Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(2): 933-938
Received: 01-01-2019
Accepted: 04-02-2019

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Screening of green gram genotypes for resistance against sucking insect pests

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Abstract
An experiment was conducted at Agronomy Farm, S. K. N. College of Agriculture, Jobner (Rajasthan) during *Kharif*, 2015 for screening of 11 genotypes of green gram [*Vigna radiata* (L.) Wilezek] against white fly (*Bemisia tabaci*), jassid (*Empoasca kerri*). The initiation of jassid and whitefly population recorded in the first week of August (32 SMW) which reached its peak in first week of September, *i.e.* 36th SMW (12.90 jassid and 14.20 whitefly/ three leaves) when maximum temperature, minimum temperature and relative humidity was 36.1 and 21.7^{0}C and 90 per cent, respectively and gradually decline thereafter. Out of eleven genotypes of green gram screened for relative resistance against white fly (*Bemisia tabaci*), jassid (*Empoasca kerri*). Genotypes, RMG-344, RMG-1051 were categorized as highly resistance, RMG-1079, RMG-975, MUN-2, RMG-1010, MSG-118 and RMG-1076 as moderately resistance, followed by RMG-492, RMG-268 and RMG-62 as less resistance.

Keywords: Genotypes of green gram, sucking insect pests, resistance, whitefly, jassid

Introduction
Green gram [*Vigna radiata* (L.) Wilczek], (synonyms, *Phaseolus aurius* Roxb., *Phaseolus radiatus* L.) It is one of important pulse crops for diversifying cereal-based cropping systems worldwide. In India pulses have been considered poor men meat, also play major role in sustainable agriculture because pulses improve soil fertility through nitrogen fixation. It is estimated that, in India pulses are grown in 25.22 million ha, area yielding 19.27 million tones with an average yield of 764 kg ha^{-1}(Anonymous 2013-14 a). In India during 2013-14 Green gram was cultivated on 3.28 million ha area and its production and productivity was 1.55 million tones and 317 kg ha^{-1}, respectively (Anonymous 2013-14 a). Green gram is the most important pulse crop of India after chickpea and pigeon pea. India alone accounts for 65% of its world acreage and 54% of the production. It is grown in about 3.50 million hectares (Mha) in the country mainly in Rajasthan, Maharashtra, Andhra Pradesh, Karnataka, Orissa and Bihar. It is an excellent source of protein (24.5%) with high quantity of lysine and tryptophan and forms a major part of the food of local population. Besides pulse, it is also consumed as boiled fried and as roasted form all over the country. It enhances the soil fertility by absorbing the atmospheric nitrogen, so it is used as a green manure crop. It is also used as cattle feed along with roughage crops.

In India about 62 species of insect Pest have been recorded from Green gram but only some species cause economic damage and are more common overlarge areas. The crucial insect pests damaging the Green gram are whitefly, jassid, thrips, pod sucking bug, pod borers, stem fly and aphid which are key constraints in cultivation of Green gram. Nymphs and adults of jassid suck the cell sap from ventral surface of leaves and prolonged feeding causes “Hopper Burn”. In which the older leaves below the growing tips burn first. They inject toxin with saliva, induce cell swelling, crush phloem and disrupt movement of photosynthates in plants. As a result of their feeding, the affected parts become yellowish, the leaves wrinkle and curl downwards and are ultimately shed. Besides the feeding, these insects exude honey dew which favors the development of sooty mould which hinders the photosynthesis of the plant resulting in stunting growth. Besides this both nymphs and adults of whitefly infest plants by sucking the juices from new growth causing stunted growth, leaf yellowing and reduced yields. Plants become weak and susceptible to disease.

In order to prevent the infestation of the insect pests and to produce a quality crop, it is essential to manage the pest population at appropriate time with suitable measures. For control these insect pests chemical insecticides are used indiscriminately which cause drastic adverse effects on environment as well as on animal and human health hazards. For obtaining higher yield of a good quality, it is necessary to adopt insect pest management practices which are economically feasible, environmentally sound and sociologically acceptable.

