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Field Evaluation of Greengram *(Vigna radiata L.)* OVT Entries Against Major Insect Pests in kharif Season.

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ABSTRACT

Twelve greengram entries and two released varieties as check were screened for three years, 2004, 2005 & 2006 in *kharif* (June-Sept) season to know their reaction against early crop stage pests like galerucid fleabeetle^{-1}, thrips, *S. exigua* (from two leaf stage), mites, *S. litura* (vegetative) and Maruca (reproductive) at Agricultural Research Station, Madhira, Khammam district. Based on their performance over three years, all the entries found to be tolerant to fleabeetle; lesser thrips population was recorded in the entries, MGG 362 (7.8), MGG 359 (8.6) and MGG 365 (8.7). Except the entries, MGG 362 (13.6), MGG 366 (13.0) and MGG 348 (15.5), remaining entries were tolerant to mite. Heavy incidence of Maruca with 9.6-49.1% pod damage was noticed in the year 2004 but not in 2005 and 2006 rainy seasons. The entries, MGG 366 (9.6%) and MGG 364 (10.6%) found to be tolerant and the entries MGG 356 (49.1%), MGG 363(43.9%), MGG 362(42.6%), MGG361 (41.2%) MGG 357(40.5%) were highly susceptible to Maruca pod damage. Though the entry MGG 357 (570 & 659 Kg ha^{-1}) susceptible to Maruca, it recorded significantly higher yield with 13.5% avoidable losses and lower yields were recorded in entries MGG 360, MGG 363, MGG 361 and MGG 364 when compared to the check varieties MGG 295 (529 & 614) and MGG 348 (508 & 644 Kg ha^{-1}) both in un protected and protected conditions respectively.

Key words : Galerucid beetle, Greengram, Maruca, Mites,Thrips.

The greengram is one of the most important pulse crops, due to its short duration, early maturity it can be grown through out the year and it fits well as sole or inter crop with cotton, redgram & maize in various parts of the country in rainy season. In India it occupies 32 lakh hectares area with 2059 kg ha^{-1} productivity (Annual Report, 2006-07) and widely cultivated in kharif, rabi and rice-fallows (Nov - March). The low yield of greengram (295 Kg ha^{-1}) may be attributed to number of factors, among them ravage of insect pest is important and there are nearly 200 insect pests belonging to 48 families in coleoptera, diptera, hemiptera, hymenoptera, isoptera, lepidoptera, orthoptera, thysanoptera and 7 mites of order Acarina are attacking and inflict heavy losses at different growth stages in different agro climatic conditions (Lal and Sachan, 1987). The galerucid /flea beetle, *Madurasia obscurella* causes damage up to 20-60% as they chew small holes in the cotyledon leaves, giving shot hole appearance (Menon & Saxena, 1970). Thrips, a vector of Pea nut bud necrosis virus in greengram (Sreekanth, 2002) was considered to be a major threat causing 40% yield loss (Nene, 1972). Spodoptera sp were active from July – January (Gedia et al, 2007). *Maruca vitrata*, a serious and a hidden pest, completes its larval development inside the web formed by rolling & tying together leaves, flowers, buds and pods (Taylor,1978) and a thresh hold of 40% larval infestation in flowers has been established by Ogunwolu, 1990 for Maruca. The reduction in grain yield by Maruca is estimated to be 2.0 - 84% (Vishakanthaiah and Jagadeesh Babu, 1980).

MATERIAL AND METHODS

Three field experiments with 12 greengram OVT entries and two released varieties as checks were conducted at Agricultural Research Station., Madhira, Khammam district during kharif season of 2004, 2005 & 2006. Experiments were laid out in randomized block Design with three replications. Each entry was sown in a plot of two rows of 4 m length, with 30 X10 cm spacing. Observations were recorded on five randomly selected plants for each entry in each replication from 10 days after germination of the crop for incidence of Galerucid beetle, Thrips, Mites and pod borers like Spodoptera & Maruca population / plant. Flea beetle damage in terms of shot holes/ two cotyledon leaves in two leaf stage only; thrips population was counted from two terminal leaves of each plant by tapping on white chart & S. exigua larvae/plant from two leaf stage; mites' population was counted on terminal two leaves/plant upto harvest of the crop at weekly

Table 1. Reaction of greengram entries to major insect pests.

