Evaluation of Fodder Cowpea Genotypes for Tolerance to Semilooper (*Plusia nigrisigna* Wlk.)

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One hundred and sixty two accessions of fodder cowpea were screened against semilooper (*Plusia nigrisigna* Wlk.) under natural infestation conditions for four consecutive years. The mean incidence of semilooper ranged from 2.14-4.57% in promising genotypes EC24102-1 (2.14%), IL-1063 (3.89%), IL-05-08 (3.99%) and EC240884 (4.57%) as compared to 14.91-24.74% in the check lines. The entry EC24102-1 may be used as a donor for resistant breeding programmes.

Key Words: Cowpea, Pest tolerance, Semilooper

Introduction

Cowpea [*Vigna unguiculata* (L.) Walp.] as a warm season annual leguminous fodder crop is mainly grown in Northern and Central India. It has a great potential for sustainable agriculture in marginal lands and semi arid regions of the country and is now rapidly spreading out to the entire country, because a number of new and better varieties have been released at national/zonal levels. The green cowpea fodder is rich in protein and forms an excellent mixture with maize, jowar, bajra and teosinte etc. considered as balance diet for animals for higher milk and meat production.

Cowpea is attacked by many insect-pests which are the principal limiting factor for its productivity throughout the country. The losses in green fodder yield were estimated to the tune of 30%. In Central India, the crop is severely damaged by the defoliator insects mainly, flea beetle (*Pagaria signata* Motsch), semilooper (*Plusia nigrisigna* Wlk.), tobacco caterpillar (*Spodoptera litura* F.) and various species of grasshoppers (*Hieroglyphus nigrorepletus* Bol., *Cantontopes pinguis* Stol., *Oedalius abruptus* Thun., *Acridida exaltata*, *Chrotogonus tachypterus* Blanch., *Atractomorpha crenulata* Fabr.). Among all these insects, maximum losses were caused by the semiloopers (Saxena *et al*., 2002).

At present, the strategy is to develop pest and disease resistant varieties through breeding programmes (Hall *et al.*, 2003). Therefore, it is necessary to screen and identify insect-pest resistant genotypes**,** which could perform more or less uniformly under different environmental conditions (Graham *et al.*, 2003). Such genotypes are very useful for commercial fodder production.

The basic information on this important forage legume crop is meager. In view of this, the present investigation was envisaged to screen the forage cowpea genotypes against semilooper, which may be of great importance to initiate an effective crop improvement programme.

Materials and Methods

One hundred and sixty two accessions both exotic and indigenous were screened under natural infestation conditions for four years (2004-2007) in monsoon season against semilooper (*P. nigrisigna* Wlk.) at Central Research Farm of Indian Grasslands and Fodder Research Institute, Jhansi.

The accessions were kept unsprayed during the experiment. The materials were planted in Augmented Design with four control varieties, *viz*., Bundel lobia 1 (BL-1), Bundel lobia 2 (BL-2), UPC 5286 and local control (IGFRI 95-1). Two rows (3 m length) were assigned for each entry. Row to row distance was 60 cm, while distance between the entries was 100 cm. Out of 162 entries tested during 2004, 2005 and 2006, ten entries were selected and planted in replicated trial during *kharif* 2007.

Assessment of per cent leaf area damage was calculated using graph paper method. Ten central leaflets of fully opened leaf (third from top) from ten randomly selected plants were selected for injury estimation. The observations were taken three times (30, 45 and 60 days after sowing) during every crop season. The damage due to semilooper may be differentiated from the grasshopper damage as the semiloopers eat away the whole leaf area

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including the leaf veins and midribs while the grasshopper feed on the leaf lamina only.

The pest resistance percentage for entries was calculated using a formula derived from Abbott (1925).

$$\text{Pest resistance (\%)} = \frac{\text{(Pest incidence in check – Pest incidence in test entry)}}{\text{Pest incidence in check}} \times 100$$

Pest Resistance/Susceptibility Rating (PRSR)	Pest Resistance (%)
1	100
2	99 to 75
3	74 to 50
4	49 to 25
5	24 to 10
6	9 to –10
7	–11 to –25
8	–26 to –50
9	> –50

The pest resistance percentage was then converted to 1 to 9 grading, based on the following scale and the low rating was the criteria of selection for resistant entries.