Materials and Methods

The present investigations were carried out at S. K. N. college of Agriculture, Jobner, during *kharif*, 2015. Being a leguminous crop, green gram needs a small quantity of nitrogen for early growth period. Fertilizers were applied at the rate of 20 kg of nitrogen per hectare as a starter dose and 40 kg phosphorus per hectare in the soil before sowing. The seed @ 12 kg ha^{-1} was used and before sowing it was treated with fungicide, bavistin @ 2.0 g /kg of seed and also with rhizobium culture, *Rhizobium phaseoli.* The seeds were sown on 13 July2015 in an already laid out Randomized Block Design. the eleven green gram genotypes RMG-492, RMG-975, RMG-62, RMG-980, RMG-268, RMG-344, RMG-1051, RMG-1076, RMG-1079, MSG-118, MUM-2 screened for varietal resistance against insect pests were considered as treatments.

The genotypes were allowed to have a natural infestation. Weekly observations on population of jassid and whitefly were recorded soon after their appearance till maturity of the crop. The method used for recording the population of measure insect pests was same as *Vide Supra* 3.1.7. Interpretation of data; The data obtained on jassid and whitefly population from the experimental field were transformed into $\sqrt{X + 0.5}$ (Gomez and Gomez, 1976) and subjected to analysis of variance. The peak population of jassid and whitefly on green gram genotypes recorded during the crop season was categorized based on formula $X \pm \sigma$ (Pradhan, 1964).

Where, X = Mean of peak population, and σ = Standard deviation

Results and discussion

Eleven genotypes of green gram, were screened for relative resistance to sucking insect pests during the year, 2015. The infestation was recorded at weekly interval on five randomly selected and tagged plants just after initiation of sucking insect pests to disappearance.

Jassid, *Empoasca motti*: The data on the relative susceptibility of green gram genotypes against jassid population recorded during the crop season at weekly interval have been presented revealed that none of the genotypes of green gram was found completely free from the attack of jassids. The first observation was taken on 6th August 2015. The mean jassid population ranged from 0.87 (RMG-1051) to 2.30 (RMG-268) jassids per three leaves/ plant. The minimum infestation was observed on genotype, RMG-1051 followed by MSG-118, RMG-344, RMG-1076, RMG-1079 and these were statistically non-significant in their degree of infestation. The maximum infestation was observed on genotype RMG-268 followed by RMG-492, RMG-62, RMG-975 were found at par with MUN-2. The variability of susceptibility in green gram genotypes was in the order of RMG-1051 <MSG-118 <RMG-344 <RMG-1076 <RMG-1079 <RMG-1010 <MUN-2 <RMG-975 <RMG-62 <RMG-492 <RMG-268.

Table 1: Screening of different genotypes of green gram against jassid, *Empoasca motti* Pruthi

S. No.	genotypes	Mean jassid population/ three leaves								
		06.08.2015	13.08.2015	20.08.2015	27.08.2015	03.09.2015*	10.09.2015	17.09.2015	24.09.2015	Mean
1.	RMG-62	1.90	4.50	5.10	9.60	13.70	8.70	7.08	3.28	6.53
		(1.55)	(2.24)	(2.37)	(3.18)	(3.76)	(3.03)	(2.75)	(1.94)	(2.65)
2.	RMG-268	2.30	4.43	5.93	9.58	13.58	8.90	6.83	4.20	6.67
		(1.67)	(2.22)	(2.54)	(3.17)	(3.75)	(3.07)	(2.71)	(2.17)	(2.68)
3.	RMG-344	1.10	2.08	4.08	7.50	6.50	4.80	3.90	2.50	4.28
		(1.26)	(1.61)	(2.14)	(2.62)	(2.64)	(2.30)	(2.10)	(1.73)	(2.19)
4.	RMG-975	1.90	3.90	4.40	9.50	10.90	8.75	5.93	3.80	6.14
		(1.55)	(2.10)	(2.21)	(3.16)	(3.38)	(3.04)	(2.54)	(2.07)	(2.58)
5.	RMG-1010	1.60	4.10	5.23	8.95	11.10	8.10	6.15	4.20	6.18
		(1.45)	(2.14)	(2.39)	(3.07)	(3.41)	(2.93)	(2.58)	(2.17)	(2.58)
6.	RMG-1051	0.87	2.50	3.10	6.50	7.20	11.10	6.20	2.70	4.51
		(1.17)	(1.73)	(1.90)	(2.64)	(2.77)	(3.40)	(2.58)	(1.79)	(2.24)
7.	RMG-1076	1.20	2.30	4.63	8.90	11.80	6.08	4.23	3.10	4.54
		(1.30)	(1.67)	(2.26)	(3.06)	(3.50)	(2.57)	(2.17)	(1.90)	(2.25)
8.	RMG-1079	1.23	2.90	4.91	6.95	10.60	7.10	5.20	3.45	5.07
		(1.32)	(1.84)	(2.33)	(2.73)	(3.33)	(2.76)	(2.39)	(1.99)	(2.36)
9.	MSG-118	0.97	3.10	3.40	7.80	11.20	7.90	4.80	2.80	4.99
		(1.21)	(1.90)	(1.97)	(2.88)	(3.42)	(2.90)	(2.30)	(1.82)	(2.34)
10	MUM-2	1.73	2.40	4.23	8.10	11.00	6.80	5.73	3.30	5.17
		(1.49)	(1.70)	(2.17)	(2.93)	(3.39)	(2.70)	(2.50)	(1.95)	(2.38)
11	RMG-492	2.00	5.10	3.40	10.90	13.40	9.80	6.50	4.00	6.80
		(1.58)	(2.37)	(1.97)	(3.38)	(3.70)	(3.21)	(2.65)	(2.12)	(2.70)
	S.E.m±	0.03	0.04	0.05	0.05	0.06	0.07	0.07	0.05	0.05
	CD at 5%	0.09	0.12	0.15	0.14	0.18	0.21	0.20	0.15	0.16

