Sensitivity of Fusarium Solani to Different Fungicides Under Laboratory Conditions

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ABSTRACT

Dry rot disease caused by *Fusarium solani* is one of the most common and destructive potato diseases.This fungi causes different colored rots on potatoes.The symptoms of dry rot include mummified and wrinkled tubers.The rotted areas of the potato is brown to black in colour and the rot leads to depression in the tubers.Seed pieces may rot completely.Dry rot inhibits the development of potato sprouts and causes yield losses up to 25% with much greater infection up to 60% during storage.The fungi also contaminate the tubers with mycotoxins.The present study aimed at evaluating the efficacy of four fungicides namely *Matco*,*Willonyl*,*Benlate* and *Carbestin* at 100 , 250 and 300 ppm against *Fusarium solani* associated with dry rot in potato.The result shows the difference in the efficacy of all tested fungicides against this pathogen.The application of *Benlate* and *Carbestin* significantly reduced the mycelial growth of tested *Fusarium solani* pathogen followed by *Willonyl* and *Matco* where the total mean of inhibitory effects were 74.64% , 63.13% , 25.73% and 21.74% respectively on 7^{th} day of incubation suggesting *Benlate* as a better one to use for the management of *F.solani.*

Keywords: Fungicides, Management, Pathogen, *Fusarium* dry rot, Potato, Tuber

1.Introduction:

Potato (*Solanum tuberosum* L) ranks first as a non-cereal food crop for human consumption.Potato plant is a member of Solanaceous family.It is one of the world's most widely grown and important food crops.The diverse distribution pattern and major cultivation as a cash crop in areas having a high level of malnutrition make it a global crop in sustainable food availability (Haverkort et al. 2013; Davaux et al. 2020; Lal et al.2020).The year 2008 has been declared as the international year of the potato by FAO (The Food and Agriculture Organisation).At present potato is grown over 19 million hectares area with the annual production of 388 million tons worldwide (FAOSTAT 2019).In India and China 1.3 billion people consume fresh potatoes as a staple food.High yield and improved nutritional quality is the major goal for potato breeders, at the same time minimizing the losses due to pests, diseases and unfavourable environmental conditions and managing post harvest losses is also important.There are more than 40 pathogenic agents such as bacteria, fungi ,nematodes and viruses that causes considerable damage to potato tubers.Earlier the rots in potato were considered inevitable but now they are major concern for potato growers.Von Martinus (1842) first reported a fungus *Fusarium solani* associated with potato tuber .*Fusarium* dry rot manifests in three ways namely storage rot, seed piece decay and stem-end rot.Dry rot in potato not only reduces the crop yield but can also contaminate the tubers with mycotoxins.*Fusarium* dry rot is considered to be mainly a problem in seed industry because seed tubers are stored for prolonged period.

2.Materials and Methods:

2.1. Experimental Location

The experiment was conducted at the Plant Protection Laboratory of Chaudhary Charan Singh University, Meerut.

2.2.Isolation of Fusarium solani

Potato tubers with dry rot symptoms were collected from commercially producing storage locations.Dry rot infected tubers were identified and collected as samples from different cold stores and open market places in Meerut district of Uttar Pradesh.To obtain pure culture of Fusarium solani, tubers were first washed, surface disinfected in 70% ethanol and 2mm disc was taken out from periphery of discoloured tissue of each tuber.Each disc was further dipped inton0.1% mercuric chloride solution for few second.The discs were then placed on potato dextrose agar (PDA) plates and incubated at 25 degree celsius for 5 days (Nelson et al, 1983). Single spore isolates of each Fusarium species were obtained by a modified technique of Tousson and Nelson(1976).Spores were harvested directly from colonies with a inoculating needle loop and streaked onto fresh PDA plates.Pure culture of the fungus were obtained by serial transfers for further experimentation.

Fig.1. a. Potato tuber infected with Fusarium solani , b. Cultural growth of Fusarium solani after five days of incubation at 25 degree Celsius

2.3. Fungicides and Invitro studies of mycelial Growth Inhibition

Four different fungicides were tested in the experiment.The efficacy of these fungicides were evaluated against Fusarium solani on PDA using the poisoned food technique.Three different concentrations viz., 100, 200, 300 ppm of each fungicide were tested.The experiment was conducted in Completely Randomized Design.Three replicates were used for each treatment and the data was analysed using Duncan’s multiple range test.Required quantity of each fungicide was added separately to sterilized medium mixed thoroughly and poured in sterilized 10 cm diameter of glass petri plates and allowed to solidify for 12 hours.Each plate was inoculated with 2mm disc of 7 days old culture of *Fusarium solani* with the help of sterilized inoculating needle and incubated at 25 degree Celsius for 7 days.The mycelial growth of the test fungus was recorded and percent growth inhibition was calculated by the formula given below.

