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Study the less susceptible genotype against major insect pests on cluster bean

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Abstract
To study Less susceptible variety/genotype against major insect on cluster bean during *kharif*, 2019, The treatments consisted of 15 genotypes of cluster bean *viz*., T-1 [RGC-1066 (ch)], T-2 [HG2-20 (ch)], T-3 [RGC-1033 (ch)], T-4 [RGr18-1 (AVT-I)], T-5 CAZG16-12 (AVT-I), T-6 (RGr19-2), T-7 (CAZG15-5-8), T-8 (RGr19-5), T-9 (CAZG17-16), T 10 (RGr 19-7) ,T 11 (CAZG17-24), T-12 (RGr19-10),T-13 (GAUG1507), T-14 (RGr19-14),T-15 (CAZG16-21) were tested in randomized block design with two replications. Genotypes minimum whitefly, jassid and thrips were recorded in genotype RGr- 19-14. Whereas, maximum population of whitefly, jassid and thrips was recorded in genotype CAZG 16-21. Minimum aphid was recorded in genotype CAZG 17-16 followed by RGr 19-17, and RGr19-10. Whereas, maximum. Aphid was recorded in genotype CAZG 16-21. Genotypes RGr 19-14 was found less susceptible for whitefly, jassid and thrips.

Keywords: Cluster bean, CAZG 16-21, RGr19-14, CAZG15-5-8 and RGC-1033

Introduction
Cluster bean [*Cyamopsis tetragonoloba* (Linn.) Taub.], commonly known as guar, has come to be recognized as one of the most important commercial crop of arid and semi-arid region. It is a drought hardy leguminous crop because of its deep tap rooting system and has high capacity to recover from water stress. The seed of cluster bean contains about 30-33% gum in the endosperm. The crop is mainly grown during rainy season, but it can also be grown successfully during summer season under irrigated condition. 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. The various pests attacking the crop, sucking pest *viz*., leafhopper, *Empoasca kerri* (Pruthi), whitefly, *Acaudaleyrodes rachipora* (Singh), thrips, *Megaleurothrips distalis* (Karny), black weevil, *Cyrtozemia dispar* (Pascoe) and termite, *Odontotermus obesus* (Rambur) and three natural enemies *viz*., Chrysoperla, spider and ladybird beetle were recorded on cluster bean crop (Pawar *et al*., 2017) [4]. Clusterbean 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) [3] reported 73.86 per cent yield loss due to its pest complex. The yield infestation relationship of Indian bean revealed that every unit increase in aphid population resulted in a yield loss of 3.54-4.68 kg/ha (Sharma *et al*., 2000) [5]. The thrips was one of main mungbean pests in dry season and significantly reduce the yield of 65 per cent, when severe incidence of this pest was observed (Indiati, 2004) [2]. There are many factors responsible for low productivity, of which infestation by insect pests is major one. The information regarding appearance of the pests and fluctuation in their population is essential for implementation of management strategies against any pest. In this case, resistant variety is one of the cost-effective and safe methods for these pests. A resistant variety can provide a base for construction on integrated control system and may most fruitful when used in connection with other methods of control (Gallun *et al*., 1975) [1].

2. Material and Methods
A field experiment was undertaken at Research Farm, Rajmata Vijyaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh during *kharif*, 2019-20.

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.

2.1. Screening of cluster bean genotypes against major insect pests

It is well known that certain genotypes of crops are less illustrates aggression by a specific insect pest than others, because of natural resistance. In the cultural practices, currently applied to minimize the losses caused by insect pests, growing of resistant varieties against insect pests is the most important one in the pest management. This also provides insect pests management without extra cost.

3. Results and Discussion

3.1. Whiteflies

On the basis of average of seven observations significant differences in different genotypes were observed with regards to whitefly population. Minimum and significant less population (6.19 whiteflies/leaf) was recorded on genotype RGr- 19-14 than rest of the genotypes except GAUG 1507, RGr- 19-10 and CAZG 15-5-8. Whereas, maximum and significantly higher than rest of the population (7.49 whiteflies/leaf) was recorded on genotype CAZG 16-21

Table 1: Population of whitefly on different genotypes of cluster bean.

