Original Research Article

ASSESSMENT OF LESS SUSCEPTIBLE GENOTYPE AGAINST MAJOR INSECT PESTS OF CLUSTER BEAN IN GIRD REGION OF MADHYA PRADESH

ABSTRACT

To study Less susceptible variety/genotype against major insect on cluster bean during kharif, 2022, The treatments consisted of 09 genotypes of cluster bean *viz*., T_1 - RGr 20-7, T_2 - GD-567, T_3 - HG 2-20 (ch), T_4 - CAZG 17-4-5 , T_5 - RGC 1066 (ch), T_6 - GD- 565, T_7 - RGR 20-15, T_8 - RGC 1033 (ch), T_9 - X- 25 were tested in randomized block design with three replications. Genotypes minimum aphid, whitefly, jassid and thrips were recorded in genotype GD- 565, which was followed by CAZG 17-4-5. Whereas, maximum population of aphid, whitefly, jassid and thrips was recorded in genotype RGC 1066 (ch). Genotypes GD- 565 found most suitable for cultivation in gird region of Madhya Pradesh.

Keywords: Cluster Bean, Aphid,Jassid, Thrips, Whitfly, sucking pest and less susceptible

Introduction

The cluster bean, also known as guar or *Cyamopsis tetragonoloba* (Linn.) Taub. is currently acknowledged as one of the most significant commercial crops of arid and semi-arid countries. (Omprakash and Raju 2014).Its young pods of cluster bean are used as vegetables and are a low-cost source of energy, protein, fat, carbohydrate, vitamin A, vitamin C, calcium, and iron for every 100 g of edible portion. Its seed contains gum ranging from 31.4 to 41.23 per cent (Pathak *et al*., 2009; Muthuselvi *et al*., 2018). The cluster beanis reportedly good for several health benefits because it is entirely nutritious and treats anaemia, which is a growing health issue in almost all women. It improves cardiovascular health, strengthens bones, and promotes better blood circulation. It is advised throughout pregnancy since it is beneficial to the.Cluster beans are one of the most widely cultivated crops in the world, with 82% of the total output being produced in India. In India,3.14million hectares area with 1.52million tonnesproductionof cluster bean seed and 484 kg/ha of productivityof cluster bean.Cluster beans are solely grown on 75280 hectares area in

Madhya Pradesh, with a productivity of 750 kg/ha (Anonymous, 2021).The cluster bean has, however got great recognition due to presence of water-soluble natural polymer galactomannan gum in protein free endosperm portion of the seeds. In recent years its importance has increased particularly, because guar seed having gum content varying from 31.4 to 43.16 per cent (Dawar *et al.*, 2022). The various pests attacking the crop, sucking pest viz., jassid, *Empoascakerri* (Pruthi), whitefly, *Acaudaleyrodesrachipora* (Singh), thrips, *Megaleurothrips distalis* (Karny) and aphid were recorded on cluster bean crop (Pawar *et al.*, 2017). Cluster bean is attacked by different insect pests at various growth stages of the crop and cumulatively it causes heavy losses in yield. Pandey *et al.*, (1991) reported 73.86 per cent yield loss due to its pest complex. A thorough investigation and appropriation of the biotic and abiotic characteristics of the pests' environment is required for accurate and essential for effective modern pest management (Ruesink and Kogan, 1975). Growing resistant varieties is one of the finest options for the most affordable and secure method of eradicating this pest. A resistant variety can serve as the foundation for creating an integrated control system (Gallun *et al.*, 1975), and its usage in conjunction with other control strategies may be most effective.

MATERIALS AND METHODS

The experiment was carried out at the research farm, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India. Randomized Block Design (RBD) with 3 replications was deployed for nine genotypes during *kharif*, 2021. The row-to-row and plant-to-plant spacing were45 cm X 10 cm respectively and the plot size was4.0 m X 2.7 m. The genotypes were allowed to have natural infestation. Weekly observations on population of aphid, jassid, whitefly and thrips were recorded soon after their appearance till harvesting of the crop. All the observations were recorded early in the morning. The population of aphid, jassid, whitefly and thrips were recorded on ten randomly selected plants in each plot.The data was collected as mean number of insect pests per plant and were transformed into square-root values as per the standard requisites. Then experimental data were subjected to statistical analysis using analysis of variance (ANOVA).

RESULTS AND DISCUSSION

To find out less susceptible varieties/ genotypes against major insect pests.

Thrips,*Megalurothrips distalis* (Karny).

