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GENUS *PARASEIULUS* MUMA. THREE NEW SPECIES (ACARINA: PHYTOSEIIDAE) FROM PAKISTAN

Amjed Parvez & Wali Muhammad Chaudhri
Department of Agri. Entomology, Univ. of Agriculture, Faisolabad

Three new mite species of genus *Paraseiulus* .... *P. cardinis. P. adalesco and P. affinis* have been described in this research paper.

Key words: genus Paraseiulus Muma, three new species

INTRODUCTION

Mites of the genus *Paraseiulus* Muma are predatory in nature and play an important part in biological control of harmful mites and small insects (Muma and Denmark, 1970). Muma (1961) erected the genus *Paraseiulus* and he designated *Seiulus soieiger* Ribaga as its type species.

The research work conducted by Wainstein (1962), Wainstein and Arutunjan (1967), Matthysse and Denmark (\981), Wainstein and Arutunjan (\ 983) and Daneshvar (1987) is worth meutioining and they described 2,2,2,3 and I new species of genus *Paraseiulus*,, respectively from their respective countries. From Pakistan, Chaudhri *et al.* (1974) and Parvez *cl al.* (1994) each described 3 new species. This research paper includes 3 new species of genus *Paraseiulus* which are described in detail as under: A comprehensive key for nine species is also given.

Key to Pakistan species of *Paraseiulus* Muma (Females)

I. Dorsal shield oval.. ... *P. sursum* Parvez. Chaudhri & Ashfaq

Dorsal shield with concave area/areas marginally ... 2

2. Dorsal shield with I concave area near 52 ... 3

Dorsal shield with more than I concave areas marginally ... 7

3. Leg IV with macroseta on basitarsus. ... 4

Leg IV without macroseta on basitarsus. ... 6

4. Peritreme with recurved tip; seta *M3* posterior to *L8* in position. ... *P.operantis* Chaudhri

Peritreme with straight tip; seta *M3* not posterior to *L8* in position. ... 5

5. Cheliceral fixed digit with 2 teeth. movable digit with I tooth; seta *M3* anterior to *L8* in position. ... *P.aditus* Parvez, Chaudhri & Ashfaq

Cheliceral fixed digit with 4 teeth, movable digit with 2 teeth; seta *M3* equals at base with seta *L8* in position. ... *P.lllaritus* Parvez, Chaudhri & Ashfaq

6. Cheliceral fixed digit with 4 teeth; dorsal shield without visible pores; genital and ventrianal shields without membranous fold in between. ... *P. ignavis* Chaudhri

Cheliceral fixed digit with 6 teeth; dorsal shield with 3 pairs visible pores; genital and ventrianal shields with a membranous fold in between. ... *P.cardinis,new* species

7. Cheliceral fixed digit with 4 teeth; seta *M3* anterior to *L8* in position. ... *P. adalescosew* species

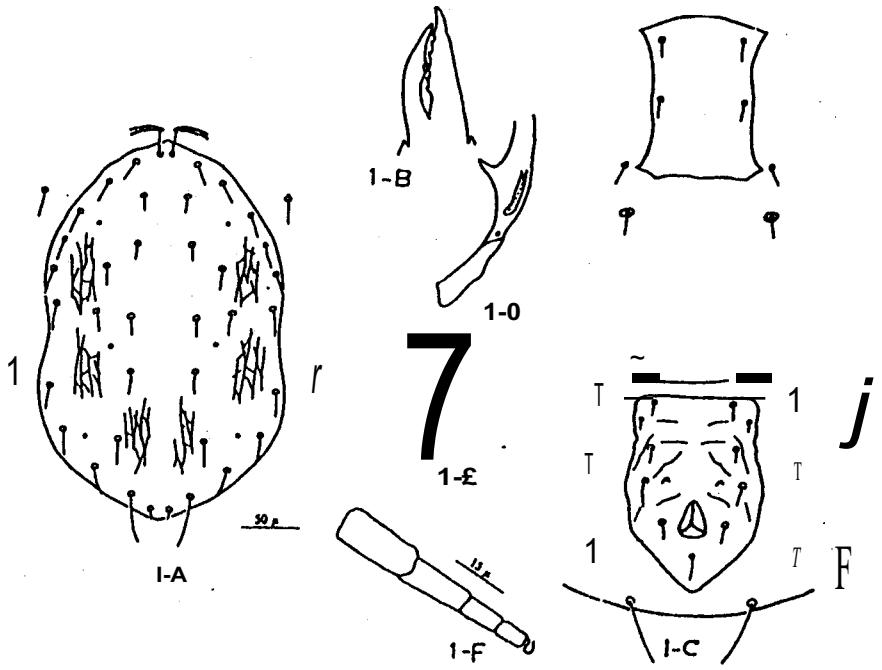
Cheliceral fixed digit with less than 4 teeth; seta *M3* not anterior to *L8* in position. ... 8