Genotypes	Different dates of observation of pest population Kharif 2019-20							Average
	09.08.19	16.08.19	23.08.19	30.08.19	07.09.19	14.09.19	21.09.19	
RGC-1066 (ch)	9.04	11.57	9.59	6.88	4.33	2.81	1.26	6.50
	(3.09)	(3.47)	(3.18)	(2.72)	(2.20)	(1.82)	(1.32)	(2.64)
HG 2-20 (ch)	8.39	11.35	10.46	7.72	5.07	2.89	1.61	6.78
	(2.98)	(3.44)	(3.31)	(5.86)	(2.35)	(1.84)	(1.45)	(2.70)
RGC-1033 (ch)	9.35	11.49	10.16	7.39	4.57	2.90	1.45	6.76
	(3.14)	(3.39)	(3.26)	(2.81)	(2.25)	(1.84)	(1.39)	(2.69)
RGr 18-1 (AVT-I)	8.93	11.05	9.72	6.75	5.07	2.52	1.70	6.53
	(3.07)	(3.41)	(3.20)	(2.69)	(2.35)	(1.74)	(1.48)	(2.65)
CAZG 16-12 (AVT-I)	9.39	11.16	9.77	6.89	5.89	2.99	1.55	6.81
	(3.14)	(3.41)	(3.20)	(2.72)	(2.53)	(1.87)	(1.43)	(2.70)
RGr 19-2	9.01	10.64	9.48	7.42	5.73	2.32	1.80	6.63
	(3.08)	(3.34)	(3.16)	(2.81)	(2.49)	(1.68)	(1.52)	(2.67)
CAZG 15-5-8	7.72	9.66	8.83	7.99	6.35	2.67	1.68	6.41
	(2.87)	(3.19)	(3.05)	(2.91)	(2.61)	(1.78)	(1.47)	(2.63)
RGr 19-5	9.46	12.41	9.54	7.19	5.90	3.49	1.75	7.11
	(3.15)	(3.59)	(3.17)	(2.77)	(2.53)	(2.00)	(1.50)	(2.76)
CAZG 17-16	8.75	9.77	9.68	6.71	5.01	3.27	1.35	6.36
	(3.04)	(3.20)	(3.19)	(2.68)	(2.35)	(1.94)	(1.36)	(2.62)
RGr 19-7	9.23	11.15	9.43	8.35	5.73	2.38	1.33	6.80
	(3.12)	(3.41)	(3.15)	(2.97)	(2.49)	(1.70)	(1.35)	(2.70)
CAZG 17-24	7.56	11.64	9.80	7.26	5.17	2.23	1.77	6.49
	(2.84)	(3.48)	(3.21)	(2.78)	(2.37)	(1.65)	(1.51)	(2.64)
RGr 19-10	8.35	10.23	9.15	8.57	4.39	2.29	1.61	6.37
	(2.97)	(3.27)	(3.10)	(3.01)	(2.21)	(1.67)	(1.45)	(2.62)
GAUG 1507	8.89	9.16	8.99	6.64	5.62	3.37	1.62	6.33
	(3.06)	(3.11)	(3.08)	(2.67)	(2.47)	(2.97)	(1.45)	(2.61)
RGr 19-14	7.26	9.98	8.63	7.68	5.03	3.09	1.72	6.20
	(2.78)	(3.23)	(3.02)	(2.86)	(2.35)	(2.02)	(1.45)	(2.59)
CAZG 16-21	7.67	12.78	9.82	8.76	7.22	4.34	1.84	7.48
	(2.85)	(3.64)	(3.21)	(3.04)	(2.78)	(2.19)	(1.53)	(2.83)
SE(m) ±	0.08	0.09	0.08	0.08	0.12	0.10	0.06	0.03
C.D. at 5%	NS	(0.27)	NS	NS	NS	NS	NS	(0.09)

Figures in the parentheses are transform (√x+0.5) values NS= Non-significant

3.2. Jassid

On the basis of average of seven observations recorded on population of jassid non-significant differences were observed in different genotypes. However, the ranged from 2.62 in (RGr 19-14) to 2.86 in (CAZG 16-21).