Entry	Fleabeetle Holes Pl^{-1} 2006	Thrips terminal leaves^{-1} 2004	2005	2006	Mean	Mites terminal leaves^{-1} 2004	2005	Mean
MGG 356	2.1	11.7	11.3	11.5	11.5	2.7	5.0	3.8
MGG 357	2.1	11.1	18.0	11.0	13.4	2.7	3.4	3.0
MGG 358	2.1	7.6	14.1	10.9	10.4	6.8	5.0	5.9
MGG 359	2.2	4.9	12.3	8.5	8.6	5.9	3.5	4.7
MGG 360	1.7	3.8	14.6	9.2	9.2	6.2	5.1	5.6
MGG 361	2.4	15.0	8.0	11.5	11.5	16.6	4.0	10.3
MGG 362	2.4	7.5	8.1	7.8	7.8	23.2	3.6	13.6
MGG 363	2.5	15.2	10.5	11.7	12.5	11.8	4.5	8.2
MGG 364	2.6	15.0	11.6	11.5	12.7	16.5	5.3	10.9
MGG 365	2.6	7.4	9.9	8.7	8.7	17.4	3.2	10.3
MGG 366	2.6	9.3	12.4	10.9	10.9	22.8	3.2	13.0
MGG 367	2.6	11.1	10.4	11.4	11.0	4.3	3.1	3.7
MGG 295©	2.6	11.6	10.7	11.2	11.2	12.5	3.3	7.9
MGG 348©	2.5	15.3	8.9	12.1	12.1	27.0	4.0	15.5
SEm ±	0.12	0.08	0.2	0.24	0.09	0.07	0.08	0.08
CD (5%)	0.35	0.24	0.6	0.69	0.27	0.21	0.24	0.23
CV(%)	8.7	1.4	2.9	3.8	1.5	1.0	3.5	1.7
F test	S	S	S	S	S	S	S	S

Table 2. Reaction of greengram entries to Maruca and Yield performance.

Entry	Webs Pl	Maruca infestation Larvae Web^{-1}	% Pod damage	Mean of three years Yield (Kg ha^{-1}) Unpro-tected	Pro tected	% Avoidable Losses
MGG 356	1.8	2.0	49.1	464	588	21.1
MGG 357	0.8	2.0	40.5	570	659	13.5
MGG 358	0.8	1.6	15.6	381	423	9.9
MGG 359	1.5	3.4	20.8	300	400	25.0
MGG 360	1.7	2.9	21.8	243	347	30.0
MGG 361	2.4	4.4	41.2	259	333	22.2
MGG 362	1.0	3.5	42.6	375	430	12.8
MGG 363	1.0	4.0	43.9	255	329	22.1
MGG 364	1.0	2.0	10.6	274	336	18.4
MGG 365	1.2	2.0	35.0	486	468	14.4
MGG 366	1.0	1.6	9.6	345	441	21.8
MGG 367	1.2	3.0	12.8	408	515	20.8
MGG 295©	1.3	3.0	26.2	529	610	30.3
MGG 348©	1.0	3.2	22.8	508	644	21.1
SE m ±	0.79	0.13	0.32	57	15.4	
CD (5%)	0.23	0.37	0.94	165	45.0	
CV (%)	10.8	8.00	2.00	11.1	6.70	
F test	S	S	S	S	S	

intervals. Maruca incidence was observed from flowering to pod maturity stage, for number of webs plant^{-1} & larvae web^{-1}, pod damage and pod damage at the time of harvest & converted to percent. The grain yield in Kg ha^{-1} data from both unprotected & protected experiments was recorded. Recommended package of practices were followed except plant protection measures. The data was subjected to the statistical analysis.

RESULTS AND DISCUSSION

Pooled data recorded year wise on pest incidence is presented in the table 1.

Fleabeetle:

Its incidence was not noticed during 2004 & 2005 but very lesser damage in 2006, ranged from 1.7- 2.6 holes / two cotyledon leaves at two leaf stage only but not later. All the entries shown tolerance. The threshold of flea beetle is on average 25% damage of the cotyledon surface. Fleabeetle is active from mid May to late July & contribute to reduced yield, especially if the weather is hot and dry. The reason for lesser damage might be the new adults begin emerging in late July & early August in cooler micro environment which slow down the activity of fleabeetle.

Thrips:

Thrips incidence was noticed from two leaf stage and population increased upto 45 DAS and then declined sharply. Raja Kumar et al (2007) observed minimum thrips population of 2 -39/15 terminal leaves. Pooled data of thrips population revealed that, there was a significant difference among the entries and it was ranged from 7.8 – 13.4 / two terminal leaves. The lowest population was recorded in the entries, MGG 362 (7.8), MGG 359 (8.6) and MGG 365 (8.7), whereas more population was recorded in the entries MGG 357 (13.4), MGG 364 (12.7) & MGG 363 (12.5) when compared to the check varieties MGG 295 (11.2) and MGG 348 (12.1). The results coincide with the findings of Kooner and Malhi (2004), who screened 30 summer mungbean genotypes and found SML 189, SML 346 and MG 414 as least susceptible to thrips. Dalwadi et al, 2007 found out of nine genotypes of Indian bean screened, the genotype AIB (P)-22-01 registered least incidence of sucking pests (aphids, leaf hoppers and thrips) as well as pod borer (*Helicoverpa armigera* Hubner) followed by AIB (P)-4-01 & AIB (P)-2-01 as source of resistance for developing multiple resistance cultivars. Chhabra and Kooner (1994 & 1998) reported that out of 20 mungbean genotypes SML99 and SML100 were the most resistant and SML117 was the most susceptible to thrips damage. They also reported that mungbean genotypes PIMS 2, PIMS 3, 12-333 at Badnapur, Co 3 at Coimbattore, ML 5, ML 337 at Durgapura are resistant to thrips and it was further investigated that non preference, resistant entries did not support thrips multiplication and low content of free amino acids, total phenols, total mineral, total sugars, non reducing sugars, calcium, potassium and high content of carbohydrates were responsible for contributing resistance.

