids to *L. orbonalis* might be due to the presence of tough fruit skin, narrow pericarp, extra longish fruits with light purple colour, less seedless area and less peripheral ring, as reported by Grewal *et al.* (1995). Pusa Purple Cluster and Black Beauty were reported as resistant by Ghosh and Senapati (2001), as they were with purple coloured leaves.

In the present study, the fairly resistant to *L. orbonalis* comprised Apsara, Brinjal-925, Kirti ARBH-555, MEBH-11 and Shubham (02) which fall in between 11.0 and 20.0 per cent infestation. However, MEBH-11 was reported as susceptible and fairly resistant based on the shoot damage and fruit damage, respectively (Dadmal *et al*., 2004). As suggested by Panda *et al*. (1971), the presence of heavily lignified sclerenchymous hypodermis and closely packed vascular bundles in the hybrids of brinjal might be responsible for the resistant and fairly resistant reactions. The resistant and fairly resistant hybrids of brinjal can be utilized as a resistance source in the breeding programmes to develop resistant/ tolerant varieties of brinjal to *L. orbonalis*.

Six varieties (Annamalai, Green Round, KKM-1, PKM-1, Nattu Kathiri and Pootheri Local) and eight hybrids (BSS-430 Darpan, Green Gold (EP-05), Haritha, MHBJ-99, Shanthi, Super Usha, MEBH-9 and Vijay ARBH-905) of brinjal in the present study were categorized as tolerant to shoot and fruit borer (Table 1 & 2). Earlier report was also supportive to the present findings in which Annamalai was reported as moderately tolerant to *L. orbonalis* (Subbaratnam and Butani, 1981). But Round Green was reported as susceptible according to Raut and Sonone (1980). The tolerance nature of above entries of brinjal might be attributed by hardness of the fruit skin and flesh

Table 1. Screening of brinjal entries for their reaction against brinjal shoot and fruit borer, *L. orbonalis*

Varities	Shoot damage (%)*	Fruit damage (%)**	
		Number	Weight
Shanti	17.9(25.03)^{ef}	24.0(29.32)^{de}	28.3(32.15)^{g}
Haritha	19.6(26.27)^{efgh}	23.2(28.76)^{cd}	27.4(31.53)^{fg}
Apsara	13.1(21.24)^{bc}	17.8(24.99)^{b}	17.6(24.79)^{c}
Sweta	8.0(16.39)^{a}	8.7(17.08)^{a}	7.2(15.52)^{a}
MHBJ - 99	22.4(28.25)^{fgh}	27.3(31.52)^{de}	24.8(29.86)^{def}
Vijay (ARBH - 905)	22.0(27.92)^{efgh}	25.2(30.06)^{de}	27.2(31.41)^{fg}
MEBH - 11	13.1(21.24)^{bc}	17.8(24.99)^{b}	16.1(23.65)^{bc}
Green Gold (EP-05)	20.4(26.84)^{efgh}	24.6(29.76)^{de}	26.8(31.18)^{fg}
Bejo Sheetal	35.7(36.64)^{j}	48.4(44.08)^{h}	45.5(42.39)^{i}
Ravaiya	9.8(18.14)^{ab}	10.6(18.49)^{a}	7.5(15.84)^{a}
Brinjal - 925	13.6(21.65)^{cd}	18.0(25.08)^{b}	17.1(24.38)^{bc}
Kirti ARBH - 555	13.5(21.58)^{cd}	17.8(24.99)^{b}	14.8(22.61)^{b}
Shubham (02)	17.6(24.73)^{de}	19.3(26.01)^{bc}	17.8(24.95)^{c}
BSS - 430 Darpan	18.8(25.69)^{efg}	23.0(28.65)^{cd}	26.4(30.89)^{efg}
MEBH - 9	22.6(28.35)^{gh}	26.0(30.68)^{de}	22.8(28.48)^{d}
Super Usha	22.7(28.40)^{gh}	27.2(31.43)^{de}	23.4(28.89)^{d}
Pusa hybrid - 6	41.7(40.22)^{k}	51.9(46.12)^{h}	46.4(42.91)^{i}
Annamalai	19.7(26.32)^{efgh}	23.9(29.22)^{cde}	24.0(29.33)^{de}
Sarukuvalayapatti Local	28.6(32.30)^{i}	38.4(38.31)^{g}	33.5(35.33)^{h}
Soorakundu Local	23.6(29.08)^{hi}	33.2(35.19)^{fg}	32.4(34.67)^{h}
Green Round	23.2(28.78)^{gh}	28.8(32.47)^{ef}	27.6(31.65)^{fg}
Pootheri Local	20.8(27.10)^{efgh}	25.3(30.19)^{de}	27.6(31.69)^{fg}
PKM - 1	19.2(25.95)^{efgh}	27.6(31.71)^{de}	27.2(31.42)^{fg}
KKM - 1	19.4(26.08)^{efgh}	27.8(31.81)^{de}	27.1(31.33)^{fg}
Nattu Kathiri	20.4(26.84)^{efgh}	24.6(29.76)^{de}	27.0(31.32)^{fg}
Mean	20.28(26.44)	25.60(30.06)	24.92(29.53)
SEd	1.60	1.58	1.27
CD at 5%	3.31	3.27	2.62

