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Effect of plant extracts on early blight of tomato (*Lycopersicon esculentum* L.)

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Abstract

An experiment was conducted to evaluate the effect of fungicide (mancozeb) and botanicals against early blight of tomato caused by *Alternaria solani* at the experimental field of Plant Pathology, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, during *Rabi* season (2016-2017). Six treatments including control with three replication were taken up using RBD. In field experiments, the highest reduction of disease intensity was achieved by applying garlic bulb extract and datura leaf extract at 5% concentration (23.17% and 24.86% respectively) as compared to treated check (mancozeb) at 0.2% concentration (21.51%) and untreated check control (29.12%). Maximum yield was reported in treated plant of garlic bulb extract (170.16 q/ha) as compared to treated (mancozeb) (250.33 q/ha) and untreated (Control) (85.33q/ha) checks. All the treatments significantly reduced the early blight disease as well as increased the plant height and yield of tomato in comparison to infected control under field conditions.

Keywords: *Alternaria solani*, early blight, plant extract, tomato

Introduction

Tomato is considered as one of the world's most important and popular vegetables (Pritesh and Subramanian, 2011) [8]. Tomato (*Lycopersicon esculentum*) belongs to the genus *Lycopersicon* and Family *Solanaceae*. Tomato is a herbaceous sprawling plant growing to 1-3 m in height with weak woody stem. It is the most important tropical vegetable crop widely used throughout the world. Tomato ranks next to the potato crop and ranks first among the processing crops in the world acreage. It is native to South America and is widely cultivated in 140 countries. (Anonymous 2011) [2]. Tomato contains 95.3 per cent of water, 0.07 per cent calcium and niacin, all of which have great importance in metabolic activities of humans. With high nutritional value, it provides a balanced source of Vitamin A, C and E needed to maintain good human health. The major tomato growing states in the country are Andhra Pradesh, Karnataka, Madhya Pradesh, Telangana, Orissa, Gujarat, Maharashtra, West Bengal, Bihar, Chhattisgarh and Himachal Pradesh. (Hort statistics data 2014-15). In Uttar Pradesh it is cultivated on 10.48 M ha with an annual production of 413.83 Mt per ha (Anonymous 2015) [3]. The disease becomes wide spread and serious, causing large economic loss to the growers when the season begins with abundant moisture or frequent rain followed by warm and dry weather which are unfavorable for the host and help in rapid disease development (Agrios, 1988) [1]. The causal organism is air borne and soil inhabiting cause disease on foliage (leaf blight), stem (collar rot) and fruit (fruit rot) and can result in severe damage during all stages of plant development (Foolad *et al.*, 2000) [6]. Disseminated by fungal spores (Datar and Mayee, 1981) [5]. Now-a-days farmers are using only the chemical fungicides for managing the disease, but it has the negative impact on the environment and develops resistant in pathogen. So due to these reasons use of specific chemical fungicides with recommended dosages, botanicals will not harm the environment and also were effective in controlling the disease. (Yadav *et al.*, 2014) [10].

Materials and method

The present investigation was carried out at the Field Experimentation Centre, Department of Plant Pathology, SHUATS, and Allahabad (U.P.) during *Rabi*-2016-2017. The experiment was conducted in Randomized Block Design with 7 treatments. The treatments were replicated three times. Treatments were randomly arranged in each replication divided into 21 plots. The cash plot size was 2 x 1m. The recommended agronomical practice was followed to raise the crop healthy. Foliar spray of chemicals and botanicals were started at onset of the disease and repeated two sprays. The twelve treatments were taken as: *Azadiracata indica* (5%), *Datura stramonium* (5%), *Allium sativum* (5%), *Ocimum santum* (5%), *Eucalyptus globolus* (5%),

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Mnacozeb @ (0.2%) and control were used for management of disease. Yield data was recorded at every picking and PDI was calculated at every 10 days after each spray by using 0-9 disease rating scale on the basis of percentage area of foliage infected by the pathogen. Disease rating scale for scoring the intensity of tomato leaves: 0 = No infection; 1 = 1-10percent; 3 = 11-25 percent; 5 = 26-50 percent; 7 = 51-75 percent and 9 = > 75 percent infection on foliage.