8. Cheliceral fixed digit with 2 teeth; seta M3posterior to *L8* in positioin. ... *P. vitreus* Chaudhri

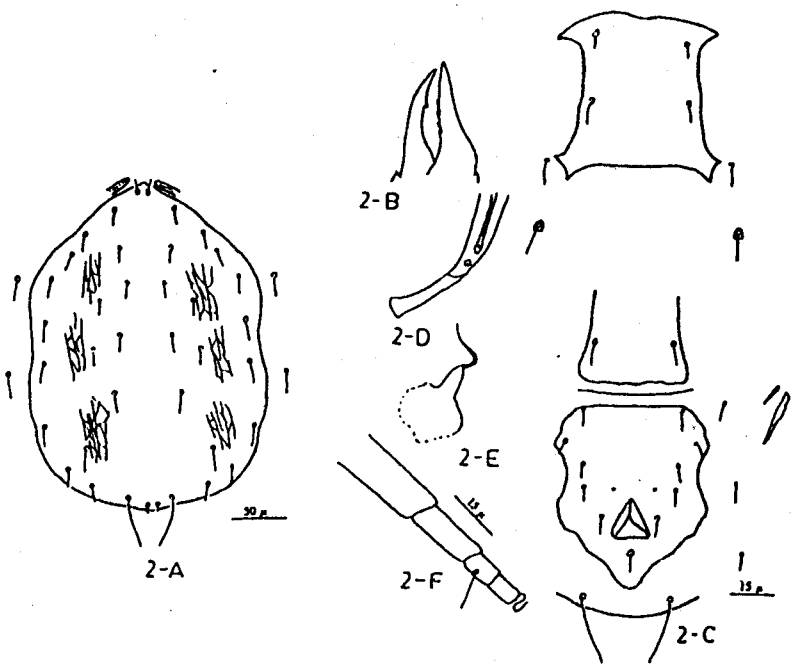
Cheliceral fixed digit with 3 teeth; seta *M3* base equals *L8* in position. ... *Piaffinis* ,new species

I. *Paraseiulus cardinis,* new species (Fig. 1)

FEMALE: Dorsal shield completely reticulated, laterally concave near seta 52; 3491-'mlong, 1841-'m wide; 19 pairs setae and 3 pairs visible, rounded pores (Fig. I-A). Chelicera 261-'mlong; movable digit with 2 teeth, fixed digit with 6 subapical teeth (Fig. I-B). Dorsal shield setae



Fit'. I. *Paraseiulus cardinis,*, n.sp.
A. Dorsal shield; B. Chelicera; C. Sternal, genital and ventrianal shields; D. Pcritremal shield base; E. Spcrmatheca; F. Leg IV.



FIt'. 2. *Paraseiulus adalesco,* n. sp.
A. Dorsal shield: B. Chelicera; C. Sternal, genital and vcntrianal shields; D. Pcritrcmal shield base. E. Spcrmaihcca: F. Leg IV.

