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Shashi Mani Tripathi
Department of Entomology, ANDUA & T Kumarganj, Ayodhya, Uttar Pradesh, India

AK Singh
Department of Entomology, ANDUA & T Kumarganj, Ayodhya, Uttar Pradesh, India

Pankaj Kumar
Department of Entomology, ANDUA & T Kumarganj, Ayodhya, Uttar Pradesh, India

Suraj Kumar
Department of Entomology, ANDUA & T Kumarganj, Ayodhya, Uttar Pradesh, India

Hari Krishna
Department of Entomology, ANDUA & T Kumarganj, Ayodhya, Uttar Pradesh, India

Corresponding Author:
Shashi Mani Tripathi
Department of Entomology, ANDUA & T Kumarganj, Ayodhya, Uttar Pradesh, India

Screening of mungbean germplasm against major insect pests

Shashi Mani Tripathi, AK Singh, Pankaj Kumar, Suraj Kumar and Hari Krishna

Abstract
Among 50 genotypes (including two checks) of mungbean screened during *Kharif* 2016. Seven genotypes were found highly susceptible, twenty genotypes moderately susceptible while twenty one genotypes were found least susceptible. The population of white fly, jassid and thrips initiated at 20 days after sowing (DAS) while the larval population initiated at 45 DAS and continued till the harvesting of the crop. The population of white fly/cage, jassid/cage, thrips/10 flowers, mean larval population/5 plants and pod damage percentage ranged between 1.20 to 5.89, 0.41 to 1.20, 0.67 to 1.78, 1.00 to 2.48 and 4.00 to 13.88% respectively.

Keywords: Screening, susceptible, white fly, jassid, thrips and pod borer

Introduction
Mungbean, *Vigna radiate* (L.) Wilczek, is an important short duration summer food legume and is the most important pulse crop of India after chickpea and pigeonpea. Being an important short duration *Kharif* grain legume mungbean is grown extensively in major tropical and subtropical countries of the world [2]. In India mungbean crop is raised in three seasons *viz.*, *kharif, rabi* and *zaid* to the production about 3.88 million tones with an average productivity of 474 kg/ hectare. In Utter Pradesh, green gram is being cultivated on 0.79 million hectares that produce 0.39 million tone of green mung with an average productivity of 494 kg/ hectare [1].
Various factors affect yield of mungbean *viz.*, seed germination, method of sowing, irrigation, fertilizers, temperature, humidity, diseases and various insect-pests. Lal *et al.*, [5] had reported sixteen species of insect-pests causing damage to mungbean *viz.*, whitefly (*Bemisia tabaci*), jassid (*Amrasca biguttula biguttula*), thrips (*Megalurothrips distalis*), Bihar hairy caterpillar (*Spilaractia oblique*), Red hairy caterpillar (*Amsecta moorei and A. albistriga*), Tobacco caterpillar (*Spodoptera litura*) and stemfly (*Ophiomiya phaseoli*).
Among the sucking pests, whitefly (*Bemisia tabaci*) (Aleyrodidae: Hemiptera) is a serious pest. They suck the sap from under surface of leaves which result chlorotic spots and also pre-mature dropping of leaves. It also leads to development of sooty mould on leaves that interfere with photosynthetic activity [7]. It also acts a vector of Mungbean Yellow Mosaic Virus (MYMV) which is a serious viral disease of mungbean that causes heavy yield losses. Jassid, *Amrasca biguttula biguttula* (Ishida) is an alarming pest throughout the crop growth. Both the nymphs and adults suck the sap from leaves and cause phytotoxic symptoms known as hopper burn which results in complete desiccation of plant and has become one of the limiting factors in economic productivity b of the crop. *Etiella zickenella* is a moth of the family Pyralidae whose caterpillars feed on the mungbean, frenchbean (*Phaseolus lunatus*) and other species of Fabaceae. They have also been recorded on *Catha edulis* (Celastraceae). Complete stripping of the plants results from the extensive feeding of *Spodoptera* larvae. *Helicoverpa armigera* severely damage all crop stages and all plant parts of mungbean. The larvae focus on the buds and flowers before attacking pods. Small pods may be totally consumed, but larvae target the seeds in large pods. Keeping in view the aforesaid fact and knowing the seriousness of the problem, the present study was undertaken to screen the mungbean germplasm capable of reducing yield losses in green gram.

