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In vitro evaluation of fungicides on *Alternaria solani* causing early blight in tomato

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Abstract
Tomato is an important crop for the human race where they are regularly used in their food. Tomatoes are largely cultivated throughout the world. Many consequences arise throughout the cultivation. Diseases are more important among one of them. disease causes more damage to the entire crop in terms of yield reduction, early blight of tomato is an destructive diseases caused at an early stages of the plants which can cause the entire crop to die. In vitro studies shows that fungicides are very much effective in control of *Alternaria solani* which causes early blight in tomato. four fungicides were used to evaluate the inhibition efficacy on *Alternaria solani* and the results shown that a combination fungicide so called Tebuconazole10%+sulphur65% gave a high inhibition rate at lower concentrations i.e, 98% inhibition @250 ppm followed by propineb and mancozeb. The least inhibition rate is shown by carbendazim i.e 55% inhibition @1000ppm.

Keywords: tomato, early blight, *Alternaria solani*, fungicides, management

Introduction
Tomato (*Lycopersicon esculentus)*
Kingdom: palntae
Class: Angiosperms
Order: Solanales
Family: Solanaceae
Genus: S*olanum*
Species: *lycopersicum*

Tomato (*Lycopersicon esculentum*, Mill) is one of the world's most lucrative and commonly grown vegetables and ranks first among the crops being processed. Orginated in south America which were found by Aztecs and they called them as *tomati* and gave rise to be called it as tomate by Spanish later it has been cultivated by the people and used in their cookings it has been brought into Europe and been cultivated largely them called them in the name called as tomato. In India annual production of tomato is 19759MT/789000ha, (NHB 2020). Tomato is used to consume as raw or cooked into many dishes producing sauces, juices, salads. They are dicots and as series of branching stems with a terminal bud, they are said as pubescents in their formation they contains hairs which facilitates in the formation of vines they have compound leaves. The leaves are 10-25 cm long with five to nine leaflets on petioles Their flowers are yellow, anthers are fused along the edges forming a column to stand the pistil firm as to facilitate self-pollination, the flowers are 1-2 cm as it is a true fruit its flesh is formed by pericarp walls of ovary and as it is two lobed 2 locular cavities are formed generally some varieties are more than two lobes initially the outer surface is green hard as it grows its turn to dark red to its shade depends on variety fleshy inside as they reaches maturity they turns to red from inside to out wards towards the peri carp this made the fruit to be perishable in its nature and to be used as early as possible.
Tomatoes have great importance for its nutritive value in both energy and protein content Tomatoes are filled with a substance called lycopene. It gives the fruit red color, tomatoes are also rich in potassium, vitamins and other nutrients, lycopene is an antioxidant, which actively fights with cancer forming cells, lycopene also lowers bad cholesterol as well as blood pressure tomatoes have substances called lutein and zeaxanthin that may protect your eyes Tomato fruit is regarded as safe food because of its high nutritive value, it is rich in vit A, C, Riboflavin and Thiamine Some of the major diseases of tomato plants are Early blight (*Alternaria solani*), Late blight (Phytophthora infestans), Fusarium wilt (*Fusarium oxysporum*), Verticillium wilt (*V. albo-atrum*, *V. dahliae*), powdery mildew *(Leveillila*

taurica), Anthracnose (*Colletotrichum coccodes*), Bacterial wilt (Ralstonia solanacearum), bacterial spot (*Xanthomonas axonopodis* pv *vesicatoria*), bacterial canker (*Clavibacter michiganensis*), tomato mosaic virus, tomato spotted wilt virus, tomato yellow leaf curl virus etc. Among them, early blight caused by the *Alternaria solani* fungus is one of the world's catastrophic disease Globally tomato yield losses due to diseases are confined to 21.8% yearly which makes plant protection more important (PK Basu 1974). Early blight disease of tomato occurs at the early stage of the crop growth. The fungus infects the leaves causing blight and distinctive leaf spot. Initially on the plants, early blight observed as small, black lesions mostly on the older foliage, concentric rings in bull's eye pattern in middle of the diseased area. Tissue that surrounds the spots may turn yellow.

