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Screening Of *Capsicum* Germplasm Against *Phytophthora capsici*.

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Abstract

Out of the 66 varieties/lines of chillies tested, 16 belonging to *Capsicum annuum* showed immune reaction both in pots and in the sick field. The varieties showing resistant reaction in pots also exhibited the same reaction in the sick field. Twenty four varieties/lines belonging to *C. annuum*, *C. chinense* and *C. frutescens* were highly susceptible and gave 90-100 per cent mortality of plants in pots while 58.33 to 100 per cent in field. However, the mortality percentage in the field was comparatively less than that in pots. The varieties/lines of *Capsicum annuum* showed comparatively resistant reaction than *C. chinense*, *C. frutescens* and *C. pendulum* varieties/lines tested.

Introduction

Chilli (*Capsicum annuum* L.), a highly profitable vegetable crop of Pakistan is cultivated over an area of about 86,500 hectares with a total production of 94,900 tones per annum. (Anonymous, 1995). Chilli plants are infected by a number of diseases out of which root and collar rot caused by *Phytophthora capsici*, is of great importance in different parts of the world including Pakistan (Sherf and Macneb, 1986; Stamps, 1985; Saleem *et al.*, 1989 and 1997). The disease is well established in Pakistan and every year causes colossal loss to the crop. Susceptibility of local commercial varieties to this disease is also a factor in the spread of the disease within the country.

Resistance in peppers has been reported by many workers (Smith *et al.*, 1967; Polach and Webster, 1972; Sharma and Saini, 1979; Sotivora and Beleva, 1979; Saini and Sharma, 1979). Of the various approaches that could be adopted for the control of root and collar rot disease of chillies, use of resistant cultivars is the most appealing both environmentally and economically. The present studies report the results of resistance of different varieties/ lines against *P. capsici*, both under greenhouse and field conditions.

Materials and Methods

Nursery of the varieties/lines was raised in earthen pots having one kg of sterilized soil. Each pot was infested with 5 g culture of *P. capsici* multiplied on oats (Papavizas, *et al.* 1981) and flooded with water. After one week 45 days old chilli nursery plants were transplanted in these pots and kept in glass house at $25 \pm 5^\circ\text{C}$. The pots were watered as and when required. One plant per pot and 10 pots per variety were kept in the trial. The data on the basis of mortality percentage was recorded after 60 days of mixing the culture of the pathogen. Equal number of non inoculated healthy plants (control) were kept for comparison. Plants were applied NPK (23:23:23) 250 mg/pot 4 times during the experiment period.

For field screening an artificial sick field patch was created in the Research area of Plant Pathology Section, Ayub Agricultural Research Institute, Faisalabad. Ten kg of the

inoculum of *P. capsici*, multiplied on oats was uniformly spread and thoroughly mixed in the field (9 x 18 M) by hoeing. The field was irrigated to establish the pathogen. In this field ridges of 15 cm height and 75 cm apart were made. After one month of mixing of the inoculum, nursery of the test varieties was transplanted on the ridges keeping 45 cm plant to plant distance. Each variety had one row. Normal Agronomic practices were followed for raising the crop in all the field experiments. Periodically data were recorded on the basis of per cent mortality and final data were recorded after 90 days of transplanting. Isolations were made intermittently from dead plants on PARP medium to confirm the presence of *P. capsici*. The evaluation of resistance and susceptibility of the germplasm was done by the use of a rating scale as given in table-1.

Table 1: Reaction wise No. of varieties in green house and in sick field trial.

Reactions	Infection range(%age)	No. of varieties	
		In pot	In field
Immune (I)	0.0	16	16
Highly resistant (HR)	1-5%	0	0
Moderately resistant(MR)	6-10%	0	2
Moderately susceptible(MS)	11-25%	0	5
Susceptible (S)	26-50%	0	3
Highly susceptible.(HS)	51 and above	50	25

Results and Discussion

Of the sixty six chillies varieties/lines evaluated in pots and 51 varieties/lines tested in field, 16 varieties/lines belonging to *Capsicum annuum* were found disease free both in pots as well as in field against *P. capsici* (Table 2), mainly emerging from the crosses of Italian varieties with Mexican wild types *C. annuum*. Twenty four varieties/lines belonging to *Capsicum annuum*, *C. chinense* and *C. frutescens* were highly susceptible and gave 90 to 100 per cent mortality of plants in pots while in field these varieties/ lines exhibited 58.33 to 100 per cent disease incidence. The mortality %age in the field was comparatively less than that in pots. This is mainly due to the fact that plants grown in pots were already under stress and they were also inoculated

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Table 2: Screening of different chillies varieties/lines against root/collar rot of chillies

