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SCREENING OF COMMERCIAL VARIETIES OF TOMATO AGAINST EARLY BLIGHT DISEASE

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ABSTRACT

Early blight disease is a serious threat to tomato cultivation in India causing severe loss in yield due to pre and post harvest losses. Apart from host environmental conditions are one of the major factors in disease development. Screening of different lines were done considering climatic conditions like temperature and relative humidity during year 2012 and 2013 and their responses for *Alternaria* disease symptoms was recorded as percent diseases index (PDI) at regular interval continuously for two years for different tomato cultivars/lines. Different lines were categorised on the basis of their PDI values and susceptible and resistant lines were selected among 77 lines during both years. None of the varieties registered highly resistant reaction but the varieties were resistant to the disease in both the years.

Key words : *Alternaria*, Resistant, Susceptible, PDI, Cultivars, Early blight

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is an important vegetable grown worldwide because of its wide adaptability and versatility. Production of tomatoes is around 1.65 MT in India from an approximated cultivated area of 0.8 million ha"1 (Anon, 2011). It is an excellent source of antioxidants and lycopene content which prevents prostrate cancer (Tan *et al*, 2010; Lee *et al*, 2011). It is also a rich source of vitamin C and K and mineral nutrients necessary for human helth (Vloutoglou, 1999). Diseases are one of the major reasons for loss of yield in tomato and degrading its nutritional values. Tomato faces a huge loss due to the attack of *Alternaria solani*, causing early blight. The disease is characterised by appearance of dark brown or black, circular to angular spots in concentric rings on leaves.

Management of *Alternaria* solani includes biological, chemical, mechanical methods. Among these, chemical measures are the most effective ones but are expensive and are non- benign to the environment (Herriot *et al*. 1986). Besides, pesticide residue in crop is also a matter of concern. It directly affects the food safety for human consumption and also act as a trade barrier to export. Thus, resistant cultivars may be the most potential method for controlling diseases and chemical application interval is delayed (Madden *et al*. 1978; Shtienberg *et al*. 1995; Keinath *et al*. 1996). However management of early blight in tomatoes is difficult by resistant cultivars due to scarcity of effective resistance genes and hence resistant breeding is yet to be explored in the full

potential (Banerjee *et al.*,1998; Vloutoglou, 1999). In the present endeavour cultivars of tomato were screened to locate resistant ones, which could be used for breeding purpose.

MATERIALS AND METHODS

Seventy seven germplasm lines were screened against early blight of tomato in the month of February- March for two consecutive years (2011-12 and 2012-13) under field conditions in the research farm of ICAR-Indian Institute of Vegetable Research, Varanasi (latitude: 25.2807æ%N, longitude: 82.995æ%E, elevation: 82 m MSL). Seeds were sown and 21 days old plants of each cultivar were transplanted as per basic recommended agronomic practices for cultivation of tomato. Each cultivar was sown in three replication in randomized block design with each plot measuring 2.5 x 1m. Each plot had two rows, with 90 cm. spacing between them. Early blight disease infection was recorded 90 and 120 days after transplanting (DAT) and Ten plants were randomly selected for scoring using standard 0-5 rating scale proposed by Pandey *et al.*, (2003), where 0 = no infection; 1 = 1–5% infection; 2 = 6–10% infection; 3 = 11- 25% infection; 4 = 26–50% infection; 5=>50% infection). The percent disease incidence (PDI) was calculated by using formula of Wheeler (1969) where:

PDI = (sum of numerical values)/ (Number of plants observed) × Maximum disease rating) × 100

The PDI values of two years are pooled and grouped under five categories depending upon their disease severity *viz.* 1-5: highly resistant (HR); 6-10: resistant (R); 11-20: moderately resistant (MR); 21-50: susceptible (S); >50: highly susceptible (HS).

