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## Role of morpho-physio characters imparting tolerance in cotton sucking pest

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### Abstract

An experiment was conducted at Cotton Research Unit, Dr. Panjabrao Deshmukh Krishi Vidypeeth, Akola during *Kharif*, 2016-17. Twenty one cotton genotypes were replicated thrice under Randomized Block Design and evaluated for tolerance against sucking pests. The data were recorded on population of sucking pests/leaves at 45 and 60 DAS. Similarly, the data were also collected on physico-morphic traits like hair density (Trichome) and number of gossypol glands/cm<sup>2</sup> to determine tolerance /susceptibility of cotton genotypes against sucking pest.

It was observed from present study that those genotypes having more trichome density and gossypol glands/cm<sup>2</sup> recorded lower population of aphids, leafhoppers and thrips but population of whiteflies on these genotypes was more indicating role of trichome density and gossypol gland in sucking pest resistance. Highest number of hair density (Trichomes/cm<sup>2</sup>) was noted in AKH-2013-3 followed by DHY-286, AKH-1523 and AKH-1524. Highest number of gossypol glands/cm<sup>2</sup> was noted in genotype DHY-286 followed by AKH-1301 and AKH-2013-3. The correlation studies revealed that the hair density (Trichomes) on leaf of cotton had negative and significant correlation with population of aphids, leafhoppers, and thrips. The hair density (Trichomes) on leaf of cotton had positive and significant correlation with population of whiteflies.

**Keywords:** cotton, genotype, trichomes, gossypol gland, sucking pest and tolerance, yield

### Introduction

#### Background information

Cotton is the “king of fiber” being most important cash crop having profound influence on economics and social affairs of the world. Due to its importance in agriculture and industrial economy; it is called as “white gold”. Cotton belongs to genus *Gossypium* of family Malvaceae. There are four cultivated species of cotton viz. *Gossypium arboreum*, *G. herbaceum*, *G. hirsutum* and *G. barbadense*. Cotton is infested by a large number of insect pests right from the sowing till harvest. In the early stages, sucking pests like aphids, thrips, leaf hoppers and white flies cause serious problem resulting reduction in yield and quality of cotton. The sucking pests cause heavy reduction in cotton yield. Defense mechanisms in resistant varieties involve either morphological barriers or elaborative array of phytochemicals, which act as repellents, phagodeterrents and oviposition deterrents, these exhibiting resistances.

#### Material and Methods

An experiment was conducted at Cotton Research Unit, Dr. Panjabrao Deshmukh Krishi Vidypeeth, Akola during *Kharif*, 2016-17. For this twenty one cotton genotypes viz., AKH-09-5, AKH-10-2, AKH-10-3, AKH-10-10, AKH-1301, AKH-1302, AKH-1317, AKH-2013-1, AKH-2013-3, AKH-2013-4, AKH-1521, AKH-1522, AKH-1523, AKH-1524, AKH-1525, AKH-1526, AKH-1527, AKH-1528, AKH-1529 and including checks DHY-286 and RCH-2 were grown in RBD with three replication. The entomological observations on sucking pest viz., aphid, leafhopper, whitefly and thrips on top, middle and bottom leaf per plant was recorded at 45 DAS and 60 DAS. Five plants were taken for recording pests population in each genotypes and replication. The observations on trichomes were recorded under compound microscope on abaxial leaf (trichomes / cm<sup>2</sup>). The number of gossypol glands were counted per three leaves and expressed as per cm<sup>2</sup>.

### Results and Discussion

#### 1) Number of aphids/leaves

The data of number of aphids/leaves among the genotypes was significant at 45 DAS and 60 DAS. Maximum number of aphid at 45 DAS and 60 DAS was observed on genotype

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genotype susceptible check RCH-2 followed by AKH-1525, AKH-1317, Whereas, minimum population was on AKH-1523 followed by DHY-286, AKH-2013-3.

### 2) Number of leaf hoppers/leaves

The data on number of leafhoppers/leaves among the genotypes was significant at 45 DAS and 60 DAS. Maximum number of leafhoppers at 45 DAS and 60 DAS was observed on genotype RCH-2 followed by AKH-1525, AKH-1529, whereas, minimum population was on DHY-286 followed by AKH-2013-3.

### 3) Number of white flies/leaves

The data on number of white flies among the genotypes was significant at 45 DAS and 60 DAS. Maximum number of white flies at 45 DAS and 60 DAS was observed on genotype DHY-286 followed by AKH-2013-3 AKH-1522, whereas, minimum population was on RCH-2) followed by AKH-1317.

### 4) Number of thrips/leaves

The data of number of thrips among the genotypes was significant at 45 DAS and 60 DAS. Maximum number of thrips at 45 DAS and 60DAS was observed on genotype AKH-1525 followed by RCH-2, AKH-1522, whereas, minimum population was on DHY-286 followed by AKH-2013-3, AKH-2013-1.