*Peak population of jassid during crop season

Figures in the parentheses are $\sqrt{x+0.5}$ values

The second observation was taken on 13th August 2015 in which the mean jassid population ranged from 2.08 (RMG-344) to 5.10 (RMG-492) jassids per three leaves/ plant. The minimum infestation of jassids was observed on genotype RMG-344 followed by RMG-1076, MUN-2, RMG-1051 and RMG-1079 and all these were statistically non-significant with each other. The maximum infestation was observed on genotype RMG-492 which was found non-significant with RMG-62, RMG-268 and RMG-1010. The genotypes, RMG-1010, RMG-975 and MSG-118 was found at par and moderately infested. The variability of susceptibility in green gram genotype was in the order of RMG-344 <RMG-1076 <MUN-2 <RMG-1051 <RMG-1079 <MSG-118 <RMG-975 <RMG-1010 <RMG-268 <RMG-62 <RMG-492.

The third observation was taken on 20th August 2015 in which the mean jassid population ranged from 3.10 (RMG-1051) to 5.93 (RMG-268) jassids per three leaves/ plant. The minimum numbers of jassids was recorded on genotype RMG-1051 followed by MSG-118, RMG-492, RMG-344 and MUN-2, however, all the five genotypes were statistically at par with each other. The maximum infestation was observed on genotype RMG-268 and RMG-1010, which was found non-significant difference with each other. The genotype RMG-1010, RMG-62, RMG-1079, RMG-1076 and RMG-975 were found moderately infested and statistically non-significant difference in their infestation. The variability of susceptibility in green gram genotypes was in the order: RMG-1051<MSG-118 <RMG-492 <RMG-344 < MUN-2 < RMG-975 <RMG-1076 <RMG-1079 <RMG-62 <RMG-1010 <RMG-268.

The fourth observation was taken on 27th August 2015 in which the mean jassid population ranged from 6.50 (RMG-1051) to 10.90 (RMG-492) jassids per three leaves/ plant. The minimum infestation was observed on genotype, RMG-344 followed by RMG- 1076, RMG-1079, MSG-118 RMG-1051 and MUN-2. These were statistically non-significant in their degree of infestation. The maximum infestation was observed on genotypes, RMG-492 which was at par with RMG-62. The variability of susceptibility in green gram genotypes were in order: RMG-1051 <RMG-1079 <RMG-344 < MSG-118 <MUN-2 <RMG-1076 <RMG-1010 <RMG-975 <RMG-268 <RMG-62 <RMG-492. The jassid population reached to peak in the fifth observation which was taken on 3rd September 2015. The mean jassid population ranged from 6.50 (RMG-344) to 13.70 (RMG-62) jassids per three leaves. The minimum number of jassids were recorded on genotype RMG- 344 (6.50/ three leaves) followed by RMG- 1051 (7.20/ three leaves). The maximum infestation of jassids was recorded on genotype RMG- 62 (13.70/ three leaves) followed by RMG-268 (13.58 / three leaves), and RMG-492 (13.20/ three leaves) and all these were statistically non-significant in their degree of infestation. Genotype RMG-1076, RMG-1010, MUN-2 and RMG-975 were found non-significant. The variability of susceptibility in green gram genotype was in the order: RMG-344 <RMG-1051 <RMG-1079 <RMG-975 <MUN-2 <RMG-1010 <MSG-118 <RMG-1076 <RMG-492 <RMG-268 <RMG-62.

