



SCREENING OF TOMATO ADVANCED LINES, GENOTYPES AGAINST *ALTERNARIA SOLANI*

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Abstract

Experiment was conducted to screen different advanced lines and genotypes against early blight of tomato caused by *Alternaria solani*. Two hundred and two advanced lines and nine genotypes were screened under natural epiphytic condition. Nineteen advanced line were found resistant against *A. solani*. The thirty one advanced lines and three genotypes were found moderate resistance. Fifteen advanced lines and genotypes were found moderate susceptible. Ninety lines and one genotype were found susceptible. Two lines and fives genotypes were found highly susceptible.

Key words : *Alternaria solani*, tomato, susceptible and early blight disease.

Introduction

Alternaria solani (Ellis and Martin) Sorauer is an important pathogen causing early blight disease in tomato. This disease, which in severe cases can lead to complete defoliation, is most damaging in tomato [*Solanum lycopersicum* L. (Peralta *et al.*, 2005, syn. *Lycopersicon esculentum* Mill.)] in regions with heavy rainfall, high humidity, and fairly high temperatures (24°–29°C). Yield losses up to 79% from early blight damage have been reported from Canada, India, the United States and Nigeria (Basu, 1974b; Datar and Mayee, 1981). The first symptoms of early blight are small, dark, necrotic lesions that usually appear on the older leaves and spread upward as the plants become older (Sherf and MacNab, 1986). As lesions enlarge, they commonly have concentric rings with a target-like appearance and they are often surrounded by a yellowing zone. The disease is characterised by dark coloured leaf spots that are necrotic in the centre and have a concentric ring pattern. As lesions expand and become numerous, leaves become blighted and plants are gradually defoliated (Thomas, 1948; Barksdale and Stoner, 1977; Konsler and Shoemaker, 1980). Fungicides used to control the disease are expensive and frequently inefficient (Cassells *et al.*, 2006). The development of tomato varieties resistant to early blight remains one of the best strategies for long-term control of this disease. Among the various

recognized methods of plant disease control, the use of resistant varieties is considered to be cheapest and the best way. Therefore, screening of the available advanced line and genotypes of tomato was carried out to find out the source of resistance against the pathogen of early blight of tomato.

Materials and Methods

Field experiments

The experiment was conducted in the field number A-32-40 at Vegetable Research Farm, Kalyanpur of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (U.P.), India, during *rabi* 2007-2008. Geographically, Kanpur is situated in Gangatic plain of central U.P. at 26°28' east (longitude) at N altitude of 127 meters of above sea level. It lies in the subtropical region.

A total of 197 genotypes including cultivars, genotypes and advanced lines of tomato were selected for this study; twenty plants of each genotype were planted. Genotypes of tomato seedlings were raised in nursery beds and 30 days old seedlings were transplanted into the main field. Distance between row to row and plant to plant was 60 and 50 cm in 3m × 2 m plot size. The investigation was carried out at the experimental farm of Department of Vegetable Science, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (U.P.), India during the main cropping seasons

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Table 1 : Scale for rating of early blight disease in tomato.

Rating	Reaction description
0	Free from infection
1	< 10% surface area covering leaf, stem and fruit infected by early blight
2	11-25% foliage of plant covered with a few isolated spot
3	Many spot coalesced on the leaves, covering 26-50% surface area of plant
4	51-75% area of the plants infected, fruits also infected at peduncle end defoliation and blighting started. Sunken lesions with prominent concentric ring on stem, petioles and fruits
5	< 75% area of plant part blighted, severe lesion on stem and fruit rotting on peduncle end

Table 2 : Screening of tomato advanced line and genotypes against early blight disease under natural epiphytotic condition.