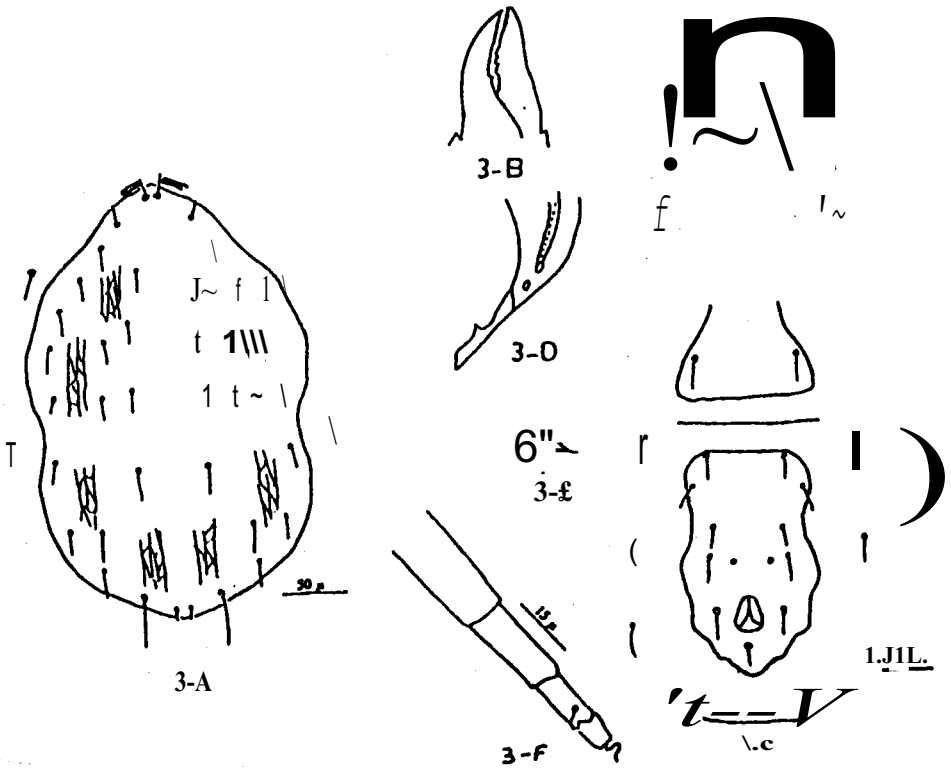


Fig. 3. *Paraseiulus affinis,* n.sp.
A. Dorsal shield; B. Chelicera; C. Sternal , genital and ventrianal shields;
D. Peritremal shield base; E. Spermatheca; F. Leg IV.

simple, smooth, short of distance to seta next in line. Dorsal shield setae: *V* 181lm; *DJ = D2 =* 131lm, *D3* 151lm, *D4* 161lm; *Cl* 51lm; *U = L2 = L3 = L4 = L5 =* 181lm, *L6* 22ll*m, L7 = L8 = L9* = 20llm, *L 10* 281lm; *MJ* = M2 = *161lm,* M3 19l1m; 51 = 52 211lm (both on membrane). Seta M3 posterior to seta *L8; 261lm* and *20llm* apart from *L8* and *L9,* respectively (Fig. I-A). 'Peritreme reaching beyond seta V, tip slightly directed downwards. Peritremal shield base ribbon-like, convex process on upper side (Fig. I-D). Sternal shield smooth, *931lm* long, *591lm* wide, slightly wavy posteriorly, convex anteriorly; 2 pairs setae on shield, I pairon membrane; I < 1- II (Fig. I-C). Metasternal shield setae I pair, each seta on a separate platelet. Genital shield smooth, *861lm* wide, I pair setae. Genital and ventrianal shields *20llm* apart with a membranous fold in between. Genital shield wider than ventrianal shield. Ventrianal shield striated, shield-shaped; laterally 3 slightly concave areas; 1091l$_m$ long, *761lm* wide, 4 pairs preanal setae and I pair elliptical pores (Fig. I-C). Four pairs setae including *VU* 311lm long on membrane surrounding ventrianal shield. Two pairs metapodal platelets; primary I pair *391lm* long, secondary I pair 131lm long (Fig. I-C). Leg IV without macroseta on basitarsus (Fig. I-F).Spermatheca .. cervix long tubular slightly flared posteriorly; atrium undifferentiated; major-duct tubular; vesicle bulbous (Fig. I-E).