The sixth observation was taken on 10th September in which the mean jassid population ranged from 4.80 (RMG-344) to 11.10 (RMG-1051) jassids per three leaves. The minimum number of jassids were recorded on genotype RMG-344 followed by RMG-1076. However, these genotypes were statistically non-significant in their degree of infestation. The maximum infestation was observed on genotype RMG-1051 followed by RMG-492 and both these were statistically at par in the degree of susceptibility. The variability of susceptibility in green gram genotypes was in the order of RMG-1076 <RMG-1051 <RMG-344 <MUN-2 <RMG-1079 <MSG-118 <RMG-1010 <RMG-62 <RMG-975 <RMG-268 <RMG-492.

In the seventh observation recorded on 17th September,2015 the mean jassid population ranged from 3.90 (RMG-344) to 7.08 (RMG-62) jassids per three leaves. The minimum infestation was observed on genotype RMG-344 followed by RMG-1076, MSG-118 and RMG-1079. All these were statistically non-significant with each other in their degree of susceptibility. The genotype, RMG-344 was found significantly superior over the genotypes, RMG-492, RMG-1010, RMG-1051, RMG-975 and MUN-2. The maximum infestation of jassids were recorded on genotype RMG-62 followed by RMG-268. All these were statistically at par in their degree of infestation. The variability of susceptibility in green gram genotypes was in the order of RMG-344 <RMG-1051 <RMG-1076 <MSG-118 <RMG-1079 <MUN-2 <RMG-975 <RMG-1010 <RMG-492 < RMG-268 <RMG-62.

The 8th observation was recorded on 24th September 2015 in which the mean jassid population ranged from 2.50 (RMG-344) to 4.20 (RMG-268) jassids per three leaves. The minimum infestation was observed on genotype RMG-344 followed by RMG-1051, MSG-118, RMG-1076 and RMG-62, all these were statistically non-significant. The genotype, RMG-344 was found significantly superior over the genotypes, RMG-492, RMG-975, RMG-1079 and MUN-2. The maximum infestation was observed on genotype RMG-268 followed by RMG-1010 and these were statistically at par in the degree of susceptibility. The variability of susceptibility in green gram genotypes was in the order of RMG-344 <RMG-1051 <MSG-118 <RMG-1076 <RMG-62 <MUM-2 <RMG-1079 <RMG-975 <RMG-492 <RMG-1010 <RMG-268. For the sake of convenience in expression the peak jassid population on green gram genotypes recorded on 3rd September, 2015 were categorized on the basis of formula $x \pm \sigma$.

Where X = Mean of peak population, σ = Standard deviation
X = 10.98, σ = 2.33
So the categories were made as 10.98 ± 2.33

Table 2: Categorization of different green gram genotypes against jassid

Mean jassid population/ three leaves	Categories	Genotypes
Below 8.65	Highly resistance	RMG-344 and RMG-1051
8.65 to13.31	Moderately resistance	RMG-1079, RMG-975, MUN-2, RMG-1010, MSG-118 and RMG-1076
Above 13.31	Less resistance	RMG-492, RMG-268 and RMG-62

Taking the above criterion into consideration, the genotype, RMG-344, RMG-1051 were considered as highly resistance and RMG-1079, RMG-975, MUN-2, RMG-1010, MSG-118 and RMG-1076 as moderately resistance, while RMG-492, RMG-268 and RMG-62 as less resistance. The order of variability of susceptibility in green gram genotypes both in the peak jassid population during the crop season and the mean jassid population of all the observations recorded during the crop season were more or less same.