Results and Discussion

On the basis of data recorded during the year 2004 and 2005 the pest incidence of semilooper (*P. nigrisigna*) on test entries varied from 1.2 to 75.3 per cent as against 25%-30% in check lines (Table 1).

Seventy one lines were found better than the check. Out of which twenty six accessions were the best with the Pest Resistance/Susceptibility Rating value of 2. While 38 lines were at par with the check for the leaf area damage in the range of 22.5-32.6% (PRSR value of 5 and 6) and 53 lines were susceptible with leaf area damage in the range of 33.2-75.3% (PRSR value of 7, 8 and 9). The most susceptible lines were IL-2000-186, IL-99-38, IL-01-88, IL-05-29 and IL-390 (IL stands for Indigenous Legume).

The twenty six promising entries were selected for further testing in the year 2006. Entries EC24102-1, EC240884, IL-05-08 were found least susceptible (with 1.2-1.5% damage) followed by accessions IL-161-1, IL-05-12, IL-05-13 (damage in the range of 2.4-3.7%).

Observations recorded in 2006 (Table 2) showed that the leaf damage by semiloopers in entries ranged between 2.3-15.0 per cent (PRSR 2-5) compared to 15.8-24.3 per cent (PRSR 6 and 8) against check entries. A total of ten entries, *viz*., EC24102-1, EC240884, IL-05-08, IL-05-12, IL-05-13, IL-05-15, IL-55-1, IL-161-1, IL-1063, IL-1177-B were found superior with damage ranging between 2.3-4.2 per cent with PRSR value of 2. These entries were promoted for further screening for fourth and final year.

Table 1. Incidence of *P. nigrisigna* in evaluated gene pool of cowpea (2004 and 2005)

PRSR	Leaf area (damage %)	Accessions*
2	1.2-6.5	EC24102-1, EC48720, EC240564, EC240884, EC240887, EC244236, EC244979, IL-05-08, IL-05-12, IL-05-13, IL-05-14,IL-05-15, IL-156, IL-90, IL-55-1, IL-161-1, IL-178-4, IL-178-8, IL-179, IL-246, IL-380, IL-1063, IL-1177-B, IL-1182, IL-3152-1, IL-3178 (26)
3	8.1-14.7	EC240782, EC241023, IL-05-22, IL-99-98, IL-160-B, IL-177, IL-216-1, IL-370, IL-380-C, IL-867, IL-887, IL-893-1, IL-966, IL-1072-5, IL-2000-188, IL-2000-189, IL-4216, IL-14177-A (18)
4	15.1-22.4	EC240714, EC240809, EC240840, EC240898, EC244243, EC244310, IL-05-11, IL-05-17, IL-05-28, IL-99-69, IL-99-72, IL-99-73, IL-160-11, IL-181, IL-182, IL-380-A, IL-419-1, IL-449, IL-622, IL-792, IL-892, IL1093, IL-3177, IL-3192, IL-1471, IL-1721, IL-2000-183 (27)
5	22.5-26.7	EC120001, EC2440995, EC244217-1, EC244236, IL-05-06, IL-99-65, IL-144-A, IL-160-B, IL-812, IL-1050-3, IL-3138-B, IL-2000-182, IL-2000-187, IL-3155, IL-3168-A, IL-4170, IL-18720-A, BL-1(17+1)
6	27.0-32.6	EC240999, EC241037, EC244249, IL-05-03, IL-05-04, IL-05-07, IL-05-16, IL-05-18, IL-99-40, IL-160, IL-632, IL-893, IL-966-B, IL-1155-B, IL-1177, IL-3117, IL-3168-A, IL-2000-184, IVM-1, RA-1, RA-2, BL-2, UPC 5286, IGFRI 95-1 (21+3)
7	33.2-37.4	EC244223-1, EC24077, IL-05-23, IL-05-26, IL-921, IL-160-9,IL-210, IL-362, IL-1170-A (9)
8	38.0-44.2	EC240740, EC240800, IL-05-05, IL-05-19, IL-15-1, IL-99-2, IL-99-98-1, IL-131, IL-155, IL-372, IL-853, IL-892, IL-1057, IL-1156-1, IL-2000-179 (15)
9	45.3-75.3	EC240650, EC240842, EC244217, IL-01-88, IL-05-09, IL-05-21, IL-05-24, IL-05-25, IL-05-27, IL-05-29, IL-14, IL-99-34, IL-99-38, IL-99-171, IL-132, IL-153-1, IL-155-1, IL-160-A, IL-390, IL-416-4, IL-419-2, IL-886, IL-1014-1, IL-2000-178, IL-2000-180, IL-2000-186, IL-3157, IVM, UPC-870 (29)

