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DIET PREDILECTION OF JASSID ON ADVANCED CULTIVARS OF COTTON UNDER LABORATORY AND FIELD CONDITIONS

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ABSTRACT

Plant material consisted of twelve advanced cultivars of cotton i.e., FH-142, FH-Lalazar, FH-444, FH-442, FH-312, FH-Noor, FH-Kakshan, FH-326, FSD-6/13, FSD 16 and ME, MN 6/16. Food preference of jassid on these cultivars was observed in laboratory of Cotton Research Institute, Faisalabad during, 2016. For this purpose ten pairs of jassid were collected from the field and confined in the center of separate chamber of olfactometer that was connected with side jars (containing leaves of different cultivars) through plastic tubes. It was to observe that how many jassids settled to food smell of different cultivars. Data regarding settling of jassid on leaves of different cultivars in side jars was observed after 24 hrs of the release of jassid. Prefrence/settlement of Jassid among different cultivars of cotton was maximum on FH Noor (1.83) and minimum on FH 142 (0.00). Intermediate response of jassid was observed on the remaining cultivars. The field data of selected cultivars was also recorded from 20 different plants of each cultivar by Mario method. Population of Jassid on different cultivars of cotton was maximum on FH Noor (1.83) and minimum on FH 142 (0.00). Morphological traits of all cultivars were also observed and correlated with field population of jassid. In correlation of these independent variable and dependent variable our data revealed that nectaries and Gossypol glands had negative effect on jassid but leaf area demonstrated the positive effect. These results can be very useful to develop a jassid resistant variety in future.

Keywords: Food preference, *Amrasca devastans,* Morphological traits, *Gossypium hirsutum*

INTRODUCTION

Cotton (*Gossypium hirsutum* L.) is an excellent important fiber and cash crop of Pakistan. Due to cotton with, its green, succulent leaves, number of large open flowers, nectaries on leaf and flower, and plenty of bolls attract a range of insect pests different that are the major reasons of yield loss (Mohyuddin *et al.,* 1997). These insects cause extensive damage to the crop from seedling stage to the harvesting stage. Insect pests are responsible for inflicting heavy losses to the cotton crop by minimizing yield and quality of cotton seed, are the basic cause of worry and economic loss to the farmers (Wilson *et al.,* 1980). The amount of insect-pests, which damage the cotton crop from sowing to maturity, plays a significant role in yield loss. The average loss of cotton yield from insect-pests is reported as5-10 percent but severe attack of insect-pests can cause heavy qualitative and quantitative losses varying from 40- 50% (Naqvi, 1976). Increasing demand of cotton for food and clothing resulted in the adoption of diversified serious agricultural programmed coupled with higher energy subsidiaries and extreme use of pesticides. The result in development of insect resistance to pesticides, renaissance of target pests, secondary pest out breaks, killing of non-target organisms, disturbance of biological balance, environmental pollution, and health hazards (Bakhetia *et al.,* 1996). There are many pest control strategies, in which varietal resistance is of massive without insecticide application (Bughio *et al.,* 1984; Jin *et al.,* 1999 and Khan *et al.,* 2003). Cotton insect Pest complex is divided into two categories; sucking insect pests and chewing insect pests. Important sucking insect pests are whitefly, *Bemisia tabaci* (Genn.), thrips, *Thrips tabaci* (Lind.) jassid, *Amrasca*

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devastans (Dist.) and aphid, *Aphis gossypii* (Glov.) which are also selected as major pests causing most of the damage to the cotton crop. There are many plant characters which can play positively or negatively role on the plant feeders and their natural enemies (Krips*et al*., 1999; Afzal & Bashir, 2007). The earlier attempts were made on exploring the methodologies to develop host plant resistance to pest complex in cotton, in Pakistan, as reported by Hassan *et al*. (2000) Bashir *et al*. (2001), Shad *et al*. (2001), Khan *et al*. (2003) etc.

Keeping in view the present studies were carried out to study food preference of jassid among different cultivars of cotton in olfactometer under the laboratory condition at cotton Research Institute, Ayub Research Faisalabad during 2016 and response of cotton cultivars against jassid under field condition.

MATERIALS AND METHODS

Laboratory experiment

The present studies were carried out at the Cotton Research Institute, Faisalabad during 2016. The experiment was laid out following Completely Randomized Design (CRD).First experiment was done to check the attack of jassid on different cotton cultivars by using Olfactometer. Ten pairs of jassid were collected from cotton field and put these jassid in separate chamber and then took leaves of 12 cotton cultivars (FH-142,FH-Lalazar, FH-444, FH-442,FH-312,FH-Noor,FH-Kakshan, FH-326,FSD-6/13,FSD 16,ME,MN 6/16) and placed it in separate chamber to check the attack of these insect on different cultivars and determine that which cultivar is more repellent for insect. Data was recorded after 24 hours after release (HAR) of Jassid.