MALE: Not known.

TYPE: Holotype female, collected 2 km, W. 6000' Murree Hills from peach *(Prunus persica)* on 2. x.1991 (Amjed and Chaudhri). Paratype I female the same collection data. Two females, collected Abbotabad 3500' on 12.vi.1992 from *Punica granatum.* All specimens deposited in Acarology Research Laboratory, Department of Agri. Entomology, U.A.F.

REMARKS: This new species *Paraseiulus cardinis* is closely related to *P. ignavus* Chaudhri but the following points separate them:

I. Dorsal shield without pores in *ignavus* but 3 pairs visible pores in this new species.
2. Cheliceral fixed digit with 4 teeth in *ignavus* but 6 teeth in this new species.
3. Peritremal shield base bluntly pointed in *ignavu»* but broad, flat in this new species.
4. Ventrianal shield smooth in *ignavus* but striated in this new species.
5. Ventrianal shields and spermathecae differ in both the species.

2. Paraseiulus adalesco, new species (Fig. 2)

FEMALE: Dorsal shield completely reticulated, 2 concave areas, between *L5 - L6* and near *L7;* 3871lm long, 1821lm

wide; !9 pairs setae (Fig. 2-A). Chelicera 26t-t1Tllong; movable digit with I tooth, fixed digit with 4 subapical teeth (Fig. 2-B). Dorsal shield setae simple, smooth, short of distance to seta next in line. Dorsal shield setae: *V* I:~t-tm; *DJ* = D2 = D3 = l0t-tm, D4 *14t-tm; Cl 5t-tm;* ***LI*** *= L2 = L3 = L4 = 13t-tm, L5 = L6 = 15t-tm, L7* 14t-tm, *L8 = L9* = 13t-tm, *LlO 32t-tm; MJ = M2* = 12t-tm, *M3* 19t-tm; 5J = 52 = 16t-tm (both on membrane). Seta *M3* anterior in position to seta *L8;* 181lm, and *20t-tm* apart from setae *L8* and *L9,* respectively (Fig. 2-A). Peritreme just reaching seta *V;* straight tip. Peritremal shield base ribbon-like, Bared at base (Fig. 2-D). Sternal shield smooth, *89t-tm* long, *78t-tm* wide; concave posteriorly; concave medio-anteriorly; 3 pairs setae (2 pairs on shield, I pair on membrane); I < I - 11 (Fig. 2-C). Metasternal setae I pair, each seta on a separate minute platelet.. Genital shield smooth, *54t-tm* wide. I pair setae. Genital and ventrianal shields *19t-tm* apart with a membranous fold in between. Genital shield not wider than ventrianal shield. Ventrianal shield smooth, 107t-tm long. *65t-tm* wide; lateral margins mostly wavy, 4 pairs preanal setae and I pair rounded pores (Fig. 2-C). Four pairs setae including *VL J 261lm* long on membrane surrounding ventrianal shield. Metapodal platelets 2 pairs; primary I pair *31t-tm* long, secondary I pair l0t-tm long; both pointing posteriorly (Fig. 2 - C) . Leg IV with I macroseta on basitarsus, *241lm* long (Fig.2 - F). Sperrnatheca ... cervix saccular, Bared 1Ot-tlong; atrium undifferentiated; major-duct filarnentous; vesicle oval (Fig. 2-E).

MALE: Not known.

TYPE: Holotype female, collected I km. N. 7000' Murree Hills from "partal" *(Pinus* sp.) on 2.x.1992 (Amjed and Chaudhri). Para type two females, the same collection data. Three females, collected Sunny Bank 6500' (Murree Hills) on 4.x.1992 from "Ioquat" *(Eriobotryiajaponica).* All specimens deposited in Acarology Research Laboratory, Department of Agri. Entomology, U.A.F.