*Mean of 20 observations; **Mean of 11 harvests; Figures in parantheses are arcsine-transformed values In a column, means followed by the same letter(s) are not significantly different by DMRT (P=0.05)

(Krishnaiah and Vijay, 1975) and hard to semi-hard shoot and medium to dense pubescence (Raut and Sonone, 1980). Tolerant entries of brinjal are highly useful in IPM to augment the natural enemies rather than resistant and fairly resistant entries.

Two accessions, Soorakundu Local and Sarukuvalayapatti Local screened in the present study were susceptible to shoot and fruit borer which might be due to the softness of the shoot, sparse pubescence and spherical and oblong fruit with soft rind and loosely arranged seeds. Highly susceptible reaction was exhibited by the entries, Bejo Sheetal and Pusa hybrid-6, which is in conformity with Deependra Singh Yadav and Sharma (2005). The possible reasons for high susceptibility of Bejo Sheetal and Pusa hybrid-6 might be due to the round shaped fruit with less number of seeds and soft and smooth surface, as reported by Sharma *et al*. (1985) and Lal (1991).

Low damage by *H. vigintioctopunctata* was observed in six entries of brinjal, Sweta, Ravaiya, Apsar, Shubham (02), Kirti ARBH-555 and MEBH-11 and the infestation ranged from 8.0 to 9.6 per cent (Table 3). Annamalai recorded the moderate level of infestation by spotted leaf beetle, as suggested by Rajendran and Gopalan (1997) who reported that the varieties, EP 19, EP 45, EP 49, EP 68, EP 78, EP 55 and Annamalai were moderately resistant to *H. vigintioctopunctata*. In the present study, the entries, Soorakundu Local, Sarukuvalayapatti Local, Bejo Sheetal and Pusa hybrid-6 were infested with ash weevil. Ash weevil incidence was low and totally absent in all the entries of brinjal screened.

Table 2. Categorisation of brinjal varities based on the mean per cent fruit damage

Fruit damage (%)	Varities	Hybrids	Grade
0	Nil	Nil	Immune
1-10	Nil	Ravaiya, Sweta	Resistant
11-20	Nil	Apsara, Brinjal - 925, Kirti ARBH - 555, MEBH - 11, Shubham (02)	Fairly resistant
21-30	Annamalai, Green Round, Nattu Kathiri, Pootheri Local, KKM - 1, PKM - 1	BSS - 430 Darpan, Green Gold (EP-05), Haritha, MHBJ - 99, Shanthi, Super Usha, MEBH-9,Vijay (ARBH- 905)	Tolerant
31-40	Sarukuvalayapatti Local, Soorakundu Local	Nil	Susceptible
>41	Nil	Bejo Sheetal, Pusa hybrid -6	Highly Susceptible