Whitefly, *bemisia tabaci*: The data on relative susceptibility of green gram genotype against whitefly recorded during the crop season at weekly interval are presented in table 3. The first observation recorded on 6th August 2015. The mean whitefly population ranged from 0.80 (RMG-344) to 2.30 (RMG-492) per three leaves/ plant. The minimum infestation was observed on genotype RMG-344 followed by RMG-1010, MSG-118 and MUN-2 which were statistically at par in their degree of infestation. The maximum infestation was observed on genotype RMG-492 followed by RMG-62, RMG-975, RMG-1076 and RMG-1079. These were statistically at par in degree of infestation with each other. The variability of susceptibility in green gram genotype was in the order of RMG-344 <RMG-1010 < MSG-118 <MUN-2

<RMG-1051 <RMG-268 <RMG-1079 <RMG-1076 <RMG-975 <RMG-62 < RMG-492. The second observation recorded on 13th August 2015 in which the mean whitefly population ranged from 2.01 (RMG-1079) to 5.90 (RMG-492) per three leaves/ plant. The minimum numbers of whiteflies were recorded on genotype, RMG-1079 followed by RMG-344 and RMG-1010 and all these were significantly at par in their infestation. The maximum number of whiteflies were recorded on genotype, RMG-492 followed by RMG-975 had non-significant. The variability of susceptibility in green gram genotypes were in the order of RMG-1079 <RMG-344 <RMG-1010 <RMG-1051 <RMG-1076 <MUN-2 < MSG-118 <RMG-268 <RMG-62 <RMG-975 <RMG-492. The third observation recorded on 20th August 2015. The mean whitefly population ranged from 3.24 (RMG-344) to 9.80 (RMG-492) per three leaves/ plant. The minimum infestation was observed on genotype, RMG-344 followed by RMG-1010, MUN-2, RMG-1076, RMG-1051 and RMG-268 were statistically non-significant to each other. The maximum infestation was observed on genotype RMG-492 followed by RMG-975 found statistically non-significant in their degree of infestation. The variability of susceptibility in green gram genotypes based on the observation was in the order of RMG-344 <RMG-1010 <MUN-2 < RMG-1076 <RMG-1051 <RMG-268 <MSG-118 <RMG-62 <RMG-1079 <RMG-975 <RMG-492.

Table 3: Screening of different genotypes of green gram against whitefly, *Bemisia tabaci* Genn.

S. No.	genotypes	Mean whitefly population/ three leaves								
		06.08.2015	**13.08.2015**	**20.08.2015**	**27.08.2015**	**03.09.2015***	**10.09.2015**	**17.09.2015**	**24.09.2015**	**Mean**
1.	RMG-62	2.20	4.00	4.90	11.60	13.75	10.01	8.20	4.20	7.31
		(1.64)	(2.12)	(2.32)	(3.48)	(3.73)	(3.24)	(2.95(	(2.17)	(2.80)
2.	RMG-268	1.60	3.90	4.20	10.40	13.80	9.43	7.44	4.80	6.68
		(1.45)	(2.10)	(2.17)	(3.30)	(3.84)	(3.15)	(2.82)	(2.30)	(2.68)
3.	RMG-344	0.80	2.10	3.24	9.10	6.90	4.23	3.97	3.10	3.82
		(1.14)	(1.61)	(1.93)	(3.10)	(2.72)	(2.17)	(2.11)	(1.90)	(2.08)
4.	RMG-975	2.10	4.65	5.30	11.90	12.20	11.20	9.10	4.50	7.74
		(1.61)	(2.27)	(2.41)	(3.52)	(3.56)	(3.42)	(3.10)	(2.24)	(2.87)
5.	RMG-1010	0.90	2.30	3.60	6.40	11.40	4.90	3.33	2.93	4.10
		(1.18)	(1.67)	(2.02)	(2.63)	(3.44)	(2.32)	(1.96)	(1.85)	(2.14)
6.	RMG-1051	1.43	2.63	4.20	6.20	7.40	10.20	4.20	3.10	4.67
		(1.39)	(1.77)	(2.17)	(2.50)	(2.81)	(3.27)	(2.17)	(1.90)	(2.27)
7.	RMG-1076	1.90	2.71	4.23	8.43	11.86	8.22	4.50	3.33	5.65
		(1.55)	(1.79)	(2.17)	(2.99)	(3.52)	(2.95)	(2.24)	(1.96)	(2.48)
8.	RMG-1079	1.60	2.01	5.20	9.21	12.25	9.20	4.10	3.43	5.96
		(1.45)	(1.58)	(2.39)	(3.12)	(3.57)	(3.11)	(2.14)	(1.98)	(2.54)
9.	MSG-118	0.93	3.20	4.81	7.93	11.60	7.33	4.93	2.60	5.29
		(1.20)	(1.92)	(2.30)	(2.90)	(3.47)	(2.80)	(2.33)	(1.76)	(2.41)
10	MUM-2	1.10	2.88	3.96	8.01	9.46	6.44	3.40	2.10	4.85
		(1.26)	(1.84)	(2.11)	(2.92)	(3.07)	(2.63)	(1.97)	(1.61)	(2.31)
11	RMG-492	2.30	5.90	9.80	10.60	14.30	8.42	5.10	3.08	7.15
		(1.67)	(2.53)	(3.21)	(3.33)	(3.67)	(2.99)	(2.37)	(1.89)	(2.77)
	S.E.m±	0.04	0.04	0.05	0.06	0.07	0.07	0.06	0.04	0.06
	CD at 5%	0.11	0.13	0.15	0.16	0.21	0.21	0.18	0.13	0.18

