



SCREENING OF GENOTYPES OF CLUSTER BEAN, *CYAMOPSIS TETRAGONOLOBA* (LINN.) TAUB. FOR RESISTANCE TO SUCKING INSECT PESTS

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ABSTRACT

Out of fifteen genotypes of cluster bean, *Cyamopsis tetragonoloba* (Linn.) Taub. screened against leaf hopper, *Empoasca motti* Pruthi; whitefly *Bemisia tabaci* (Genn.), and aphid, *Aphis craccivora* Koch; none was found immune. Based on statistical categorization; the genotypes, RGC–197, RGC–1031, RGC–986, RGC–1017, RGC–1055 and RGC–1076 were found least susceptible to leaf hopper, genotypes RGC–1077, RGC–1066 and RGC–1078 moderately susceptible and genotypes RGC–1038, RGC–1003, RGC–1002, HGS–365, RGC–936 and HGS–563 were highly susceptible. The genotypes, RGC–1017, HGS–365, RGC–986, RGC–197, RGC–1031 and RGC–1076 were least susceptible, genotypes RGC–1077 and RGC–1066 were moderately susceptible and RGC–1038, RGC–1003, RGC–1002, RGC–1078, RGC–936 and HGS–563 were highly susceptible to whitefly. The genotypes, RGC–197, RGC–1017, RGC–1031, RGC–986 and RGC–1055 were found least susceptible; RGC–1077, RGC–1076, RGC–1038, RGC–1078, RGC–1066 and RGC–1002 as moderately susceptible; and RGC–1003, RGC–936, HGS–365 and HGS–563 as highly susceptible to aphid.

Key words: Cluster bean, *Cyamopsis tetragonoloba*, screening

INTRODUCTION

Insect pests are major constraints in the productivity of cluster bean. Among them; leaf hopper, *Empoasca motti* Pruthi; whitefly, *Bemisia tabaci* (Genn.), *Acaudaleyrodes rachipora* (Singh); aphid, *Aphis craccivora* Koch; pod borer, *Helicoverpa armigera* (Hub.), leaf perforator, *Dichomeris inthes* Meyr, *Maruca testulalis* Geyer; *Protaetia terrosa* G. & P. are important infesting cluster bean (Arora and Kashyap, 2002; Khan *et al.*, 2002 and Singh, 2004). The leaf hopper, *E. motti* commonly known as jassid is a serious polyphagous pest which adversely affects the vegetative growth and seed yield upto 20 per cent (Singh, 1997). It is 3 mm long, delicate and yellowish green insect. Both nymphs and adult suck cell sap from under surface of leaves. The whitefly, *B. tabaci* is an inconspicuous polyphagous insect pest and causes heavy toll to the crop by withdrawing large amount of cell sap. The pale yellow bodied whitefly measures 1.0–1.5 mm in length and the body is covered with a white waxy powder. The aphid, *A. craccivora* suck cell sap from the plants and causes heavy losses. The damage is caused by nymphs and adults which are louse like, pale greenish insects.

MATERIALS AND METHODS

The experiment was laid out in simple randomized block design with three replications. The plot size kept was 3.0×2.7 m² with row to row and plant to plant distance of 30 cm and 10 cm, respectively. The crop was sown on 10th July, 2007. The observations on leaf hopper, whitefly and aphids were recorded soon after their appearance. All the observations were recorded early in the morning. The method used for recording the population of major insect pests, *viz.*, leaf hopper, *Empoasca motti* Pruthi; whitefly, *Bemisia tabaci* (Genn.) and aphid, *Aphis craccivora* Koch have been described below: The population was recorded from five randomly selected and tagged plants in each plot. Three leaves, *viz.*, one each from top, middle and lower canopy of the plant were taken into account for recording the jassids. The data obtained on leaf hopper, whitefly and aphid population recorded from the experimental field were subjected to square root transformation ($\sqrt{X + 0.5}$) (Gomez and Gomez, 1976) and subjected to analysis of variance. The peak population of leaf hopper, whitefly and aphid on cluster bean genotypes recorded during the crop season was categorized on the basis of mean and standard deviation

