Relative Resistance of *Gossypium* Species to Insect Complex Under Non-Sprayed Conditions

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ABSTRACT

A number of varieties and strains of Gossypium were grown under non-sprayed conditions to evaluate their relative resistance against insects during two seasons 1993-94 and 1994-95. The strains belonged to Gossypium. Barbadense (Pima), G. palmeri, G. arboreum and G. hirsutum. These varieties had varying degree of resistance to insects. The pima types were highly susceptible to sucking insects and Cotton Leaf Curl Virus. The two entries of G. palmeri exhibited complete tolerance to all sucking insects and Cotton Leaf Curl Virus. Their leaves were lush green, showing no sign of sucking insects injury. The source of resistance in G. palmeri is not known. If this character could be successfully transferred to upland cotton, it may revolutionize cotton production. The potential for substantial saving on insecticides could also lead to reduced environmental pollution. Varieties of G. hirsutum and G. arboreum had a varying but higher degree of resistance against sucking insects, compared to pima types.

Introduction

The cotton plant is attacked by a host of insects and diseases that significantly control yield and production. The sucking insects commonly found in Pakistan are whitefly (*Bemisia tabaci*) jassid (*Amrasca devastans*) and thrips (*Thrips tabaci*). The bollworm complex includes pink bollworm (*Pectinophora gossypiella*), spotted bollworm (*Earias insulina*) and American bollworm (*Helicoverpa armigera*).

In order to control these insects, repeated chemical sprays are applied. To a certain extent, the relative inbuilt resistance helps the plants escape injury. The length and density of leaf hair is directly related to comparative resistance and tolerance to jassid (Knight, 1952; Ahmad, 1980; Yousaf, 1981; Akram, 1998). While pubescence density has been reported as promising mechanism to hinder the movement of first instar of pink bollworm larvae concluded by Wilson and Wilson (1975, 1977) and Smith *et al.* (1975). Ali (1994) studied the role of physical factors, like hair density and gossypol glands in contributing resistance against insect pest complex of cotton. Out of 10 varieties only two varieties NIAB-86 and FH-87 were significantly resistant.

The leaves of okra and super okra produce an open canopy leading to lower humidity, higher temperatures and are thus less preferred by some pests while at the same time permitting the crop to be more effectively sprayed.

Material and Methods

The varieties/strains in this trial, derived from four group of gossypium (G. hirsutum, G. arboreum, G. barbadense and G. palmeri) were grown during 1993-94 and 1994-95 in unreplicated trial due to non-availability of sufficient seed. In both years, the experimental area was sown by the middle of June with three ten-metre rows per variety.

Observations on insect population dynamics were recorded at weekly interval from mid July to the end of October for jassid, whitefly and thrips on 15 randomly selected plants. The insect population was counted from an upper leaf of the first plant, the middle position of second plant and lower leaf from the third plant. In this way, fifteen leaves from 15 plants were counted.

Bollworm infestation was recorded by counting healthy and damaged fruiting parts, square, flowers and bolls from five randomly selected plants in each row at weekly interval, starting from square initiation until the end of October.

Results and Discussion

The weather during 1994-95 was relatively rainy in July and August with low temperatures, conducive for multiplication of sucking insects and *H. armigera*. Whitefly population increased after mid September during both seasons, resulting in poor lint quality and yield.

There was a wide range of response to the sucking complex and bollworm pests. The Pima S–6 and Pima S-7 (*G. barbadense*) were highly susceptible to the sucking pest complex. The sucking insect attack reduced the boll setting potential to almost zero. TX 336 and TX 339 (*G. palmeri*) exhibited complete resistance to sucking insects which had very low populations on the leaves. The leaves were lush green in colour, indicating no significant leaf damage during both years. Rohi (*G. arboreum*) had mild susceptibility

to sucking insects and bollworm. The entries of *G. hirsutum* varied in the degree of leaf damage, a few being highly susceptible while others were highly tolerant. Gohar-87 and SLH-41 had higher inbuilt tolerance to sucking insects because of their rough and more hairy leaves. Coccinelids played a vital role in reducing aphid populations while chrysopids (lacewings) reduced whitefly populations.

The cause of resistance in *G. palmeri* is unknown. It produced only a few small squares and flowers late in the season as it is unsuited to climatic conditions in Pakistan. It appears to be resistant to cotton leaf curl virus (the vector numbers were very low). It may be worth exploring the genetic basis of resistance to whitefly and cotton leaf curl virus and the potential for breeding this resistance into *G. hirsutum*.

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Table 1. Average number of sucking insects per leaf.

Species	Variety/Strain	1993/94			1994/95		
		Jassid	W/Fly	Thrips	Jassid	W/Fly	Thrips
G. hirsutum	MNH-429	1.75	2.35	1.50	1.91	2.17	1.70
	BH-61	1.55	2.78	2.98	2.36	3.90	3.50
	Gohar-87	0.95	1.95	2.01	1.10	2.31	2..20
	SLH-41	1.75	2.15	2.02	1.85	2.32	2.30
	MNH-439	3.55	2.45	3.95	3.13	2.53	4.00
G. arboreum	Rohi	0.68	0.68	1.35	0.75	1.05	1.50
G. barbadense	Pima S-6	4.35	3.34	5.65	4.52	3.65	5.52
	Pima S-7	4.35	3.65	5.25	4.40	3.75	6.00
G. palmeri	Texas-336	0.00	0.35	0.15	0.00	0.45	0.25
	Texas-339	0.00	0.24	0.20	0.00	0.35	0.20

Table 2. Effect of insect complex on yield components.

Varieties / Strains	1993-94				1994-95			
	No. of Bolls per plant	Boll weight. gms	Boll Worm Infestation %	Yield Kg/ha	No. of Bolls per plant	Boll weight. gms	Boll Worm Infestation %	Yield Kg/ha
MNH-429	12.45	3.32	7.50	1,044	11.20	3.21	8.48	908
BH-61	19.52	3.35	4.48	1,856	18.00	3.44	1.050	1,602
Gohar-87	27.34	3.38	6.02	2,476	25.52	3.51	8.69	2,110
SLH-41	24.65	3.45	8.01	2,223	22.31	3.36	10.97	2,061
MNH-439	15.05	3.45	8,50	1,269	14.50	3.48	10.23	1,159
Rohi	21.55	2.45	3.45	1,879	20.00	2.55	4.50	1,539
Pima S-6	3.00	2.22	0.00	12	2.00	2.34	0.00	10
Pima S-7	4.00	2.32	0.00	15	3.00	2.42	0.00	12
Texas -336	0.00	0.00	0.00	0	0.00	0.00	0.00	0
Texas-339	0.00	0.00	0.00	0	0.00	0.00	0.00	0