Indian Journal of Hill Farmg 15(1) : 39-43 (2002)

SCREENING OF TOMATO VARIETIES/BREEDING LINES AGAINST BUCJEYE ROT (*Phytophthora nicotianae* var. Parasitica Dastur)

A.K. Bijaya*, R.N., Tewari and T.S. Verma**
Division of Vegetable Crops, Indian Agricultural Research Institute, New Delhi

ABSTRACT

In all, 106 tomato varieties/ breeding lines were screened against buckeye rot at two different stages i.e. at the time of seed emergence and also at fruiting stage during 1994-95 and 1995-96 crop season. The tomato varieties/breeding lines showed wide range of variability. Some of the varieties/breeding lines such as KT-10, KT-15, Tom-1`93, Triumph, EC-11958, Florida, Hawaii and C-32 were found resistant in both types of Screening. Among these varieties/ breeding lines KT-10 and KT-15 were found most promising and also having good horticultural characteristics. These two breeding lines can be used in further breeding programme.

INTRODUCTION

Tomato (Lycopersicon esculentum mill) is one of the most popular vegetables which tops the list of canned vegetable and ranked seconed on order of its importance to potato. It s known to suffer heavy loss due to buckeye rot (Jain et. al., 1961; Rattan and Saini, 1978; Sokhi et.al., 1982). Variable degree of resistance against buckeye rot was reported by many scientists (Rattan and Saini, 1978 and Dhaliwal and Rattan, 1990). Various factors affect the resistance mechanism. The present study was conducted to locate the source of resistance against naturally occurring virulent strains of buckeye rot.

MATERIALS AND METHODS

Screening of one hundred six germplasm against buckeye rot (phytophthora nicotianae var. parasitica. Dastur) were carried out during cropping season of 1995 and 1996 under natural epiphytic conditions of IRRI Regional Station Katrain, Kulu Valley. Screening methods were standardized and two stages namely seed germplasm and seedling screening were observed critical for screening.

For seed germination test, one hundred healthy seeds of these varieties were sown in natural buckeye to infected field in replicated trial. Observation of seed emergence were recorded and mortality percentage were counted in each treatment and classified as follows :

Per cent of plant died due to damping off	Symptom severity grade
No plant died	0
Seedling died upto 25 per cent	1
26-50 per cent seedling died	2
51-75 peer cent seedling died	3
> 75 per cent seedling died	4

* Central Agricultural University, Imphal, Manipur
** IARI, Regional Station Katrain, Kulu Valley, Himanchal Pradesh

For seedling reaction, highly susceptic lines (4 grade) were discarded. Twelve plants were planted for each treatment and replication. Healthy and diseased fruits were picked up regularly and incidence of disease of each variety was counted for all the picking. The variation observed was graded as follows after calculating the coefficient of infection; coefficient and responsible value assigned to each grade and then combines both percent of infection and severity.

Scale for classifying the disease reaction

Percent diseased fruits	Symptom severity grade	Response value
No disease fruit	0	0
25 per cent diseased fruits	1	0.25
26-50 per cent diseased fruits	2	0.50
51-75 per cent diseased fruits	3	0.75
> 75 per cent diseased fruits	4	1.00

Scale for classifying coefficient of infection and its reaction.

Co efficient of infection (C.I.)	reaction
0-4	Highly resistant (HR)
5-9	Resistant (R)
10-19	Moderately resistant (MR)
20-39	Moderately susceptible (MS)
40-69	Susceptible (S)
70-100	Highly susceptible (HS)

The resistance of buckeye rot was confined artificially in selected germplasm by artificial screening technique. Pre and post damping off screening was adapted as first screening

Pathogenicity tests were conducted on detached fruits Fruits were sterilized with 0.1 % Mercuric chloride and washed with distilled water. Inoculations were on fruit surface with or without injury. Observations were recorded on severity of lesions produced.