Table 2: Population of jassid on different genotypes of cluster bean.

Genotypes	Different dates of observation of pest population Kharif 2019-20							Average
	09.08.19	16.08.19	23.08.19	30.08.19	07.09.19	14.09.19	21.09.19	
RGC-1066 (ch)	3.25	3.54	3.32	2.97	2.36	1.92	1.56	2.70
	(1.93)	(2.00)	(1.95)	(1.86)	(1.69)	(1.55)	(1.43)	(1.77)
HG 2-20 (ch)	3.01	3.41	3.38	3.04	2.63	1.99	1.59	2.72
	(1.87)	(1.97)	(1.96)	(1.88)	(1.76)	(1.57)	(1.44)	(1.77)
RGC-1033 (ch)	3.22	3.61	3.38	3.02	2.49	1.95	1.64	2.75
	(1.92)	(2.02)	(1.96)	(1.87)	(1.72)	(1.56)	(1.46)	(1.78)
RGr 18-1 (AVT-I)	3.13	3.53	3.41	2.82	2.60	1.94	1.52	2.70
	(1.90)	(2.00)	(1.97)	(1.82)	(1.76)	(1.56)	(1.42)	(1.77)
CAZG 16-12 (AVT-I)	3.13	3.50	3.31	2.87	2.73	1.99	1.66	2.74
	(1.90)	(2.00)	(1.95)	(1.83)	(1.79)	(1.57)	(1.46)	(1.78)
RGr 19-2	3.03	3.38	3.38	3.00	2.55	1.92	1.61	2.69
	(1.87)	(1.96)	(1.96)	(1.87)	(1.74)	(1.55)	(1.45)	(1.77)
CAZG 15-5-8	3.11	3.49	3.34	3.14	2.78	1.97	1.59	2.77
	(1.9)	(1.99)	(1.95)	(1.90)	(1.81)	(1.57)	(1.44)	(1.79)
RGr 19-5	3.09	3.62	3.26	2.94	2.56	1.87	1.55	2.69
	(1.89)	(2.02)	(1.93)	(1.85)	(1.74)	(1.53)	(1.43)	(1.77)
CAZG 17-16	3.12	3.38	3.42	2.73	2.39	1.95	1.58	2.65
	(1.90)	(1.96)	(1.97)	(1.79)	(1.7)	(1.56)	(1.44)	(1.76)
RGr 19-7	3.16	3.38	3.34	3.07	2.58	1.97	1.48	2.71
	(1.91)	(1.96)	(1.95)	(1.88)	(1.75)	(1.56)	(1.40)	(1.77)
CAZG 17-24	2.97	3.57	3.42	3.06	2.41	1.79	1.63	2.69
	(1.86)	(2.01)	(1.97)	(1.88)	(1.70)	(1.51)	(1.45)	(1.76)
RGr 19-10	2.91	3.58	3.33	2.92	2.48	1.81	1.52	2.65
	(1.84)	(2.01)	(1.95)	(1.84)	(1.72)	(1.51)	(1.42)	(1.75)
GAUG 1507	3.16	3.30	3.33	2.94	2.50	1.96	1.59	2.68
	(1.91)	(1.94)	(1.95)	(1.85)	(1.73)	(1.56)	(1.44)	(1.76)
RGr 19-14	2.84	3.47	3.26	3.04	2.38	1.89	1.51	2.62
	(1.35)	(1.99)	(1.93)	(1.88)	(1.69)	(1.54)	(1.41)	(1.68)
CAZG 16-21	2.87	3.66	3.44	3.28	2.82	2.20	1.79	2.86
	(1.83)	(2.03)	(1.98)	(1.94)	(1.82)	(1.64)	(1.51)	(1.82)
SE(m) ±	0.08	0.09	0.07	0.05	0.05	0.08	0.06	0.07
C.D. at 5%	NS	NS	NS	(0.16)	(0.17)	NS	NS	NS

Figures in the parentheses are transform (√x+0.5) values NS= Non-significant

3.3. Aphid

On the basis of average of seven observations recorded on population of aphid non-significant differences were observed in different genotypes. However, the ranged from 3.15 in (CAZG 17-16) to 3.72 in (CAZG 16-21).

