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Yield and yield attributes of non-bt cotton genotypes under different protection measures for sucking pest

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Abstract

Trial was sown at Main Cotton Research Station, Navsari Agriculture University, Surat during 2021-22 under protected and unprotected condition for sucking pest. Ten cotton genotypes were selected for study with 3 replication RBD design. All agronomical practices and plant protection measures were adopted as and when required. Biochemical parameters were performed at 90 DAS using standard methods. Yield and yield attributing parameters were observed at harvest. The plant height was significantly higher due to protected condition as compared to unprotected condition. The genotypes GISV-236 (153 cm) showed significant plant height which was at par with GISV-366 (152 cm). No of sympodia showed significant decrease due to unprotected condition. GSHV-191 (1049.1 kg/ha) relieved significant higher seed cotton yield followed by GISV-375 (1041.5 kg/ha), GISV-382 (942.7 kg/ha) and GISV-236 (911.8 kg/ha) respectively. Protein was found highest in GISV-375 (18.36 mg/g) under unprotected environment for Jassid while sugar was found higher in GISV-371 under unprotected compared to protected condition. Phenol content was observed highest in GSHV-191 (40.12 mg/g) under protected field while it GISV-323 (41.62 mg/g) showed highest under unprotected condition. Range of tannin content 24.07 to 34.97 (mg/100g) was observed. Non-bt genotypes under both conditions showed significant difference for flavonoid and gossypol content. GISV-366 under (0.83%) under protected and unprotected condition recorded higher content of gossypol while GISV-236 showed lower under protected condition.

Keywords: Unprotected, sucking pest, seed cotton yield, gossypol

Introduction

Adversely effect of Sucking pests on cotton crop production was observed (Rizwan *et al.*, 2021) [1]. Production of cotton cultivars resistance to measure pest is one of the most effective measures to minimize the yield losses. In reviewing the role of morphological and biochemical biomolecules, 10 non-bt cotton genotypes were screened against Jassid population for yield, yield attributes and biochemical characters under field conditions. Notable yield losses have occurred due to increased insect and pesticide resistance in cotton (Amjad and Aheer 2007) [2].

Methodology

Trial was formulated at Main Cotton Research Station, Navsari Agriculture University, Surat during 2021-22 under protected and unprotected condition for sucking pest. Ten cotton genotypes were selected for study with 3 replication RBD design. All agronomical practices and plant protection measures were adopted as and when required. Biochemical parameters were performed at 90 DAS using standard methods. Yield and yield attributing parameters were observed at harvest.

Jassid population

Jassid per three leaves data were collected at 30, 60 and 90 DAS and values shown in table were transformed values.

Protein content

Protein analysis was done as per standard method described by the method of Lowry *et al.*, (1951) [3]. Protein content was observed at 660 nm using BSA as standard and amount of protein presented as mg per gm.

Phenol content

Phenol was done by the method of Malick and Singh, (1980) [4]. Phenol was read at 650 nm using Catechol as standard and amount of phenol calculated as mg per gm.

Reducing sugar content

Somogyi (1952) [5] and (Miller, 1959) [6] methods were used for Reducing sugar analysis from leaf samples and read at 510 nm using glucose as standard.

Tannin

Tannin content from leaf samples was analysed as method described by Schanderl (1970) [7].

Flavanoid content

Flavanoid concentration in leaf was estimated as per method of Thimmaiah (1999) [8] standard curve of phloroglucinol was prepared and amount of flavanoid expressed as mg per g.

Gossypol content

Gossypol content was determined by standard methods of Bell (1967) [9]. It was read at 550 nm using Gossypol acetate as standard.