Result presented on the basis of seven observation, the result on the overall mean *M. distalis*population throughout the crop season revealed that the lowest *M. distalis*population (1.32 thrips/ plant) was recorded in the genotype GD- 565. The next potential genotypes in resisting the infestation of *M. distalis* were CAZG 17-4-5, GD- 567, X- 25, RGR 20-15, HG 2-20 (ch), RGr 20-7and RGC 1033 (ch) exhibiting the significant difference between them. However, the highest pest population (2.65 thrips/ plant) was recorded in the genotype RGC 1066 (ch), being the most susceptible cluster bean genotype. On the basis of statistical categorization of the genotypes, out of the nine cluster bean genotypes tested, only one genotype (GD- 565) was observed with significantly lower susceptibility to *M. distalis* population compared to the rest of the genotypes. Further, RGr 20-7, GD- 567, HG 2-20 (ch), CAZG 17-4-5, RGR 20-15 and X- 25 were categorised as moderately susceptible genotypes. However, RGC 1066 (ch) and RGC 1033 (ch) were observed as highly susceptible genotypes of cluster bean throughout the crop season. Additionally, the results of Dawar *et al.* (2022) support partially the present findings and reported that no significant differences were observed in different genotypes. According to GD 1903, GD 567, and HG 19-2-6 were genotypes that were less susceptible to thrips, while DRLGG 13-28, CAZG 18-4, GL-01, CAZG 19-9, GG 1806, RGC-1033, CAZG 17-16-1, GG 1903, DRLGG 13-39, CAZG 19-7, and GD 580 were genotypes that were moderately susceptible, and GG 1909, HG 2-20, X-25 and RGC 1066 as highly susceptible. Panwar and Patel (2011) tested 20 varieties/genotypes for their susceptibility /resistance. The present results are supported by previous studies as done by Yadav and Kumawat (2008) and Kumawat (2022).

Aphid, *Aphis craccivora*(Koch).

According to seven observations, the lowest *A. craccivora*population (1.80 aphid/ plant) was recorded in the genotype GD- 565 which was followed by CAZG 17-4-5 (2.16 aphid/ plant). The next potential genotypes in resisting the infestation of *A. craccivora*were GD- 567, X- 25, RGR 20-15, HG 2-20 (ch), RGr 20-7 and RGC 1033 (ch) exhibiting the significant difference between them. However, the highest pest population (3.26 aphid/ plant) was recorded in the genotype RGC 1066 (ch), being the most susceptible cluster bean genotype. On the basis of statistical categorization of the genotypes, out of the nine cluster bean genotypes tested, only one genotype (GD- 565) was observed with significantly lower susceptibility to *A. craccivora*population compared to the rest of the genotypes. Further, RGr 20-7, GD- 567, HG 2-20 (ch), CAZG 17-4-5, RGR 20-15 and X- 25 were categorised as moderately susceptible genotypes. However, RGC 1066 (ch) and RGC 1033 (ch) were observed as highly susceptible genotype. The present results are supported by previous studies as done by Akbar *et al*. (1996) who found lowest numbers of jassid and aphid on variety. Yadav *et al.* (2011) are consistent who screened fifteen genotypes of cluster bean.

Whitefly,*Acaudaleyrodesrachipora*(Singh).

On the basis of average of seven observations significant differences in different genotypes were observed with regards to whitefly population. The lowest *A. rachipora*population (3.22 whitefly/ plant) was recorded in the genotype GD- 565 which was followed by CAZG 17-4-5 (3.64 whitefly/ plant). The next potential genotypes in resisting the infestation of *A. rachipora*were GD- 567, X- 25, RGR 20-15, HG 2-20 (ch), RGr 20-7 and RGC 1033 (ch) exhibiting the significant difference between them. However, the highest pest population (4.67 whitefly/ plant) was recorded in the genotype RGC 1066 (ch), being the most susceptible cluster bean genotype. On the basis of statistical categorization of the genotypes, out of the nine cluster bean genotypes tested, only one genotype (GD- 565) was observed with significantly lower susceptibility to *A. rachipora*population compared to the rest of the genotypes. Further, RGr 20-7, GD- 567, HG 2-20 (ch), CAZG 17-4-5 , RGR 20-15 and X- 25 were categorised as moderately susceptible genotypes. However, RGC 1066 (ch) and RGC 1033 (ch) were observed as highly susceptible. The present results are supported by the findings of Patel *et al.* (2009) who revealed that whitefly population differed among all the varieties. Similarly, Yadav *et al.* (2011) also reported that the genotypes against whitefly. Panwar and Patel (2011) tested 20 varieties/genotypes for their susceptibility /resistance. More relevantly, Dawar *et al.* (2022) observed that the genotype against whitefly.

