

Original Research Article

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***In vitro* Evaluation of Fungicides Early Blight of Potato (*Solanum tuberosum* L.) caused by *Alternaria solani* [Ellis Jones and Grout]**

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Talking about the agriculture industry, it's not only most important industry it also provides huge employment. As in India the major source of income is agriculture. Around 70 percent of the population is dependent on agriculture it plays an important role in Indian economy. Variety of vegetables are sown in India. One of them is potato it is important part of a meal in every diet as it provides variety of minerals and vitamins. Potatoes are sown in large quantities in India It is in top 4 crops grown in the entire country. Various types of disease are found in potato some of them are Late Blight of potato (19%), Common Scab (13%), *Fusarium* sp. (05%), Early Blight of Potato (15%). To stop Early Blight Of Potato (15%) I have used three types of fungicides Namely Mancozeb 75% WP (65.73%) at 1000 PPM Tebuconazole 25.9% (100%) at 250PPM Azoxystrobin 23 (47.73%) at 500 PPM.

Introduction

The potato (*Solanum Tuberosum*) is the most important food crop of the world Potato (*Solanum tuberosum*) cultivation was too old as 2000 years ago in south America in India the Portuguese introduced Potatoes in the early seventeenth century. The Potato is a major staple full filling human nutritional requirements. Worldwide the Potato was forth in terms of production of the wheat, maize and rice The Potato is a crop has always has the

“Poor man’s friend” Potato are an economical food because they Provide a Source of low cost energy to the human diet Potato are a excellent Source of Starch, Vitamins is especially c and b1 and minerals. They contain 20.6% Carbohydrates, 2.1% Protein, 0.3% fat, 1.1% crud yield and 0.9% ash In India is in 2018-2019 the area under Potato Cultivation is about 496 m ha. With the Production with 5mt. According to national horticulture board the Production Of Potato in Uttar Pradesh for the 2019-2020 fiscal was 14 mt. as against the

15mt Produced the Corresponding Period in 2018-2019. The limitation of Potato yield also to some biotic and abiotic factor such as high temperature, deficiency of zn and in biotic factor some insect –pest and disease the early blight of potato *Alternaria solani* alone reduced 32% and in Condition damaged 100% the Pathogen can Survive for extensive Periods in the Soil as mycelia and /or as condition infected Plant debris to manage the disease and increase the Production used fungicides Present investigation we observed in vivo and in vitro medium to manage early blight disease.

Studies on early blight (*Alternaria solani*) of potato have therefore, been carried out with the following objectives that include Isolation, identification and pathogen city of the pathogen. To evaluate (in vitro) of bio control agents, botanicals and fungicides against *Alternaria solani*. To evaluate (in vivo) of bio agents, botanicals and fungicides against *Alternaria solani*. Effect of different treatments on growth and yield.

Materials and Methods

The experiments were conducted (*invitro*) at department of plant pathology, Brahmanand PG College, Rath Hamirpur (UP) during Rabi season in 2019-20.

Isolation

The freshly collected potato plants having the symptoms of early blight were selected for isolation of the fungus was made by tissue isolation technique. Small pieces of leaf tissue (3 mm) collected from the infected leaves, showing blighting, along with some healthy tissue were cut using sterilized scalpel and the cut tissues were sterilized with 0.1% Mercuric Chloride for 30 sec. The pieces of tissues were washed subsequently in three changes of sterile water and transferred on to Petri Plates-dishes containing potato dextrose agar (PDA)

medium before incubating at $25 \pm 1^\circ\text{C}$.

The culture was transferred into PDA tubes and later purified by hyphal tip method and then by single spore isolation in an isolation chamber with a laminar flow. The culture was maintained on PDA by storing it under refrigeration (10°C) and making periodical transfers every month for further studies.

Tuber

Planting material (tubers) of potato variety viz; Kufri Bahar for Rabi season purchased from Rath, (Hamirpur) District market for controlling.

Invitro evaluation of fungicides against *Alternaria solani*

The efficacy of three fungicides viz., Mancozeb 75%wp, Azoxystrobin (0.1%), *Teubaconazole 25.9 ec* were tested against *Alternaria solani* on Potato dextrose agar medium using poisoned food technique (Vincent, J.M., 1927) and dual culture technique (Ashwani, T. N., Nandini, S. G. and Kumar, G. R. (2011)) using PDA as basal medium under in vitro condition.

Observation recorded

The radial growth of the fungus on the poisoned medium was recorded at time of mycelium growth reached 90 mm in control.

Percent inhibition of mycelium growth of the fungus was calculated by using the formula described by Vincent (1927).

$$I = \frac{(C-T)}{C} \times 100$$

I = Percent Inhibition

C= Radial Growth

T= Radial Growth in treath (fungicide).