REMARKS: *Paraseiulus adalesco,* new species is closely related to *P. vitreus* Chaudhri due to most body characters but the following characters separate them from each other:

I. Cheliceral fixed digit with 2 teeth in *vitreus* but 4 teeth in this new species .
2. Membranous fold absent between genital and ventrianal shields in *vitreus* as against present in this new species.
3. Shape of spermatheca differs in both the species.

3. Paraseiulus affinis, , new species (Fig. 3)

FEMALE: Dorsal shield completely reticulated, I concave area near *L2,* deeply concave near 52; *390t-tm* long, 195t-tm wide; 19 pairs setae (Fig. 3-A). Chelicera 26t-tm long; movable digit with I tooth, fixed digit with 3 subapical teeth (Fig. 3-B). Dorsal shield setae smooth, simple, short of distance to seta next in line. Dorsal shield setae: *V* l6llm; *DJ = D2 = D3 = 15t-tm. D4* 18t-tm, *Ci Sqsa; LL = L2 = L3 = L4 = L5 = L6 = L7 = L8 = 151lm, L9* 161lm, *LlO 26t-tm; M1 = M2 = 14t-tm, M3* 18t-tm; 51 *18t-tm, 52 161lm* (both on membrane). Seta *M3* posterior to seta *L8; l8llm,* and *20t-tm* apart from seta *L8* and *L9,* respectively (Fig. 3-A). Peritreme reaching up to seta *V,* straight tip. Peritremal shield base with slanting straight base-end; pointed process on lower side (Fig. 3-D). Sternal shield smooth, 3 pairs setae (2 pairs on shield, I pair on membrane); I < I - 11; slightly concave posteriorly, straight anteriorly (Fig. 3-C). Metasternal setae I pair, each seta on a separate platelet.. Genital shield smooth, *59t-tm* wide, I pair setae. Genital and ventrianal shields *26t-tm* apart with a membranous fold in between. Genital shield wider than ventrianal shield. Ventrianal shield smooth, 104t-tm long, *52t-tm* wide, concave area laterally near preanal seta Ill, opposite to anus and 2 beyond anus forming wavy lateral margins; 4 pairs preanal setae and I pair rounded pores (Fig. 3-C). Four pairs setae including *VL* 1 *28t-tm* long on membrane surrounding ventrianal shield. Metapodal platelets 2 pairs; primary I pair *34t-tm* long, shape hockey blade-like but pointed posteriorly, rounded anteriorly, secondary I pair, pointed anteriorly 14t-tm long (Fig. 3-C). Leg IV with I macroseta on basitarsus, 27t-tm long (Fig. 3-F). Spermatheca ... cervix saccular, slightly Bared; atrium undifferentiated; major-duct filamentous; vesicle droplet-like (Fig. 3-E).

MALE: Not known.

TYPE: Holotype female, collected 2 km.E. 7000' Murree Hills from "partal" *(Pinus* sp.) on 2.x.1992 (Amjed and Chaudhri) and deposited in Acarology Research Laboratory, Department of Agri. Entomology, U.A.F.

REMARKS: *Paraseiulus affinis,* new species can be separated from *P. vitreus* Chaudhri on the basis of the following characters:

I. Cheliceral fixed digit with 2 teeth in *vitreus* but 3 teeth in this new species:
2. Peritrernal shield base ribbon-like, smooth in *vitreusbut* with a pointed process in this new species.
3. Membranous fold absent between genital and ventrianal shields in *vitreus* but present in this new species.
4. Genital shield not wider than ventrianal shield width in *vitreus* but wider in this new species.
5. Shape of spermatheca differs in both the species.

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Natural inoculum was also relied upon for infection especially for leaf curl virus disease. All conventional agronomic practices were followed to keep the crop in good condition. However, no pesticides were sprayed to develop maximum disease pressure. Bacterial blight disease ratings were taken five times at an interval of 10 days according to the scale (Table I) described by Brinkerhoff (1977) after the first initiation of disease symptoms. Response of cotton lines to CLCuV was rated according to a scale agreed upon by eight member scientist committee (Anonymous. 1996). These data were subjected to analysis of variance and differences among varieties were determined by Least Significant Difference Test at 5% level of probability (Steel and Torrie , 1980).