Jassid, *Empoascakerri*(Pruthi).

In seven observations, population of jassid was recorded with significant differences in different genotypes. The lowest *E. kerri*population (3.51 jassid/ plant) was recorded in the genotype GD- 565 which was followed by CAZG 17-4-5 (3.89 jassid/ plant). The next potential genotypes in resisting the infestation of *E. kerri*were GD- 567, X- 25, RGR 20-15, HG 2-20 (ch), RGr 20-7 and RGC 1033 (ch) exhibiting the significant difference between them. However, the highest pest population (4.88 jassid/ plant) was recorded in the genotype RGC 1066 (ch), being the most susceptible cluster bean genotype. On the basis of statistical categorization of the genotypes, out of the nine cluster bean genotypes tested, only one genotype (GD- 565) was observed with significantly lower susceptibility to *E. kerri* population compared to the rest of the genotypes. Further, RGr 20-7, GD- 567, HG 2-20 (ch), CAZG 17-4-5, RGR 20-15 and X- 25 were categorised as moderately susceptible genotypes. However, RGC 1066 (ch) and RGC 1033 (ch) were observed as highly susceptible genotype. The present results are supported by the findings of Yadav and Kumawat (2008) who evaluated fifteen genotype of cluster bean against jassid and whitefly.

References

Akbar, S., & Latif, A. (1996). Estimation of yield losses in different varieties of mung bean and mash due to pest insects. In *Second International Congress of Entomological Sciences, Islamabad (Pakistan),* 19-21 Mar 1996. PARC.

Anonymous (2021). Ministry of Agriculture, Government of India. https://www.indiastatagri.com/table/agriculture/area-production-yield-guar-seed-india-1997-1998-20/421001

Dawar, P., Dwarka, Vishwakarma, D., Singh, Yadav, P. S., Rien, S.P., Pandey, R., Akanksha, Aggarwal, M. and Singh, U. C. (2022). Study the less susceptible genotype against major insect pests on cluster bean. *The Pharma Inn. J*. SP-11(2): 268-272.

Gallun, R. L., Starks, K. J., & Guthrie, W. D. (1975). Plant resistance to insects attacking cereals. *Annual Review of Ent.* 20(1): 337-357.

Kumawat (2022). Studies on Pest complex of Cluster bean [*Cyamopsis tetragonoloba*(Linn.) Taubert] in Northern M.P.M.Sc. (Ag.) Thesis. RVSKVV, Gwalior, M.P. pp62.

Muthuselvi, R., Shanthi, A. and Praneetha, S. (2018). Mean performance of cluster bean (*Cyamopsis tetragonoloba*) genotypes for yield and quality parameters. *International Journal of Chemical Studies*. 6(2): 3626-3629.

Nitharwal, M. and Kumawat, K.C. (2009). Population dynamics of insect pest of green gram, *Vigna radiata* (Linn.) in Semi-Arid region of Rajasthan. *Indian Journalof Applied Entomology*. 23: 90-9.

Pandey, S.N., Singh, R., Sharma, V.K. and Kanwat, P.M. (1991). Losses due to insect pests in kharif pulses. *J Ent. Res*. 53(4): 629-631.

Panwar, S.T. and Patel, P.S. (2011). Pest succession, varietal screening and management of important pests of cluster bean. M.Sc. Thesis Submitted to Chimanbhai Patel College of Agriculture, SardarkrushhinagarDantiwada Agriculture University, Sardarkrushhinagar, Gujarat.

Patel, P.S.; Patel, I.S.; Panickar, B. and Acharya, S. (2009). Evaluation of newer insecticides against sucking insect pests of cluster bean. International Conference on Nurturing Arid Zones for People and the Environment: Issues Agenda for 21st Century Arid Zone Reasearch Association of India, CAZRI Campus, Jodhpur, India. pp 102.

Ruesink, W. G., & Kogan, M. (1975). The quant basis of pest management: Sampling and meaning. *RL Metcalf and WH Luckman, Introduction to Insect Pest Management. John Wiley & Sons, New York, 351*.

Yadav SR, Kumawat KC. (2008). Seasonal incidence and management of major insect pests of cluster bean [*Cyamopsis tetragonoloba*(L.)]. M.Sc. Thesis Submitted to Rajasthan Agricultural University, Campus- Jobner.