Mites:

Sporadic incidence of mites was noticed during 2004 & 2005 but not in 2006. The mean population was ranged from 3.0-15.5/plant. The lowest population was recorded in MGG 357(3.0), MGG 367(3.7) & MGG 356(3.9) and maximum population in MGG 362 (13.6), MGG 366 (13.0) and MGG 348 (15.5) when compared to the check MGG 295 (7.9).

Spodoptera:

Incidence was not recorded in three years in rainy season.

Maruca:

The incidence of Maruca increased progressively from flowering to advanced pod formation stage and then gradually decreased towards the pod maturity and crop maturity stages. The maximum infestation was observed at maximum pod formation stage. These observations coincide with the findings of Krishna et al (2006). All the entries showed significant difference in respect of the number of webs /plant, larvae / web and percent pod damage were ranged from 0.8-2.4, 1.6-4.4 and 9.6-49.1% respectively. (Table.2)

The least infestation of Maruca web & larvae was recorded in the entries MGG 358 (0.8 &1.6) & MGG 357 (0.8 & 2.0), whereas entries MGG 361(2.4 & 4.4), MGG 363(1.0 & 4.0) & MGG 362 (1.0 & 3.5) recorded more infestation when compared to the check varieties MGG 295 (1.3 & 3.0) and MGG 348 (1.0 & 3.2).

Regarding pod damage, entries MGG 366 (9.6%) and MGG 364 (10.6%) found to be tolerant, whereas the entries MGG 356 (49.1%), MGG 363 (43.9%), MGG 362 (42.6%), MGG 361(41.2%) and MGG 357 (40.5%) found to be highly susceptible to Maruca, when compared to the check varieties MGG 295 (26.2) and MGG 348 (22.8%). An infestation level of two Maruca larvae per plant was enough to detect differences in flower & pod damage, grain yield between infested and uninfected plants (Echendu and Akingbohung, 1989). Maruca damage to major plant parts severely affects the productivity of food legumes wherever the insect has achieved the pest status. In mungbean, invariably adjacent 2-3 pods are stuck together around area where insect has made entry hole in a pod. Sometimes, usually when the eggs are laid on leaves and if the leaf is in the proximity of a pod, larva sticks together part of the pod touching the leaf and makes hole in the pods be it distal or central part of the pod. We rarely find a larva boring inside a pod which is not touching to other pod or leaves. This indicates that a mungbean cultivar with pods not touching each other and radiates from well above the foliage so that the pods will not touch stem or foliage could be “resistant” to Maruca podborer.

Yield Performance:

There was significant difference among the entries tested when compared to check varieties and yield ranged from 243 – 570 & 329-659 Kg/ha both in unprotected & protected conditions. The entry MGG 357 (570 & 659) found to be high yielder, whereas the entries MGG 360 (243 & 347), MGG 363 (256 & 329), MGG 361 (259 & 333) and MGG 364 (274 & 336) recorded lower yields in both the conditions. Grain yield was significantly higher under protected conditions. The reduction in grain yield by Maruca is estimated to be 9 – 84 % (Vishakanthaiah and Jagadeesh Babu, 1980). The percent avoidable losses due to early crop stage pests like *Madurasia sp*, thrips, mites and maruca were ranged from 9.9 - 30 %. Low productivity of greengram in India could be attributed to biotic stresses including viruses which are transmitted by sucking pests like thrips. The reason for higher yields of susceptible entries might be the preference of pod borers for feeding the flowers & pods of plants having high protein content (Hard wick, 1965). Sahoo and Patnaik (2003) found that there was significant positive correlation with the total sugars, amino acid and protein content but inverse relationship with phenol content of seeds & pod coat of susceptible redgram varieties to pod borers. Phenolics in a fairly large concentration could ward off the insect pests because of their direct toxicity and the adverse effects, as an anti nutritional factor (Murkute et al., 1993). The levels of resistance to pests in the tested entries are very poor and this has necessitated the need for selecting genotypes with greater ability to tolerate or recover from the pest damage (Sharma et al., 2005). The results clearly revealed that, the resistant genotypes identified were very poor in yield. Thus these resistant entries can not be exploited directly but can be used in resistant breeding programmes to identify the source of resistance.

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