Reaction	PDI	Lines/genotypes
R	0-5	5105, 5198, 52135, 53106, 5404, 5414, 5515, 5617, 5903, 6040, 6042, 6126, 6132, 6303, 7047, 7049, 7067, 7081, EC-521071
MR	5.1-12	7085, 7102, 8102, 8104, 8106, 8201, 8301, 8304, 8306, 8307, 8308, 8309, 8314, 8318, 8402, 8501, 8505, 8511, 8514, 8516, 8517, 8602, 8607, 8608, 8615, 8620, 8721, 8702, 8707, 8712, 8716, CO3, Panjab upma, NDTVR-60
MS	25.1-50	8718, 8725, 8727, 8739, 8745, 8768, 9401, 9702, 9403, 9407, 9408, 9415, 9416, 9705, 9703, 9706, 9709, 9721, 0609, 7037, 7017, 6904, 6803, 681, 6534, 6519, 5048, 5051, 5178, 5193, 51134, 5452, 9201, 5906, 6003, 6031, 6036, 6135, 6515, 7048, 6516, 6517, 6601, 6602, 6604, 6802, 6806, 6902, 6905, 7009, 7010, Punjab Chhuhara.
S	50.1-75	7012, 7015, 719, 733, 7035, 7736, 7038, 7041, 7045, 7048, 7054, 7060, 7063, 7066, 7069, 7070, 7171, 7076, 7094, 7203, 7301, 7370, 7702, 7709, 7711, 8105, 8502, 8504, 8508, 8510, 8512, 8513, 8515, 8611, 8612, 8613, 8614, 8704, 8708, 8709, 8710, 8715, 8719, 8720, 8724, 8729, 8730, 8731, 8736, 8743, 5748, 8749, 8750, 8762, 8765, 8769, 8771, 9403, 9405, 9406, 9409, 9412, 9417, 9419, 9420, 9421, 9402, 9701, 9701, 9713, 9714, 9716, 9717, 9718, 9723, 9724, 0202, 0601, 0602, 0604, 0605, 0607, 0608, 0610, 0611, 0612, 8505, 9719, 9720, 9726, 9729, 0101, Co-3.
HS	>75	Azad T-1, Azad T-6, 7710, 8728, Azad T-5, Superbug, Shalimar-2

R = Resistant, MR = Moderately resistant, MS = Moderately susceptible, S = Susceptible, HS = Highly susceptible, PDI = Percent disease incidence.

of *Rabi* 2008 under natural conditions of infection by early blight. Inoculum was present naturally at the test sites. All the recommended package of practices for cultivation of tomato was followed in order to raise a good crop, except fungicide application.

Twenty plants were selected randomly in each plot and observation on disease severity recorded individually using 0-5 rating scale (table 1) based on leaf area, stem and fruit covered by blight symptoms following the rating scale described by Pandey *et al.* (2003). Disease incidence was calculated on the basis of per cent of infected leaves and stem. Percentage disease index (PDI) was calculated as follows :

$$PDI = \frac{\text{Sum of all rating} \times 100}{\text{Total no. of observations} \times \text{Maximum rating grade}}$$

Results and Discussion

The twenty advanced lines *viz.*, 5105, 5198, 52135, 53106, 5404, 5414, 5515, 5617, 5903, 6040, 6042, 6126, 6132, 6303, 7047, 7049, 7067, 7081, EC-521071 were

resistant. The thirty one advanced lines *viz.*, 7085, 7102, 8102, 8104, 8106, 8201, 8301, 8304, 8306, 8307, 8308, 8309, 8314, 8318, 8402, 8501, 8505, 8511, 8514, 8516, 8517, 8602, 8607, 8608, 8615, 8620, 8721, 8702, 8707, 8712, 8716, and three genotypes CO3, Panjab upma, NDTVR-60 were moderately resistant. Fifteen lines 8718, 8725, 8727, 8739, 8745, 8768, 9401, 9702, 9403, 9407, 9408, 9415, 9416, 9705, 9703, 9706, 9709, 9721, 0609, 7037, 7017, 6904, 6803, 681, 6534, 6519, 5048, 5051, 5178, 5193, 51134, 5452, 9201, 5906, 6003, 6031, 6036, 6135, 6515, 7048, 6516, 6517, 6601, 6602, 6604, 6802, 6806, 6902, 6905, 7009, 7010 and one genotype Punjab Chhuhara was moderately susceptible.