Results and Discussion**Yield and Yield attributes**

The results noted during Kharif 2021 for different yield traits parameters in protected and unprotected condition, were expressed in Table 1. Plant height showed significant deviation due to protected condition and genotypes. The plant height was significant higher due to protected condition as compare to unprotected condition. The genotypes GISV-236 (153 cm) showed significant plant height which was at par with GISV-366 (152 cm). The interaction for plant height was significant and showed that all genotypes except GISV-319, GISV-319 and GISV-366 showed significant decreased plant height due to unprotected condition. The interaction of genotype and

condition for no of sympodia and no. of monopodia were non-significant. However, no of sympodia showed significant decrease due to unprotected condition. Boll weight and yield were expressed in table 2. Both parameter were significantly decreased due to the unprotected condition as compare to protected condition. Overall, GSHV-191 (1049.1 kg/ha) gave significant higher seed cotton yield which was similar with GISV-375 (1041.5 kg/ha), GISV-382 (942.7 kg/ha) and GISV-236 (911.8 kg/ha). The interaction for the genotypes and condition showed significant deviated for seed cotton yield. The genotype GISV-371 showed significant lower deviation due to unprotected condition followed by GISV-319, GISV-332, GISV-366 and GISV-380.

Biochemical parameters and Sucking pest measures

Table 3 revealed primary metabolites of non-bt genotypes in different measures before and after sucking pest infestation. Amount of Protein was significantly different under both condition. Highest protein content was observed by GISV-375 (18.36 mg/g of tissue) under unprotected condition while reducing sugar was highest in GISV-371 under unprotected condition. Table 4 presented secondary metabolites of non-bt genotypes in protected and unprotected condition at before and after incidence of sucking pest. Phenol content was recorded highest in GSHV-191 (40.12 mg/g) and GISV-323 (41.62 mg/g) under unprotected and unprotected condition respectively. Rang of tannin from 24.07 to 34.97 (mg/100g) was observed. It was significant between protected and unprotected condition in all the non-bt genotypes. Flavanoid and Gossypol among non-bt genotypes under protected and unprotected condition were recorded significant. GISV-366 showed highest gossypol content (0.83%) under protected and unprotected condition while it was found lower in GISV-236 under protected condition (Table 5). Sucking pest incidence of non-bt genotypes in protected and unprotected condition presented in Table 6.

Table 1: Plant height and No of sympodia at harvest

Genotypes	Plant Height (cm)			No. Sympodia		
	Protected	Unprotected	Mean	Protected	Unprotected	Mean
GISV-380	124.3	104.7	114.5	22.11	17.22	19.67
GISV-332	146.4	117.3	131.9	21.78	17.11	19.44
GISV-382	157.3	123.2	140.3	23.00	18.22	20.61
GSHV-191	130.6	110.8	120.7	22.44	19.11	20.78
GISV-375	148.1	116.4	132.3	21.67	19.89	20.78
GISV-319	125.4	119.0	122.2	20.67	20.11	20.39
GISV-366	159.4	144.6	152.0	23.33	19.33	21.33
GISV-323	148.1	122.7	135.4	22.67	17.11	19.89
GISV-371	126.9	115.9	121.4	21.33	17.11	19.22
GISV-236	169.2	136.8	153.0	23.00	18.56	20.78
Mean	143.6	121.1	132.4	22.20	18.38	20.29
	S. Ed	CD at 5%	CV%	S. Ed	CD at 5%	CV%
P	4.68	20.43	13.71	0.31	1.35	5.89
G	4.00	8.11		1.09	NS	
P x G	5.65	17.19	5.24	1.53	NS	9.26

Table 2: Boll weight and seed cotton at harvest

Genotypes	Boll weight (g)			Seed cotton yield (kg/ha)		
	Protected	Unprotected	Mean	Protected	Unprotected	Mean
GISV-380	3.64	3.11	3.38	978.6	778.2	878.4
GISV-332	2.87	2.68	2.77	561.2	455.3	508.2
GISV-382	3.42	3.17	3.30	1228.0	657.3	942.7
GSHV-191	3.27	2.92	3.09	1389.9	708.2	1049.1
GISV-375	3.92	3.64	3.78	1260.2	822.8	1041.5
GISV-319	3.30	3.41	3.35	819.6	773.7	796.7
GISV-366	3.78	3.31	3.54	780.2	613.2	696.7
GISV-323	3.51	2.93	3.22	1184.8	576.8	880.8
GISV-371	2.82	3.02	2.92	496.5	454.7	475.6
GISV-236	3.14	3.11	3.13	1184.4	639.3	911.8
Mean	3.37	3.13	3.25	988.3	648.0	818.1
	S. Ed	CD at 5%	CV%	S. Ed	CD at 5%	CV%
P	0.05	0.20	5.33	60.6	264.5	15.0
V	0.19	0.38		73.4	149.0	
P x V	0.25	NS	9.73	103.9	277.3	15.5

