



E-ISSN: 2320-7078

P-ISSN: 2349-6800

www.entomoljournal.com

JEZS 2021; 9(2): 117-121

© 2021 JEZS

Received: 16-01-2021

Accepted: 18-02-2021

Devashrayee Vaidik M

Department of Entomology,
N.M. College of Agriculture,
Navsari Agricultural University,
Navsari, Gujarat, India

DR Patel

Department of Entomology,
College of Agriculture,
Navsari Agricultural University,
Bharuch, Gujarat, India

SG Patel

Department of PI Pathology,
College of Agriculture,
Navsari Agricultural University,
Bharuch, Gujarat, India

A Shrivastava

Department of Agril. Statistics,
College of Agriculture,
Navsari Agricultural University,
Bharuch, Gujarat, India

Screening of Indian bean genotypes/cultivars against major insect pests

Devashrayee Vaidik M, DR Patel, SG Patel and A Shrivastava

Abstract

The investigations on varietal screening against pest complex of Indian bean were carried out at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat during year, 2019-20. Out of 10 genotypes/cultivars of Indian bean screened for their relative resistance against major insect pests, the genotype/cultivar NI-09-261 and GNIB-21 were found resistant whereas, Guj.Wal-2, NI-07-153, NI-05-26 and NI-06-74 were found susceptible against aphid. NI-09-261 and NI-08-198 were found resistant while, GNIB-21, Guj.Wal-1 and GNIB-22 susceptible against jassid. NI-09-261 and NI-07-153 were found resistant whereas, GNIB-22, Guj.Wal-2 and Guj.Wal-125-36 were found susceptible against whitefly. While, Guj.Wal-1 and NI-05-26 were found resistant and NI-08-198, Guj.Wal-125-36 and NI-09-261 were found susceptible against pod borers.

Keywords: Indian bean, genotype, resistant, susceptible

Introduction

In India pulses are grown on an area of 223.90 million hectares and production is nearly 142.44 million tonnes with the productivity of 623 kg/ha. Pulses occupy an area of 9.20 million hectares in Gujarat state and production is 6.64 million tonnes with the productivity of 685 kg/ha. Among the various pulses grown in Gujarat, the Indian bean occupy an area of 30,000 hectares with 27,000 tonnes production with an average productivity of 900 kg/ha^[1]. Insect pests are major constraints in reducing the productivity of Indian bean. Indian bean is attacked by a number of insect pests viz. aphid, *Aphis craccivora* Koch.; jassids, *Empoasca fabae* (Harris) and *E. kerri* Pruthi; pod borer, *Etiella zinckenella* (Treit.); whitefly, *Bemisia tabaci* (Genn.); stemfly, *Ophiomyia phaseoli* (Tryon); bihar hairy caterpillar, *Spilosoma oblique* (Walk.) etc.,^[5]. Among these, aphids, jassids and whiteflies have been reported as one of the major sucking pests infesting Indian bean. Both the nymphs and adults cause damage by sucking the cell sap from the tender portions of plant and also from lower portion of the leaves. In case of severe infestation, these pests attack all parts of the plants including pods which result in stunted growth and decreased yield^[5]. The pod borers were considered to be most important and they appeared regularly causing crop loss to the tune of 80-100 per cent^[7]. Host plant resistant does not involve any cost or applicable skill in pest control techniques. It is most useful when carefully utilized with other components of pest management. Therefore, evolution of varieties, genotypes against major pest was studied for their resistant.

Materials and Methods

With view to evaluate the varieties/genotype of Indian bean for their susceptibility against major insect pests experiment was conducted under filed conditions during 2019-20 at college farm, N.M.C.A., N.A.U., Navsari. Ten varieties/genotypes viz., GNIB-21, GNIB-22, Guj.Wal-1, Guj.Wal-2, Guj.Wal-125-36, NI-05-26, NI-06-74, NI-07-153, NI-08-198, NI-09-261 were sown in a plot size 1.8 m × 4.2 m with a spacing 60 cm × 30 cm in a Randomized Block Design (RBD) with three replications. All the recommended agronomical practices were followed to raising the crop. Three plants from net plot from each genotype/cultivar were selected randomly and tagged to record the observation. The whole plot was kept free from any insecticide application. The observations were recorded at weekly interval from one week after germination till to the harvesting of crop. Aphid population was recorded on three randomly selected twigs (about 10 cm in length) from each tagged plant and mean number of aphids per twig were counted. For recording the population of jassid and whitefly three leaves (from top, middle and bottom) of each tagged plant was observed and mean number of per leaf