Materials and Methods
A total of 50 germplasms including two checks (SML 1811-R & ML623-S) were sown in

Augmented block design for screening major insect pests under field conditions. All the recommended agronomical practices were used to grow a good crop. Each genotype was assigned 2 rows of 2 m length. Resistant and susceptible checks were sown after every 10 genotypes. Whitefly and jassid populations were recorded on 5 randomly selected plants at weekly interval starting with 20 days after sowing (DAS) till harvesting by using rectangular cage (45cm long, 30cm wide and 90cm high) between 5-7 a.m. Thrips populations were recorded at weekly intervals on 5 randomly selected plants staring with 50% flowering till harvest in terms of number/plants. Larval populations of pod borer complex were recorded at weekly intervals on 5 randomly selected plants starting with 50% flowering till harvest.

The pest susceptibility rating (PSR) for pod is worked out as per the formula given by Bant Singh Kooner and Harpreet Kaur Cheema [3]

$$\text{Pest susceptibility (\%)} = \frac{\text{\% pod damage in check cultivar - \% pod damage in test cultivar}}{\text{\% pod damage in check cultivar}} \times 100$$

PSR Rating

Pest susceptibility (%)	Susceptibility rating	Category (1-9 scale)
100	1	Highly Resistant (HR)
75 to 99.9	2	Highly Resistant (HR)
50 to 74.9	3	Least Susceptible (LS)
25 to 49.9	4	Least Susceptible (LS)
10 to 24.9	5	Least Susceptible (LS)
-10 to 9.9	6	Moderately Susceptible (MS)
-25 to-9.9	7	Moderately Susceptible (MS)
-50 to -24.9	8	Highly Susceptible (HS)
-50 or less	9	Highly Susceptible (HS)

Results and Discussion

The result presented in Table 1. 50 genotypes of mungbean were screened in the field during *Kharif* 2016 to check the susceptible per cent of pod borers. On the basis of pod damage per cent and PSR, entries fell under the categories highly susceptible (8 to 9), moderately susceptible (6 to 7) and least susceptible (3 to 5) PSR. The seven genotypes viz., PUSA 1472, IPM 9901-8, IPM 2K-15-4, IPM05-17, PUSA 1471, PM09-11 and MH 2-15 were found highly susceptible. Similarly twenty genotypes viz., IPM 440-3, KM 2342, PUSA 0672, TMB 45, IGKM 05-26-3,Vamban 7, DGG 3, ML 2333, HUM 27, IPM 2-14, IPM 2-3, HUM 12, IPM 10-14, PUSA 1371, GM 11-02, VGG 05-006, MH 810, Selection 4, DGGV 2 and LGG 460 fell under moderately susceptible category. The twenty one genotypes viz., NDMK 13-1, SGC 20, COGG 10-10, TARM-1, MH 934, NVL 641, DGG 6, DGG 1, HUM 1, AKM 12-10, AKM- 4, RMG 10-30, RMG 10-20, ML1779, DGG 5, GM 04-02, HUM 12, ML 2056, IPM 9901-8, ML 1774 and NVL 516 were found least susceptible.