Table 3: Population of aphid on different genotypes of cluster bean.

Genotypes	Different dates of observation of pest population *Kharif* 2019-20							Average
	09.08.19	16.08.19	23.08.19	30.08.19	07.09.19	14.09.19	21.09.19	
RGC-1066 (ch)	3.26	3.47	3.32	7.83	2.36	1.92	1.67	3.40
	(1.93)	(1.99)	(1.95)	(2.88)	(1.69)	(1.55)	(1.47)	(1.92)
HG 2-20 (ch)	2.88	3.41	3.38	8.25	2.63	1.99	1.55	3.44
	(1.83)	(1.97)	(1.96)	(2.95)	(1.76)	(1.57)	(1.43)	(1.92)
RGC-1033 (ch)	2.66	3.61	3.34	8.13	2.49	1.95	1.59	3.39
	(1.77)	(2.02)	(1.95)	(2.93)	(1.72)	(1.56)	(1.44)	(1.91)
RGr 18-1 (AVT-I)	3.06	3.53	3.41	6.93	2.60	1.94	1.52	3.28
	(1.88)	(2.00)	(1.97)	(2.72)	(1.76)	(1.56)	(1.42)	(1.90)
CAZG 16-12 (AVT-I)	3.13	3.50	3.31	7.25	2.73	1.99	1.57	3.35
	(1.90)	(2.00)	(1.95)	(2.78)	(1.79)	(1.57)	(1.43)	(1.91)
RGr 19-2	3.03	3.38	3.38	8.05	2.55	1.92	1.56	3.41
	(2.08)	(1.96)	(1.96)	(2.92)	(1.74)	(1.55)	(1.43)	(1.94)
CAZG 15-5-8	3.11	3.49	3.34	8.89	2.78	1.97	1.58	3.59
	(1.9)	(1.99)	(1.95)	(3.06)	(1.81)	(1.57)	(1.44)	(2.02)
RGr 19-5	3.09	3.62	3.26	7.62	2.56	1.87	1.53	3.36
	(1.89)	(2.02)	(1.93)	(2.84)	(1.74)	(1.53)	(1.42)	(1.91)
CAZG 17-16	3.12	3.39	3.18	6.48	2.39	1.95	1.56	3.15
	(1.90)	(1.97)	(1.91)	(2.64)	(1.7)	(1.56)	(1.43)	(1.87)
RGr 19-7	3.16	3.41	3.31	6.48	2.58	1.97	1.48	3.19
	(1.91)	(1.97)	(1.95)	(2.64)	(1.75)	(1.57)	(1.40)	(1.88)
CAZG 17-24	2.97	3.34	3.34	8.40	2.41	1.79	1.63	3.41
	(1.86)	(1.95)	(1.95)	(2.98)	(1.70)	(1.51)	(1.45)	(1.91)
RGr 19-10	2.91	3.31	3.17	7.52	2.48	1.81	1.58	3.25

