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Effect of Different Doses of Fungicide (Mancozeb) against Alternaria Leaf Blight of Tomato in Tunnel

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Abstract

Tomato (*Lycopersicon esculentum* Mill.) is an important commercial vegetable of the world. Tomato cultivars cultivated in Pakistan have low level of genetic resistance to Alternaria leaf blight disease. Farmers, in pursuance of high yield are inclined to cultivate some varieties which may be less resistant to the disease and rely on fungicide applications for the control of *Alternaria solani*, the casual organism of Alternaria blight of tomato. Five tomato varieties (Litah545, Litah514, Eurica, Ti-166 and Astra) were sown in five replications with one standard check in tunnel. Different doses of mancozeb (4 g/L, 8 g/L, 12 g/L and 16 g/L of water) were applied after 7 days intervals. Disease data was recorded after ten days interval from flowering stage to onward. Average yield of each variety was calculated after ten pickings. All fungicide doses reduce the disease severity as compared to untreated check. The highest reduction in the disease was achieved by applying mancozeb 12 g/L of water at an interval of 7, 14, 21 and 28 days. The yield of Litah545 and Litah514 give higher yield as compared to Eurica, Ti-166 and Astra. Overall results revealed that weekly sprays of mancozeb at 12 g/L of water were cost effective and eco-friendly for the management of Alternaria blight of tomato.

Keywords: Alternaria blight; *Alternaria solani*; Tomato; Fungicides; Mancozeb

Introduction

Tomato (*Lycopersicon esculentum* Mill.) is the second most important remunerable solanaceous vegetable crop after potato. It is native to South America and is widely cultivated in 140 countries of the world with an annual production of 150 million tons (FAO, 2009). Tomato ranks next to the potato crop and ranks first among the processing crops in the world acreage. Tomato is commonly consumed in our daily life and it is a good source of antioxidants [1]. Tomato contains 95.3% of water, 0.07% calcium and niacin, all of which have great importance in metabolic activities of humans. With high nutritional value, it provides a balance source of Vitamin A, C and E needed to maintain good human health [2,3]. Varied climatic adaptability and high nutritive value made the tomato cultivation more popular in the recent years. At present, in Pakistan average production of tomato is 10.51 tons per hectare which is quite low as compared to other tomato growing countries such as USA (89.33 t/ha), China (52.98 t/ha), Egypt (43.53 t/ha), Turkey (36.44 t/ha) and India (21.30 t/ha) (FAO, 2009). Tomato crop is vulnerable to infect by bacterial, viral, nematode and fungal diseases. Among the fungal diseases, Alternaria leaf blight of tomato caused by *Alternaria solani* is the worst damaging one [4,5] that cause reduction in quantity and quality of the potato crop. *Alternaria solani* (Ellis and Martin) is a soil inhabiting air-borne pathogen responsible for leaf blight, collar and fruit rot of tomato disseminated by fungal spores [6]. It is an important disease of tropical and sub-tropical areas. Distinctive bulls-eye pattern of leaf spots with concentric rings of spores surrounded by a halo of chlorotic leaf area are the common. Leaves turn yellow and dry up when only a few spots are present [7]. The pathogen causes infection on leaves, stem, petiole, twig and fruits as well as leads to the defoliation, drying of twigs and premature fruit drop which ultimately reduce the yield. The disease, if favored by high temperature and humidity (crowded plantation, high rainfall and extended period of leaf wetness from dew) and plants are more susceptible to the blight infection during fruiting period [8]. Primary methods of controlling Alternaria leaf blight include preventing long periods of wetness on the leaf surface, cultural scouting, sanitation, and development of the host plant resistance with the application of fungicides [9,10]. Cultivation of resistant varieties is the ultimate control of this disease. However, farmers in pursuance of high yield are inclined to cultivate some varieties which may be less resistant to disease. Fungicide application can increase the genetic potential and yield reduction due to disease can be minimized. Preventive fungicides inhibit the spore germination and penetration but pathogen can derive resistance against fungicide application so repeated application of fungicides at proper dose and interval of time is mandatory [9,11]. Application of mancozeb (a subclass of carbamate pesticides called dithiocarbamates) against late blight has been reported in Pakistan [12-14]. Unplanned and wide use of fungicides often leads to serious environmental problems besides affecting the health of users and consumers. So, it is necessary to minimize the use of chemicals for controlling disease. Present study was aimed to determine the efficacies of different doses of fungicide (Mancozeb) against Alternaria leaf blight of tomato.