RESULTS AND DISCUSSION

It is evident from Table 1 that leaf hopper (*E. motti*) on different genotypes of cluster bean appeared in the second week of August, reached at the peak in the first week of September and thereafter exhibited a decreasing trend. The last observation on its population was recorded on second October, 2007. Based on the mean population of the season, the variability of susceptibility in cluster bean genotypes was in order of RGC-197 < RGC-1301 < RGC-986 < RGC-1017 < RGC-1055 < RGC-1076 < RGC-1077 < RGC-1066 < RGC-1078 < RGC-1038 < RGC-1003 < RGC-1002 < HGS-365 < RGC-936 < HGS-563. The leaf hopper population on cluster bean was categorized on

the basis of mean values \pm standard deviation. The population was comparatively low (below 5.39/ three leaves) on RGC-197, RGC-1031, RGC-986, RGC-1017, RGC-1055 and RGC-1076 and considered as least susceptible; in middle order (5.39-6.65 / three leaves) on RGC-1077, RGC-1066 and RGC-1078 which were considered as moderately susceptible and high (above 6.65/ three leaves) on genotypes RGC-1038, RGC-1003, RGC-1002, HGS-365, RGC-936 and HGS-563 which were considered as highly susceptible. Chari (1971) screened eight varieties of cluster bean under natural conditions, however, none of them were found completely free from leaf hopper. Genotypes, Pusa navabhar showed the lowest percentage of infested pods which has not been included in the present study.

Table 1. Population of leaf hopper, *Empoasca motti* Pruthi on different genotypes of cluster bean

S. No.	Genotypes	Leaf hopper population /3 leaves								Mean of season
		14.08.07	21.08.07	28.08.07	04.09.07*	11.09.07	18.09.07	25.09.07	02.10.07	
1.	RGC-197	1.20 (1.30)	2.33 (1.68)	5.07 (2.36)	8.33 (2.97)	4.07 (2.14)	3.13 (1.91)	0.87 (1.17)	0.13 (0.79)	3.14 (1.91)
2.	RGC-1017	2.27 (1.66)	3.87 (2.09)	6.33 (2.61)	9.87 (3.22)	6.37 (2.62)	4.07 (2.14)	1.13 (1.28)	1.07 (1.25)	4.37 (2.21)
3.	RGC-1003	4.33 (2.20)	5.93 (2.54)	10.33 (3.29)	13.47 (3.74)	9.87 (3.22)	7.07 (2.75)	4.33 (2.20)	2.87 (1.84)	7.28 (2.79)
4.	RGC-1076	2.27 (1.66)	4.00 (2.12)	7.27 (2.79)	10.80 (3.36)	7.60 (2.85)	5.00 (2.35)	3.13 (1.91)	2.00 (1.58)	5.26 (2.40)
5.	RGC-1077	2.53 (1.74)	5.07 (2.36)	7.47 (2.82)	11.87 (3.52)	8.07 (2.93)	5.87 (2.52)	3.33 (1.96)	2.33 (1.68)	5.82 (2.51)
6.	RGC-986	2.33 (1.68)	3.07 (1.89)	6.00 (2.55)	9.60 (3.18)	6.33 (2.61)	4.27 (2.18)	1.87 (1.54)	1.20 (1.30)	4.33 (2.20)
7.	RGC-1078	3.47 (1.99)	5.47 (2.44)	8.87 (3.06)	12.47 (3.60)	8.93 (3.07)	6.33 (2.61)	3.87 (2.09)	1.87 (1.54)	6.41 (2.63)
8.	RGC-1055	2.50 (1.73)	3.50 (2.00)	7.13 (2.76)	10.13 (3.26)	7.27 (2.79)	4.50 (2.24)	3.07 (1.89)	1.27 (1.33)	4.92 (2.33)
9.	RGC-936	5.27 (2.40)	7.07 (2.75)	11.53 (3.47)	15.13 (3.95)	11.07 (3.40)	8.20 (2.95)	5.60 (2.47)	3.00 (1.87)	8.36 (2.98)
10.	RGC-1066	2.87 (1.84)	5.27 (2.40)	8.00 (2.92)	12.07 (3.55)	8.67 (3.03)	6.27 (2.60)	3.53 (2.01)	2.67 (1.78)	6.17 (2.58)
11.	RGC-1002	4.67 (2.27)	6.35 (5.62)	10.93 (3.38)	13.87 (3.79)	10.07 (3.25)	7.33 (2.80)	4.87 (2.32)	2.47 (1.72)	7.57 (2.84)
12.	RGC-1031	1.93 (1.56)	2.67 (1.78)	5.13 (2.37)	8.47 (2.99)	4.27 (2.18)	4.00 (2.12)	1.07 (1.25)	0.87 (1.17)	3.55 (2.01)
13.	RGC-1038	4.27 (2.18)	5.67 (2.48)	9.07 (3.09)	12.80 (3.65)	9.33 (3.14)	6.67 (2.68)	4.07 (2.14)	1.93 (1.56)	6.73 (2.69)
14.	HGS-563	5.33 (2.41)	7.13 (2.76)	11.60 (3.48)	15.20 (3.96)	11.13 (3.41)	8.27 (2.96)	5.67 (2.48)	2.87 (1.84)	8.40 (2.98)
15.	HGS-365	5.07 (2.36)	6.53 (2.65)	11.07 (3.40)	14.33 (3.85)	10.47 (3.31)	7.87 (2.89)	5.07 (2.36)	2.93 (1.85)	7.92 (2.90)
	S.Em. \pm	0.06	0.07	0.09	0.11	0.09	0.08	0.6	0.04	0.08
	CD (p=0.05)	0.17	0.20	0.28	0.34	0.26	0.23	0.18	0.13	0.24