Table 3: Protein and reducing sugar content under protected and unprotected condition

Genotypes	Protein (mg/g of tissue)						Reducing sugar (mg/g of tissue)					
	Protected			Unprotected			Protected			Unprotected		
	Before	after	Mean	Before	after	Mean	Before	after	Mean	Before	after	Mean
GISV-380	9.92	11.88	10.90	11.85	12.00	11.92	13.88	19.82	16.85	16.89	7.10	11.99
GISV-332	8.41	9.67	9.04	14.45	9.03	11.74	15.12	16.43	15.77	20.98	19.13	20.05
GISV-382	5.18	17.63	11.41	6.82	7.15	6.98	16.43	17.35	16.89	23.37	13.73	18.55
GSHV-191	8.93	14.87	11.90	16.68	10.91	13.79	13.88	9.49	11.69	21.75	9.10	15.43
GISV-375	8.93	8.32	8.63	24.68	12.04	18.36	16.89	5.86	11.38	19.82	17.66	18.74
GISV-319	11.08	10.50	10.79	11.78	8.95	10.37	16.66	21.44	19.05	23.99	10.26	17.12
GISV-366	24.04	8.05	16.05	15.32	9.52	12.42	11.57	8.64	10.10	21.98	21.83	21.91
GISV-323	10.09	10.80	10.44	18.99	10.01	14.50	14.12	11.65	12.88	19.13	7.33	13.23
GISV-371	15.90	13.07	14.49	6.31	9.53	7.92	15.27	14.42	14.85	24.53	21.21	22.87
GISV-236	11.90	12.21	12.06	18.83	9.47	14.15	18.20	17.66	17.93	21.75	15.04	18.40
	P	I	G	P x I	P x G	I x G	P	I	G	P x I	P x G	I x G
CD@5%	0.163	0.047	0.106	0.067	0.150	0.150	N.S	0.80	1.79	1.13	2.53	2.53

Table 4: Phenol and tannin content under protected and unprotected condition

Genotypes	Phenol (mg/g of tissue)						Tannin (g/100g of dry tissue)					
	Protected			Unprotected			Protected			Unprotected		
	Before	after	Mean	Before	after	Mean	Before	after	Mean	Before	after	Mean
GISV-380	33.53	43.38	38.46	30.41	43.38	36.89	25.14	30.57	27.86	32.54	28.76	30.65
GISV-332	28.91	42.39	35.65	30.43	42.39	36.41	28.52	28.17	28.35	29.39	29.92	29.65
GISV-382	28.68	41.18	34.93	30.72	41.18	35.95	32.12	27.76	29.94	24.39	32.45	28.42
GSHV-191	36.79	43.44	40.12	26.75	43.44	35.10	44.06	25.88	34.97	32.89	29.95	31.42
GISV-375	23.21	42.03	32.62	30.04	42.03	36.04	32.30	26.38	29.34	34.76	35.00	34.88
GISV-319	27.48	41.59	34.53	27.27	41.59	34.43	23.59	24.54	24.07	35.39	31.76	33.58
GISV-366	34.10	39.98	37.04	28.11	39.98	34.05	30.72	30.25	30.49	18.01	34.14	26.07
GISV-323	36.10	40.85	38.48	42.40	40.85	41.62	35.57	30.07	32.82	34.70	29.71	32.21
GISV-371	36.57	41.11	38.84	35.55	41.11	38.33	34.67	31.70	33.19	34.23	34.14	34.18
GISV-236	30.30	41.66	35.98	35.97	41.66	38.82	32.18	28.64	30.41	37.20	35.12	36.16
	P	I	G	P x I	P x G	I x G	P	I	G	P x I	P x G	I x G
CD@5%	2.46	0.84	1.89	1.20	2.68	2.68	0.37	0.13	0.30	0.19	0.43	0.43

