International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(6): 323-325

Received: 20-09-2018
Accepted: 21-10-2018

S Pavan Kumar
College of Agriculture, Orissa University of Agriculture and technology, Bhubaneswar, Odisha, India

MK Mishra
Professor, Department of Plant Pathology, OUAT, Bhubaneswar, Odisha, India

KC Sahu
Former Professor and Head, Department of Plant Pathology, OUAT, Bhubaneswar, Odisha, India

Correspondence
S Pavan Kumar
College of Agriculture, Orissa University of Agriculture and technology, Bhubaneswar, Odisha, India

In vitro efficacy of agro chemicals against fungal leaf blight complex in tomato (*Solanum lycopersicum*)

S Pavan Kumar, MK Mishra and KC Sahu

Abstract
Leaf blight of tomato caused by a complex mycoflora viz., *Alternaria solani*, *Fusarium oxysporum* and *Curvularia lunata*. The disease complex causes considerable yield as well as post-harvest losses. *In vitro* screening of nine different contact, systemic and combi-products against three fungal pathogens was done employing poison food technique. Cent percent radial growth inhibition of *A. solani* and *F. oxysporum* was found in case of Carboxin + Thiram 0.2%, Hexaconazole 0.1% and Carbendazim + Mancozeb 0.2%. Propineb 0.2% recorded least percentage inhibition (49.66%) among all the chemicals against *Alternaria solani* and *Fusarium oxysporum*. Carbendazim 0.15%, Difenoconazole 1.5%, Carboxin + Thiram 0.2% recorded 100% growth inhibition of *Curvularia lunata*, While Thiophanate methyl 0.1% was least effective only reducing 45.76% growth of the *C. lunata*. The study will be helpful for further investigation and selection for best Agro chemicals for management of fungal leaf blight of tomato.

Keywords *Alternaria solani*, *Fusarium oxysporum* and *Curvularia lunata*, Thiophanate methyl

Introduction
Tomato is considered as the world's largest vegetable crop after potato and sweet potato but it tops the list of canned vegetables. It is one of the most important "protective foods" because of its special nutritive value Tomato is a good source of vitamins A, C and E and minerals that are very good for body and protect the body against diseases (Taylor, 1987) [7]. Climate of Odisha is warm and humid with mild winter and a hot summer which is very much conducive for rapid growth of pathogenic micro-organisms. Like other crops this crop is also attacked by several diseases caused by fungi, bacteria, viruses, nematodes and abiotic factors (Balanchard 1992) [2]. The crop suffers from a number of foliar diseases such as early blight, also called Alternaria leaf blight (*Alternaria solani*), late blight (*Phytophthora infestans*), Septoria leaf spot (*Septoria lycopersici*), Gray mold (*Botrytis cinerea*) and leaf mold (*Fulvia fulva*). Among the fungal diseases, early blight also known as target spot disease incited *by Alternaria solani* (Ellis and Martin) Jones and Grout, Fusarium blight incited by *Fusarium oxysporum* f.sp. *lycopersici* and Curvularia leaf spot incited by *Curvularia lunata* are important. Leaf blight in tomato is the most destructive disease as it accounted for 78 % yield loss at 72% disease intensity (Datar VV and Mayee CD 1981) [3]. The pathogen of the disease has been documented as *A. solani* globally as well as in India (Gomes SMDTP *et al*. 2010) [4]. *Fusarium oxysporum* Schltdl. is an ascomycete fungal pathogen which is usually soil borne in nature causing wilt as well as foliar diseases, having wide host range. *Curvularia lunata* (Wakker) is also an ascomycete which is normally associated with a number of foliar diseases as a saprophyte.

Materials and Methods
The present investigation was carried out in Plant pathology department, College of Agriculture, Bhubaneswar. Nine fungicides belonging to different groups' were screened against the pathogen under laboratory conditions to find out their relative efficacy in inhibiting the growth of the pathogen in culture by the "Food poison technique" at recommended concentrations. Required quantity of each fungicide was added to 2% Potato Dextrose Agar medium prior to solidification and thoroughly mixed them by shaking prior to pouring in sterilized Petri plates.

The medium was allowed to solidify and then 5 mm bits of fungus culture cut from seven days old culture with sterilized cork borer and were placed at the centre of Petri plates with sterilized inoculation needle in three replications of each treatment. The fungus bit was reversed so that the pathogen could come in direct contact with the medium. The Petri plates were incubated at 27±1°C. One set of control was maintained in which the medium was not mixed with any fungicide but simply inoculated with the pathogen. After the control Petri plates were fully grown with myclelium, the data was recorded. The data were analyzed statistically and efficacy of fungicide was expressed as percentage of inhibition of mycelia growth over control. The formula (Vincent, 1947) for calculation was

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

Where, I = Per cent inhibition of the mycelium C = Growth of the mycelium in control T = Growth of the mycelium in treatment.