Corresponding Author:**Devashrayee Vaidik M**

Department of Entomology,
N.M. College of Agriculture,
Navsari Agricultural University,
Navsari, Gujarat, India

were computed. Number of pod borers, larvae presented on tagged plants was recorded. For recording observations on pod damage by pod borer, total and damaged pod were counted at each picking from each plot. The Indian bean genotypes/cultivars were grouped in to six categories of resistance to pests viz., highly resistant, resistant, moderately resistant, moderately susceptible, susceptible and highly susceptible based on the population of pests per plant. For the

purpose, mean value of individual variety (\bar{X}_i) was compared with mean value of all genotypes (\bar{X}) and Standard Deviation (SD) following the modified scale adopted by [6]. The retransform data were used for computation of \bar{X} , \bar{X}_i and SD in case of this parameter. The scale used for categorizing different genotypes was as under.

Category of resistance	Scale for resistance
Highly Resistant	$\bar{X}_i < (\bar{X} - 2SD)$
Resistant	$\bar{X}_i > (\bar{X} - 2SD) < (\bar{X} - SD)$
Moderately Resistant	$\bar{X}_i > (\bar{X} - SD) < \bar{X}$
Moderately Susceptible	$\bar{X}_i > \bar{X} < (\bar{X} + SD)$
Susceptible	$\bar{X}_i > (\bar{X} + SD) < (\bar{X} + 2SD)$
Highly Susceptible	$\bar{X}_i > (\bar{X} + 2SD)$

Results and Discussion

Among different ten genotypes/cultivars (Table 1), significantly the lowest population of aphid was noticed on the genotype NI-09-261(12.18) followed by GNIB-21(15.03). The maximum population was noticed on NI-06-74 (27.99) and it was at par with NI-05-26, NI-07-153 and Guj.Wal-2 registered 27.73, 27.57 and 27.53 aphids/twig, respectively. Significantly lowest population of jassid was noticed on the genotype NI-09-261 (1.53) followed by NI-08-198 (2.08). The maximum population was noticed on GNIB-21 (4.35) and it was at par with Guj.Wal-1 and GNIB-22 registered 4.31 and 4.24 jassids/leaf, respectively. Significantly lowest population of whitefly was noticed on the genotype NI-09-261(1.54 whiteflies/leaf) followed by NI-07-153 (1.99). While maximum population was noticed on Guj.Wal-125-36 (4.25) and it was at par with GNIB-22 and Guj.Wal-2 registered 4.14 and 4.19 whiteflies/leaf, respectively. Among different ten genotypes/cultivars, significantly the lowest population of *H. armigera* and *M. vitrata* was noticed on the variety Guj.Wal-1(2.14, 2.31, respectively) followed by NI-05-26(2.72, 3.08, respectively).

Categorization of genotypes/cultivars for susceptibility

The genotype NI-09-261 and variety GNIB-21 were found resistant by recording less than 15.09 aphid per twig. Varieties GNIB-22 and Guj.Wal-125-36 were found

moderately resistant by recording population in between 15.09 and 21.27 aphids per twig. Variety Guj.Wal-1 and genotype NI-08-198 registered less population than 27.45 but more than 21.27 aphids per twig so considered as moderately susceptible. Whereas, genotypes/cultivars Guj.Wal-2, NI-07-153, NI-05-26 and NI-06-74 categorized as susceptible having more than 27.45 aphids per twig. The genotypes NI-09-261 and NI-08-198 were found resistant as it was recorded less than 2.27 jassids per leaf, whereas NI-07-153 was moderately resistant with population in between 2.27 and 3.23 jassids per leaf. The genotypes/cultivars, NI-06-74, Guj.Wal-2, NI-05-26 and Guj.Wal-125-36 showed population in between 3.23 to 4.19 jassids per leaf, hence categorized as moderately susceptible, while GNIB-21, Guj.Wal-1 and GNIB-22 had more than 4.19 jassids per leaf, so considered as susceptible. Looking to the whitefly population, genotypes NI-09-261 and NI-07-153 recorded less than 2.22 whiteflies per leaf and proved as resistant. Genotypes NI-08-198 and NI-05-26 considered as moderately resistant as it scored the whitefly population in the range of 2.22 to 3.15 whiteflies per leaf. Genotypes/cultivars GNIB-21, NI-06-74 and Guj.Wal-1 recorded less than 4.08 but more than 3.15 whiteflies per 3 leaf so considered as moderately susceptible (Table 2).