Yadav, S.R., Kumawat, K.C., Khinchi, S.K. and Naga, R.P. (2011). Screening of genotypes of cluster bean, *Cyamopsis tetragonoloba*(Linn.) Taub. for resistance to sucking insect pests. *Indian Journal of Applied Entomology*. 25(2): 110–114.

Table 1: Screening of cluster bean genotypes/ varieties for their susceptibility against thrips,*Megalurothrips distalis* (Karny) during *Kharif 2022*.

Genotypes	Different dates of observation of pest population during *Kharif* 2022									Overall Mean
	16-08-2022	23-08-2022	30-08-2022	06-09-2022	13-09-2022	20-09-2022	27-09-2022	04-10-2022	11-10-2022	
RGr 20-7	1.11 (1.27)*	2.90 (1.84)	2.09 (1.61)	1.42 (1.39)	3.61 (2.03)	3.71 (2.05)	3.15 (1.91)	1.63 (1.46)	1.17 (1.29)	2.31 (1.68)
GD- 567	0.58 (1.04)	2.38 (1.7)	1.60 (1.45)	0.90 (1.18)	3.12 (1.9)	3.19 (1.92)	2.29 (1.67)	1.11 (1.27)	0.79 (1.14)	1.77 (1.51)
HG 2-20 (ch)	1.05 (1.24)	2.86 (1.83)	2.04 (1.59)	1.38 (1.37)	3.56 (2.02)	3.67 (2.04)	3.05 (1.88)	1.59 (1.45)	1.10 (1.27)	2.26 (1.66)
CAZG 17-4-5	0.42 (0.96)	2.22 (1.65)	1.43 (1.39)	0.74 (1.11)	2.95 (1.86)	3.03 (1.88)	2.12 (1.62)	0.95 (1.2)	0.69 (1.09)	1.61 (1.45)
RGC 1066 (ch)	1.38 (1.41)	3.42 (1.98)	2.39 (1.7)	1.94 (1.56)	3.91 (2.1)	4.23 (2.18)	3.22 (1.93)	2.15 (1.63)	1.24 (1.32)	2.65 (1.78)
GD- 565	0.12 (0.79)	1.91 (1.55)	1.11 (1.27)	0.43 (0.97)	2.63 (1.77)	2.72 (1.8)	1.75 (1.5)	0.64 (1.07)	0.56 (1.03)	1.32 (1.35)
RGR 20-15	0.81 (1.14)	2.61 (1.76)	1.82 (1.52)	1.13 (1.28)	3.34 (1.96)	3.42 (1.98)	2.51 (1.74)	1.34 (1.36)	0.93 (1.2)	1.99 (1.58)
RGC 1033 (ch)	1.31 (1.35)	3.15 (1.91)	2.24 (1.66)	1.67 (1.47)	3.76 (2.06)	3.96 (2.11)	3.20 (1.92)	1.88 (1.54)	1.22 (1.31)	2.49 (1.73)
X- 25	0.72 (1.1)	2.51 (1.74)	1.73 (1.49)	1.03 (1.24)	3.25 (1.94)	3.32 (1.96)	2.42 (1.71)	1.24 (1.32)	0.84 (1.16)	1.90 (1.55)
SE(m) ±	**0.017**	**0.006**	**0.018**	**0.008**	**0.014**	**0.006**	**0.019**	**0.008**	**0.028**	**0.008**
C.D. at 5%	**0.051**	**0.019**	**0.053**	**0.025**	**0.042**	**0.018**	**0.058**	**0.024**	**0.084**	**0.025**

*figures in parentheses are square root ($\sqrt{x + 0.5}$) values.

Table 2: Screening of cluster bean genotypes/ varieties for their susceptibility against aphid, *Aphis craccivora*(Koch) during *Kharif* 2022.