Materials and Methods

A field experiment for the evaluation of different doses of mancozeb (4 g/L, 8 g/L, 12 g/L and 16 g/L) was conducted at the research area of Barani Agricultural Research Institute, Chakwal. Well sprouted tomato seedlings of five varieties (Litah545, Litah514, Eurica, Ti-166 and Astra) were transplanted in the tunnel with 35 cm between row spacing and

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30 cm within row spacing. The experiment was laid out in randomized complete block design with five replications using variety modern. Fungicide application treatments were done by hand sprayer consisting of a boom with two XR11003VS flat fan nozzles at regular intervals of seven, fourteen, twenty one and twenty eight days. Data on the disease severity was recorded after every ten days intervals from flowering stage to onwards using 0-5 disease rating scale as shown in the Table 1.

Data analysis

Recorded data were subjected to statistical analysis using ANOVA of SAS statistical data analysis software. Duncan's multiple range tests was used to determine the most significant treatment [15].

Results and Discussions

All fungicide applications significantly reduced the disease severity. Data regarding percent disease severity in different varieties 7 days after the application of fungicide (Mancozeb) demonstrated that minimum disease (29%) was recorded in Litah514 followed by (30%) in Litah545 by the application mancozeb 12 g/L of water. Disease severity recorded by the application of 16 g/L was almost same as that of 12 g/L of water. The response of all other cultivars fungicide treatment 4 g/L and 8 g/L of water was also satisfactory as compared to control but less than 12 g/L of water as shown in Figure 1.

Scale	Disease incidence %age	Description
0	0.0	Leaves free from leaf spot
1	0-5%	0-5 per cent leaf area infected and covered by spot, no spot on petiole and branches.
2	6-20%	6-20 per cent leaf area infected and covered by spot, some spots on petiole.
3	21-40%	21-40 per cent leaf area infected and covered by spot, spots also seen on petiole, branches.
4	41-70%	41-70 per cent leaf area infected and covered by spot, spots also seen on petiole, braches, stem.
5	>70%	>71 per cent leaf area infected and covered by spot, spots also seen on petiole, branch, stem, fruits.

Table 1: Disease rating scale for the assessment of Alternaria blight of tomato.

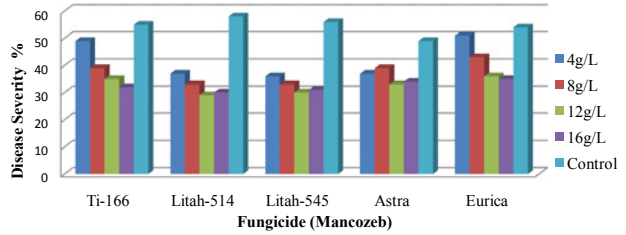

Figure 1: Disease severity of five potato cultivars - 7days after the application of fungicide (Mancozeb).

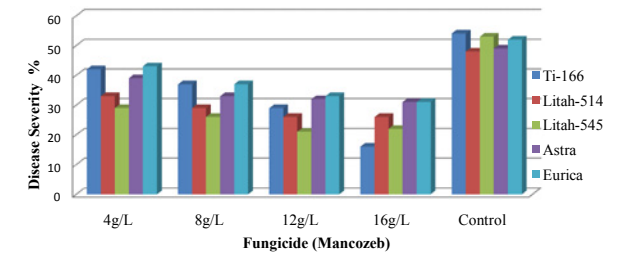

Figure 2: Disease severity of five potato cultivars 14 days after the application of fungicide (Mancozeb).