Field experiment

The present studies were carried out at the Cotton Research Institute, Faisalabad during 2016. Data was recorded from 20 plants by using Mario method i.e., used to collect information on insect pest in which observations were collected from the upper, middle and lower leaves of the plants of different cultivarsI The morphological traits of these cotton cultivars were also observed under a CARL ZEISS binocular microscope 200 X. RCBD design was followed under field and CRD for laboratory experimentation.

Statistical analysis:

In order to observe association of jassid population among morphological traits; data was correlated with nectries, leaf gossypol glands, leaf hairs, Midrib Gossypol glands, Midrib hair, Stem Gossypol glands and Leaf Area.

RESULTS

Response of cotton cultivars against jassid under field condition

Analysis of variance regarding population of Jassid on different cultivars of cotton given in (Table-1). The results revealed that population of Jassid did not differed significantly from each other. Mean comparison regarding population of Jassid on different cultivars of cotton is given in Table-2). It is evident from the result that population of Jassid on different cultivars of cotton was maximum on FH Noor (1.83) and minimum on FH 142 (0.00). The tested plant possessing Jassid population effects are arranged in to the following order: FH Noor>MN 6/16>FH 444>FH 326≈FSD 6/13>FH 312 ≈FH Kahkshan≈ME>FSD 16>FH Lalazar>FH 442>FH 142.

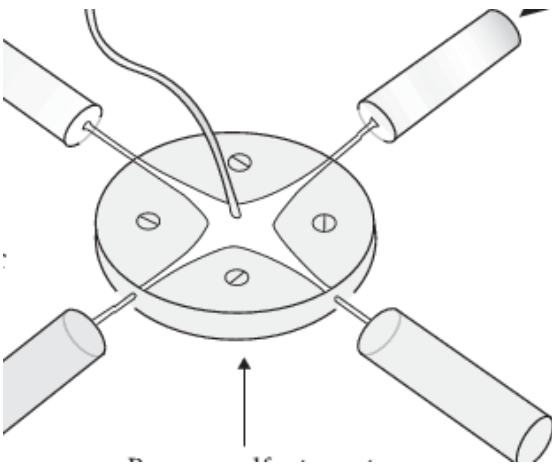

Fig.1
Olfactometer designed on this pattern for preference of jassid in advanced cultivars of cotton

Table 1
Analysis of variance of population of Jassid on different cultivars of cotton under laboratory condition.

Source	df	SS	MS	F	P
Replications	5	39.83	7.96		
Treatment	11	19.16	1.74	1.70	0.09
Error	55	56.50	1.02		
Total	71	115.50			

df: degree of freedom, SS: Sum of squre, MS: mean sum of square, F: F-tabulated value, P: probability value

Table 2
Mean comparison of population of Jassid on different cultivars of cotton under laboratory condition.

Treatment	Varieties	Jassid
1	FH 142	0.00a
2	FH Lalazar	0.50a
3	FH 444	1.50a
4	FH 442	0.33a
5	FH 312	0.83a
6	FH Noor	1.83a
7	FH Kahkshan	0.83a
8	FH 326	1.00a
9	FSD 6/13	1.00a
10	FSD 16	0.66a
11	ME	0.83a
12	MN 6/16	1.66a
LSD		1.996

Table 3
ANOVA Table for response of Jassid on cotton cultivars under field condition.

Source	Df	SS	MS	F	P
Replications	5	12.00	2.40		
Treatment	11	3.27	0.29	1.17	0.32
Error	55	13.94	0.25		
Total	71	29.21			

Table 4
Mean comparison of population of Jassid on different cultivars of cotton under field condition.