	(1.84)	(1.95)	(1.91)	(2.83)	(1.72)	(1.51)	(1.44)	(1.88)
GAUG 1507	3.16	3.28	3.22	7.66	2.50	1.96	1.56	3.33
	(1.91)	(1.94)	(1.92)	(2.85)	(1.73)	(1.56)	(1.43)	(1.90)
RGr 19-14	2.84	3.39	3.21	8.26	2.38	1.89	1.59	3.36
	(1.82)	(1.97)	(1.92)	(2.95)	(1.69)	(1.54)	(1.44)	(1.96)
CAZG 16-21	2.87	3.36	3.36	9.76	2.82	2.19	1.73	3.72
	(1.83)	(1.96)	(1.96)	(3.20)	(1.82)	(1.64)	(1.49)	(2.05)
SE(m) ±	0.09	0.13	0.07	0.32	0.05	0.08	0.07	0.11
C.D. at 5%	(0.28)	NS	NS	(0.99)	(0.17)	NS	NS	NS

Figures in the parentheses are transform (√x+0.5) values NS= Non-significant

3.4. Thrips

On the basis of average of seven observations recorded on population of thrips no significant differences were observed in different genotypes. However, the ranged from 2.58 in (RGr 19-14) to 2.83 in (CAZG 16-21).

Table 4: Population of thrips on different genotypes of cluster bean.

Genotypes	Different dates of observation of pest population *Kharif* 2019-20							Average
	09.08.19	16.08.19	23.08.19	30.08.19	07.09.19	14.09.19	21.09.19	
RGC-1066 (ch)	3.17	3.47	3.25	2.89	2.31	1.92	1.56	2.65
	(1.91)	(1.99)	(1.93)	(1.84)	(1.67)	(1.55)	(1.43)	(1.77)
HG 2-20 (ch)	2.98	3.44	3.38	3.04	2.56	1.98	1.59	2.71
	(1.86)	(1.98)	(1.96)	(1.88)	(1.74)	(1.57)	(1.44)	(1.77)
RGC-1033 (ch)	3.14	3.52	3.34	2.98	2.46	1.95	1.64	2.71
	(1.90)	(2.00)	(1.95)	(1.86)	(1.72)	(1.56)	(1.46)	(1.77)
RGr 18-1 (AVT-I)	3.07	3.39	3.27	2.79	2.56	1.94	1.52	2.64
	(1.88)	(1.97)	(1.94)	(1.81)	(1.74)	(1.56)	(1.42)	(1.76)
CAZG 16-12 (AVT-I)	3.14	3.56	3.28	2.89	2.72	1.98	1.66	2.74
	(1.90)	(2.01)	(1.94)	(1.84)	(1.79)	(1.57)	(1.46)	(1.78)
RGr 19-2	3.00	3.34	3.31	2.99	2.68	1.91	1.61	2.69
	(1.87)	(1.95)	(1.95)	(1.86)	(1.78)	(1.55)	(1.45)	(1.77)
CAZG 15-5-8	3.00	3.34	3.21	3.08	2.80	1.96	1.59	2.71
	(1.87)	(1.95)	(1.92)	(1.89)	(1.81)	(1.56)	(1.44)	(1.77)
RGr 19-5	3.19	3.59	3.25	2.77	2.53	1.86	1.55	2.67
	(1.92)	(2.02)	(1.93)	(1.80)	(1.74)	(1.53)	(1.43)	(1.76)
CAZG 17-16	3.04	3.20	3.34	2.68	2.35	1.94	1.58	2.59
	(1.88)	(1.92)	(1.95)	(1.78)	(1.68)	(1.56)	(1.44)	(1.74)
RGr 19-7	3.12	3.48	3.31	3.14	2.57	1.96	1.47	2.72
	(1.90)	(1.99)	(1.95)	(1.90)	(1.75)	(1.56)	(1.40)	(1.77)
CAZG 17-24	2.84	3.48	3.36	2.96	2.38	1.79	1.63	2.63
	(1.82)	(1.99)	(1.96)	(1.86)	(1.69)	(1.51)	(1.45)	(1.75)
RGr 19-10	2.97	3.42	3.26	2.93	2.43	1.81	1.52	2.62
	(1.86)	(1.97)	(1.93)	(1.85)	(1.71)	(1.51)	(1.42)	(1.75)
GAUG 1507	3.07	3.27	3.24	2.85	2.47	1.96	1.59	2.63
	(1.88)	(1.94)	(1.93)	(1.83)	(1.72)	(1.56)	(1.44)	(1.75)
RGr 19-14	2.77	3.39	3.18	3.03	2.35	1.89	1.51	2.58
	(1.80)	(1.97)	(1.91)	(1.87)	(1.68)	(1.54)	(1.41)	(1.74)
CAZG 16-21	2.86	3.64	3.36	3.19	2.78	2.19	1.79	2.83
	(1.83)	(2.03)	(1.96)	(1.92)	(1.81)	(1.64)	(1.51)	(1.81)
SE(m) ±	0.06	0.07	0.05	0.04	0.06	0.08	0.06	0.05
C.D. at 5%	(0.18)	(0.23)	NS	(0.11)	(0.17)	NS	NS	NS