Genotypes	Different dates of observation of pest population during *Kharif* 2022									Overall Mean
	16-08-2022	23-08-2022	30-08-2022	06-09-2022	13-09-2022	20-09-2022	27-09-2022	04-10-2022	11-10-2022	
RGr 20-7	1.63 (1.46)*	3.04 (1.88)	3.41 (1.98)	4.30 (2.19)	4.59 (2.26)	4.02 (2.13)	2.43 (1.71)	1.68 (1.47)	1.06 (1.25)	2.91 (1.85)
GD- 567	1.11 (1.27)	2.43 (1.71)	2.89 (1.84)	3.62 (2.03)	4.07 (2.14)	3.37 (1.97)	2.01 (1.59)	1.16 (1.29)	0.64 (1.07)	2.37 (1.69)
HG 2-20 (ch)	1.46 (1.4)	2.82 (1.82)	3.24 (1.93)	4.08 (2.14)	4.42 (2.22)	3.80 (2.07)	2.36 (1.69)	1.49 (1.41)	0.99 (1.22)	2.74 (1.8)
CAZG 17-4-5	0.88 (1.18)	2.20 (1.64)	2.66 (1.78)	3.38 (1.97)	3.84 (2.08)	3.23 (1.93)	1.82 (1.52)	0.93 (1.2)	0.45 (0.97)	2.16 (1.63)
RGC 1066 (ch)	1.98 (1.57)	3.40 (1.97)	3.76 (2.06)	4.66 (2.27)	4.94 (2.33)	4.38 (2.21)	2.75 (1.8)	2.13 (1.62)	1.38 (1.37)	3.26 (1.94)
GD- 565	0.46 (0.98)	1.82 (1.52)	2.24 (1.66)	3.08 (1.89)	3.42 (1.98)	2.80 (1.82)	1.61 (1.45)	0.55 (1.02)	0.24 (0.86)	1.80 (1.52)
RGR 20-15	1.34 (1.36)	2.70 (1.79)	3.12 (1.9)	3.96 (2.11)	4.30 (2.19)	3.57 (2.02)	2.24 (1.66)	1.35 (1.36)	0.87 (1.17)	2.60 (1.76)
RGC 1033 (ch)	1.88 (1.54)	3.25 (1.94)	3.66 (2.04)	4.51 (2.24)	4.84 (2.31)	4.14 (2.15)	2.64 (1.77)	1.98 (1.57)	1.27 (1.33)	3.13 (1.91)
X- 25	1.24 (1.32)	2.55 (1.75)	3.02 (1.88)	3.81 (2.08)	4.20 (2.17)	3.44 (1.99)	2.14 (1.63)	1.28 (1.33)	0.77 (1.13)	2.50 (1.73)
SE(m) ±	**0.009**	**0.009**	**0.006**	**0.009**	**0.005**	**0.013**	**0.006**	**0.014**	**0.009**	**0.006**
C.D. at 5%	**0.027**	**0.027**	**0.019**	**0.028**	**0.016**	**0.039**	**0.018**	**0.043**	**0.026**	**0.017**

*figures in parentheses are square root ($\sqrt{x + 0.5}$) values.

Table 3: Screening of cluster bean genotypes/ varieties for their susceptibility against whitefly,*Acaudaleyrodesrachipora* (Singh) during *Kharif* 2022.

Genotypes	Different dates of observation of pest population during *Kharif* 2022									Overall Mean
	16-08-2022	23-08-2022	30-08-2022	06-09-2022	13-09-2022	20-09-2022	27-09-2022	04-10-2022	11-10-2022	
RGr 20-7	3.89 (2.1)*	5.07 (2.36)	5.02 (2.35)	5.29 (2.41)	5.84 (2.52)	4.53 (2.24)	3.93 (2.11)	2.28 (1.67)	3.36 (1.97)	4.36 (2.2)
GD- 567	3.37 (1.97)	4.55 (2.25)	4.50 (2.24)	4.89 (2.32)	5.32 (2.41)	4.13 (2.15)	3.41 (1.98)	1.76 (1.5)	2.84 (1.83)	3.87 (2.09)
HG 2-20 (ch)	3.72 (2.05)	4.90 (2.32)	4.85 (2.31)	5.16 (2.38)	5.67 (2.48)	4.40 (2.21)	3.76 (2.06)	2.14 (1.63)	3.19 (1.92)	4.20 (2.17)
CAZG 17-4-5	3.14 (1.91)	4.32 (2.2)	4.27 (2.18)	4.66 (2.27)	5.09 (2.36)	3.90 (2.1)	3.18 (1.92)	1.53 (1.43)	2.61 (1.76)	3.64 (2.03)
RGC 1066 (ch)	4.24 (2.18)	5.42 (2.43)	5.37 (2.42)	5.51 (2.45)	6.19 (2.59)	4.75 (2.29)	4.28 (2.19)	2.55 (1.75)	3.71 (2.05)	4.67 (2.27)
GD- 565	2.72 (1.8)	3.90 (2.1)	3.85 (2.09)	4.24 (2.18)	4.67 (2.27)	3.48 (2)	2.76 (1.81)	1.11 (1.27)	2.19 (1.64)	3.22 (1.93)
RGR 20-15	3.60 (2.02)	4.78 (2.3)	4.73 (2.29)	5.10 (2.37)	5.55 (2.46)	4.34 (2.2)	3.64 (2.03)	2.01 (1.59)	3.07 (1.89)	4.09 (2.14)
RGC 1033 (ch)	4.14 (2.15)	5.32 (2.41)	5.19 (2.39)	5.40 (2.43)	6.01 (2.55)	4.64 (2.27)	4.10 (2.14)	2.37 (1.69)	3.53 (2.01)	4.52 (2.24)
X- 25	3.50 (2)	4.68 (2.28)	4.63 (2.27)	5.02 (2.35)	5.45 (2.44)	4.26 (2.18)	3.54 (2.01)	1.89 (1.55)	2.97 (1.86)	4.00 (2.12)
SE(m) ±	**0.006**	**0.005**	**0.008**	**0.008**	**0.007**	**0.009**	**0.009**	**0.010**	**0.009**	**0.006**
C.D. at 5%	**0.018**	**0.015**	**0.023**	**0.025**	**0.022**	**0.027**	**0.026**	**0.030**	**0.028**	**0.017**