Results and Discussion

Early blight of potato caused by *Alternaria solani* (Jones & Grount) is the historical disease of economic importance. Study on the early blight development on potato in relation to weather parameters, cultural and morphological variability of isolates in vitro, evaluation of fungicides against pathogen in vitro were. under taken during 2018-19 in the Department of Plant pathology. B.N.V. PG College, of Agriculture, Rath, Hamirpur. Three new fungicidal chemicals and their combines molecules i.e. Azoxystrobin 100 g/l Tebuconazole 250 g/l SC. Mancozeb 75% WP and their different concentration were screened for their fungi toxicity in vitro by poisoned food technique to assess their efficacy towards *A.solani* on potato dextrose agar amended with their required concentrations and incubated at 25 at 1°C and the data on radial growth of mycelium (mm) and inhibition over control (%) The fungus grew in its characteristics manner in all the treatments The data indicates that all the three treatments were significantly inhibitory in reducing radial growth of *A.solani* over control. The fungicides were evaluated against *A.solani* in laboratory by adopting food

techniques at different concentration. The systemic and non systemic fungicides used in this study were Mancozeb, Azoxystrobin, Tebuconazole, at 250, 500 and 1000 ppm concentrations. The radial growth of the mycelium was recorded on 9 days after inoculation. The maximum radial growth observed in Mancozeb was recorded 41.46, 31.63, 27.41(mm) at 250, 500 and 1000 ppm concentration respectively. The fungicide Azoxystrobin also found maximum radial growth of 47.07, 41.81,37.37 (mm) at 250, 500 and 1000 ppm concentration respectively. The fungicides tubeconazole also found maximum radial growth of 00.00,00.00,00.00,(mm) at 250, 500, 1000ppm concentration respectively were found to be effective against *A.solani* at all concentration.

Per cent inhibition of the fungus over control was calculated and found that maximum inhibition of 250 per cent was found in the fungicide Tebuconazole at 250, 500 and 1000 ppm followed by Azoxystrobin whereas the maximum inhibition (53.48 %) was obtained at 1000 ppm concentration. The fungicide Tebuconazole inhibited 00.00 and 00.00 per cent inhibition at 500 and 1000 ppm concentration.

Table.1

S.N O.	Treatment	Colony diameter (mm)				Percent inhibition			
		250 Ppm	500 Ppm	1000 Ppm	Mean	250 ppm	500 Ppm	1000 Ppm	Mean
1.	Mancozeb75% wp	41.46 (40.14)	31.63 (34.20)	27.41 (31.56)	33.5 (35.37)	48.1 (43.91)	60.46 (51.11)	65.73 (54.15)	48.18 (44.51)
2.	Azoxystrobin 23 sc	47.07 (43.28)	41.81 (40.28)	37.37 (37.64)	42.08 (40.70)	41.16 (40.12)	47.73 (43.68)	53.28 (47.18)	41.17 (40.22)
3.	<i>Teubaconazole 25.9 ec</i>	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	100 (90.00)	100 (90.00)	100 (90.00)	100 (90.00)
4.	Control	80.00 (63.44)	80.00 (63.44)	80.00 (63.44)	80.00 (63.44)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)
	SE (m)	1.414	0.82	1.024		0.45	0.57	0.66	
	CD	1.00	2.74	3.390		1.51	1.916	2.18	
	CV	4.11	3.30	4.89		1.67	1.925	2.087	