RESULTS AND DISCUSSION

Water-soaked spots appeared on the lower surface of coiylcdonary leaves of AU-59 in the last week of June. which later on turned into necrotic angular spots. Such type of symptoms appeared on secondary leaves in the subsequent week indicating systemic nature of the disease. Bacterial blight symptoms appeared on FH-632 and FH-682 in the first week of July. During second week of July, disease symptoms were recorded on FH-632. FH-682. B-821 and B-871 respectively. Heavy rainfall in the subsequent three weeks resulted in the secondary spread of the disease in epidemic form. Except asymptomatic expression of FDH-170, R-231, Ravi, which are *arboreum* type and TsR-21, TsR-23-7, T x ORB-75 and T x ORB-76 which are exotic upland cotton lines, symptoms of bacterial blight disease got intensified on majority of cotton lines/varieties. Immune reaction of some genotypes of *Gossypium arboreum* and resistant response of upland *Gossypium hirsutum* has been reported (Chopra *et al., 1983;* 5ingh *et al*.. 1987). According to the disease ratings made eight weeks after the first initiation of disease symptoms, which continued up to 10, 12, 14, and 16 weeks, none of the cotton lines was found to be resistant to bacterial blight. Of 60 lines, only B-284, B-822 and TxCAB were moderately resistant (Table 2). A total of 32 lines/varieties gave moderately susceptible response while 18 were susceptible to bacterial blight disease. This indicated the scarcity of resistance in the available test germplasm, Diverse virulences of bacterial blight pathogen have been reported from different parts of the world (Brinkerhoff, , 1963; Nayudu, 1964; Brinkerhoff and Hunter, 1965; Hunter et aI., 1968; Verma, 1970; Bird and Tsai, 1975; Verma and Singh, 1975; Randhawa and Singh, 1980). Race 18, the most virulent so far recorded in the world has also been reported from Pakistan (Hussain and Brinkerhoff, 1978). Four races of the pathogen i.e. 18. 12, 10 and 8 have also been identified from Pakistan (Hussain, 1984). Among these, race 18, 10. and 8 have been recorded from cotton growing regions of Faisalabad (Hussain, 1984). The pathogen is both externally as well as internally seed-borne (Massey, 1931; Hunter and Brinkerhoff, 1963; Verma and Singh, 1974). Bacterial blight primary infection takes place through sowing of seed infected by *Xanthomonas campestris* pv. *malvacearum.* The bacterium has been reported to survive for six and three months in the trash applied on the surface of the soil and buried 15 cm deep respectively (Verma *etal.,* 1977). According to Alippi (1989) this pathogen was not detectable in non-sterile soil after 50 days and in sterile soil after 80 days. Secondary spread of the disease takes place through rain splashes and air currents. Screening of canon germplasm against bacterial blight has been reported by several research workers (Hussain, 1969; Hussain and Yaqub, 1977; Brinkerhoff and Hussain, 1978a, 1978b; Chauhan *et al*.. 1986; Dizon and Reyes, 1987). The cotton lines containing blight resistant genes. B_1B_0, $B_2B_1B_7$ + BN and many other combinations were reported to be resistant (Hussain, 1984).

Typical symptoms of canon leaf curl virus disease appeared on 5-12 in the first week of July in the form of thickening of veins and curling of leaves at the top. These symptoms were observed on most of the lines/varieties in the 2nd and 3rd week. The symptoms of CLCuV got intensified in the subsequent week and according to disease rating scale none of the cotton lines was resistant. Three entries i.e. MS-95. CDP37-H and TxCAB B-872 were moderately resistant. Fifteen cotton lines were moderately susceptible, 21 susceptible and 11 highly susceptible to CLCuV (Table 2). Screening of cotton germplasm to CLCuV has been reported by several research workers with limited success in getting lines with moderate resistance to disease (Mahmood *et al*.. 1994; Tahir *et al.,* 1994; Mukhtar, 1996).