RESULTS AND DISCUSSION

The results (Table 1) revealed that out of 106 genotypes screened none was found immune to buckeye rot. However, in 14 varieties/ breeding lines the seedling mortality rate ranged between 1 and 25 per cent whereas, 14 germplasm were found moderately resistant causing 26-50 per cent infection. Moderately susceptible lines comprising 18 germplasms produced 51 -75 per cent seedling mortality. The remaining in 60 germplasm were highly susceptible and caused seedling mortality more than 75 per cent. Among resistant varieties/breeding lines KT-10 and KT-15 were most promising producing 5.25 and 5.75 per cent infection respectively. This was followed by variety pierline from Bulgaria which produce 12.5 per cent infection.

Screening was done again at the time of fruiting on those varieties, which survived damping off infection and are presented in (Table 2). The mean of co-efficient of infection value of two years showed that some varieties, which were found highly resistant in the seed emergence, were resistant at fruiting stage. Varieties like KT-10, KT-15, Tom 163, Triumph, EC - 11958, Florida Hawaii and C-32 were found resistant in both types of screening. Among these resistant lines KT-10 and KT-15 scored lowest C.I. value e.i. 5.16 and 5.6 respectively. These two resistant lines KT-10 and KT-15 were the most promising resistant germplasms.

Lowest scored varieties KT-10 and KT-15 were again screened in artificially inoculated soil for confirmation of resistance (Table 3). KT-10 and KT-15 scored uniformly 3 per cent pre emergence and 6 and 7 per cent post emergence damping off, respectively whereas susceptible variety Sioux exhibited cent per cent susceptibility.

At seedling (Fruiting stage) the data as present in Table 4 revealed that fruit infection in KT-10 and KT-15 as 13.33 and 20 per cent when inoculated with injury and 6 per cent in both the variety showed 100 per cent with injury and 6.66 per cent without injury. These studies have confirmed the resistance of KT-10 and KT-15 against rot.

Resistance to this disease was mainly attributed to virulence pathogenicity of inoculation. Some of the resistant sources like VHF-10, San Marzano, Money Maker as reported by Sharma 1974 were found highly susceptible in the present study mainly due to effective virulence natural inoculation.

REFERENCES

Dhaliwas, M.S and Rattan, M.S. (1990 B.K. Sarma). Genetic variability for buckeye rot resistance and horticultural trials in tomato, *Annals of Biology*, Ludhiana, 5: 111-115.

Dutta, O.P. and Banerjee, M.K. (1997). Resistant Varietal Trail. Proceedings of the XVI group meeting on vegetable Research, ICAR, pp 101-112.

Jain, S.S., Sharma, S.L. and Junija, S.L. (1961). Studies on buckeye rot of tomato new to Himanchal Pradesh, Proc. Indian Sci. Cong. Assoc., 50: 351-352

Ratan, R.S. and Saini, s.S. (1978). Inheitence of resistance to fruit rot (*Phytophthora parasitica Dast.*) in tomato (Lycopersicon esculentum mill.) *Euphytica*, 28: 315-317.

Sokhi, S.S and Sohi, H.S. (1982). Assurement of loss in tomato caused by buckeye rot (*Phytophthora nicotianae* var. parasitica) *Ind. Phtopathology.* 35: 675-676.