Pooled result (Table 3) revealed that the significant lowest pod damage was recorded in variety Guj.Wal-1(12.66%) and it was at par with genotype NI-05-26(15.50%). The variety Guj.Wal-2 recorded 36.83% pod damage and it was at par with GNIB-22(39.66%). While, genotype NI-06-74 recorded 48.00% pod damage and it was at par with NI-07-153(48.00%) and GNIB-21(46.16%). Highest percent pod damage was observed in genotype NI-09-261 (59.50%) and it was at par with NI-08-198(57.33%) and Guj.Wal-125-36 (56.33%).

The data on pod yield of Indian bean (Table 3) clearly revealed significant difference among the varieties under study. Maximum pod yield was recorded from genotypes/cultivars Guj.Wal-2(26.40 q/ha) whereas, minimum yield was observed from genotypes/cultivars NI-08-198(9.72 q/ha). The yield data indicated the following trend: Guj.Wal-2(26.40 q/ha) > NI-05-26(27.76 q/ha) > NI-09-261(24.06 q/ha) > Guj.Wal-1(23.14 q/ha) > GNIB-21(17.60 q/ha) > NI-06-74(16.66 q/ha) > NI-07-153(14.80 q/ha) > GNIB-22(10.80 q/ha) > Guj.Wal-125-36(10.20 q/ha) > NI-08-198(9.72 q/ha).

Earlier, [4] screened eleven genotypes of Indian bean against aphid, *A. craccivora* and reported that among eleven genotype, the lowest mean population of aphid was observed on genotype JDL-79-1 and VRSEM-11. While, the highest mean population of aphid was observed on genotype Ankur Goldy, Flora and Laxmi. [3] reported that among six cultivars, the lowest mean population of aphid was observed on genotype DOLVAR-4 and the lowest pod damage by *Helicoverpa armigera* was observed on genotype DOLVAR-4. The lowest population of jassid and whitefly was observed on variety PEP. According to [2] variety NIB-1 was found highly resistant and Tirupathi Local was categorized as moderately resistant to *M. vitrata*.

Table 1: Varietal screening of Indian bean against major insect pests

Sr. no	Genotypes/cultivars	Mean no. of insect pest (pooled over periods)				
		Aphid per twig of 10 cm	Jassid per leaf	Whitefly per leaf	<i>H. armigera</i> per plant	<i>M. vitrata</i> per plant
1	GNIB-21	3.88 (15.03)	2.08 (4.35)	1.81 (3.28)	1.97 (3.87)	2.05 (4.05)
2	GNIB-22	3.96 (15.70)	2.06 (4.24)	2.03 (4.14)	1.89 (3.58)	2.02 (4.10)
3	Guj.Wal-1	4.61 (21.33)	2.07 (4.31)	1.82 (3.31)	1.46 (2.14)	1.52 (2.31)
4	Guj.Wal-2	5.24 (27.53)	1.83 (3.34)	2.04 (4.19)	1.69 (2.87)	1.79 (3.20)
5	Guj.Wal-125-36	4.02 (16.23)	1.84 (3.40)	2.06 (4.25)	2.18 (4.77)	2.26 (5.10)
6	NI-05-26	5.27 (27.73)	1.83 (3.35)	1.76 (3.11)	1.65 (2.72)	1.76 (3.08)
7	NI-06-74	5.29 (27.99)	1.81 (3.28)	1.81 (3.28)	1.99 (3.95)	2.01 (4.04)
8	NI-07-153	5.25 (27.57)	1.56 (2.44)	1.41 (1.99)	2.01 (4.02)	2.05 (4.24)
9	NI-08-198	4.62 (21.40)	1.44 (2.08)	1.55 (2.42)	2.17 (4.73)	2.21 (4.92)
10	NI-09-261	3.49 (12.18)	1.24 (1.53)	1.24 (1.54)	2.19 (4.82)	2.22 (4.94)
Mean		21.27	3.23	3.15	3.75	4.00
S.E.m ±		0.20	0.08	0.07	0.06	0.06
S.E.m ± (P×T)		0.17	0.07	0.07	0.07	0.07
C.D at 5%		0.60	0.24	0.20	0.18	0.18
C.D at 5% (P×T)		0.47	0.20	0.21	0.19	0.22
C.V%		10.99	13.10	13.62	10.64	12.05