Screening of 50 germplasms revealed that population of whitefly/cage, jassids/cage (taken on 5 plants), thrips/10 flowers and pod borers larvae/plant initiated in most of the germplasms at 20 days after sowing (DAS) till harvesting the population of whitefly/cage, thrips/10 flowers, pod borer complex and pod damage percent ranged between 1.20 to 5.89, 0.41 to 1.20, 0.67 to 1.78 and 1 to 2.48 respectively. The pod damage % in different germplasms ranged from 4.0 to 13.88%. The maximum population of whitefly was recorded in germplasm PM 09-11(5.89 whitefly/cage) followed by IPM 05-17 (5.44 whitefly/cage) while minimum population of 1.20 whitefly/cage in germplasms IPM 9901-8 in comparison on to check germplasm (SML 1811 R) and (ML 623 S) where population recorded was 1.20 and 4.80 whitefly/cage respectively. The maximum population of jassid was recorded in germplasms ML 1774 (1.20 jassid/cage) followed by RMG 10-20 (1.19 jassid/cage) and the minimum population of 0.41 jassid/cage in germplasm TRAM-1 and IPM 10-14 in comparison to check germplasm (SML 1811 R and ML 623 S) where population recorded was 0.67 and 1.67 jassid/cage respectively. The maximum population of thrips/10 flowers was recorded in germplasm PUSA 0672 (1.78 thrips/10 flowers) followed by GM 11-02 (1.67 thrips/10 flowers) and minimum population of 0.67 thrips/10 flowers in germplasm MH 810 in comparison to check germplasm (SML 1811 R and ML 623 S) where population recoded was 1.22 and 1.87 thrips/10 flowers respectively. The present findings are in partial agreement with findings of Nadeem *et al.*,[5] who found the lowest number of whitefly (3.7±1.20) in MH 1353 and highest (11±1.53) in MH 34143, lowest number of jassid (1.2) in MH 3153 and highest of 3.3 in AZRI 2006 and the lowest number of thrips (4±1) in MH 3153 and highest (12.3±0.67) in MH 34143 while the respective number of these sucking pests in the present study ranged between 1.20 to 5.89, 0.41 to 1.20 and 0.67 to 1.78. The maximum pod borer larvae were recorded in germplasm PUSA 1472 (2.48 larvae/plant) followed by IPM 9901-8 and MH 2-15 (2.25 larvae/plant) and minimum of 1 larvae/plant in germplasm NVL 516. The present findings are also accordance with the finding of Soundararajan and Chitra [8] who screened 51 black gram for resistant against pod borer complex during *Kharif* 2012 and found that the larval population ranged from (0.33-4.67/ plant) whereas in the present study the population of pod borer larvae/plant ranged from 1 to 2.48. The maximum pod damage % was recorded in germplasm PUSA 1472 (13.88% pod damage) followed by IPM 9901-8(10.27% pod damage) and minimum (4 % pod damage) in germplasm ML 2056 in comparison on to check germplasms (SML 1811 R and ML623 S) where pod damage % recorded was 5.03 and 7.32 % pod damage respectively. Out of 50 genotypes of mungbean were screened in the field during *Kharif* 2016, check the susceptible % of pod borer. The seven genotypes viz., PUSA 1472, IPM 9901-8, IPM 2K-15-4, IPM 05-17, PUSA 1471, PM 09-11 and MH 2-15 were found highly susceptible (PSR 8 to 9). Similarly twenty genotypes viz., Similarly twenty genotypes viz., IPM 440-3, KM 2342, PUSA 0672, TMB 45, IGKM 05-26-3,Vamban 7, DGG 3, ML 2333, HUM 27, IPM 2-14, IPM 2-3, HUM 12, IPM 10-14, PUSA 1371, GM 11-02, VGG 05-006, MH 810, Selection 4, DGGV 2 and LGG 460 fell under moderately susceptible category (PSR 6 to 7). The twenty one genotypes viz., NDMK 13-1, SGC 20, COGG 10-10, TARM-1, MH 934, NVL 641, DGG 6, DGG 1, HUM 1, AKM 12-10, AKM- 4, RMG 10-30, RMG 10-20, ML1779, DGG 5, GM 04-02, HUM 12, ML 2056, IPM 9901-8, ML 1774 and NVL 516 were found least susceptible (PSR 3 to 5). The results are in conformity with Kooner and Cheema [4] who found the pest susceptibility rating (PSR). The PSR ranging from 3 to 3.5 in the promising entries AL1458, AL1502, AL1340, while the PSR of the least susceptible genotype in the present study ranged from 3 to 5. He recorded the PSR 6 on the infestor varieties while in the present study the PSR infestor variety recorded was 8 to 9.