Plant protection is a very important phase in the life of plants so that the plant grows healthy and yield will be increased some fungicides Sharma *et al*., (2018) [14] his work said that Carbendazim, Mancozeb, Difenoconazole, Propiconazole, Mancozeb, Propineb, Copper-oxy chloride can inhibit the growth of Alternaria solani through Poisoned food technique under In vitro conditions Carbendazim and mancozeb showed lowest percent disease intensity, which was followed by difenoconazole and propiconazole..

Materials and Methods

All the following experiment is carried out in plant pathology laboratory, school of agricultural sciences Uttaranchal university, Dehradun

Isolation of *Alternaria solani*

Alternaria solani is a disease causing fungal organism, isolated by collecting the diseased sample like leaf and stem grown at experimental field. The collected samples were brought to the plant pathology laboratory thoroughly washed under the running water and shade dried. The diseased samples along with the healthy part are cut into 3-4 bits and surface sterilized with 1% sodium hypochlorite for 120 sec for 2-3 times and then cleaned with sterilized distilled water to remove the traces of surface sterilant then blot dried and transferred to Potato Dextrose Agar (PDA) plates and incubated at 25±2 °C for mycelial growth formation then they are sub cultured, pure culture is obtained by hyphal tip isolation. obtaining pure culture is followed by removing the peripheral or marginal hyphal growth which contains the hyphal tip and placing it on the PDA surface then incubated at 25±2 °C for 3-5 days. obtained pure cultures are further used for the research studies. identification of Alternaria solani is carried out by its morphological features

In vitro evaluation of fungicides on *Alternaria solani* causing early blight in tomato

Fungicides like carbendazim, propineb, Tebuconazole+sulphur, mancozeb were used in evaluating the efficacy on myclelial growth of Alternaria solani. Poisoned food technique (neni and tapiyal) is used for evaluating these fungicides on Alternaria solani by using PDA as the medium. Four concentrations i.e 100ppm, 250ppm, 500ppm, 1000ppm were used for each fungicide and three replications are maintained for each concentration. The radial growth of the mycelium is recorded on the tenth day after the inoculation of pathogen, an untreated control PDA plate is maintained to record the maximum growth of the pathogen. Inhibition percentage is recorded by using the formula

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

I= inhibition percentage
C=radial growth of the mycelium in control
T=radial growth of the mycelium in treatment

Table 1: list of fungicides and their concentrations

Sr.no	Fungicide	Trade name	Concentrations(ppm)
1	Tebuconazole10%+sulphur65%wp	Haru	100,250,500,750,1000
2	Mancozeb75%wp	DithaneM-45	100,250,500,750,1000
3	Propineb70%wp	Antracol	100,250,500,750,1000
4	Carbendazim50%wp	Bavistin	100,250,500,750,1000

Experimental Results

Four fungicides were used in evaluating the efficacy on Alternaria solani i.e Tebuconazole10%+sulphur65% WP, propineb70%WP, mancozeb75%WP, carbendazim50%WP.all the fungicides are capable of inhibiting the growth of the pathogen at all the concentrations(table 2). Among these high inhibition rate is seen in Tebuconazole10%+sulphur65% i.e (93.96%) @ 100ppm, (97.63%) @ 250 ppm, (100%) @ 500 ppm, (100%) @ 750 ppm (100%) @ 1000ppm followed by Propineb 70% (39.63%) @ 100ppm, (59.55%) @ 250ppm, (74.74) @ 500ppm, (80.48) @ 750ppm, (87.04) @ 1000ppm where as mancozeb75%WP gave (31.60%) @ 100ppm, (46.26) @ 250ppm, (74.22) @ 500ppm, (78.41) @ 750ppm, (86.04) @ 1000ppm and carbendazim50%WP shows less inhibition percentage as (19.82) @ 100ppm, (32.74) @ 250ppm, (58.33) @ 500ppm, (65.07) @ 750ppm, (72.74) @ 1000ppm.this proves that all the fungicides can inhibit the growth of Alternaria solani and all the results were significantly superior

Table 2: Inhibition percentage

SL.no	Fungicides	100ppm	250ppm	500ppm	750ppm	1000ppm
1	Tebuconazole10%+sulphur65%	93.96	97.63	100.00	100.00	100.00
2	mancozeb75%	31.60	46.26	74.22	78.41	86.04
3	propineb70%	39.63	59.55	74.74	80.48	87.04
4	carbendizim50%	19.82	32.74	58.33	65.07	72.74
	SEM±CV%	12.79 28.90				