*Peak population of whitefly during crop season

Figures in the parentheses are $\sqrt{x+0.5}$ value.

The fourth observation recorded on 27th August 2015 in which the mean whitefly population ranged from 6.20 (RMG-1051) to 11.90 (RMG-975) per three leaves/ plant. The minimum number of whiteflies were recorded on genotype (RMG-1051) followed by RMG-1010 had non-significant with each other. The maximum number of whiteflies were recorded on genotype, RMG-975 followed by RMG-62 were statistically at par in degree of infestation. The variability of susceptibility in green gram genotypes was in order of RMG-1051 <RMG-1010 <MSG-118 <MUN-2 <RMG-1076 <RMG-344 <RMG-1079 <RMG-268<RMG-492 <RMG-62 <RMG-975. As shown in table 3. that the whitefly population reached to peak in the fifth observation recorded in 3rd September 2015. The mean whitefly population ranged from 6.90 (RMG-344) to 14.30 (RMG-492) per three leaves/ plant. The minimum numbers of whiteflies were recorded on genotype, RMG-344 followed by RMG-1051 which was found significantly superior. The maximum number of whiteflies were recorded on genotype, RMG-268 followed by RMG-62, RMG-492, RMG-1079, RMG-975, RMG-1076 and MSG-118 all these were statistically non-significant in their degree of infestation. The variability of susceptibility in green gram genotypes based on observations was in order of RMG-344 < RMG-1051< MUN-2 <RMG-1010 < MSG-118 < RMG-1076 < RMG-975 < RMG-1079 < RMG-492 < RMG-62 < RMG-268.

The sixth observation recorded on 10th September 2015 in which the mean whitefly population ranged from 4.23 (RMG-344) to 11.20 (RMG-975) per three leaves/ plant. The minimum infestation was observed on genotype, RMG-344 followed by RMG-1010 and MUN-2 these were statistically at par in their degree of infestation. The maximum infestation was observed on genotype, RMG-975 which was significantly at par with RMG-1051. The variability of susceptibility in green gram genotype, was in order of RMG-344 <RMG-1010 <MUN-2 < MSG-118 <RMG-1076 <RMG-492 <RMG-1079 <RMG-268 <RMG-62 <RMG-1051<RMG-975.

The seventh observation recorded on 17th September 2015 in which the mean whitefly population ranged from 3.33 (RMG-1010) to 9.10 (RMG-975) per three leaves/ plant. The minimum infestation was observed on genotype RMG-1010 followed by MUN-2, RMG-344, RMG-1079, RMG-1051 and RMG-1076 which was statistically at par in their degree of infestation, also which were significantly superior over the

genotypes RMG-492 and MSG-118. The maximum infestation was observed on genotype, RMG-975 followed by RMG-62 and RMG-268 all these were statistically at par with each other. The variability was in order of RMG-1010 <MUN-2 <RMG-344 <RMG-1079 <RMG-1051 <RMG-1076 <MSG-118 <RMG-492 <RMG-268 <RMG-62 <RMG-975. The eighth observation recorded on 24th September 2015 in which the mean whitefly population ranged from 2.10 (MUN-2) to 4.80 (RMG-268) per three leaves/ plant. The minimum infestation was observed on genotype MUN-2 followed by MSG-118 and RMG-1010 had non-significant. The maximum infestation was observed on genotype RMG-268 which was at par with RMG-975. The variability of susceptibility in green gram genotypes was in order of MUN-2 <MSG-118 <RMG-1010 <RMG-492 <RMG-1051 <RMG-344 < RMG-1076 <RMG-1079 <RMG-62 <RMG-975 <RMG-268.