Figures in the parentheses are transform (√x+0.5) values NS= Non-significant

3.5. The screening of genotypes against insect pests of cluster bean

3.5.1. Whitefly, *Acaudaleyrodes rachipora* (Singh)

On the basis of average of seven observations significant differences in different genotypes were observed with regards to whitefly population. Minimum population (6.19 whiteflies/leaf) was recorded on genotype RGr 19- 14 indicated their least susceptible to whitefly followed by GAUG 1507, RGr 19-10 and CAZG 15-5-8. Whereas, maximum population (7.49 whiteflies/leaf) was recorded on genotype CAZG 16-21 to showed their higher susceptible to whitefly followed by RGr 19-5, CAZG 16-12 (AVT-I), RGr 19-7 and HG 2-20 (ch) (fig. 1).

Similar to the present findings Singh *et al.*, (1996) [6] screened sixteen genotypes of cluster bean against whitefly and among them five genotypes observed with low nymph population, HGS-365 was one.

Verma and Henry, (2003) [7] also screened fifteen normal maturity and 9 early maturity varieties of cluster bean, against the whitefly.

3.5.2. Jassid, *Empoasca kerri* (Pruthi)

On the basis of average of seven observations recorded on population of jassid no significant differences were observed in different genotypes. Minimum population (2.62 jassid/leaf) was recorded on genotype RGr 19-14 followed by RGr 19-10, CAZG 17-24 and GAUG 1507. Whereas, maximum population (2.86 jassid/leaf) was recorded on genotype CAZG

16-21 followed by CAZG 15-5-8, RGC-1033 (ch), CAZG 16-12 (AVT-I) and HG 2-20 (fig. 1).
The present findings are in agreement with that of Yadav and Kumawat, (2008) [8] who evaluated fifteen genotype of clusterbean against jassid.

3.5.3. Aphid, *Aphis craccivora* (Koch)
On the basis of average of seven observations recorded on population of aphid non-significant differences were observed in different genotypes. Minimum population (3.15 aphid/leaf) was recorded on genotype CAZG 17-16 followed by RGr 19-17, RGr 19-10 and RGr 18-1 (AVT-I). Whereas, maximum population (3.72 aphid/leaf) was recorded on genotype CAZG 16-21 followed by CAZG 17-21, HG 2-20 and RGr 19-2 (fig. 1).

3.5.4. Thrips, *Megalurothrips distalis* (Karny)
On the basis of average of seven observations recorded on population of thrips no significant differences were observed in different genotypes. Minimum population (2.58 thrips/flower) was recorded on genotype RGr 19-14 followed by CAZG 17-16, RGr 19-10 and CAZG 17-24. Whereas, maximum population (2.83 thrips/flower) was recorded on genotype CAZG 16-21 followed by CAZG 16-12 (AVT-I), RGr 19-7 and CAZG 15-5-8 (fig. 1).
Similar to the present finding Yadav and Kumawat, (2008) [8] reported that genotypes RGC-1066, HG 2-20, RGC-1033, RGr18-1(AVT-I), RGr-19-5-8 and RGr-19-7 as least susceptible to thrips, CAZG-17-16, RG19-10, CAZG-16-21, RGr19-2 and GAUG-1507 as moderately susceptible and RGC-936 were highly susceptible to thrips.