Ninety lines 7012, 7015, 719, 733, 7035, 7736, 7038, 7041, 7045, 7048, 7054, 7060, 7063, 7066, 7069, 7070, 7171, 7076, 7094, 7203, 7301, 7370, 7702, 7709, 7711, 8105, 8502, 8504, 8508, 8510, 8512, 8513, 8515, 8611, 8612, 8613, 8614, 8704, 8708, 8709, 8710, 8715, 8719, 8720, 8724, 8729, 8730, 8731, 8736, 8743, 5748, 8749, 8750, 8762, 8765, 8769, 8771, 9403, 9405, 9406, 9409,

9412, 9417, 9419, 9420, 9421, 9402, 9701, 9701, 9713, 9714, 9716, 9717, 9718, 9723, 9724, 0202, 0601, 0602, 0604, 0605, 0607, 0608, 0610, 0611, 0612, 8505, 9719, 9720, 9726, 9729, 0101 and one variety were susceptible. Two lines *viz*, 7710, 8728 and five genotypes Azad T-1, Azad T-6, Azad T-5, Superbug, Shalimar-2 were highly susceptible (table 2).

Alsafadi *et al.* (2012) was recorded disease level based on a 1-9 scale. Results showed that cultivars Bosfer and Daher aljabal had a high level of resistance to early blight, compared to cultivars Dara, Gerdi, Haragel and Magdal Mawash, which were moderately or highly susceptible to the disease. Moreover, cultivars Wardiat, Breh and Baskanta showed moderate resistance to the disease. Lohith *et al.* (2011) were found four genotypes EC 251709, EC 251717, EC 164295 and LE 15 showed highly resistant reaction with PDI ranged from 0-10%; whereas LE 44 was resistant (PDI 10.1-25%); EC 165690, EC 163681, EC 136711, EC 163683, LE 16, LE 35, LE 54, LE 85, LE-172 and LE-189 were moderately resistant (PDI 25.1-40%).

Conclusion

Different advanced lines and genotypes against early blight of tomato to screening caused by *Alternaria solani*. Two hundred and two advanced lines and nine genotypes were screened under natural epiphytic condition. Nineteen advanced line were found resistant against *A. solani*. The thirty one advanced lines and three genotypes were found moderate resistant. Fifteen advanced lines and genotypes were found moderate susceptible. Ninety lines and one genotype were found susceptible. Two lines and fives genotypes were found highly susceptible.

References

Alsafadi, F., T. A. Al-Fadil and B. A. Trabi (2012). Evaluation of some local tomato cultivars reaction to early blight disease caused by *Alternaria solani*. *Arab J. Plant Protection*, **30(1)**: 139-141.

- Basu, P. K. (1974). Measuring early blight, its progress and influence on fruit losses in nine tomato cultivars. *Canadian Plant Disease Survey*, **54** : 45-51.
- Cassells, A. and B. Kowalski (1998). Strategies for the evaluation of variation as a source of resistance to early and late blight of potato. Pages 50-60 in: *Comprehensive Potato Biotechnology*, P. Khurana, R. Chandra and D. Mahesh, eds. Malhotra Publishing House, New Delhi.
- Datar, V. V. and C. D. Mayee (1981). Assessment of losses in tomato yield due to early blight. *Indian Phytopath*, **34** : 191-195.
- Horsfall, J. G. and J. W. Heuberger (1942). Causes, effect and control of defoliation on tomatoes. *Conn. Agr: Expt. Sta. Bul.*, **456** : 183-223.
- Lohith, M. R., K. C. Reddy, C. V. Ramana, P. V. Rao, K. R. Reddy and D. L. Reddy (2011). Screening of tomato genotypes against early blight (*Alternaria solani*) by detached leaf method. *Acta Hort.*, **91** : 465-468.
- Pandey, K. K., P. K. Pandey, G. Kallou and M. K. Banerjee (2003). Resistance to early blight of tomato with respect to various parameters of disease epidemics. *J. Gen. Pl. Pathol.*, **69** : 364-71.
- Peralta, I. E., S. Knapp and D. M. Spooner (2005). New species of wild tomatoes (*Solanum* section *Lycopersicon* : Solanaceae) from northern Peru. *Syst. Bot.*, **30** : 424-434.
- Sherf, A. F. and A. A. MacNab (1986). *Vegetable diseases and their control*. John Wiley and Sons, New York. pp. 634-640.
- Thomas, H. R. (1948). Effect of nitrogen, phosphorus and potassium on susceptibility of tomatoes to *Altemaria solani*. *J. Agr: Res.*, **76** : 289-306.