For the sake of convenience in expression, the peak whitefly population on green gram genotype, recorded on 3rd September, 2015 were categorized on the basis of formula $X \pm \sigma$

Where, $\overline{X}$ = Mean of peak population, σ = Standard deviation

$X = 11.25$, $\sigma = 2.37$ so the categories were made as 11.25 ± 2.37.

Table 3: Categorization of different green gram genotypes against whitefly.

Mean whitefly population/ three leaves on plant	Categories	Genotypes
Below 8.88	Highly resistance	RMG-344 and RMG-1051
8.88 to 13.65	Moderately resistance	MUN-2, RMG-1010, MSG-118, RMG-1076, RMG-975 and RMG-1079
Above 13.65	Less resistance	RMG-62, RMG-268 and RMG-492

Taking the above criterion into consideration, the genotypes RMG-344 and RMG-1051 considered as highly resistance, MUN-2, RMG-1010, MSG-118, RMG-1076, RMG-975 and RMG-1079 as moderately resistance while RMG-62, RMG-268 and RMG-492 as less resistance. The order of variability of susceptibility in green gram genotypes both in the peak whitefly population during the crop season and the mean whitefly population of all the observation recorded during the crop season was more or less same.

The minimum mean whitefly population (3.82 whiteflies/ 3 leaves on plant) was observed on genotype RMG-344, while maximum (7.74 whiteflies/ 3 leaves on plant) on RMG-975 during the crop season. The whitefly population on green gram was categorized on the basis of formula $X \pm \sigma$. The population was comparatively low (below 8.88 whitefly/ 3 leaves on plant) on genotype RMG-344 and RMG-1051could be categorized as highly resistance. On genotypes, MUN-2, RMG-1010, MSG-118, RMG-1076, RMG-975 and RMG-1079 the whitefly population was in the middle order (between 8.88 to 13.65 whitefly/ 3 leaves on plant) and regarded as moderately resistance. The whitefly population was comparatively more (above 13.65 whitefly/ 3 leaves on plant) on genotypes RMG-62, RMG-268 and RMG-492 categorized as less resistance. The present studies are in agreement with the studies of Kumar *et al.* (2006) [5] and Nadeem *et al*. (2014) [6] who screened fifty and eight entries of mung bean, respectively and reported that none of the entry was completely free from damage of whitefly.

Conclusion

Out of eleven genotypes of green gram screened against jassid and whitefly, none of the genotype was found immune. Based on categorization; the genotypes RMG-344 and RMG-1051 were found highly resistance having below 8.65 jassids / three leaves, RMG-1079, RMG-975, MUN-2, RMG-1010, MSG-118 and RMG-1076 were found moderately resistance having 8.65 to 13.31 jassids / three leaves and genotypes RMG-492, RMG-268 and RMG-62 were found less resistance, having above 13.31 jassid / three leaves. Based on categorization, the genotypes RMG-344, RMG-1051 were found highly resistance to whitefly, having population below 8.88 whiteflies/ three leaves per plant; genotypes, MUN-2, RMG-1010, MSG-118, RMG-1076, RMG-975 and RMG-1079 were found moderately resistance to whiteflies; having population 8.88 to 13.65 whiteflies / three leaves per plant and genotype RMG-62, RMG-268 and RMG-492 were found less resistance to whitefly having population above 13.65 whiteflies / three leaves per plant. Eleven genotypes of green gram screened against jassid and whitefly showed that the genotype RMG-344, RMG-1051 were considered as highly resistance; RMG-1079, RMG-975, MUN-2, RMG-1010, MSG-118 and RMG-1076 as moderately resistance, while RMG-492, RMG-268 and RMG-62 as less resistance.

Acknowledgement

The authors are thankful to the Dean, S.K.N. College of Agriculture, Jobner for providing necessary facilities and permission to conduct the study.

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