Figures in the parentheses are $\sqrt{X+0.5}$ values; * Peak population of leaf hopper during the crop season.

The population of whitefly was first recorded in second week of August on different genotypes (Table 2); it reached to a peak in the first week of September and gradually declined thereafter. Based on mean population data, the over all variability of susceptibility in different genotypes was in order of RGC-1017 < HGS-365 < RGC-986 < RGC-197 < RGC-1055 < RGC-1301 < RGC-1076 < RGC-1077 < RGC-1066 < RGC-1038 < RGC-1003 < RGC-1002 < RGC-1078 < RGC-936 < HGS-563. The categorization revealed that genotypes, RGC-1017, HGS-365, RGC-986, RGC-197, RGC-1055, RGC-1031 and RGC-1076 exhibited population below 5.35 per three leaves and were regarded as least susceptible; genotypes RGC-1077 and RGC-1066 having a population of 5.35-6.61 per three

leaves were moderately susceptible and RGC-1038, RGC-1003, RGC-1002, RGC-1078, RGC-936 and HGS-563 possessed whitefly population above 6.61/ three leaves and were considered as highly susceptible. Singh *et al.* (1996) screened sixteen genotypes of cluster bean against whitefly, *B. tabaci* and observed HGS-365 with low nymph population. Singh (2002) reported that variety RGC-1017 of early maturing group showed less than 10 per cent whitefly incidence. Similar observations were recorded by Verma and Henry (2002).

The aphid, *A. craccivora* population was recorded initially in second week of August which gradually reached to the peak in the last week of August and declined thereafter as the last observation was recorded in the

Table 2. Population of whitefly, *Bemisia tabaci* (Genn.) on different genotypes of cluster bean