### 5) Hair density (Trichome/cm<sup>2</sup>)

The hair density (cm<sup>2</sup>) recorded at 45 and 60 DAS. Highest number of trichomes/cm<sup>2</sup> was noted in AKH-2013-3 followed in DHY-286. Least number of trichomes/cm<sup>2</sup> was noted in genotype RCH-2 followed in AKH-1525.

### 6) Gossypol glands/cm<sup>2</sup>

The number of gossypol gland (cm<sup>2</sup>) recorded at 45 and 60 DAS. Highest number of gossypol glands/cm<sup>2</sup> was noted in genotype DHY-286 followed by AKH-1301 and AKH-2013-3. Least number of gossypol glands/cm<sup>2</sup> was noted AKH-1522, AKH-1524 and AKH-2013-4.

### Correlation studies

#### Phenotypic correlations at 45 DAS and 60 DAS

The data indicated that hair density (Trichomes) on leaf of

cotton had negative and highly significant correlation with number of aphids, leafhoppers and number of thrips. However, hair density (Trichomes) had positive and highly significant correlation with number of whiteflies.

Number of gossypol glands had negative and non-significant correlation with number of thrips and leafhopper. It showed positive but non- significant association with number of whiteflies and number of aphids.

#### Genotypic correlations at 45 DAS and 60 DAS

The data indicated that hair density (trichomes) on leaf of cotton had negative and highly significant correlation with number of aphids, number of leafhoppers and number of thrips and it was significantly and positively correlated with number of whiteflies.

The number of gossypol glands on cotton leaves had positive but non-significant correlation with number of aphids and number of whiteflies. The number of gossypol glands on cotton leaves had negative but non-significant correlation with number of leafhoppers and number of thrips.

### Discussion

#### Population of major sucking pests/leaves on different cotton genotypes

It was observed from present study that those genotypes having more trichome density recorded lower population of aphids, leafhoppers and thrips but population of whiteflies on these genotypes was more indicating role of trichome density and gossypol gland in sucking pest resistance. Similar results were recorded by Jindal *et al.* (2007), Ali and Aheer (2007) [7]; Amjad *et al.* (2003) [8] and Zanwar *et al.* (2010) [17]

#### Correlations of sucking pest with physico-morphic characters

The hair density (Trichomes) and gossypol gland at 45 and 60 DAS on leaf of cotton had negative and significant correlation with number of aphids, leafhoppers, and thrips at 45 and 60 DAS. The hair density (Trichomes) and gossypol gland at 45 and 60 DAS had positive and significant correlation with number of whiteflies at 45 and 60 DAS. The present findings confirm the findings of Bashir *et al.* (2001) [10]. Also the similar result of Chang-Chi Chu *et al.* (2001); Ahmad *et al.* (2005) [4] and Batti *et al.* (2015).

Table 1: Population of sucking pests on different cotton genotypes

Sr. No.	Genotype	No. of Aphids/leaves		No. of Leafhoppers/leaves		No. of White flies/leaves		No. of Thrips/leaves		Hair density (Trichomes) / cm <sup>2</sup>	
		45 DAS	60 DAS	45 DAS	60 DAS	45DAS	60 DAS	45 DAS	60 DAS	45 DAS	60 DAS
1	AKH-1521	4.84	1.66	2.95	2.30	1.04	2.30	2.95	2.59	51.78	50.44
2	AKH-1522	5.70	1.86	3.55	2.55	1.41	2.86	3.03	2.35	41.00	40.89
3	AKH-1523	4.64	1.48	2.68	2.06	1.28	2.82	2.35	2.90	55.55	51.66
4	AKH-1524	4.64	1.15	2.86	2.04	0.97	3.08	2.19	2.88	54.55	52.00
5	AKH-1525	9.42	2.01	4.64	2.44	0.90	3.01	3.64	4.01	20.77	20.88
6	AKH-10-3	5.46	1.28	2.93	1.90	0.79	3.15	2.48	2.33	50.55	50.11
7	AKH-1526	7.84	1.37	3.84	2.21	0.84	2.95	2.48	2.79	29.11	30.11
8	AKH-10-10	6.75	1.48	3.33	2.26	0.77	2.48	2.19	2.80	39.22	39.55
9	AKH-1527	5.57	1.73	2.79	1.97	0.91	2.68	2.39	2.64	42.89	41.33
10	AKH-1528	5.28	1.26	2.64	2.04	0.80	2.35	2.39	2.64	44.77	41.66
11	AKH-2013-4	5.77	1.73	2.77	2.11	1.04	2.10	2.73	2.59	41.33	41.11
12	AKH-1529	8.18	1.91	4.44	2.73	0.70	2.19	2.77	2.71	21.66	21.11
13	AKH-09-5	7.28	1.75	3.30	2.33	0.81	3.15	2.60	2.79	33.55	31.11
14	AKH-10-2	4.79	1.26	2.60	2.08	0.95	3.08	2.46	2.66	49.22	49.33
15	AKH-2013-3	4.66	1.01	1.77	1.15	1.44	3.57	2.01	1.88	65.22	59.33
16	AKH-2013-	5.57	1.66	2.57	2.15	0.75	3.08	2.13	2.66	44.77	41.78

