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Short Communication

SOURCES OF RESISTANCE IN CHILLI GERMPLASM AGAINST BACTERIAL WILT AND ANTHRACNOSE

S. J. N. BARUAH AND H. A. RACHID, Department of Horticulture, Assam Agricultural University, Jorhat 785013 (Assam)

Sources of resistant genetic stocks are of great importance to the plant breeders for exploitation in crop improvement programme. Extensive screening for sources of resistance in chilli against anthracnose disease caused by *Colletotrichum* spp. resulted in different degrees of resistance in different genetic stocks of chilli. Sources of resistance against bacterial wilt and anthracnose disease so far identified have been listed in this article.

Key words: Chilli, *Capsicum annuum*, resistance, *Pseudomonas solanacearum*, *Colletotrichum* spp.

Bacterial wilt caused by *Ralstonia solanacearum* and anthracnose caused by *Colletotrichum* spp. are two severe and devastating diseases of chilli. They create a great havoc in commercial cultivation of chilli and limit the production. In India 50-100 per cent incidence of bacterial wilt disease has been reported (Das and Chottopadhyay, 1955; Khan *et al.*, 1979). In Assam, bacterial wilt occurs in all the six agro-climatic zones and becomes most severe when environmental factors favours the disease (Addy *et al.*, 1980; Bora, 1996). On the other hand, the anthracnose is present throughout India but more common and aggressive in Assam, North Bihar, Andhra Pradesh and parts of UP (Singh, 1992). It appears season after season as the pathogen continues to survive by vegetative mycelium or resting spores. In India, it is known to cause 12-32 per cent fruit rot in Assam (Choudhury, 1957), 10-30 per cent reduction in yield in Punjab (Bansal and Grover, 1969) and 10-35 per cent reduction in yield in Punjab and Haryana (Bansal and Grover, 1969). Both the diseases may occur simultaneously in the field causing tremendous loss in yield of the crop. (Fugro *et al.*, 1989). Moreover application of only chemicals cannot serve our purpose in the present day context of sustainable agriculture. Moreover, host plant resistance has assumed greater importance in integrated disease management strategies.

RESISTANT OR TOLERANT GENETIC STOCKS

a. Bacterial wilt

Different experiments have been conducted to screen and evaluate varieties of chilli against bacterial wilt caused by *P. solanacearum* (Table 1). Walker and Manser (1980) isolated the bacteria from bacterial wilt of an exotic capsicum cv. Asgrow Long Green and found susceptible. Local cultivars of capsicum were found resistant or tolerant to the pathogen. It appeared that the bacterial wilt pathogen was present in the soil and indigenous lines of solanaceous crops have developed some tolerance against it.

Baruah (1994) also appraised by presentation of data that local chillies of Assam were significantly

more resistant to bacterial wilt than introduced ones from other parts of India. This can be attributed to the climato-geographical peculiarities of the region where indigenous germplasm have attained inherent survival capacity. Nath (1996) tested the relative reaction of seven different varieties against bacterial wilt in Assam. But no variety was found resistant to bacterial wilt. California Wonder was found to be moderately susceptible showing 22.22 per cent wilt incidence while Pusa Jwala and Indo American Hybrid chillies were found to be susceptible. Four varieties Kharika (local), Gagan (local), Krishna and NP464 were found highly susceptible showing more than 40 per cent wilt incidence. This disease has also become a major constraint in capsicum production in Kerala (Jyothi *et al.*, 1993).

In Central and South America, pepper was found consistently susceptible to the wilt causing bacterial isolates of 70, 163, 130 isolated by French and Sequeira (1970). Most plants inoculated with these isolates died within 6-12 days. Other isolates caused wilting only in the inoculated leaf with slight inhibition of internode elongation. However, most pepper varieties had been considered to be moderatly or highly resistant to racel isolates in the past. In Brazil, fifty genotypes were grown under green house and inoculated at the 2 leaf stage with a mixture of 2 cultures of *P. solanacearum.* Six genotypes (with 1.8-2.8 scores) in 1-4 scale were rated resistant and the remaining were found susceptible (Matos *et al.*, 1990).

b. Anthracnose disease

From time to time different workers have screened and evaluated various genotypes of chilli (Table 2).