*figures in parentheses are square root ($\sqrt{x + 0.5}$) values.

Table 4: Screening of cluster bean genotypes/ varieties for their susceptibility against jassid, *Empoascakerri*(Pruthi)during *Kharif* 2022.

Genotypes	Different dates of observation of pest population during *Kharif* 2022									Overall Mean
	16-08-2022	23-08-2022	30-08-2022	06-09-2022	13-09-2022	20-09-2022	27-09-2022	04-10-2022	11-10-2022	
RGr 20-7	4.11 (2.15)*	5.14 (2.38)	4.24 (2.18)	5.27 (2.4)	5.87 (2.52)	4.93 (2.33)	4.73 (2.29)	3.38 (1.97)	3.07 (1.89)	4.53 (2.24)
GD- 567	3.59 (2.02)	4.62 (2.26)	3.72 (2.06)	4.75 (2.29)	5.35 (2.42)	4.41 (2.22)	4.21 (2.17)	2.86 (1.83)	2.55 (1.75)	4.01 (2.12)
HG 2-20 (ch)	3.94 (2.11)	4.97 (2.34)	4.10 (2.15)	5.10 (2.37)	5.74 (2.5)	4.78 (2.3)	4.60 (2.26)	3.23 (1.93)	2.94 (1.85)	4.38 (2.21)
CAZG 17-4-5	3.36 (1.97)	4.39 (2.21)	3.67 (2.04)	4.60 (2.26)	5.35 (2.42)	4.26 (2.18)	4.17 (2.16)	2.71 (1.79)	2.51 (1.74)	3.89 (2.1)
RGC 1066 (ch)	4.46 (2.23)	5.49 (2.45)	4.59 (2.26)	5.62 (2.47)	6.23 (2.59)	5.29 (2.41)	5.09 (2.37)	3.74 (2.06)	3.43 (1.98)	4.88 (2.32)
GD- 565	2.94 (1.86)	3.97 (2.12)	3.37 (1.97)	4.42 (2.22)	4.73 (2.29)	4.08 (2.14)	3.59 (2.02)	2.53 (1.74)	1.93 (1.56)	3.51 (2)
RGR 20-15	3.82 (2.08)	4.85 (2.31)	3.95 (2.11)	4.98 (2.34)	5.58 (2.47)	4.64 (2.27)	4.44 (2.22)	3.09 (1.89)	2.78 (1.81)	4.24 (2.18)
RGC 1033 (ch)	4.36 (2.2)	5.39 (2.43)	4.49 (2.23)	5.52 (2.45)	6.12 (2.57)	5.18 (2.38)	4.98 (2.34)	3.63 (2.03)	3.32 (1.95)	4.77 (2.3)
X- 25	3.72 (2.06)	4.75 (2.29)	3.85 (2.09)	4.88 (2.32)	5.48 (2.45)	4.54 (2.25)	4.34 (2.2)	2.99 (1.87)	2.68 (1.78)	4.14 (2.15)
SE(m) ±	**0.006**	**0.005**	**0.004**	**0.004**	**0.004**	**0.005**	**0.005**	**0.006**	**0.006**	**0.004**
C.D. at 5%	**0.017**	**0.015**	**0.013**	**0.012**	**0.012**	**0.015**	**0.014**	**0.018**	**0.017**	**0.012**

*figures in parentheses are square root ($\sqrt{x + 0.5}$) values.