S. No.	Genotypes	Whitefly population /3 leaves								Mean of season
		14.08.07	21.08.07	28.08.07	04.09.07*	11.09.07	18.09.07	25.09.07	02.10.07	
1.	RGC-197	2.47 (1.72)	3.13 (1.91)	5.47 (2.44)	9.40 (3.15)	5.27 (2.40)	4.33 (2.20)	1.87 (1.54)	1.00 (1.22)	4.12 (2.15)
2.	RGC-1017	1.20 (1.30)	2.27 (1.66)	5.27 (2.40)	8.33 (2.97)	4.20 (2.17)	3.13 (1.91)	1.73 (1.49)	2.27 (1.66)	3.55 (2.00)
3.	RGC-1003	5.33 (2.41)	6.60 (2.66)	10.47 (3.31)	13.87 (3.79)	10.00 (3.24)	7.27 (2.79)	4.60 (2.26)	3.53 (2.01)	7.71 (2.87)
4.	RGC-1076	2.93 (1.85)	4.00 (2.12)	7.27 (2.79)	10.27 (3.28)	7.07 (2.75)	5.00 (2.35)	2.60 (1.76)	2.07 (1.60)	5.15 (2.38)
5.	RGC-1077	3.47 (1.99)	5.07 (2.36)	7.47 (2.82)	11.87 (3.52)	8.27 (2.96)	6.00 (2.55)	3.87 (2.09)	2.93 (1.85)	6.12 (2.57)
6.	RGC-986	2.53 (1.74)	3.07 (1.89)	5.40 (2.43)	9.27 (3.13)	5.13 (2.37)	4.27 (2.18)	1.80 (1.52)	1.20 (1.30)	4.08 (2.14)
7.	RGC-1078	3.87 (2.09)	6.27 (2.60)	8.07 (2.93)	12.47 (3.60)	8.40 (2.98)	6.23 (2.59)	4.00 (2.12)	3.33 (1.96)	4.58 (2.25)
8.	RGC-1055	2.80 (1.82)	3.27 (1.94)	6.00 (2.55)	9.87 (3.22)	6.07 (2.56)	4.40 (2.21)	2.00 (1.58)	1.60 (1.45)	4.50 (2.24)
9.	RGC-936	5.47 (2.44)	7.33 (2.80)	11.20 (3.42)	15.27 (3.97)	11.07 (3.40)	8.20 (2.95)	5.33 (2.41)	3.93 (2.10)	8.48 (3.00)
10.	RGC-1066	3.47 (1.99)	5.13 (2.37)	7.53 (2.83)	11.93 (3.53)	8.33 (2.97)	6.07 (2.56)	3.93 (2.10)	3.00 (1.87)	6.17 (2.58)
11.	RGC-1002	5.37 (2.42)	7.07 (2.75)	11.00 (3.39)	14.07 (3.82)	10.33 (3.29)	7.33 (2.80)	4.60 (2.26)	3.33 (1.96)	7.89 (2.90)
12.	RGC-1031	2.00 (1.58)	2.67 (1.78)	5.33 (2.41)	8.67 (3.03)	4.27 (2.18)	4.20 (2.17)	1.13 (1.28)	0.93 (1.20)	3.65 (2.04)
13.	RGC-1038	5.00 (2.35)	6.33 (2.61)	8.67 (3.03)	12.80 (3.65)	8.47 (2.99)	6.37 (2.62)	4.33 (2.20)	3.73 (2.06)	6.97 (2.73)
14.	HGS-563	5.53 (2.46)	7.37 (2.81)	11.27 (3.43)	15.33 (3.98)	11.13 (3.41)	8.27 (2.96)	5.37 (2.42)	3.87 (2.09)	8.52 (3.00)
15.	HGS-365	5.40 (2.43)	7.27 (2.79)	11.07 (3.40)	14.87 (3.92)	11.00 (3.39)	8.07 (2.93)	5.27 (2.40)	3.67 (2.04)	8.33 (2.97)
S.Em. ±		0.06	0.07	0.09	0.11	0.09	0.08	0.6	0.05	0.08
CD (p=0.05)		0.17	0.20	0.28	0.34	0.26	0.23	0.18	0.14	0.23

Figures in the parentheses are $\sqrt{X+0.5}$ values; * Peak population of leaf hopper during the crop season.