Fig.1

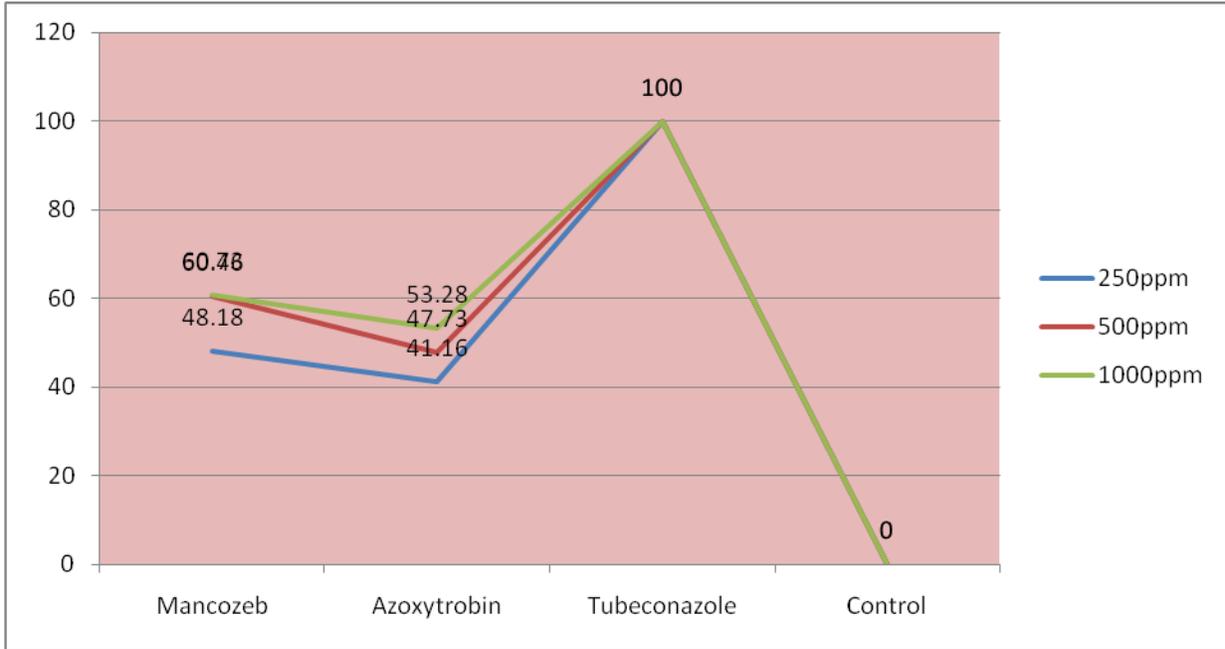


Fig.2

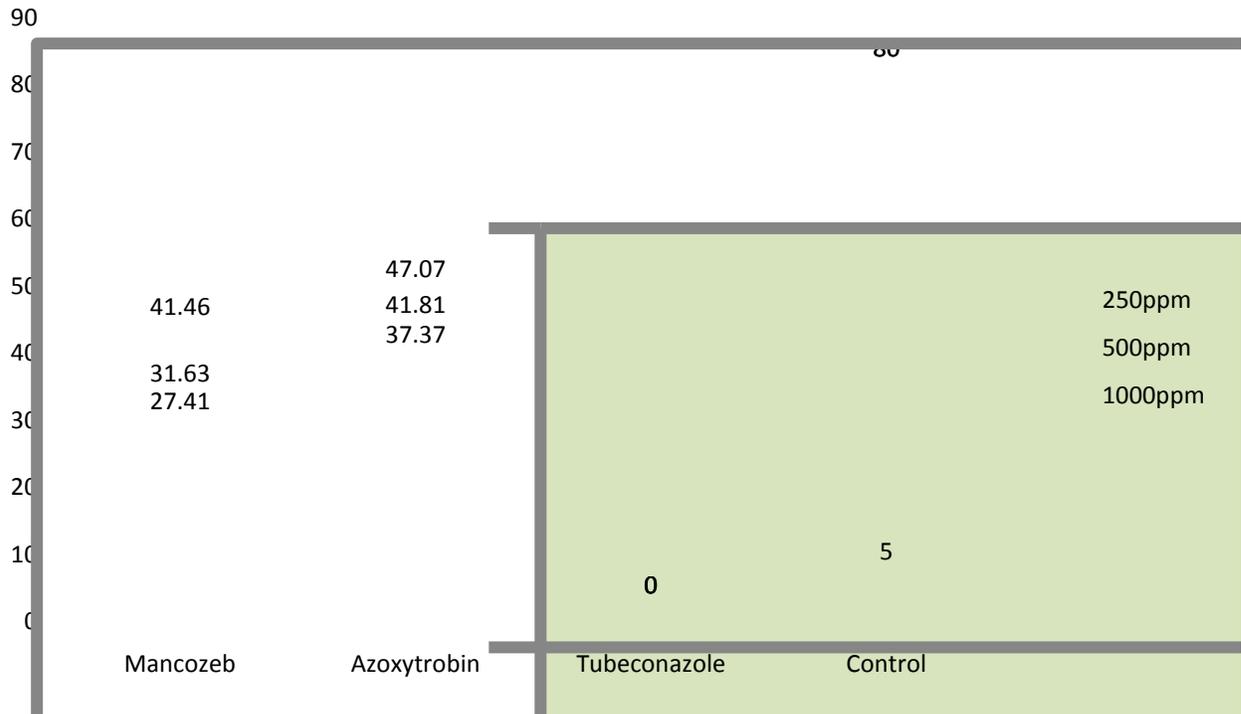


Fig.3 Pure Culture grow Culture Tube



Fig.4 Pure Culture grow and PetriPlate



Among the fungicides evaluated in vitro at different concentrations, the fungicide Mancozeb, Tebuconazole, Azoxystrobin, were effective against solani. Ilhe *et al.*, (2008) tested the efficacy of Mancozeb 75 WP (0.25%) and Tebuconazole 25 EW (0.0596) in controlling the early blight and powdery mildew of tomato. *Alternate* sprays of both the chemicals found effective in controlling the disease with 71.08%% disease control and also given better yield.

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- Ilhe *et al.*, (2008) tested the efficacy of Mancozeb 75 WP (0.25%)

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