Table 1: Mean population of insect pests

S.No.	Entries	Mean population of insect pests			Mean no. of pod borers/5 plants	Pod damage %
		White fly/Cage	Jassid/Cage	Thrips/ 10 flowers		
1	IPM 9901-8	2.59	0.63	1.64	2.25	10.27
2	IPM 2K-15-4	2.56	0.66	1.29	2.21	9.63
3	IPM 440-3	1.96	0.59	1.30	2.10	9.00
4	NDMK 13-1	2.37	0.84	1.38	1.80	6.33
5	HUM 27	2.52	0.77	1.46	1.91	7.87
6	KM 2342	3.07	0.85	1.57	2.00	8.47
7	IPM 05-17	5.44	1.19	0.96	2.20	9.87
8	DGG-5	2.89	0.67	1.26	1.61	5.44
9	IPM 2-14	2.93	0.74	1.49	1.92	7.52
10	IPM 2-3	2.93	1.07	1.39	1.94	7.58
11	HUM 12	4.19	0.63	1.21	1.85	7.47
12	IPM 10-14	2.63	0.41	1.61	1.81	6.63
13	PUSA 1371	1.63	0.63	1.22	1.91	7.76
14	PUSA 1471	1.96	0.56	0.82	2.22	10.13
15	PUSA 0672	2.33	0.67	1.78	2.19	8.22
16	PUSA 1472	2.30	0.59	1.46	2.48	13.88
17	GM 04-02	4.93	0.96	1.56	1.33	5.33
18	PM 09-11	5.89	0.85	1.14	2.19	9.33
19	TMB 45	3.22	0.48	1.17	2.15	8.94
20	GM 11-02	2.52	0.67	1.67	1.93	7.45
21	SGC 20	2.81	0.74	1.42	1.61	5.52
22	HUM 12	2.22	0.96	1.18	1.32	4.70
23	MH 2-15	2.41	1.07	1.21	2.25	10.22
24	VGG 05-006	2.70	0.59	1.41	1.91	7.76
25	COGG 10-10	2.81	0.93	1.28	1.67	5.86
26	TARM 1	2.93	0.41	1.21	1.65	5.61
27	ML 2056	1.90	0.56	0.88	1.20	4.00
28	IGKM 05-26-3	2.26	0.59	1.03	2.11	8.10
29	Vamban 7	2.07	0.67	1.22	2.19	9.03
30	NVL 516	2.56	0.81	1.14	1.00	4.12
31	DGG 3	2.19	0.78	0.98	2.10	8.22
32	MH 934	2.11	0.70	1.38	1.91	6.41
33	ML 2333	1.70	0.74	1.24	2.08	8.83
34	MH 810	2.48	0.93	0.67	1.93	7.80
35	NVL 641	1.89	0.76	0.89	1.69	5.84
36	DGG 6	1.52	0.56	1.40	2.00	6.57
37	DGG 1	2.15	0.67	1.22	1.17	5.65
38	Selection 4	1.74	1.07	1.18	2.03	6.74
39	DGGV 2	2.07	0.78	1.11	1.21	7.59
40	HUM 1	1.56	0.81	1.09	1.19	5.51
41	AKM 12-10	1.81	0.63	0.98	1.61	5.61
42	AKM 4	1.63	0.96	1.04	1.64	5.74
43	RMG 10-30	1.59	0.67	0.87	1.80	6.32
44	RMG 10-20	1.81	1.19	1.11	1.31	5.02
45	IPM 9901-8	1.20	0.68	0.88	1.30	5.00
46	ML 1774	1.60	1.20	0.96	1.62	6.00
47	ML 1779	1.80	0.90	1.00	1.60	5.58
48	LGG 460	2.10	0.86	1.10	2.00	6.60
49	SML 1811(R)	1.20	0.67	1.22		5.03
50	ML 623(S)	4.80	1.67	1.87		7.32

Conclusion

During the screening of mungbean germplasms against whitefly, jassid, thrips and pod borers population. Out of 50 mungbean germplasms screened against whitefly, jassid, thrips and pod borers 7 genotypes viz., PUSA 1472, IPM 9901-8, IPM 2K-15-4, IPM 05-17, PUSA 1471, PM 09-11 and MH 2-15 were found highly susceptible while 20 genotypes viz., IPM 440-3, KM 2342, PUSA 0672, TMB 45, IGKM 05-26-3,Vamban 7, DGG 3, ML 2333, HUM 27, IPM 2-14, IPM 2-3, HUM 12, IPM 10-14, PUSA 1371, GM 11-02, VGG 05-006, MH 810, Selection 4, DGGV 2 and LGG 460 fell under moderately susceptible category and remaining The 21 genotypes namely NDMK 13-1, SGC 20, COGG 10-10, TARM-1, MH 934, NVL 641, DGG 6, DGG 1, HUM 1, AKM 12-10, AKM- 4, RMG 10-30, RMG 10-20, ML1779, DGG 5, GM 04-02, HUM 12, ML 2056, IPM 9901-8, ML 1774 and NVL 516 were found least susceptible.

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