During last 10 years bacterial blight and leaf curl virus have emerged as two destructive diseases of cotton crop as indicated by the enormous yield losses reported by various research workers (Hussain and Ali, 1975; Rampandu *et al*.. 1979; Khan and Ilyas, 1990; Ali *et al.,* 1992; Anonymous, 1992; Ahmad, 1995). Continuous efforts are needed to develop blight and CLCu V resistant cotton lines by combining several single gene resistance factors onto a polygenic resistance background. Such type of immunity has remained stable for more than 20 years (Brinkerhoff *et al.,* 1984). In the current studies bacterial blight and leaf curl virus disease were significantly higher (Table 2) on AU-59 and it was graded as susceptible to highly susceptible to both diseases. This variety can thus be used as a disease spreader/check variety for future studies. Only T x CAB was moderately resistant to blight and CLCu V. The varieties B-284 and B-822 were moderately resistant to bacterial blight but moderately susceptible to CLCuV. Similarly. MS-95 and CDP37H were moderately resistant to CLCuV but moderately susceptible to bacterial blight. The results of these studies indicate that most of the commercial cultivars and advance lines lack durable resistance against bacterial blight and CLCuV. However, cotton lines/varieties such as B-284, B-622, B-868, B-872, CDP37H, CIM-434, CIM-I 100. FH-682, and MS-95 having moderately resistant to moderately susceptible response

Table I. Disease rating scales used to determine the level of resistance or susceptibility of cotton lines to bacterial blight and CLCuY disease

Grade	Symptom description	Level of resistance/susceptibility
Bacterial blight*		
0=	No symptoms	Immune
0.2 =	1 to 2 angular lesions per plant	Highly resistant
0.4 =	3 to 10 angular lesions per plant	
0.6 =	11 to 25 angular lesions per plant	
0.8 =	25 angular lesions (+) wet vein lesions per plant	
1 =	25 angular lesions and wet vein lesions surrounded by yellowing and necrosis	
2 =	Leaves shed from two nodes	Resistant
3 =	leaves shed from three nodes	Moderately resistant
4=	Leaves shed from four nodes	
5 =	Leaves shed from five nodes	
6=	Leaves shed from six nodes (+) slight infection of leaves above hare nodes (+) black arm infection	Moderately susceptible
7 =	Leaves shed from six nodes (+) slight to moderate infection of above bare nodes (+) black arm phase	
8 =	Leaves shed from six nodes (+) moderate infection of leaves above bare nodes (+) black arm phase	Susceptible
9 =	Leaves shed from six nodes (+) severe infection of leaves above bare nodes (+) black arm phase	
10 =	Leaves shed from six nodes (+) very severe infection of leaves above bare nodes (+) black arm phase	Highly susceptible
CLCuY**		
0=	No symptoms	Immune
1 =	Scattered thickening of small veins	Resistant
2 =	Thickening of all veins hut no curling	Moderately resistant
3 =	Thickening of veins and curling of leaves at the top (light effect)	Moderately susceptible
4 =	Thickening of veins and curling of leaves on half the plant (medium effect)	Susceptible
5 =	Thickening of veins and curling of leaves (upward/downward) on the entire plant and dwarfing of plant (severe effect)	Highly susceptible

*Brinkerhoff (1977): **Anonymous (1996).

Table 2. Screening of cotton germplasm for sources of resistance against bacterial blight and leaf curl virus diseases at the University of Agriculture. Faisalabad