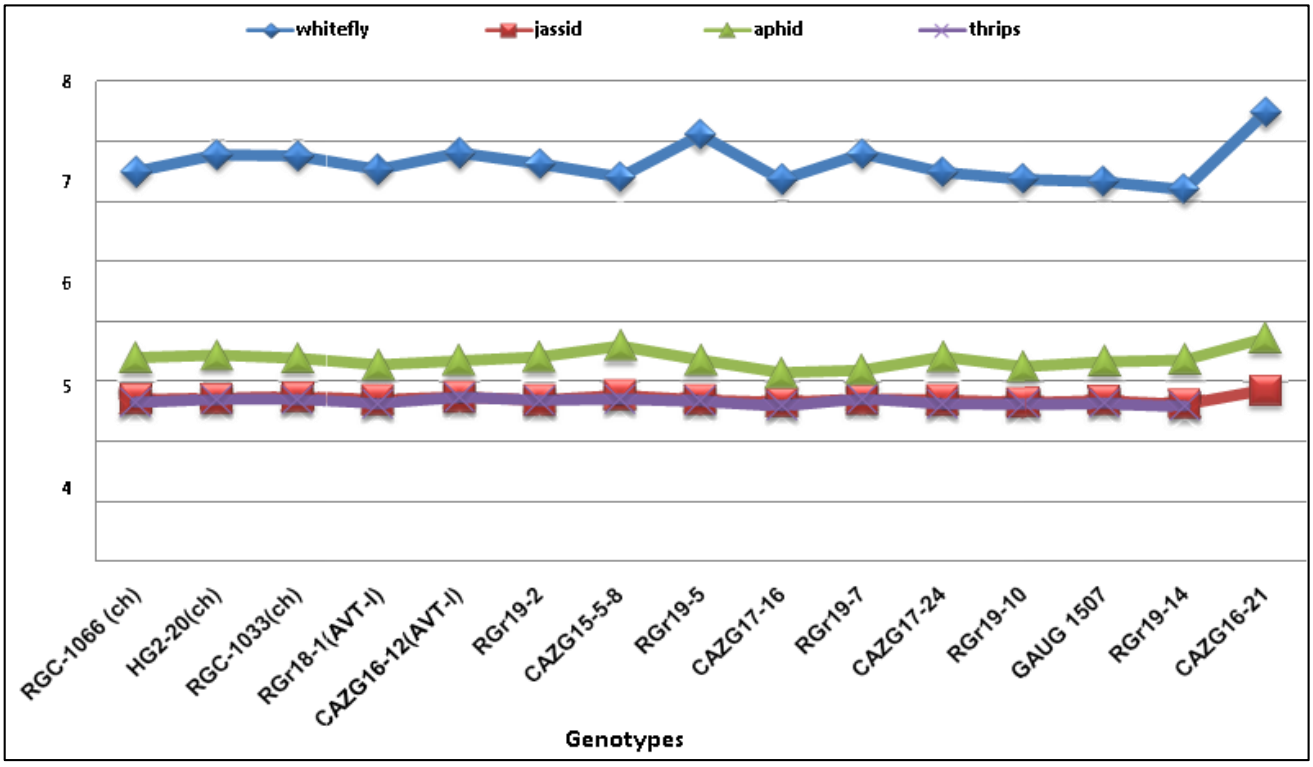

Fig 1: Population of whitefly, jassid and aphid.

4. Conclusion
Research conducted to find out the conclusion the minimum whitefly, jassid and thrips were recorded in genotype RGr 19-14. Whereas, maximum population of whitefly, jassid and thrips was recorded in genotype CAZG 16-21. Minimum aphid was recorded in genotype CAZG 17-16 followed by RGr 19-17, and RGr 19-10. Whereas, maximum aphid was recorded in genotype CAZG 16-21. Genotype RGr 19-14 was found less susceptible for whitefly, jassid and thrips.

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