Table 3. Population of aphid, *Aphis craccivora* Koch on different genotypes of cluster bean

S. No.	Genotypes	Population of Aphid / Central shoot					Mean of season
		14.08.07	21.08.07	28.08.07*	04.09.07	11.09.07	
1.	RGC-197	2.27 (1.66)	3.13 (1.91)	3.93 (2.10)	1.93 (1.56)	1.13 (1.28)	2.21 (1.65)
2.	RGC-1017	2.93 (1.85)	3.27 (1.94)	4.07 (2.14)	2.00 (1.58)	1.67 (1.47)	2.51 (1.73)
3.	RGC-1003	4.67 (2.27)	5.27 (2.40)	7.27 (2.79)	3.33 (1.96)	2.67 (1.78)	4.19 (2.17)
4.	RGC-1076	3.93 (2.10)	4.20 (2.17)	5.47 (2.44)	2.53 (1.74)	2.00 (1.58)	3.24 (1.93)
5.	RGC-1077	3.80 (2.07)	4.00 (2.12)	5.33 (2.41)	2.47 (1.72)	1.93 (1.56)	3.20 (1.92)
6.	RGC-986	3.40 (1.97)	3.80 (2.07)	5.13 (2.37)	2.27 (1.66)	1.80 (1.52)	2.99 (1.87)
7.	RGC-1078	4.33 (2.20)	4.53 (2.24)	6.27 (2.60)	2.40 (1.70)	2.33 (1.68)	3.59 (2.02)
8.	RGC-1055	3.53 (2.01)	3.93 (2.10)	5.20 (2.39)	2.33 (1.68)	1.87 (1.54)	3.02 (1.88)
9.	RGC-936	5.00 (2.35)	6.27 (2.60)	8.00 (2.92)	4.07 (2.14)	2.80 (1.82)	4.70 (2.28)
10.	RGC-1066	4.37 (2.21)	4.67 (2.27)	6.73 (2.69)	2.60 (1.76)	2.40 (1.70)	3.75 (2.06)
11.	RGC-1002	4.40 (2.21)	4.93 (2.33)	7.00 (2.74)	3.07 (1.89)	2.53 (1.74)	3.96 (2.11)
12.	RGC-1031	3.00 (1.87)	3.33 (1.96)	5.00 (2.35)	2.20 (1.64)	1.73 (1.49)	2.76 (1.81)
13.	RGC-1038	4.07 (2.14)	4.27 (2.18)	6.07 (2.56)	2.60 (1.76)	2.27 (1.66)	3.48 (1.99)
14.	HGS-563	5.33 (2.41)	7.07 (2.75)	8.40 (2.98)	4.27 (2.18)	3.00 (1.87)	5.03 (2.35)
15.	HGS-365	5.27 (2.40)	6.73 (2.69)	8.27 (2.96)	4.33 (2.20)	2.93 (1.85)	5.00 (2.35)
S.Em. ±		0.06	0.07	0.08	0.05	0.04	0.06
CD (p=0.05)		0.17	0.20	0.25	0.15	0.11	0.17

Figures in the parentheses are $\sqrt{X+0.5}$ values; * Peak population of aphid during the crop season.

second week of September (Table 3). The overall variability of susceptibility in cluster bean genotypes based on the mean population during the season was in order of RGC-197 < RGC-1017 < RGC-1031 < RGC-986 < RGC-1055 < RGC-1077 < RGC-1076 < RGC-1038 < RGC-1078 < RGC-1066 < RGC-1002 < RGC-1003, RGC-936 < HGS-365 < HGS-563. On the basis of statistical categorization ($X \pm \sigma$), the genotypes having population below 3.09 per central shoot (RGC-197, RGC-1017, RGC-1031, RGC-986 and RGC-1055) were considered as least susceptible; genotypes having 3.09–4.07 aphids per central shoot (RGC-1077, RGC-1076, RGC-1038, RGC-1078, RGC-1066 and RGC-1002) fell into moderately susceptible group and the genotypes having population above 4.07 (RGC-1003,

RGC-936, HGS-365 and HGS-563) fell into the highly susceptible group. Patel *et al.* (1999) screened the germplasm lines of cluster bean against leaf crinkle virus transmitted by *Aphis gossypii* but none of the genotypes screened in the present investigation were included.

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