The hybrids of brinjal, Sweta, Ravaiya, Kirti ARBH-555, Apsara, MEBH-11, Brinjal 925 and Shubham (02) designated as resistant and fairly resistant to *L. orbonalis* in the present study had also recorded the low population of mealybugs and aphids. Nattu Kathiri, KKM-1, PKM-1 and Pootheri Local designated as tolerant to *L. orbonalis* were found to record low population of *A. devastans* (Table 3). It is obvious that the entries of brinjal designated as resistant/ fairly resistant/ tolerant to *L. orbonalis* can also record low population of sucking pests as suggested by Muthukumar (2002). Gaikwad *et al*. (1991) reported KB 9, Pusa Purple Long, KP 10, L 13 and BB 1 as tolerant to *A. devastans*. PKM-1, KKM-1, Pootheri Local and Sooraku ndu Local were less susceptible to *B. tabaci*, recording a mean population of less than one per three leaves. Shunmugaraj (1995) reported few resistant entries (EP 55, EP 78, EP 52) to *B. tabaci*. The reasons attributed to the less susceptibility of above entries to sucking pests of brinjal are due to the poor quality of host plants with purple coloured leaves, as pointed by Kalra (2004).

In the present studies, Bejo Sheetal and Pusa hybrid-6 recorded high population of coccinellids, syrphids and spiders (Table 4). This might be due to volatile chemicals from susceptible plants promoting the population of natural enemies by hardening high pests load, as suggested by Ananthakrishnan and Raman (1993).

The ability of plant to withstand attack of insect is due to certain biochemical characteristics which exert unfavourable effects on the insects. The moisture content of the resistant entry of brinjal, Sweta was comparatively low (78.4 %) than the susceptible entries. The moisture content of leaves had significant positive correlation with shoot damage (r = 0.95) (Table 5). Similar correlation was reported by the earlier workers (Kale *et al*., 1986; Patil *et al*., 1994; Jat and Pareek, 2003; Dadmal *et al*., 2004) who reported increased palatability of the food material with more moisture content in case of susceptible varieties.

Ash content was high in resistant/ fairly resistant/ tolerant entries of brinjal (Sweta, Shubham (02), Green Gold (EP-05)) and it had negative correlation with shoot damage (r = - 0.92). This result is in conformity with the findings of Panda and Das (1975), Patil *et al*. (1994) and Dadmal *et al*. (2004 b) who reported a negative correlation between the ash content and infestation by the pest in brinjal.

A strong positive correlation was observed between the pest infestation and total chlorophyll content (r = 0.99). Maximum contents of total chlorophyll (1.86 mg/ g) was recorded in the highly susceptible cultivar (Bejo Sheetal) and minimum in resistant cultivar, Sweta (1.23 mg/ g). Similar results were reported by the earlier workers (Murugesh, 1997) in brinjal.

Phenols are the extremely abundant plant allelochemicals, often associated with feeding deterrence or growth inhibition of herbivores. Phenolics in a fairly large concentration could ward off insect pests because of direct toxicity (Mohan *et al*., 1987). In the present studies, maximum contents of total phenol was recorded in resistant cultivar, Sweta (7.61 mg/ g) and minimum in highly susceptible cultivar, Bejo Sheetal (1.95 mg/ g) indicating that it plays an important role in imparting resistance against the pest. A strong negative correlation was observed between the pest infestation and total phenol content (r = - 0.88) (Table 5). Raju *et al*. (1987); Darekear *et al*. (1991); Muthukumar (2002); Ranjan and Chakravarthi (2002); Jat and Pareek (2003); Dadmal *et al*. (2004) and Soundararajan and Baskaran (2005) reported similar type of correlation. In addition, Kalappanavar and Hiremath (2000) found that high phenolic content in resistant genotypes may be due to more sugars as it is the precursor for phenolic synthesis.

The lowest total sugars (5.76 mg/ g) was found in the resistant cultivar, Sweta as compared to highest quantity in the susceptible cultivar, Bejo Sheetal (18.02 mg/ g). A strong positive correlation between total sugars and the infestation of fruit borer was noticed (r = 0.89) (Table 5).