Table 1: List of fungicides used in management of the causal fungus

SI. No.	Chemical name	Trade name	Dose (%)
1	Carbendazim 50% WP	Bavistin	0.1
2	Difenoconazole	score	0.15
3	Carboxin + Thiram	Vitvaxpower	0.2
4	Propineb 70WP	Antracol	0.2
5	Thiophanate methyl 70% WP	Rook	0.1
6	Hexaconazole 5% EC	Contest	0.1
7	Carbendazim 12% + mancozeb 63% WP	Sixer	0.2
8	Copper oxychloride 50% WP	Nag copper	0.3
9	Validamycin	Sheathmar	0.2

Result

Inhibition of radial growth of *Alternaria solani* in different chemicals

Significant difference in inhibition of growth observed all the chemicals compared to control (69.33). All the chemicals behaved significantly difference inhibition pattern for the said pathogen. Carbendazim 0.1%, Difenoconazole 0.15%, Carboxin+ Thiram 0.2%, Hexaconazole 0.1%, Carbendazim+ Mancozeb 0.2% and copper oxy chloride 0.3% completely reduce the growth of *Alternaria solani* inducing 100% growth inhibition. Thiophanate methyl 0.1% reduced 77.74% growth of test pathogen which was at par with Validymycin 0.2%. Propineb 0.2% recorded least percentage inhibition (49.66%) among all the chemicals (Table-2).

Inhibition of radial growth of *Fusarium oxysporum* in different chemicals

Significant difference in growth inhibition was also observed among all the chemicals tested for *Fusarium oxysporum*. Carbendazim 0.1%, Difenoconazole 1.5%, Carboxin + Thiram 0.2%, Hexaconazole 0.1% and Carbendazim + Mancozeb 0.2% also completely inhibited the growth of *Fusarium oxysporum*. Copper oxychloride 0.3% was found to be next best chemical reducing growth to 83.25%. Propineb 0.2% was found to be least effective against *Fusarium oxysporum* (46.22%) Table-2

Inhibition of radial growth of *Curvularia lunata* in different chemicals

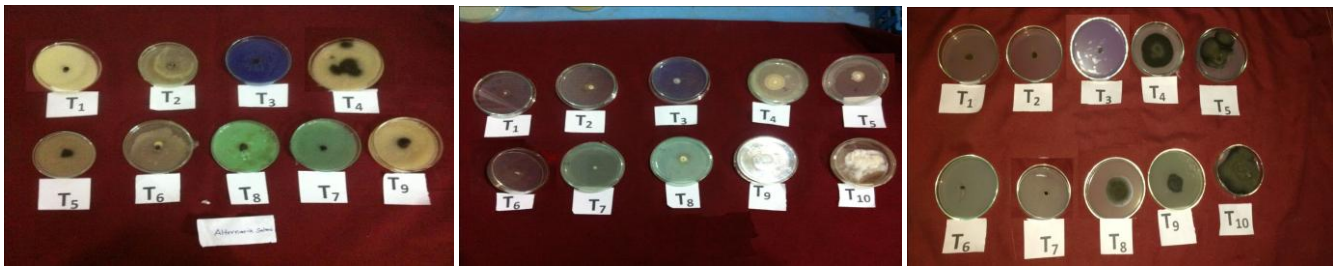
Similar growth inhibition was also observed in *Curvularia lunata* as in case of *Fusarium oxysporum*. Carbendazim 0.15%, Difenoconazole 1.5%, Carboxin + Thiram 0.2% recorded 100%growth inhibition of *Curvularia lunata* Thiophanate methyl 0.1% was least effective only reducing 45.76% growth of the test pathogen (Table-2).

Table 2: Efficacy of various chemicals against radial growth of different foliar pathogens

Treatments	Dosage%	Alternaria solani		Fusarium oxysporum		Curvularia lunata	
		Mean radial growth(mm)	Per cent inhibition	Mean radial growth(mm)	Per cent inhibition	Mean radial growth(mm)	Per cent inhibition
T_1	0.1	0(0.71)	100	0.0(0.71)	100	0.0(0.71)	100
T_2	0.15	0(0.71)	100	0.0(0.71)	100	0.0(0.71)	100
T_3	0.2	0(0.71)	100	0.0(0.71)	100	0.0(0.71)	100
T_4	0.2	34.9(5.94)	49.66	36.93(6.11)	46.22	24(4.94)	65.35
T_5	0.1	15.43(3.99)	77.74	22.77(4.82)	66.84	37.57(6.16)	45.76
T_6	0.1	0(0.71)	100	0.0(0.71)	100	0.0(0.71)	100
T_7	0.2	0(0.71)	100	0.0(0.71)	100	0.0(0.71)	100
T_8	0.3	0(0.71)	100	11.50(3.46)	83.25	27.67(5.30)	60.05
T_9	0.2	16.9(4.17)	75.62	22.27(4.77)	67.56	14.93(3.92)	78.44
T_{10} Control		69.33(8.36)	-	68.67(8.32)	-	69.27(8.35)	-
SEm (±)		0.06		0.05		0.1	
CD (5%)		0.2		0.1		0.3	

*Figures in the parentheses indicate $\sqrt{(x + 0.5)}$ transformed values.