Fungal mycelial growth reduction (%) = $\frac{C-T}{C} \times 100$

Where; C =Mycelial diameter in the control, T= Mycelial diameter in the treatment

Result and Discussion

The efficacy of different fungicides against *Fusarium solani* at three concentrations viz., 100, 200 and 300 ppm were assayed in vitro.

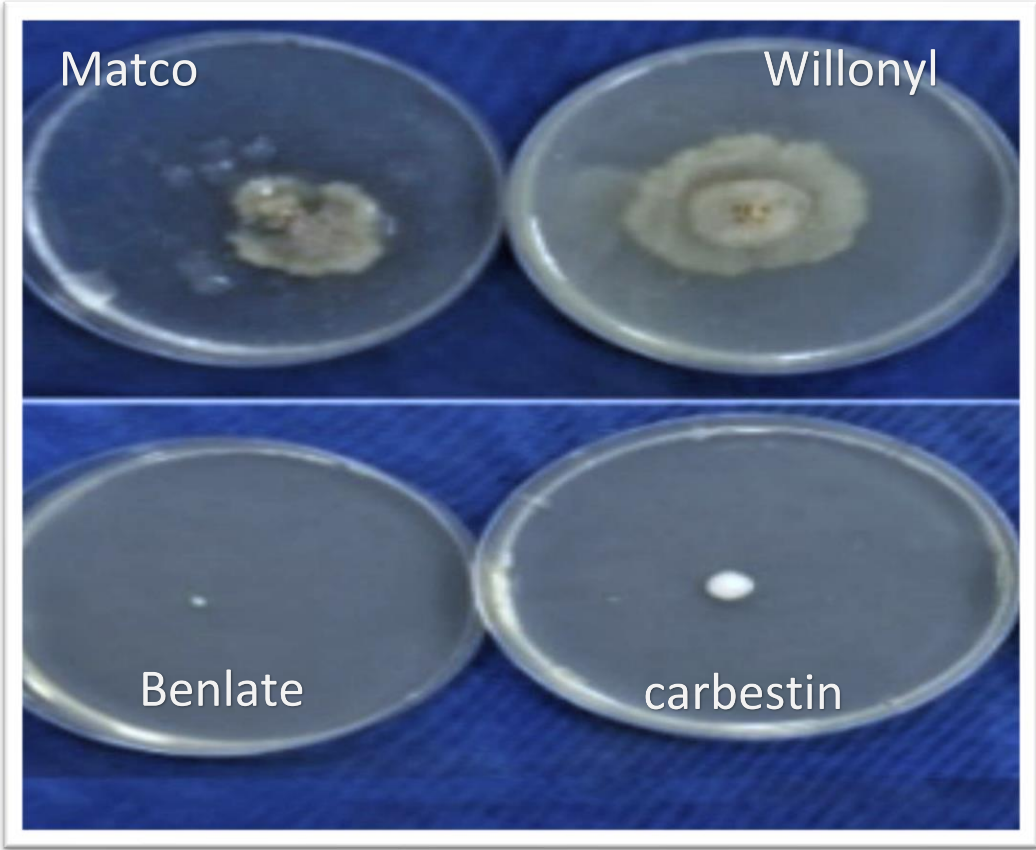
Table;2 *In vitro* effect of fungicides on linear mycelial growth of *Fusarium solani*

S.NO	Fungicides	Conc (ppm)	Mycelial redial growth in (mm)		Percent reduction in mycelial growth	Mean reduction in myceliel growth
			Control	Treatment		
1.	Matco	100	70.80	65.25	7.83	45.49
		200	75.00	58.50	22.66	
		300	72.00	47.50	34.72	
2.	Willonyl	100	75.00	67.50	10.05	
		200	80.00	62.00	22.50	25.73
		300	85.00	47.00	44.70	
3.	Benlate	100	77.50	45.00	41.93	
		200	77.80	14.00	82.00	74.64
		300	80.00	0.00	100	
4.	Carbestin	100	70.00	43.50	37.85	
		200	76.50	37.05	51.56	63.11
		300	79.25	0.00	100	

Table; 3. Comperative rating of growth reduction of *Fusarium solani* pathogen by different fungicides :

Name of the fungicide	Fungal pathogen	Mean reduction in radial growth of the pathogen (%)	Rating of the tested fungicides
Matco	*F. solani*	45.49	Least effective
Willonyl	*F. solani*	25.73	Least effective
Benlate	*F. solani*	74.64	High effective
Carbestin	*F. solani*	63.13	Medium effective

Results presented in Table 1, indicate that all the chemicals at all the concentration inhibited the fungal growth and the data also indicated that all the fungicides were significantly superior over untreated control at all concentrations.Benlate gave highest growth inhibition of *Fusarium solani* (74.64%) at 100, 200 and 300 ppm concentrations followed by the fungicides Carbestin (63.13%), Matco (45.49) and Willonyl (25.73).



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