Table3. Screening brinjal entries for their reaction against spotted leaf beetle, *H. vigintioctopunctatata*, ash weevils, *Myllocerus* spp. Mealy bug, *C. insolitus*, *aphid, A. gossypii*, leafhopper, *A. devastans* and whitefly, *B. tabaci*

varities	Population (Nos./ three leaves)*					
	H. vigintioctopunctata	*Myllocerus* spp.	*C. insolitus*	*A. gossypii*	*A. devastans*	*B. tabaci*
Shanti	11.3(3.35)^{bcde}	0.00(0.71)^{a}	9.5(2.92)^{abcd}	12.0(3.32)^{cde}	0.00(0.71)^{a}	0.00(0.71)^{a}
Haritha	11.5(3.39)^{bcde}	0.00(0.71)^{a}	10.5(3.23)^{bcdef}	10.4(3.33)^{bcde}	0.00(0.71)^{a}	0.00(0.71)^{a}
Apsara	8.6(2.93)^{abc}	0.00(0.71)^{a}	8.5(2.92)^{abcd}	8.2(2.83)^{abc}	0.00(0.71)^{a}	0.00(0.71)^{a}
Sweta	8.0(2.82)^{a}	0.00(0.71)^{a}	6.5(3.20)^{bcdef}	6.3(2.90)^{abcd}	0.00(0.71)^{a}	0.00(0.71)^{a}
MHBJ - 99	11.9(3.45)^{cde}	0.00(0.71)^{a}	9.7(3.10)^{abcd}	11.4(3.51)^{bcde}	0.00(0.71)^{a}	0.00(0.71)^{a}
Vijay (ARBH - 905)	11.3(3.36)^{bcde}	0.00(0.71)^{a}	10.1(2.93)^{abcd}	11.0(3.51)^{bcde}	0.00(0.71)^{a}	0.00(0.71)^{a}
MEBH - 11	9.6(3.10)^{abcd}	0.00(0.71)^{a}	8.5(2.92)^{abcd}	10.2(3.19)^{bcde}	0.00(0.71)^{a}	0.00(0.71)^{a}
Green Gold (EP - 05)	11.3(3.35)^{bcde}	0.00(0.71)^{a}	10.2(2.55)^{a}	11.1(2.51)^{bcde}	0.00(0.71)^{a}	0.00(0.71)^{a}
Bejo Sheetal	19.6(4.42)^{h}	13.5(3.72)^{e}	19.5(4.42)^{g}	20.2(4.49)^{h}	10.4(3.23)^{g}	3.2(2.53)^{e}
Ravaiya	8.4(2.90)^{ab}	0.00(0.71)^{a}	7.5(2.72)^{abc}	8.5(2.92)^{abcd}	0.00(0.71)^{a}	0.00(0.71)^{a}
Brinjal - 925	10.1(3.14)^{abcd}	0.00(0.71)^{a}	8.6(3.17)^{abcde}	9.9(3.12)^{abcd}	0.00(0.71)^{a}	0.00(0.71)^{a}