Treatment	Varieties	Jassid (mean)
1	FH 142	0.26a
2	FH Lalazar	0.85a
3	FH 444	0.70a
4	FH 442	0.85a
5	FH 312	0.96a
6	FH Noor	0.63a
7	FH Kahkshan	0.58a
8	FH 326	0.65a
9	FSD 6/13	0.70a
10	FSD 16	0.25a
11	ME	0.58a
12	MN 6/16	0.41a

Response of cotton cultivars against jassid under field condition

Analysis of variance regarding population of Jassid on different cultivars of cotton given in (Table-3). The results revealed that population of Jassid did not differ significantly from each other. Mean comparison regarding population of Jassid on different cultivars of cotton is given in (Table-4). It is evident from the result that population of Jassid on different cultivars of cotton was maximum on FH 312 (0.96a) and minimum on FSD 16 (0.25). The tested plant possessing Jassid population effects are arranged in to the following order: FH 312>FH Lalazar≈FH 442>FH 6/13≈FH 444>FH 326>FH Noor>ME≈FH Kahkshan>MN 6/16>FH 142>FSD 16.

Morphological traits among selected cultivars of cotton

Results demonstrated that gossypol glands on stem were maximum (380) on advanced cultivar FSD-6/13 followed by (350) on FH-444 and FH-312, however minimum (200) on FH-Noor and MN-6/16 whereas gossypol glands on leaf were maximum (320) on MN-6/16 followed by (290) on FSD-16 however minimum (150) on FH-142. The gossypol glands on midrib were maximum (84) on ME and FH-444 but minimum (56) on MN-6/16. The leaf hairs were maximum (230) on FH-326 and FH-Lalazar and minimum (80) on FH-312 and ME. The midrib hairs were maximum (330) on FH-Noor and minimum (150) on FH-442 and FSD-16.The nectries were maximum (7) on FSD-16 and minimum (1) on FH-312.The leaf area were maximum (335.4cm^2) of FSD-16 followed by (283.05cm^2) of FSD-6/13 and minimum (130.9cm^2) of FH-Noor as shown in Table- 5.

In correlation of these independent variable and dependent variable our data revealed that nectaries and Gossypol glands had negative effect on jassid. Leaf area exhibited positive effect on this insect (jassid) as shown in Table- 6.

DISCUSSION

Present studies were carried out to screen out response of advanced cultivars and the role of morphological traits toward sucking insect pest of cotton. Many morphological traits such as glabrous leaves, stem and bracts, red plant, frego bract, nectariless, yellow pollen and thick boll rind make plants less preferred (non-preference) by insects (El-Zik and Thaxton, 1989; Jenkins, 1989; Bhat et al., 1988; Jayswal and Sundaramurthy, 1992).

FH 312 (0.96) possessing high density of jassid as compared with FSD 16 (0.25) had less number of hairs as compared with FH-326, and FH-Lalazar. The maximum number of hairs on leaf midrib were recorded on FH-142, some of them may be glandular that excrete exudates therefore jassid demonstrated non-preference toward FH-142. Other than leaf hairs, the gossypol glands also play an important role toward food preference. FH-Noor having less number of gossypol glands on stem was preferred by jassid. Similar effect of gossypol glands on bollworms has also been recorded, according to them High gossypol, high condensed tannins and heliocides (H1, H2, H3, H4) impart resistance/tolerance to bollworms

Table 5

Gossypol glands, hairs, Nectaries and Leaf Area on different cotton cultivars.

Treatment	Varieties	Stem gossypol glands	Leaf gossypol glands	Midrib gossypol glands	Leaf hairs	Midrib hairs	Nectries	Leaf Area (cm^2)
1	FH 142	250	150	83	200	325	3	12×15.5=186
2	FH Lalazar	300	250	64	230	300	3	12×15=180
3	FH 444	350	170	84	150	200	5	14.5×13=188.5
4	FH 442	210	250	60	130	150	3	12×16.5=198
5	FH 312	350	260	67	80	190	1	12×12.5=150
6	FH Noor	200	240	77	250	330	3	11×11.9=130.9
7	FH Kahkshan	275	250	78	104	160	3	12.2×15.3=186.66
8	FH 326	335	275	69	230	300	3	12.5×15.3=191.25
9	FSD 6/13	380	260	75	150	300	2	15.3×18.5=283.05
10	FSD 16	310	290	60	96	150	7	15.6×21.5=335.4
11	ME	320	205	84	80	210	6	12×18.3=219.6
12	MN 6/16	200	320	56	120	250	4	12.8×18.5=236.8

(antibiosis) (Narayanan *et al.,* 1990). The earlier attempts were also made on exploring the methodologies to develop host plant resistance to pest complex in cotton in Pakistan, like those of Hassan *et al*. (2000) Bashir *et al*. (2001), Shad *et al*. (2001), Khan *et al*. (2003) etc. but a lot remains yet to be done to arrive at some definite results.