	1										
17	AKH-1301	6.39	1.37	4.28	2.59	0.77	2.93	2.64	2.75	29.33	27.55
18	AKH-1302	5.35	2.02	3.37	1.99	1.04	2.82	2.66	2.55	41.33	39.22
19	AKH-1317	8.30	1.37	3.64	2.31	0.70	2.75	2.73	3.06	25.89	26.33
20	RCH-2	10.22	2.19	4.90	2.84	0.54	1.90	3.30	3.26	17.44	17.11
21	DHY 286	4.66	1.06	1.66	1.24	2.50	4.30	1.70	1.93	59.66	54.55
	Range	4.64-10.22	1.01-2.19	1.66-4.90	1.15-2.84	0.54-2.50	1.90-4.30	1.70-3.64	1.88-4.01	17.44-65.22	17.11-59.33
	Mean	6.25	1.55	3.21	2.16	1.00	2.84	2.56	2.70	40.93	39.39
	S.E. (M) ±	0.14	0.06	0.12	0.08	0.07	0.09	0.09	0.10	0.59	0.48
	C.D. 5%	0.41	0.18	0.34	0.24	0.19	0.25	0.26	0.29	1.67	1.38
	C.V.	3.95	7.00	6.32	6.65	11.58	5.31	6.05	6.50	2.48	2.12

**Table 2:** Correlations of sucking pests with hair density (Trichomes) at 45 DAS.

Character	Correlation	No. of Aphids/leaves	No. of Leafhoppers/leaves	No. of White flies/leaves	No. of Thrips/leaves	Hair density (cm <sup>2</sup> )
No. of Aphids/leaves	G	1	0.8687**	-0.5174*	0.6952**	-0.9305**
	P	1	0.8318**	-0.4964*	0.6346**	-0.9160**
No. of Leafhoppers/leaves	G		1	-0.6319**	0.8188**	-0.9359**
	P		1	-0.5791**	0.7650**	-0.9081**
No. of White flies/leaves	G			1	-0.4689*	0.6234**
	P			1	-0.4417*	0.6009**
No. of Thrips/leaves	G				1	-0.7270**
	P				1	-0.6843**
No. of Trichomes (cm <sup>2</sup> )	G					1
	P					1

**Table 3:** Correlations of sucking pests with hair density (Trichomes) at 60 DAS.

Character	Correlation	No. of Aphids/leaves	No. of Leafhoppers/leaves	No. of White flies/leaves	No. of Thrips/leaves	Hair density (cm <sup>2</sup> )
No. of Aphids/leaves	G	1	0.7124**	-0.6154**	0.5498**	-0.6679**
	P	1	0.6415**	-0.5520**	0.4720*	-0.6293**
No. of Leafhoppers/leaves	G		1	-0.7349**	0.7010**	-0.8125**
	P		1	-0.6593**	0.5746**	-0.7617**
No. of White flies/leaves	G			1	-0.4385*	0.5004*
	P			1	-0.4004	0.4792*
No. of Thrips/leaves	G				1	-0.7123**
	P				1	-0.6578**
No. of Trichomes (cm <sup>2</sup> )	G					1
	P					1

Note: \* Significant at 5% level of significance, \*\* Significant at 1% level of significance.

G= Genotypic; P=Phenotypic correlation

**Table 4:** Correlations of sucking pests with gossypol glands at 45 DAS.

Character	Correlation	No. of Aphids/leaves	No. of Leafhoppers/leaves	No. of White flies/leaves	No. of Thrips/leaves	No. of Gossypol glands (cm <sup>2</sup> )
No. of Aphids/leaves	G	1	0.8687**	-0.5174*	0.6952**	0.1543
	P	1	0.8318**	-0.4964*	0.6346**	0.1494
No. of Leafhoppers/leaves	G		1	-0.6319**	0.8188**	-0.0369
	P		1	-0.5791**	0.7650**	-0.0365
No. of White flies/leaves	G			1	-0.4689*	0.3169
	P			1	-0.4417*	0.2978
No. of Thrips/leaves	G				1	-0.2022
	P				1	-0.1898
No. of Gossypol glands (cm <sup>2</sup> )	G					1
	P					1

**Table 5:** Correlations of sucking pests with gossypol gland at 60 DAS.

Character	Correlation	No. of Aphids/leaves	No. of Leafhoppers/leaves	No. of White flies/leaves	No. of Thrips/leaves	No. of Gossypol glands (cm <sup>2</sup> )
No. of Aphids/leaves	G	1	0.7124**	-0.6154**	0.5498**	-0.1806
	P	1	0.6415**	-0.5520**	0.4720*	-0.1773
No. of Leafhoppers/leaves	G		1	-0.7349**	0.7010**	-0.2139
	P		1	-0.6593**	0.5746**	-0.2035
No. of White flies/leaves	G			1	-0.4385*	0.4577*
	P			1	-0.4004	0.4317
No. of Thrips/leaves	G				1	0.0196
	P				1	0.0256

No. of Gossypol glands (cm <sup>2</sup> )	G					1
	P					1

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