Chang and Chung (1985) from Korea reported that among 21 capsicum cvs. Kumchang No. 2, Bulamhouse, Pakistan and Hongilpam were found resistant. Another five were moderately resistant and other twelve (all these were sweet tasting cultivars) were susceptible. Pearson *et al.*, (1984) in Papua New Guinea found that among 23 CVs. assesed the sweet bell varieties were generally found more susceptible than long pungent ones (Red pepper, Pretty Red, Long Red Cayenne, Ilimo, Anaheim, NG7238, Hot Spike). Choi and Pae (1987) reported from Korea that six varieties of chilli showed differences in lesion size from 3-7 days after inoculation with *C. gloeosporioides* (*Glomerella cingulata*) or *C. ematium.* None was found immune out of ten cvs screened by Basak (1997) against *Colletotrichum capsici, G. cingulata* and *Fusarium semitectum* in Chittagong, Bangala Desh.

In Maharastra, it was found that cv. CA 960 suffered less from (Jieback and fruit rot than cvs. Bhiwarpur local followed by Musalwadi L, Jwala and Pant C-1. The variety CA 960 also gave significantly higher yield. It was noticed that variety with large fruit and thick pericarp were less affected and gave higher yield compared to variety with smaller fruits and thin pericarp (Patil *et al.*, 1993). Pusadhakar and Moghe (1991-92) reported that all the cvs. grown in the field produced fruit rot and dieback symptom, but M.G. Katol, Washim-30, Akolkhed, Warangal have shown some tolerance to fruit rot and dieback. Three varieties viz. Ceictio no.2, Sewal and Patna chilli were found least susceptible (Singh and Thakur, 1979). While searching for field tolerance to fungal and viral diseases in Punjab conditions the genotypes CH-1, Punjab Lal, ELS-2, Indonesia Sel, LLS and Pusa Jwala were found to be promising by Kaur *et al.* (1994) in addition to acceptable horticultural characters. The reaction of 21 varieties or selections to die back and fruit rot after infection with the fungus with or without previous or subsequent inoculation with TMV was studied. Selection of 34-13

Table 1. List of some chilli genotype showing resistant reaction against bacterial wilt

Germplasm	Reaction	Worker(s)	Year
KAU cluster,White Kandari and Pant C-1	R	Hibberd *et al.*	1984
Pant-C	R	Peter *et al.*	1984
Cholo	R	Jimenej *et al.*	1988
17245	FR	Jimenej *et al.*	1988
LCA-304,BC-24,BC-14-2	I	Fugro *et al.*	1988
Arka Lohit,Jayant,Phule-6-5 and X -235	MR	Fugro *et al.*	1988
Sel-2,HC-203 and Nath Heera	R	Fugro *et al.*	1988
Manjeri	MR	Jyothi *et al.*	1993
Ranche Khorsani (*C. chinense*) Heiser 6240, LS 2390,LS1840 (*C. frutescens*), LS1716, Casali BGH 1761 and Pickersgill 277 (*C. baccatum*)	R	Matsunga and Monma	1995
Capsicum annuum: CNPH 143 (MCA), CNPH 144 (MC5) and CNPH 145 (HC10)	HR	Matos *et al.*	
Selections CA219 and CA33	I	Gopalkrisna and Peter	1991
MC-4	R	Quezdo-Soares and Lopes	1995
MC4,MC5,PBC631,P1322727,Pi358812,PBC066,Kerting,P1369994,P136 9998,P1377688,OMS-B,P1322728 and Jatilaba	HR	KimByungSoo *et al.*	1998

I = Immune, HR = Highly resistant, R = resistant, FR = Fairly resistant, MR = Moderately resistant

showed acquired resistance to the fungus when first inoculated with TMV (Bansal *et al.*,1982). Such acquired resistance has great implications in biological control of disease. Chouhan and Duhan (1986) also studied reactions of different strains/varieties of capsicum against anthracnose under Haryana condition. Fugro *et al*, (1989) found that varieties LCA-304, BC-24, BC-14-2 were completely free from bacterial wilt and showed moderate resistance to die-back. The varieties Arka, Lohit, Jayant, Phule-6-5 and X-235 were found resistant to die back, but showed moderate resistance to bacterial wilt. The varieties Konkon Kirti were found moderately resistant to both the diseases. In an another experiment, they found that Sel-2, HC-203 and Nath Heera were resistant to both the diseases.