Based on the results of present studies it was found that nectaries and Gossypol glands had negative effect on jassid. Leaf area exhibited positive effect on this insect (jassid). These results are confirmatory to the findings of (Murugesan and Kavitha, 2010) who described that leafhopper had negative association with leaf hair density, hair length, hair density on mid vein and based on the resistance index. They further explained that entries were grouped under five categories as, highly resistant- KC 2, SVPR 2; Resistant-TKH 1128: Intermediate- MCU 5, MCU 10, NISD 2, TKH 1143,TKH 1175:Susceptible- TKH 1789, TKH 1173, TKH 1174, TKH 1178, TKH 1179, TKH 1185, TKH 1186, TKH 1209, TKH 1225, TKH 1233 and Highly susceptible- ICMF 20, LRA 5166, TKH 1133, TKH 1172, TKH 1176, TKH 1182, TKH 1197, TKH 1198.

CONCLUSION

Our data results revealed that nectaries and Gossypol glands had negative effect on jassid but leaf area demonstrated the positive effect. These results may be useful to develop a jassid resistant variety in future.

Table 6
Correlation of independent variable with dependent variable.

Independent variable	Dependent variable r(p-value)
Morphological traits	*Jassid*
Nectaries	-0.582 (0.047)
Leaf Gossypol glands	-0.056 (0.862)
Leaf hair	-0.042 (0.896)
Midrib Gossypol glands	-0.0820 (0.799)
Midrib hair	-0.085 (0.792)
Stem Gossypol glands	-0.273 (0.390)
Leaf Area	0.509 (0.090)

AUTHORS' CONTRIBUTION

M. Abdul Majid and Abid Mehmood conducted research; while Saghir Ahmad provided seed facility of cotton cultivars. M. Rafiq Shahid supervised research and prepared the manuscript for publication. M. Kamran statistically analyzed the data and M. Ishtiaq, Qaisar Abbas and M. Hussain critically reviewed and helped in write up.

REFERENCES

Afzal, M. and M.H. Bashir, 2007. Influence of certain leaf characters of some summer vegetables with incidence of predatory mites of the family Cunaxidae. Pakistan Journal of Botany, 39(1):205.

Bashir, M.H., M. Afzal, M.A Sabri and A.B.M. Raza, 2001. Relationship between sucking insect pests and physico-morphic plant characters towards resistance/susceptibility in some new genotypes of cotton. Pakistan Entomologist, 23(1-2):75-78.

Bakhetia, D.R.C., J. Singh, A.S. Sohi and J. Singh, 1996. Integrated pest management in sustainable agric: Punjab Scenario. Pest Management Ecology Zoology, 4:1-13.

Bughio, A., Z.A. Qureshi, T. Hussain and Q.H. Siddiqui, 1984. Field evaluation of cotton mutants for pink and spotted bollworms resistance. Nucleus (Pakistan), 21(4): 47-49

Jin, Z.Q., G.D. Cao, S.S. Luo, J.M. Hong and Y.Q. Hung, 1999. Insect resistance and yield of different insect resistant hybrid cotton cultivars. Zhejiang Nongye Kexue, 3:142-144.

Jiskan, M.M., 1999. Crop protection and economy of country. Economic Survey of Pakistan, 2000. pp.1-6.

Khan, M.T., M. Naeem and M. Akram, 2003. Studies on varietal resistance of cotton against insect pest complex. Sarhad Journal of Agriculture (Pakistan), 9:93-96.

Krips, O.E., P.W. Kleijn, P.E.L. Willems, G.J.Z. Gols and M. Dicke, 1999. Leaf hairs influence searching efficiency

and predation rate of the predatory mite *Phytoseiulus persimilis* (Acari: Phytoseiidae). Experimental and applied Acarology, 23: 119-131

Mohyuddin, A.I., G. Jilani, A.G. Khan, A. Hamza, I. Ahmed and Z. Mahmood, 1997. Integrated pest management of major cotton pests by conservation, redistribution and augmentation of natural enemies. Pakistan Journal of Zoology, 29:293-298.

Naqvi, K.M., 1976. Crop protection to boost up cotton production. In *Proc. Cotton.* Prod. Seminar, Organized by ESSO Fert. Co. Ltd., Pakistan: 119-125

Shad, S.A., W. Akram and R. Akbar, 2001. Relative response of different cultivars of cotton to sucking insect pests at Faisalabad. Pakistan Entomologist, 23(1/2):79-81.

Wilson, M.C., F.T. Turpin and A.V. Provonsha, 1980. *Practical insect pest management 2. Insects of livestock and agronomic crops* (No. Ed. 2). Waveland Press, Inc.:1-198.