Table 2: Categorization of different genotypes/cultivars of Indian bean for their susceptibility to major insect pests

Category of resistance	Scale	Varieties
Population of aphid/ shoot \bar{X} = 21.27 SD = 6.18		
Highly Resistant (HR)	$\bar{X}_i < 8.91$	-
Resistant (R)	$8.91 < \bar{X}_i < 15.09$	NI-09-261(12.18)
		GNIB-21 (15.03)
Moderately Resistant (MR)	$15.09 < \bar{X}_i < 21.27$	GNIB-22 (15.70)
		Guj.Wal-125-36(16.23)
Moderately Susceptible (MS)	$21.27 < \bar{X}_i < 27.45$	Guj.Wal-1 (21.33)
		NI-08-198 (21.40)
Susceptible (S)	$27.45 < \bar{X}_i < 33.69$	Guj.Wal-2 (27.53)
		NI-07-153(27.57)
		NI-05-26(27.73)
		NI-06-74(27.99)
Highly Susceptible (HS)	$\bar{X}_i > 33.69$	-
Population of jassid/ leaf \bar{X} = 3.23SD = 0.96		
Highly Resistant (HR)	$\bar{X}_i < 1.31$	-
Resistant (R)	$1.31 < \bar{X}_i < 2.27$	NI-09-261(1.53)
		NI-08-198(2.08)
Moderately Resistant (MR)	$2.27 < \bar{X}_i < 3.23$	NI-07-153 (2.44)
Moderately Susceptible (MS)	$3.23 < \bar{X}_i < 4.19$	NI-06-74(3.28)
		Guj.Wal-2(3.34)
		NI-05-26(3.35)
		Guj.Wal-125-36(3.40)
Susceptible (S)	$4.19 < \bar{X}_i < 5.16$	GNIB-22(4.24)
		Guj.Wal-1(4.31)
		GNIB-21(4.35)
Highly Susceptible (HS)	$\bar{X}_i > 5.16$	-
Population of whitefly/leaf \bar{X} = 3.15SD = 0.93		
Highly Resistant (HR)	$\bar{X}_i < 1.29$	-
Resistant (R)	$1.29 < \bar{X}_i < 2.22$	NI-09-261(1.54)
		NI-07-153 (1.99)
Moderately Resistant (MR)	$2.22 < \bar{X}_i < 3.15$	NI-08-198(2.42)
		NI-05-26(3.11)
Moderately Susceptible (MS)	$3.15 < \bar{X}_i < 4.08$	GNIB-21(3.28)

		NI-06-74(3.28)
		Guj.Wal-1(3.31)
Susceptible (S)	4.08 < \bar{X}_i < 5.01	GNIB-22(4.14)
		Guj.Wal-2(4.19)
		Guj.Wal-125-36(4.25)
Highly Susceptible (HS)	$\bar{X}_i > 5.01$	-

Category of resistance	Scale	Varieties
Population of <i>H. armigera</i> / plant $\bar{X} = 3.75$ SD = 0.93		
Highly Resistant (HR)	$\bar{X}_i < 1.89$	-
Resistant (R)	1.89 < \bar{X}_i < 2.82	Guj.Wal-1 (2.14)
		NI-05-26 (2.72)
Moderately Resistant (MR)	2.82 < \bar{X}_i < 3.75	Guj.Wal-2 (2.87)
		GNIB-22 (3.58)
Moderately Susceptible (MS)	3.75 < \bar{X}_i < 4.67	GNIB-21 (3.87)
		NI-06-74 (3.95)
		NI-07-153 (4.02)
		NI-08-198 (4.73)
Susceptible (S)	4.67 < \bar{X}_i < 5.60	Guj.Wal-125-36 (4.77)
		NI-09-261 (4.82)
Highly Susceptible (HS)	$\bar{X}_i > 5.60$	-
Population of <i>M. vitrata</i> /plant $\bar{X} = 4.00$ SD = 0.90		
Highly Resistant (HR)	$\bar{X}_i < 2.19$	-
Resistant (R)	2.19 < \bar{X}_i < 3.09	Guj.Wal-1 (2.31)
		NI-05-26 (3.08)
Moderately Resistant (MR)	3.09 < \bar{X}_i < 4.00	Guj.Wal-2 (3.20)
Moderately Susceptible (MS)	4.00 < \bar{X}_i < 4.90	NI-06-74 (4.04)
		GNIB-21 (4.05)
		GNIB-22 (4.10)
		NI-07-153 (4.24)
Susceptible (S)	4.90 < \bar{X}_i < 5.81	NI-08-198 (4.92)
		NI-09-261 (4.94)
		Guj.Wal-125-36 (5.10)
Highly Susceptible (HS)	$\bar{X}_i > 5.81$	-
Notes: \bar{X} = Mean value of all varieties, \bar{X}_i = Mean value of individual varieties, SD = Standard Deviation		