Name of Variety	Name of species	%Mortality	
		Pots	Field
1-1-1(82xCM.323)	<i>Capsicum annuum</i>	0.0	0.0
1-2-1(5056xCM.339)	"	0.0	0.0
1-3-1(5056xCM.338)	"	0.0	0.0
1-3-2(5056xCM.338)	"	0.0	0.0
1-3-3	"	0.0	0.0
1-3-4	"	0.0	0.0
1-4-1(39xCM.331)	"	0.0	0.0
1-4-2	"	0.0	0.0
1-5(395xCM.334)	"	0.0	0.0
Italy 24.	"	0.0	0.0
Italy 42.	"	0.0	0.0
Italy 40.	"	0.0	0.0
Italy 44.	"	0.0	0.0
Italy 48.	"	0.0	0.0
Italy 49.	"	0.0	0.0
Italy 55.	"	0.0	0.0
G1(Malay Hot).	"	100.0	58.3
G2(Baclani).	"	100.0	75.0
G3(Pimiento Petol).	"	90.0	91.7
G4(Key Stor).	"	100.0	83.0
G5(Acc.1447).	"	100.0	91.7
G6(Acc.1531).	"	100.0	65.7
G7(Acc.1575).	"	100.0	100.0
G8(Sweet Banana).	"	100.0	83.0
G9(lenque Hot).	"	100.0	91.7
Red fire.	"	100.0	25.0
Cluster.	"	100.0	25.0
Kerseem	"	100.0	83.3
Kollotki.	"	100.0	41.7
Sanam.	"	100.0	100.0
Large Cherry.	"	100.0	100.0
Dhing Shah.	"	100.0	83.3
(FD-selection).	"	"	"
Chillie M1-2	"	100.0	91.7
Chillie M1-1	"	100.0	83.3
Bahawalpur	"	100.0	66.7
Tatapuri.	"	100.0	100.0
Skyline	"	100.0	83.3
Gola Peshawari.	"	100.0	66.7
California Wonder.	"	100.0	8.3
Acc. 311.	"	100.0	58.3
Neelum.	"	100.0	83.3
Pasilla.	"	90.0	-
Elpaso(L).	"	70.0	-
Numex, Biggim(hot).	"	70.0	-
Numex R. Naky.	"	90.0	-
Hungarian Yellow Wax.	"	90.0	-
Colorado (Mild).	"	70.0	-
College.	"	40.0	-
Anaheim. M(W).	"	100.0	-
Salaword (W).	"	70.0	-

Chilli Long (Hot).	"	"	90.0	-
Italian Sweet.	"	"	90.0	-
Colorado Hot.	"	"	100.0	-
Anaheim (L).	"	"	70.0	-
Roumanian (Hot).	"	"	100.0	-
Banana Sweet.	"	"	100.0	-
G10(Acc.1553).	<i>C. chinense</i>	"	100.0	83.3
G11(Acc.1555).	"	"	100.0	91.7
G12(P.L.159236).	"	"	100.0	41.7
G13(Acc.906).	<i>C. frutescens</i>	"	100.0	25.0
G14(Acc.1634).	"	"	100.0	58.3
G15(P.L.257069).	"	"	100.0	8.3
G19(Green Leaf Tobacco).	<i>C. pendulum</i>	"	100.0	41.7
G16(Acc.853).	"	"	100.0	16.7
G17(Acc.1634).	"	"	100.0	25.0
Aji.6 + 718 in PL152234	"	"	100.0	25.0

- = Not tested.

under optimum conditions for the disease development. In the field the plants were healthy, moreover different types of microflora were present in the soil and the availability of the inoculum may not be always 100 per cent under the most conducive conditions for disease development. Similar situation has been observed by different workers while testing the resistance of apple rootstocks in the field and green house against *P. cactorum*. This lack of consensus in assessment of resistance has been attributed to geographical differences in the edaphic environments and distributions of different *Phytophthora* spp. in areas where the root stocks are evaluated (Mircetich and Browne 1987).

Thirty three varieties/lines which showed highly susceptible reaction in pots exhibited more or less the same reaction of moderately susceptible and susceptible reaction in field while G-15(PL.257069) and California Wonder belonging to *C. frutescens* and *C. annuum* respectively gave 100 per cent mortality of plants in pots. These varieties were found moderately resistant in the field and showed 8.33 per cent mortality of chillies plants in each case.

Six varieties/ lines, i.e., Red fire, Cluster, G13 (Acc.906), G16 (Acc.853), G17(Acc.1634) and Aji.6 + 718 in PL152234 exhibited moderately susceptible reaction in field while only 3 varieties/lines, G-12 (PL-159236), G-19 (Green leaf tobacco) and Kollotki were found susceptible in the field and exhibited 41.7 percent mortality of plant in each case, while these varieties gave 100 per cent mortality of plants in pots.

The varieties/lines of *C. annuum* gave good resistance against the pathogen. No variety/line of other species of *Capsicum* i.e. *C. chinense*, *C. frutescens* and *C. pendulum* tested was found resistant in pot experiment. However, G-15 (PL.257069) belonging to *C. frutescens* proved moderately resistant in sick plot as compared to pot experiment. No disease symptoms were observed in the healthy check

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grown under similar conditions. Periodical isolations made from dead plants on PARP medium yielded *P. capsici*, thus confirming the cause of mortality. The results of the present study are in agreement with the studies of Goth and Webb (1984), Peter *et al.* (1984), who found that KAU cluster and Pant C-1 (*Capsicum annuum*) varieties/ breeding lines, belonging to *C. annuum* species, were resistant and moderately resistant respectively against *P. capsici* while the lines belonging to other species were susceptible. The varieties found resistant in the present studies are shy bearer and thus cannot be adopted as commercial varieties, however these can serve as a good sources of resistance for the breeding programme.

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