Isolation of the pathogen

The pathogen was isolated from the disease infected plants and it was identified as the *Alternaria solani*. Alternaria leaf spot of tomato infected leaves were collected from experimental field of SHUATS. The infected leaves were cut into small pieces (0.5cm²) surface sterilized with mercuric chloride (0.1%) for 15-30 seconds, rinsed with three changes of sterile distilled water to remove the disinfectant and blotted dry. The sterilized pieces were plated (4 pieces/dish) on potato dextrose agar (PDA) medium in Petri dishes under aseptic conditions and incubated at 25°C for 2 weeks. For obtaining sufficient quantity of inoculums, pure cultures were obtained by sub culturing. For this purpose, small bits of the fungus were taken at the tip of a sterilized needle and transferred aseptically to the centre of fresh PDA medium in Petri dishes. The dishes were incubated for 2 weeks at 25°C in the dark.

Preparation of extract

Extracts from leaves of five plants namely, *A. indica*, *D. stramonium*, *A. sativum*, *O. basilicum*, and *E. chamadulonsis*

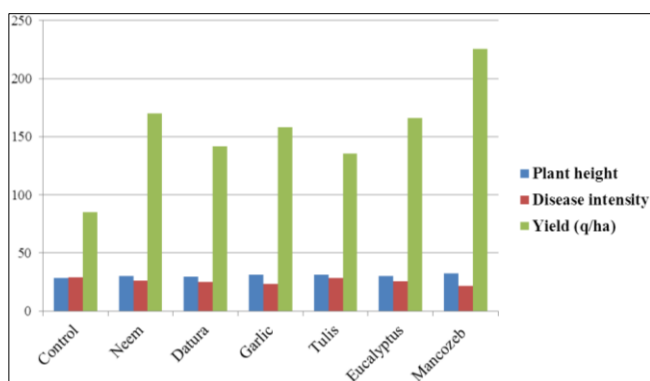
were collected from different parts. For preparation of extract 50gm. leaves were taken in a clean blender and blended without water, the pulverized leaves tissue were filtered through three fold of muslin cloth and 100% pure filtrate was used as an extract in the ratio of 1:1(W/V) of seed and solution.

Results and discussion

The experimental results of the present investigation entitled, "Effect of plant extract against early blight of tomato" shows that the perusal Table 1 and figure 1 depicts that significantly (P < 0.05) average minimum diseases intensity was recorded in foliar sprays of *A. sativum* (5%) 23.17% and yield (170.16 q/ha.), *Datura stramonium* (5%) 24.86% and yield (166.33q/ha.), *Eucalyptus globolus* (5%) 25.29% and yield (158.16q/ha.), *A. indica*, (5%) 26.13% and yield (141.50q/ha.), *Ocimum sanctum* (5%) 28.28% and yield (135.75q/ha.) as compared to mancozeb (0.2%) (Treated) 21.51% with yield (250.33 q/ha) and control (Untreated check) 29.12% and yield 85.33q/ha., the result of present study are in accordance to the finding of Nashwa M. A. Sallam (2011) [7], D.K. Sahu (2013) and Chourasiya *et al.* (2013) [4]. All the treatment combination was showed significant different to over control. Plant height (cm) reveals that the maximum plant height was observed in *A. sativum* (31.43cm) followed by *Ocimum sanctum* (31.34cm), *Eucalyptus globolus* (30.22), *A. indica* (30.17cm), *Datura stramonium* (29.63cm) as compared mancozeb (32.59cm) (Treated check) and (Untreated check) control (28.46cm).

Table 1

Treatments	Plant height	Disease intensity	Yield (q/ha)
T ₀ Control (Untreated check)	28.46	29.12	85.33
T ₁ Neem leaf extract	30.17	26.13	141.50
T ₂ Datura leaf extract	29.63	24.86	166.33
T ₃ Garlic bulb extract	31.43	23.17	170.16
T ₄ Tulsi leaf extract	31.34	28.24	135.75
T ₅ Eucalyptus leaf extract	30.22	25.29	158.33
T ₆ Mancozeb75%WP (Treated check)	32.59	21.51	250.33
S. Ed. (±)	0.029	5.542	7.102
C. D. (P = 0.05)	0.059	11.362	15.057



Conclusion

The result allows to conclude that the improvement of local knowledge about the use of botanicals, can permit propose new alternatives of pathogen fungi management. *Allium sativum* (5%) concentrations were found as best treatment to control of early blight leaf spot of tomato and also gave higher yield (q/ha) and was the most economical with B:C ratio of 1:4.52 is as par compared with mancozeb (check). Since present day economists are advising for net return

concept, *Allium sativum* can be recommended and keeping a point view of environmental safety others botanicals *Datura stramonium* can also be recommended to the farmers for the efficient management of early blight leaf spot of tomato.

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