Table 3: Pod damage caused by pod borer in different genotypes/cultivars of Indian bean

Sr. No.	genotypes/ cultivars	Pod damage (%)			Yield (q/ha)
		1 st picking	2 nd picking	Pooled	
T ₁	GNIB-21	45.00 (50.00)	40.54 (42.33)	47.76 (46.16)	17.60
T ₂	GNIB-22	40.00 (41.33)	38.04 (38.00)	30.1 (39.66)	10.80
T ₃	Guj.Wal-1	22.27 (15.00)	18.62 (10.33)	20.69 (12.66)	23.14
T ₄	Guj.Wal-2	38.62 (39.00)	36.07 (34.67)	37.74 (36.83)	26.40
T ₅	Guj.Wal-125-36	51.22 (60.67)	46.15 (52.00)	48.68 (56.33)	10.20
T ₆	NI-05-26	26.16 (19.67)	21.38 (13.33)	23.76 (15.50)	27.76
T ₇	NI-06-74	47.88 (55.00)	39.76 (41.00)	43.81 (48.00)	16.66
T ₈	NI-07-153	45.21 (50.33)	42.49 (45.67)	43.85 (48.00)	14.80
T ₉	NI-08-198	51.62 (61.33)	46.92 (53.33)	49.26 (57.33)	9.72
T ₁₀	NI-09-261	52.56 (63.00)	48.49 (56.00)	50.52 (59.50)	24.06
S. Em. \pm		2.20	2.23	1.56	1.24
S.E.m \pm (P×T)		-	-	2.21	-
C. D. at 5%		6.53	6.63	4.49	3.71
C.D at 5% (P×T)		-	-	NS	-
C. V.%		9.05	10.21	9.59	10.71

Figure in parentheses are retransform value whereas, those outside are arcsine transformed values.

Conclusion

Among 10 different genotypes/cultivars, NI-09-261 and GNIB-21 were found resistant against aphid, NI-09-261 and NI-08-198 was found resistant against jassid, NI-09-261 and NI-07-153 were found resistant against whitefly. While, Guj.Wal-1 and NI-05-26 were found resistant against pod borer. So these genotypes/cultivars can be utilized for the further breeding program.

References

1. Anonymous. Annual Research Report (Pulse Entomology): 1999 - 2000. Main Pulse Research Station, GAU, Sardarkrushinagar (Unpublished) 2000.
2. Bharathi VD, Viji CP, Reddy PD, Sravani D. Incidence of spotted pod borer, *Maruca vitrata* (Geyer) in Indian bean, *Lablab purpureus* var. *Typicus* in unprotected conditions. Journal of pharmacognocny and Phytochemistry 2020;9(4):499-502.
3. Chouragade V, Shukla A, Sharma A, Bijewar AK. Evaluation of Indian bean genotypes against insect pests. Journal of Entomology and Zoology Studies 2018;6(5):1968-1971.
4. Godwal B. Population dynamics and varietal preference of aphid, *Aphis craccivora* Koch on Indian bean. M.Sc. (Agri) thesis submitted to Rajasthan Agricultural University, Bikaner 2010.
5. Jakhar S, Choudhary PK, Nagal G. Study of the seasonal incidence of hemipteran pests of Indian bean, *Lablab purpureus* (L.) and its natural enemies in semi-arid conditions of Rajasthan. Trends in Biosciences 2017;10(21):4188-4191.
6. Patel IS, Prajapati BG, Patel GM, Pathak AR. Response of castor genotypes to castor semilooper, *Achaea janata* Fab. Journal of Oilseeds Research 2002;19(1):153.
7. Reddy SS, Reddy CN, Srinivas C, Rao AM, Reddy SN. Studies on population dynamics of spotted pod borer *Maruca vitrata* in dolichos bean, *Lablab purpureus* L. and their relation with abiotic factors. International Journal of Pure and Applied Biosciences 2017;5(4):1232-1239.