*Figures in parentheses are number of entries+check

Table 2. Incidence of *P. nigrisigna* in selected entries of cowpea during 2006

PRSR	Leaf area damage (%)	Accessions*
2	2.3-4.2	EC24102-1, EC240884, IL-05-08, IL-05-12, IL-05-13, IL-05-15, IL-55-1, IL-161-1, IL-1063, IL-1177-B (10)
3	4.9-8.5	EC48720, EC240564, EC240887, IL-178-4, IL-246, IL-380, IL-3178 (7)
5	13.0-15.0	IL-05-14, IL-156, IL-3152-1, EC244236, EC244979 (5)
6	15.5-18.7	IL-90, IL-178-8, IL-179, BL-1 (3+1)
8	21.5-25.7	IL-1182, Bl-2, UPC5286, IGFRI 95-1 (1+3)

* Figures in parentheses are number of entries+check

Table 3. Incidence of *P. nigrisigna* in selected entries of cowpea during 2007

PRSR	Leaf area damage (%)	Accessions*
2	1.6-2.4	EC24102-1, IL-1063 (2)
3	2.6-3.6	IL-05-08, EC240884 (2)
4	3.8-4.4	IL-05-12, IL-05-13, IL-05-15, IL-161-1, BL-1 (4+1)
7	7.8-21.6	IL-55-1, IL-1177-B, BL-2, UPC 5286, IGFRI 95-1 (2+3)

* Figures in parentheses are number of entries+check

Table 4. Incidence of *P. nigrisigna* in promising entries of cowpea

Accessions	Per cent leaf damage in different years			
	2005	2006	2007	Mean
EC24102-1	2.26	2.36	1.80	2.14
IL-1063	4.70	3.23	2.23	3.89
IL-05-08	5.53	3.63	2.80	3.99
EC240884	6.23	4.07	3.40	4.57
Bundel Lobia-1 (C)	24.67	15.80	4.27	14.91
Bundel Lobia-2 (C)	27.07	22.17	18.1	22.44
UPC 5286 (C)	26.83	21.97	19.33	22.71
IGFRI 95-1	30.13	24.30	19.80	24.74
(Local Control) CD (5%)	1.43	0.85	0.74	0.61

During the experimentation year 2007 the damage varied from 1.6–21.6 per cent (Table 3).

The entries EC24102-1 and IL-1063 were found least susceptible (1.6-2.4% damage) followed by IL-05-08 and EC240884 (2.6-3.6% damage). It is evident from the data presented in Table 4 that the mean leaf area damage in the test entry EC24102-1 was 2.14 and IL-1063 with 3.89 per cent damage (PRSR 2) and is statistically superior to the check entries.

Several fodder cowpea genotypes, *viz*., IL-118, IL-138, IL-148, EC24426, TUV 2287, TUV 2937 were reported as highly tolerant towards defoliator pests and semilooper damage (Shree Ram *et al*., 1984; Pandey *et al*., 1995). Similar trend of findings have also been endorsed by many workers (Mathur, 1995; Prasad *et al*., 1996; Adebitan, *et al*., 1997; Anku, *et al*., 2000; Yadav and Dahiya, 2000; Bhadauria *et al*., 2001; Kohali, 2002; Singh and Verma, 2002). They reported wide range of diversity and responsiveness in percentage of damage in various genotypes of cowpea caused by semilooper.

This study has identified four genotypes *viz*., EC24102-1, IL-1063, IL-05-08 and EC240884 which have consistent tolerance towards semilooper damage and thus could be used in breeding programmes as pest resistance donors.

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