	Name of cotton tine/variety	Bacterial blight of cotton		Cotton leaf curl virus disease	
		Mean grades	Response	Mean grades	Response
1	AU-59	8.00a*	S	5.00a	HS
2.	B-284	4.33hi	MR	2.66de	MS
3.	B-163	7.00abe	S	4.66a	HS
4.	B-496	5.33efgh	MS	4.66a	HS
5.	B-557	6.66 bed	S	4.66a	HS
6.	B-622	5.66 defg	MS	2.66de	MS
7.	B-727	6.00 edef	MS	4.66a	HS
8.	B-803	6.33 bede	MS	3.66be	S
9.	B-811	5.66 defg	MS	4.33cd	S
10.	B-820	7.00 abe	S	4.33ab	S
11	B-82 1	6.66 bed	S	1.66he	S
12.	B-822	4.33 hi	MR	3. 33j	MS
13.	B-842	6.33 bcde	MS	4.66a	HS
14.	B-850	5.66 defg	MS	3.66bc	S
15.	B-868	5.33 efgh	MS	3.00ede	MS
16.	B-869	5.33 efgh	MS	3.66be	S
17.	B-870	5.66 defg	MS	3.66be	S
18.	B-871	6.66 bed	S	4.33ab	S
19.	B-872	5.66 bed	MS	2.66de	MS
20.	B-873	7.33 ab	S	4.33ab	S
21.	B-874	5.33 etgh	MS	3.66be	S
22.	B-876	6.33 bcde	MS	4.66a	HS
23.	B-877	6.33 bcde	MS	3.66bc	S
24.	Bc879	5.33 efgh	MS	3.66he	S
25.	CDP 37-H	5.00 fgh	MS	2.33ef	MR
26.	CIM-109	7.33 ab	S	4.66a	HS
27.	C[M-240	6.66 bed	S	4.33ab	S
28.	CIM-434	5.33 efgh	MS	2.66de	MS
29.	CIM-435	5.33 etgh	MS	3.66bc	S
30.	C[M-IIOO	5.66 defg	MS	2.66de	MS
31	FDH-[70	O.OOj	I	O.OOg	[
32.	FH-632	6.33 bede	MS	3.66bc	S
33.	FH-682	6.00cdef	MS	2.33ef	MS
34.	FSD-629	5.33 efgh	MS	3.66bc	S
35.	FSD-63[	5.33 efgh	MS	3.66bc	S
36.	MNH-[47	7.33 ab	S	3.66bc	S
37.	MNH-329	6.66 bed	MS	3.66bc	S
38.	MNH-93	7.33 ab	S	4.66a	HS
39.	MS-95	4.66 ghi	MS	2.33 er	MR
40.	N[AB Krishna	6.66 bed	S	3.66 be	S
41.	NIAB-78	6.33 bcde	S	4.66 a	HS
42.	R-231	O.OOj	I	0.00 g	[
43.	RAY I	O.OOj	I	0.00 g	I
44.	S-12 (Check)	4.66 ghi	MS	4.66 a	HS
45.	S-14	6.33 be de	S	3.00ede	MS
46.	S- [50/93	6.33 bcde	S	3.33 cd	MS
47.	S- [51/93	6.33 bede	S	4.66 a	HS
48.	S-152/93	6.66 bed	S	4.66 a	HS

49.	SLS-1	5.33 efgh	MS	3.66 be	S
50.	TsR-21	0.00 j	I	O.OOg	I
51.	TsR-23-7	0.00 j	I	O.OOg	I
52.	Tx37AF	5.66 defg	MS	2.66 de	MS
53.	Tx37NAF	5.66 defg	MS	2.66 de	MS
54.	TxBlank	6.66 bed	S	2.66 de	MS
55.	TxCAB	4.00 hi	MR	1.66 f	MR
56.	TxCD-3H	5.66 defg	MS	3.33 cd	MS
57.	TxGN-761	6.33 bcde	MS	2.66 de	MS
58.	TxORB-75	0.00 j	I	0.00 g	I
59.	TxORB-76	O.OOj	I	O.OOg	I
60.	TxORH-76-C	0.00 j	I	0.00 g	I
61.	TxSP-21-C	3.66 I	MR	2.66 de	MS
62.	VS-135.	6.33 bcde	MS	4.66 a	HS
		1.0505		0.7987	

*Mean values in a column sharing similar letters do not differ significantly as determined by the LSD Test at P= 0.05.

can be graded as tolerant and their genetic potential can be exploited by the application of pesticides and by following proper agronomic practices, profitable yield can be obtained.

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