Discussions

Al these research proves that early blight of tomato caused by Alternaria solani can be controlled by the timely application of recommended fungicides. This experiment shows tebuconazole10%+sulphur65%wp a combination fungicide marketed with the trade name HARU is very effective in controlling the early blight of tomato at the lower concentrations i.e 500ppm (0.05%) with 100% inhibition percentage and another fungicide named propineb70%wp also shows great results in controlling the disease at 1000ppm (0.1%) with 87.04% inhibition percentage followed by mancozeb and carbendazim

References

1. Abhinandan D, Randhawa HS, Sharma RC. Incidence of Early Blight on Tomato and Efficacy of commercial fungicides for its control. Ann. Biol 2004;20(2):211-218.
2. Arunkumar KT, Kulkarni MS, Thammaiah N, Hedge Y. Fungicidal management of early blight of Tomato. Indian Phytopath 2010;63(1):96-97
3. Abada KA, Mostafa SH Hillal, Mervat R. Effect of some chemical salts on suppressing the infection by early blight disease of tomato. Egypt J Appl. Sci 2008;23:47-58
4. Chohan S, Perveen R, Mehmood MA, Naz S, Akram N. Morphophysiological studies, management and Screening of Tomato Germplasm against Alternaria solani, the causal agent of tomato early blight. Int. J Agri. Biol 2015;17(1):111-118
5. Datar VV, Mayee CD. Assessment of loss in tomato yield due to early blight. Indian Phytopathol 1981;34:191-195.
6. Fontem DA. Survey of Tomato disease in Cameroon. Tropiculture 1993;11(3):87-90
7. Fontem DA. Quantitative effects of early and late blights on tomato yields in Cameroon. Trop. Agric 2003;21(1):36-41
8. Ghazanfar MU, Raza W, Ahmed KS, Rasheed MH, Qamar J, Haider N. Evaluation of different fungicides against *Alternaria solani* (Ellis & Martin) Sorauer cause of early blight of tomato under laboratory conditions. Int. J. Zool. Studies 2016;1(5):8-12
9. Gleason ML, Edmonds BA. Tomato diseases and disorders 2006, 1266-1277.
10. Kamble SB, Pawar DR, Sankeshwar SB, Arekal JS, Sawant VK. *In-Vitro* efficacy of fungitoxicants against *Alternaria solani*. Internl. J. Agri. Sci 2009;5(1):137-139.
11. Momel TM, Pemezny KL. Florida plant disease management guide: Tomato. Florida Cooperation Extensive Service, Institute of Food and Agriculture Sciences. 134. NHB. 2006.
12. Neesha T, Akhtar G, Khan S, Zobia J, Anwar HM, Khan A. *In vivo* assessment of efficacy of different fungicides for control of early blight of tomato. Int. J Life Sci 2015;9(1-4):3257-3263.
13. Prasad Y. Studies on variability, pre and post-harvest management of early blight of tomato. M.Sc. (Agri) Thesis, Univ. Agric. Sci, Dharwad (India) 2002, 153.
14. Sharma RK, Patel DR, Chaudhari DR, Kumar V, Patel MM. Effect of Some Fungicides against Early Blight of Tomato (Lycopersicon esculentum Mill.) Caused by Alternaria solani (Ell. & Mart.) Jones and Grout and Their Impact on Yield. Int. J. Curr. Microbiol. App. Sci 2018;7(07):1395-401.
15. Sahu DK, Khare CP, Singh HK, Thakur MP. Evaluation of newer fungicide for management of early blight of tomato in Chhattisgarh. The Bioscan 2013;8(4):1255-1259.
16. Singh RS. Introduction to Principles of Plant Pathology, fourth edition, Oxford and IBH Publication, Pvt. Ltd., NEW Delhi, India 2004.
17. Soni R, Bunker RN, Dhakad UK, Yadav A. Efficacy of fungicide, botanical and bionanoformulation for suppression of early blight of tomato caused by Alternaria solani. The Ecoscan 2015;8:337-340.