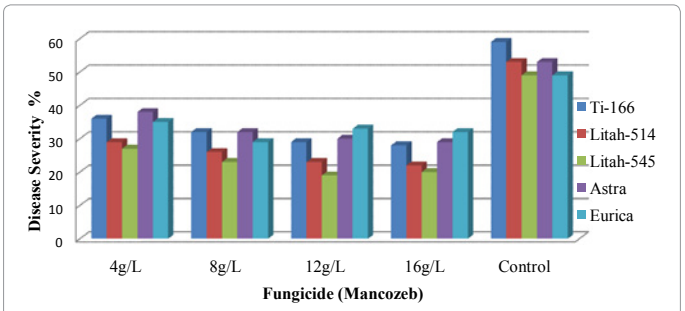

Figure 3: Disease severity of five potato cultivars 28 days after the application of fungicide (Mancozeb).

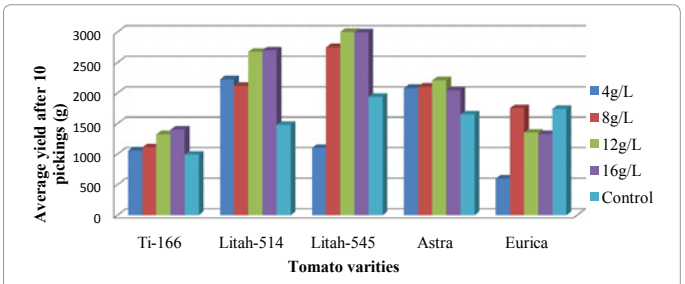

Figure 4: Average yield of each variety after ten picking.

Disease data recorded 14 days after the application of fungicide demonstrated that all fungicide treatments significantly reduced the disease percentage. Minimum disease severity (26%) was recorded in Litah545 followed by (27%) in Litah514 by the application of mancozeb 12 g/L of water. Same results were obtained by the application of mancozeb at 16 g/L of water. All other fungicide treatments were less effective as shown in Figure 2.

Data regarding disease severity percentage recorded 21 days after the application of fungicide treatment as shown in Figure 3 revealed that all fungicide treatments caused significant reduction in Alternaria leaf blight infection as compared to untreated check. Minimum disease severity (26%) was recorded in Litah545 followed by (27%) in Litah514 by the application of mancozeb 12 g/L of water. All other fungicide treatments were less effective as compared to 12 g/L of water. Disease severity percentage 28 days after the application of fungicide treatments revealed that mancozeb 12 g/L of water show maximum yield reduction (19%) in variety Litah545 followed by (20%) in Litah514. All other fungicide treatments were less effective. Among all five varieties, Litah545 and Litah514 remained best as compared to Eurica, Ti-166 and Astra as shown in the Figure 3.

After ten pickings, yield of each variety was calculated which demonstrated that variety Litah545 gave maximum yield (3000g) per plant under the fungicide application 12g/L of water followed by Litah514 (2675g), Astra (2208g), Eurica (1350g) and Ti-166 (1325g) as shown in the Figure 4. All other fungicide treatments had significant effect on the average yield of ten pickings but yield was less for the plant treated with mancozeb 12 g/L of water.

Results of the present study showed that all fungicide treatments significantly controlled the early blight infection on tomato as compared to untreated control. There was a significant difference in all the treatments. Application of mancozeb 12 g/L and 16 g/L of water showed best results as spraying of mancozeb has been recommended for the control of early blight of tomato by several workers [16-20]. Among the five cultivars tested, Litah-545 showed best results followed

by Litah514. This variation in different response to the Alternaria blight infection might be due to their genetic makeup.

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