Table 5: Flavanol and Gossypol content under protected and unprotected condition

Genotypes	Flavanol (mg/g of tissue)						Gossypol (%)					
	Protected			Unprotected			Protected			Unprotected		
	Before	after	Mean	Before	after	Mean	Before	after	Mean	Before	after	Mean
GISV-380	5.26	2.75	4.00	2.65	2.48	2.57	0.84	0.76	0.80	0.85	0.79	0.82
GISV-332	3.26	2.38	2.82	2.61	1.55	2.08	0.84	0.80	0.82	0.81	0.80	0.80
GISV-382	1.30	3.05	2.17	1.55	2.94	2.24	0.83	0.63	0.73	0.83	0.71	0.77
GSHV-191	6.38	1.10	3.74	2.84	2.32	2.58	0.81	0.72	0.76	0.82	0.79	0.81
GISV-375	1.16	3.63	2.40	2.61	2.01	2.31	0.84	0.66	0.75	0.84	0.79	0.82
GISV-319	2.32	2.92	2.62	2.31	2.10	2.20	0.86	0.72	0.79	0.84	0.81	0.82

GISV-366	3.03	2.55	2.79	1.28	2.36	1.82	0.84	0.83	0.83	0.83	0.81	0.82
GISV-323	4.39	2.45	3.42	2.68	1.59	2.14	0.85	0.78	0.81	0.82	0.79	0.81
GISV-371	7.06	3.02	5.04	2.31	1.99	2.15	0.78	0.81	0.80	0.82	0.76	0.79
GISV-236	4.42	2.65	3.53	2.84	2.00	2.42	0.71	0.76	0.73	0.82	0.80	0.81
	P	I	G	P x I	P x G	I x G	P	I	G	P x I	P x G	I x G
CD@5%	0.079	0.026	0.058	0.036	0.081	0.081	0.017	0.010	0.023	0.014	0.032	0.032

Table 6: Sucking pest incidence of non-bt genotypes in protected and unprotected condition

	Av. leafhopper/3 leaves											
	30 DAS			60DAS			90DAS					
	Protected (TV)	Unprotected (TV)	Mean	Protected (TV)	Unprotected (TV)	Mean	Protected (TV)	Unprotected (TV)	Mean	S. Ed	CD at 5%	CV%
GISV-380	1.39	1.61	1.50	GISV-380	1.61	1.91	1.76	GISV-380	1.88	2.05	1.96	
GISV-332	1.41	1.98	1.70	GISV-332	1.83	2.31	2.07	GISV-332	2.10	2.85	2.47	
GISV-382	1.34	1.86	1.60	GISV-382	1.73	2.11	1.92	GISV-382	1.97	2.58	2.27	
GSHV-191	1.13	1.41	1.27	GSHV-191	1.41	1.61	1.51	GSHV-191	1.63	1.79	1.71	
GISV-372	1.24	1.44	1.34	GISV-372	1.57	1.69	1.63	GISV-372	1.75	1.84	1.80	
GISV-319	1.26	1.71	1.49	GISV-319	1.69	1.95	1.82	GISV-319	1.91	2.08	2.00	
GISV-366	1.41	1.53	1.47	GISV-366	1.77	1.79	1.78	GISV-366	1.93	1.97	1.95	
GISV-323	1.18	1.59	1.39	GISV-323	1.59	1.86	1.73	GISV-323	1.79	2.00	1.89	
GISV-371	1.37	1.90	1.63	GISV-371	1.75	2.28	2.02	GISV-371	2.16	2.76	2.46	
GISV-236	1.15	1.39	1.27	GISV-236	1.46	1.51	1.48	GISV-236	1.69	1.73	1.71	
	S. Ed	CD at 5%	CV%		S. Ed	CD at 5%	CV%		S. Ed	CD at 5%	CV%	
P	0.03	0.11	6.82	P	0.25	0.11	1.78	P	0.09	NS	17.82	
V	0.72	0.15		V	0.10	0.21		V	0.10	0.19		
P x V	0.10	0.22	9.65	P x V	0.14	NS	9.77	P x V	0.13	0.38	8.56	

TV - Transformed Value

Conclusion

GSHV-191 under protected and GISV-375 for unprotected condition exposed higher seed cotton yield (kg/ha) while Jassid population was found significantly lower in same genotypes (GSHV-191) under protected and Unprotected condition. Also reducing sugar content and Phenol content were found higher in GSHV-191 under unprotected condition.

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