Kirti ARBH - 555	9.5(3.08)^{abcd}	0.00(0.71)^{a}	8.5(3.00)^{abcd}	10.2(3.47)^{cdef}	0.00(0.71)^{a}	0.00(0.71)^{a}
Shubham (02)	8.9(2.99)^{abc}	0.00(0.71)^{a}	8.8(2.97)^{abcd}	9.0(3.23)^{bcde}	0.00(0.71)^{a}	0.00(0.71)^{a}
BSS - 430 Darpan	11.1(3.33)^{abcde}	0.00(0.71)^{a}	10.4(3.21)^{bcdef}	12.1(2.51)^{a}	0.00(0.71)^{a}	0.00(0.71)^{a}
MEBH - 9	10.9(3.29)^{abcde}	0.00(0.71)^{a}	10.4(3.21)^{bcdef}	12.0(3.46)^{cde}	0.00(0.71)^{a}	0.00(0.71)^{a}
Super Usha	10.7(3.27)^{abcd}	0.00(0.71)^{a}	10.8(3.28)^{cdef}	12.2(3.48)^{cdef}	0.00(0.71)^{a}	0.00(0.71)^{a}
Pusa hybrid - 6	20.5(4.53)^{h}	11.3(3.36)^{d}	19.1(4.37)^{g}	20.6(3.19)^{h}	6.8(2.61)^{f}	5.4(2.32)^{e}
Annamalai	16.2(4.03)^{fgh}	0.00(0.71)^{a}	11.0(3.29)^{cdef}	7.6(2.71)^{ab}	0.00(0.71)^{a}	0.00(0.71)^{a}
Sarukuvalayapatti Local	19.4(4.41)^{h}	6.4(2.53)^{c}	17.8(4.21)^{g}	17.0(4.30)^{fgh}	5.2(2.27)^{e}	2.8(1.63)^{d}
Soorakundu Local	18.4(4.29)^{gh}	5.0(2.22)^{b}	17.0(4.13)^{g}	18.4(3.80)^{gh}	4.6(2.14)^{e}	1.0(1.01)^{c}
Green Round	11.7(3.42)^{bcde}	0.00(0.71)^{a}	11.9(3.44)^{def}	12.3(4.13)^{def}	0.00(0.71)^{a}	0.00(0.71)^{a}
Pootheri Local	14.4(3.79)^{efg}	0.00(0.71)^{a}	14.5(3.81)^{fg}	12.6(3.37)^{def}	0.8(0.86)^{d}	1.0(0.52)^{b}
PKM - 1	16.4(4.05)^{fgh}	0.00(0.71)^{a}	11.1(3.34)^{cdef}	14.4(4.54)^{efg}	0.4(0.61)^{c}	0.3(0.78)^{c}
KKM - 1	11.7(3.43)^{bcde}	0.00(0.71)^{a}	14.1(2.64)^{ab}	12.2(3.50)^{def}	0.2(0.42)^{b}	0.6(0.47)^{b}
Nattu Kathiri	12.9(3.59)^{def}	0.00(0.71)^{a}	14.4(3.80)^{efg}	14.5(3.81)^{efg}	0.1(0.27)b	0.0(0.71)
Mean	12.6(3.51)	1.46(0.47)	11.59(3.31)	12.28(3.46)	1.14(0.50)	0.54(0.37)
SEd	0.25	0.08	0.30	0.32	0.08	0.12
CD at 5%	0.53	0.16	0.63	0.66	0.17	0.24