RESULTS AND DISCUSSION

Out of 77 lines, 10 lines viz. Arka Alok, GT-1, BT-12 (Utkal Urvashi), Arka Abha, Best of all, Pusa Ruby, Swarna Naveen, Patharkutchi, Kalyanpur T-1 and Sioux were found resistant (Table 1). Among these, Patharkutchi was found most resistant (6.1) followed by GT-1 (6.2) and Best of all (6.2). Sioux and Pusa Ruby showed the maximum PDI values viz. 10.5 and 10.0 respectively. Among resistant category, no lines were categrized under HR and MR groups. Eleven lines (Hisar Anmol, Azad Tomato-4, Punjab Ratta, Kashi Hemant (Sel.-1), Dhrubya, NDT-9, PT-11, Azad T-5, Marglobe, Arka Saurabh, Angoorlata) manifested to 5 reaction. Minimum and maximum PDI values among the 5 categries were of Angoorlata (28.8) and Azad Tomato (49.0) and the PDI values more comparatively higher in the second season. The remaining 56 lines were grouped under highly susceptible category. Out of these Ageta-32 (98.1) and CO-3 (90.0) showed the maximum PDI value Singh *et. al.* (2011) reported that Punjab Chhuhara, BT-120, Sel-1 and Arka Saurabh as moderately susceptible, which does not support the present study. Where, Punjab Chuhara and BT-120 are HS whereas Sel-1 and Arka Saurabh are S. High resistance to early blight was exhibited in those lines where new leaves were continuously coming out. The disease was most active at fruit ripening stage and destroyed the entire plant (Pandey *et al.* 2003). It has been reported that sugar content and their translocation is important in susceptibility of plant . In older leaves or plants, there is low sugar content and it is susceptible as sugar translocation occurs from leaves to ripening fruits (Rotem, 1994). Disease severity was found at maximum during February and March when the climatic

conditions fully supports the pathogen to invade successfully. Disease is initiated slowly but later on become severe as plant become more mature. Therefore, at regular interval symptoms observation and PDI calculation is important because single evaluation may ignore or represent over information of disease and the original level of resistance of lines could not be reflected or expressed (Sands and Lukens (1974). In case of natural screening, single observation or scoring is not sufficient to evaluate the pathogen invasion and vigour of same line at later stages (Pandey *et al*, 2003) and multilocational testing under natural conditions is a must. However, the resistant lines, report in the present endeavour may be utilized for further resistant breeding against early blight of tomato.

Table 1. Classification of cultivars on the basis of their disease reaction

Class	Percent blight foliage	Cultivars/Germplasm/ lines
Highly resistant (HR)	1-5	-
Resistant (R)	6-10	Arka Alok, GT-1, BT-12 (Utkal Urvashi), Arka Abha, Best of all, Pusa Ruby, Swarna Naveen, Patharkutchi, Kalyanpur T-1, Sioux
Moderately Resistant (MR)	11-20	-
Susceptible (S)	21-50	Hisar Anmol, Azad Tomato-4, Punjab Ratta, Kashi Hemant (Sel.-1), Dhrubya, NDT-9, PT-11, Azad T-5, Marglobe, Arka Saurabh, Angoorlata,
Highly Susceptible (HS)	>50	Kashi vishesh, Punjab Chhuhara, Arka Meghali, Anand Tomato-3, LE-415, Mukthi, Hisar Arun, Kalyanpur T-3, VL Tamatar-4, Pusa Upma, JT-3, DMT-1, DARL-66, Azad T-6, Selection-18, CO-3, Swarna Sampada, Manileimia, Kashi Sharad (Sel.-2), Swarna Dipti, Pusa Gaurav, BT-136h, Azad T-2, Utkal Pallavi, Floradade, , Roma, DCT-1, Pusa-120, BT-11, Hisar Lalit, Dhanshree, Utkal Pragyan, BT-120 (Utkal Uphar), Selection-12, Swarna Lalima, DCT-2, GT-2, Columbia, NDT-8, NDT-3, BT-10 (Utkal Kumari), CTS-6, Punjab Barkha Bahar-1, Utkal Raja, Arka Vikash, Solan Vajra, Kashmiria, Arka Ahuti, Pant T-5, NDT-5, Punjab Keshari, Ageta-32, Punjab Barkha Bahar-2, KS-16, PNR-7.

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