T_1- Carbendazim 50% WP,T_2-Difenaconozole,T_3- Carboxin + thiram, T_4- Propineb 70WP, T_5-Thiophanate methyl, T_6-Hexaconazole, T_7-Carbendazim 12% + mancozeb 63% WP, T_8-Copper oxychloride, T_9-Validamycin, T_{10}-Control.



(A) *Alternaria solani*, (B) *Fusarium oxysporum*, (C) *Curvlaria lunata*

Plate 1: showing the effect of different agro chemicals on the growth of three test pathogens

Discussion

Efficacy studies of different fungicides were tested in *in vitro* conditions. All the fungicides tested show significant difference among each other.

Among all the fungicides the maximum growth inhibition was recorded with Carbendazim 0.1%, Difenoconazole 0.15%, Carboxin+ Thiram 0.2%, Hexaconazole 0.1%, Carbendazim+ Mancozeb 0.2% and Copper oxychloride 0.3%, against *Alternaria solani*. In Thiophanate methyl 0.1% growth inhibition was 77.74% it is at par with Validamycin and lowest growth inhibition was recorded in Propineb among the rest of fungicides these findings has been reported by Alexander *et al*. (1981) [1], Sawant *et al*. (1999) [6], Roopa *et al*. (2014) [5].

Maximum growth inhibition against *Fusarium oxysporum* was recorded with Carbendazim 0.1%, Difenoconazole 0.15%, Carboxin+ Thiram 0.2%, Hexaconazole 0.1%, Carbendazim + Mancozeb 0.2%. The lowest growth inhibition with Propineb (46.22%), Copper oxychloride 0.3% was found to be next best chemical reducing growth to 83.25%.

The treatment Thiophanate methyl 0.1% was at par with Validamycin in growth inhibition against *Fusarium oxysporum*. The study was supported by Jahanshir Amini *et al*. (2010).

Similar growth inhibition was also observed in *Curvularia lunata* as in case of *Fusarium oxysporum*. Carbendazim 0.15%, Carboxin + Thiram 0.2% recorded 100%growth inhibition of *Curvularia lunata*. Thiophanate methyl 0.1% was least effective only reducing 45.76% growth of the test pathogen.

Conclusion

This investigation reveals that Carboxin+ Thiram 0.2%, Hexa conazole 0.1% and Carbendazim+ Mancozeb 0.2% best for management *A. solani* and *F. oxysporum* while Carbendazim 0.15%, Difenoconazole 1.5%, Carboxin+ Thiram 0.2% are best for management of *C. lunata*

References

1. Alexander AA, Eude Nagler A. Some aspects of the effect of fungicide on tomato crop. Ahalede Institute Decorcetari Pentery. 1981; 16:331-350.
2. Balanchard D. A color atlas of tomato diseases. Wolfe Pub. Ltd., Brook house, London, 1992, 298
3. Datar VV, Mayee CD. Assessment of losses in tomato yield due to the early blight. Indian Phytopath. 1981; 34:191-195.
4. Gomes SMDTP, Carneiro EDB, Romano EP, Teixeira MZ, da Costa ME, Vasconcelos JCG. 2010. Effect of biotherapic of Alternaria solani on the early blight of tomato-plant and the *in vitro* development of the fungus. Int J High Dilution Res. 2010; 9:147-155.
5. Roopa RS, Yadahalli KB, Kavyashree MC. Evaluation of natural Plant extracts, antagonists and fungicides against early blight caused by A. solani *in vitro* Bio scan. 2014; 9(3):1309-1312
6. Sawant GG, Desai PV, Padhial PG. Effect of different spacing, fertilizer dose, use of *Trichoderma* sp. and use of different fungicides on early blight of tomato. Indian J Ento. Toxico. 1999; 9(2):84-87.
7. Taylor JH. Text of lectures delivered at the national workshop on fruit and vegetable seedlings production held at NIHORT, 1987, 9-13.
8. Vincent JM. Distortion of fungal hyphae in the presence of certain inhibitors. Nature. 1947; 159:850-850.