Out of 60 germplasms screened at AAV, Jorhat only one variety 'Balijuri' found to be resistant to both the diseases. Varieties C-1, C-3 and Kolajalakia (long) were found moderately resistant to both the diseases. Again varieties Ou Jalakia-II, Tupura Jalakia, Thupa Jalakia, Ugda Jalakia, Paharia Bhot and Dhan Marish resistant to anthracnose found moderately resistant to bacterial wilt.

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Table 2. The list of some chilli genotypes showing different reactions to anthracnose

Genotype Place/Country	Reactions	Worker(s)		Year
NP hybrid,Kashmir Yellow,Kalyanpur No1	R	Singh *et al.*	1977	Punjab
C-22-A.R. Larm,VIP-45-A,B-8-A-Hydarabad, C.A. 1047,C15-A-Mexico,CH-113,C.A.960, K-Surkh,745-Achalpur,745-America,I.C. 13277,724-Guntur,CH-107,B-29-A-Bihar, B-2-A-Dharwar,No. 762,Sel-14,Hy-No-8-Self,Chamatkar,G-2-A-Mexico				Local, G-5
Bengal Green,H-1,H-4,S20-1,H-6	R	Singh and Thind	1980	Punjab
520-l,H-1,H-A,H-6	HR	Singh and Thind	1980	Punjab
Capsicum annuum CVs. Artakis,August,Chinese Giant,Yolo-Y,Hungarian Wax,Sparton Emerald,Pimiento Paprika,Kalinkov-805,D-103,Ukrainskij Gorkij,Zlanten Medal,Wonder Top,Malaquetta,Paprika C. sinensis var. panca C. fasciculatum	R	Ullasa *et al.*	1981	
C. annuum cvs. Chinese Giant,Floriyis,Kapija,Szentesi,Maidova-118	MR	Ullasa *et al.*	1981	
NG7236,NG7239 Kumchang No 2,Bulamhouse	DE	Pearson *et al.*	1984	Papua New Guinea
Pakistan,Hongilpam	R	Chang and Chung	1985	Korea
Lorai,Perennial	R	Kaur and Singh	1985	Punjab
7262,Deglur,B79A,LIC24 764 Guntur,574 Thirumalapuram	MR	Perane and Joi	1986	Maharashtra
Pant C1,B7-9 self	R	Perane and Joi	1986	Maharashtra
Janghong	R	Choi *et al.*	1990	Korea
BG-1,Lorai,Perennial	R	Singh *et al.*	1980	Punjab
MS-13,MS-12,Surjamani,Laichi -IV-3,Tiwari-II,Laichi IV-4,Anheim Thick,Bharat Hybrid,ET-Late,MY 13-1-1,Laichi-1,MS4-MF3,Tiwari,X-200,Punjab Lal,MY 10-2,Anheim,Laichi-III,MF-11-1	R	Singh *et al.*	1980	Punjab
K Swekh, Ch 107,Chamatkar,Safer yellow, G4	MR	Singh *et al.*	1980	Punjab
Punjab Lal	R	Sokhi	1994	Punjab
HC28,HC44	R	Pandita *et al.*	1995	Haryana
Jati Cluti,Jati Small,Kharika,KC1,Round Chilli,Jati Long,Krishna,Nagabat,Karanga,Bhot	R	Baruah and Deka	1996	Assam
IC 99910,IC 99912,IC92150,P-1718,P- 1939,N-1015,EC 362901,EC 362910 EC 362913,EC 362925,EC 362934,EC 362935,EEC 3637	T	Muneem *et al.*	1995	Uttar Pradesh
DC1,DC2,DC3,DC4,DC5,DC6	MR	Roy *et al.*	1998	Assam
Longamiri,Latabih-1,Ou Jalakia-2,Chakma,Garofingi,Latabih-2,Firingi Jalakia,Tupura Jalakia,Kola Jalakia,Thupuka Jalakia,Balijuri,Nadharia, Kola Jalakia (uper mukhia),Ugda Jalakia,Khoti Jalakia,Bogori Jalakia,Sahab Jalakia,Pahari firingi,Pahiri bhot,Dhan marish	R	Unpublished data project, ICAR- Adhoc	1999	Assam
Rangulul,C-1,C-3,C-5,Refugi(AP),Singhasan,OuJalakia-1, Kolajalakia(L),SJNB,Mihi Firingi,Thupa jalakia, Assamia jalakia,Uparmukhia, Pavaria,Goswami-1 Andhra Pradesh	MR	Do	1999	Assam

Note: HR=highly resistant, R=resistant, MR=moderately resistant, T= tolerant, DE= disease escaping

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