Table 1. Disease reaction of 106 tomato germplasm according to the scale

No germplasm	14 germplasm	14 germplasm	18 germplasm	60 germplasm
	Tomato Sel. 10, C-32, Florida Hawaii, EC-11958, Money Market Type, Pusa Lalmaruti, Triumph, To-193, Tom-202, Virosra, KT-10, KT-15, Pierline, MST-21/173	KS-7, C-35, KS-17, EC-111085, 901,1231, EC-9668, Pusa Ruby, Oxheart, Italian, Red, Pear, Indian River, Tropics, Tuckcross, Bangalore-1	Best of all, EC-111071, EC-102134, H-2274, K-7721, Marglobe, 960, Packmore, Pritchard, WIR 4063, WIR 3969, Roma, Pusa -120, Pusa Sheetal, Park -5, Acc. 1395, Tomato Sel-7, Sel -22	EC-93060, EC 101657, Co-1-2, Calky, CPC-2, C-1327, EC-1112686, Grosslisse, Harvestar, K-25, Keneveny, Stamboj, Laurano, Kesckmih jabilum, Homestead, Laukit, H-137, Hebro, Merit, San-Marzano, Money Maker, Makadopink, Planet, 958, Poineer, Priesta, Potomac, RAF, Sioux, Sel-4, St.pierre, Mini Red Pear, Tricum Tom-180, Splendour, Ventura, Vulgare Bregh, W.I.R. -4616, 4315, 4088, 3900, 3905,3622, 3595, 3432, 3957, 2030,3945, 3948 and 3951, Azura, Bangalore -2, UHF -10, Darkred, Red cherry, Esobelle, Park-18, MST-21/23, Dorchesta, Pondeheart.

Table 2. Disease reaction of 46 tomato germplasm according to 0-5 scale

0	1	2	3	4	5
No germplasm	3 germplams	5 germplasms	6 germplasms	20 germplasms	12 germplasms
	KT-10, KT-15 and Tom – 193	MST 21/73, Triumph, EC-11958, Florida Hawaii, C-32	Pierline, Virosa, Tropics, Tom-202, Pusa Lalmiruti, Money Market Type	Bangalore-1, Tomato Sel-10, KS-7, C-35, 901, EC-9668, Indian River, tuckcross, EC-102134, Marglobe, 960 Packmorem, WIR-4003, WIR-3969, Roma, Pusa-120, Pusa Sheetal, Sel-22 and Pritchand	KS-17, EC-111085, 1231, Pusa Ruby, Italian Red Paear, EC-111071, H-2274, K-7721, Park-5, ACC-1395, Tomato Sel-7 and Oxheart

0 - Highly resistant (HR); 1 - Resistant (R); 2 - Moderately resistant (MR); 3 - Moderately susceptible (MS); 4 - Susceptible (S); 5 - Highly Susceptible (HS)

Table 3. Per cent comparative damping off of KT-10, KT-15 and Sioux

Varieties	Per cent Pre emergence damping off	Per cent post-emergence damping off	Total per cent damping off	Per cent decreased over Sioux
KT-10	3	6	9	91.00
KT-15	3	7	10	90.00
Sioux	58.0	100	100	-

Table 4. Laboratory test on detached fruits of KT-10 and KT-15

Treatment	No. of fruits inoculated	No. of fruits infected	Percent fruit infection	Average diameter of lesion on fruits in cm at Different times (in hours)						
				24	48	72	96	120	144	168
I-Inoculation with injury										
KT-10										
i) mature fruits but still green in colour	15	2	13.33	-	1.2	1.8	2.7	3.8	4.7	Rotted
ii) mature fruits red in colour	15	-	-	-	–	-	-	-	-	-do-
KT-15										
i) mature fruits but still in green colour	15	3	20.00	-	1.3	2.1	3.0	4.0	4.9	-do-
ii) mature fruits red in colour	15	-	-	-	-	-	-	-	-	-do-
II – Inoculation without Injury										
KT-10										
i) mature fruits but still in green colour	15	1	6.66	-	1.1	1.7	2.6	3.9	4.7	-do-
ii) mature fruits red in colour	15	-	-	-	-	-	-	-	-	-do-
KT-15										
i) mature fruits but still in green colour	15	1	6.66	-	1.1	1.8	2.7	3.9	4.8	Rotted
ii) mature fruits red in colour	15	-	-	-	-	-	-	-	-	-
III-Inoculation without fungus (control)										
KT-10										
i) mature fruits but still in green colour	15	-	-	-	-	-	-	-	-	-
ii) mature fruits red in colour	15	-	-	-	-	-	-	-	-	-
KT-15										
i) mature fruits but still in green colour	15	-	-	-	-	-	-	-	-	-
ii) mature fruits red in colour	15	-	-	-	-	-	-	-	-	-