* Mean of 20 observations; Figures in parentheses are square root transformed values; In a column, means followed by the same letter(s) are not significantly different by DMRT (P=0.05)

Lapidus *et al*. (1963); Knapp *et al*. (1965) and Kalode and Pant (1967) reported that insect susceptible plant parts had higher concentration of sugars and also stated that the total soluble sugars acted as feeding stimulant in the susceptible varieties.

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Table 4. Natural enemies population in different brinjal entries

varities	Natural enemies (Nos./ plant)		
	Coccinellids	Syrphids	Spiders
Shanti	5.5(2.35)^{cde}	2.2(1.50)^{cde}	0.0(0.71)^{f}
Haritha	5.2(2.28)^{cde}	2.6(1.62)^{c}	0.0(0.71)^{f}
Apsara	2.2(1.47)^{gh}	0.4(0.65)^{k}	0.0(0.71)^{f}
Sweta	1.5(1.21)^{h}	0.3(0.51)^{k}	0.0(0.71)^{f}
MHBJ – 99	4.9(2.19)^{def}	2.3(1.51)^{cd}	0.0(0.71)^{f}
Vijay (ARBH 905)	5.9(2.42)^{cd}	2.2(1.47)^{cdef}	0.0(0.71)^{f}
MEBH - 11	1.8(1.35)^{h}	0.9(0.93)^{i}	0.0(0.71)^{f}
Green Gold (EP -05)	4.7(2.16)^{def}	2.5(1.59)^{c}	0.0(0.71)^{f}
Bejo Sheetal	12.0(3.46)^{a}	4.6(2.13)^{a}	0.3(0.52)^{c}
Ravaiya	1.7(1.27)^{h}	0.4(0.66)^{jk}	0.0(0.71)^{f}
Brinjal - 925	2.4(1.52)^{gh}	1.0(1.01)^{hi}	0.0(0.71)^{f}
Kirti ARBH - 555	1.9(1.36)^{h}	0.8(0.87)^{ij}	0.0(0.71)^{f}
Shubham 02	2.0(1.42)^{h}	0.5(0.68)^{jk}	0.0(0.71)^{f}
BSS - 430 Darpan	5.4(2.31)^{cde}	2.3(1.53)^{c}	0.0(0.71)^{f}
MEBH - 9	4.7(2.16)^{def}	2.7(1.65)^{c}	0.0(0.71)^{f}
Super Usha	5.5(2.35)^{cde}	2.5(1.60)^{c}	0.0(0.71)^{f}
Pusa Hybrid 6	8.5(2.92)^{b}	3.6(1.90)^{b}	1.0(1.01)^{a}
Annamalai	5.7(2.39)^{cd}	2.1(1.45)^{cdef}	0.0(0.71)^{f}
Sarukuvalayapatti Local	7.2(2.68)^{bc}	3.6(1.90)^{b}	0.2(0.47)^{cd}
Soorakundu Local	7.2(2.68)^{bc}	3.5(1.86)^{b}	0.2(0.42)^{de}
Green Round	4.5(2.12)^{def}	1.7(1.28)^{fg}	0.0(0.71)^{f}
Pootheri Local	4.3(2.08)^{def}	1.6(1.27)^{fg}	0.1(0.27)^{e}
PKM -1	3.9(1.95)^{ef}	1.7(1.30)^{defg}	0.6(0.74)^{b}
KKM -1	3.4(1.83)^{fg}	1.4(1.18)^{gh}	0.4(0.60)^{bcd}
Nattu Kathiri	5.2(2.28)^{cde}	1.7(1.29)^{efg}	0.0(0.71)^{f}
Mean	4.69(2.17)	1.96(1.33)	0.10(0.16)
SEd	0.56	0.10	0.08
CD at 5%	1.16	0.21	0.17

*Mean of 20 observations; Figures in parentheses are square root transformed values; In a column, means followed by the same letter(s) are not significantly different by DMRT (P=0.05)

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Table 5. Biochemical composition of leaves of brinjal varities

Varities	Shoot damage (%)	Moisture (%)*	Ash(%)*	Total (mg/ g) * Chlorophyll	Total Phenol (mg/ g) *	Total Sugars (mg/g) *
Sweta (R)	9.8(18.14)[a]	78.38(52.17)[a]	12.25(20.57)[a]	1.23(6.36)[a]	7.61(16.00)[a]	5.76(13.89)[d]
Shubham (02) (FR)	17.6(17.6)[b]	80.75(53.15)[b]	11.29(19.70)[b]	1.37(6.71)[b]	6.81(15.12)[b]	6.66(14.96)[d]
Green Gold (EP-05) (T)	20.4(26.84)[c]	84.27(54.98)[b]	11.10(19.49)[b]	1.47(6.96)[c]	3.87(11.33)[c]	11.91(20.16)[c]
Soorakundu Local (S)	23.6(29.08)[d]	86.68(55.94)[b]	10.22(18.56)[c]	1.61(7.29)[c]	2.60(9.27)[d]	16.41(23.90)[b]
Bejo Sheetal (HS)	35.7(36.64)[e]	89.21(67.40)[b]	10.06(18.54)[c]	1.86(7.82)[d]	1.95(8.01)[d]	18.02(25.12)[a]
Mean	21.42(27.13)	83.86(56.75)	10.98(19.37)	1.51(7.03)	4.57(11.95)	11.75(19.61)
SEd	0.08	2.42	0.21	0.13	0.34	0.50
CD (0.05%)	0.22	5.27	0.45	0.28	0.74	1.10
Correlation coefficient (r)		0.9514	-0.9176	0.9904	-0.8868	0.8976

*Mean of four replication; In a column, means followed by the same letter(s) are not significantly different by MRT (P=0.05) ; R: Resistant; FR: Fairly Resistant; T: Tolerant; S: Susceptible; HS: Highly Susceptible

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