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Efficacyof fungicides against *Stemphylim* blight and Purple blotch of Garlic (*Allium sativum* L.)

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Abstract

Garlic (*Allium sativum*L.) is an herbaceous plant belong to family Alliaceae grown for its edible bulbs and leaves. Itis a most important vegetable, spice and medicinal crop produced on large scale throughout the world. Garlic is a good source of vitamins, carbohydrates, fibers, protein, moisture and minerals. It is one of the important commercial vegetable crops cultivated in India.The crop is attacked by various fungaldiseases which result in deteriorating the quality and also yield losses.In the present study, *in vitro* study was conducted for evaluating efficacy of some fungicidesin different concentrationsfor the management of*Stemphylium*blight and Purple blotch of garlic.Carbendazimshowed maximum inhibition against *Stemphyliumvesicarium*(96.06%)and *Alternariaporri* (92.9%) inhibition followed by Mancozeb (85.86% inhibition), Benomyl (83.96 % inhibition) against*Stemphyliumvesicarium* and Benomyl(80.9% inhibition) and Mancozeb (73.36% inhibition) anginst*Alternariaporri*. Copper oxychloride less effective against both fungal pathogens *Stemphyliumvesicarium*(79.86% inhibition)and*Alternariaporri*(72.46% inhibition).

Keywords: Garlic, Pathogenic fungi, fungicide.

Introduction

Garlic is most important bulb crop use for spice and vegetable worldwide. It is used as a flavoring agent, food and medicine. It is the second most widely cultivated vegetable next to the onion. As per the FAO currently in India the production of garlic is

12.50 lakh tons from an area of 2.47 lakh hectors with productivity of 5.09 tons/ha. The garlic is grown in the states of Haryana, Madhya Pradesh, Uttarakhand, Jammu & Kashmir and Maharashtra. The productivity of garlic in India is low as compared to other countries because various fungal, bacterial and viral pathogens which causes various diseases.

There are number of fungal pathogens that attack on garlic plant throughout their development. Various fungi are reported on garlic plant and stored bulbs (Rath and Mohanty1979). The foliar diseases is leaf blight caused by *Stemphylium spp.*(Raghayendra and Pavagi, 1975) and Purple blotch by *Altrnariaporri* (Ellis M.B. 1971).Stemphylium leaf blight disease was first recorded on garlic in India by Rao&Pavgi in 1975.Most of the diseases reported on onion (*Allium cepa*L.) are common on garlic (Miller and Lacy 1996).Stemphylium leaf blight and Purple blotch are the major foliar disease of garlic. It is heavily attacked by *Stemphyliumvesicarium*and *Alternariaporri*causes Stemphylium leaf blight and Purple blotch respectively. Many foliar diseases caused by fungi are reported on *Allium* species including *Stemphylium*blight (*Stemphylium*spp.),*Alternaria*leaf blight (*Alternariaporri*(Ellis) Cif.), and downy mildew (*Peronosporadestructor* (Berk.) Casp.) (Maffia*et al.*,2002).*Stemphyliumvesicarium* was reported on onion from Bihar (Sinha et al. 1996) and from Maharashtra (Patil&Patil 1992).The chemicals such as mancozeb, azoxystrobin, propiconazole and propineb allow *in vitro* fungal growth inhibition of *S. vesicarium*isolated from onion at high concentrations (Mishra and Gupta, 2012). The fungicides tested against *Stemphyliumvesicarium*mancozeb ,carbendazim, topsin-M, benomyl,captanandvitavax and have proved to be the most effective in inhibiting the growth of *Stemphyliumvesicarium*under in vitro(Kumar *et al*. 2011)

As per the NHRDF survey Stemphylium blight was more severe in the winter/summer than in the rainyseason with 1.3-100 per cent incidence (Gupta *etal.*, 1994) and sometimes may even cause 100 % crop losses (Singh *et al.*, 1992).Bisht and Agarwal (1993) reported the susceptibility of purple blotch (*Alternariaporri*) on garlic.

Material and Method

Isolation of Pathogen

Infected leaves were brought into the laboratory and cut into small pieces by sterilized blade. Then surface sterilized with 0.1% mercuric chloride for 30 seconds. The pieces washed with sterilized distilled water thrice. The pieces were transferred to solid potato dextrose agar medium (PDA) by sterile forceps. Inoculated plates kept at 27 ± 2^0 C. Pathogens were identified and isolated as *Stemphyliumvesicarium*(Wallr.ESommons.)and*Alternariaporri*. The pathogens maintained on PDA slants for further study.

Efficacy of fungicide against*Stemphyliumvesicarium*and*Alternariaporri.*

Four fungicides namely Carbendazim, Mancozeb, Benomyl and Copper oxychloride were assessed at different concentrations for their efficacy against *Stemphyliumvesicarium*and*Alternariaporri* by poisoned food technique in vitro(Nene and Thapliyal, 1993).The required quantity of each fungicide was added aseptically in sterilized melted Potato dextrose agar (PDA) medium in conical flask and shaken well to make homogeneous. 20 ml melted poisoned PDA as poured aseptically to each sterilized 9 cm diameter petri plates and allow to solidify. Then the disc of 6mm diameter mycelium of test fungi cut by sterile cork borer from the growing edge of 7 days old culture of targeted pathogens were placed at the center of each plates. Media without fungicideserved as control. Three replicates of each plate were maintained and incubated at 28 ± 1^0 C for 7 days. The radial growth of test fungi measured and compared with control. The percentage of growth inhibition was calculated by using the following formula described by (Vincent 1947).

$I = C – T / C =100$

Where, I = Percent inhibition

C = Colony diameter in the control

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T = Colony diameter in treatedpetriplates

1) **In-vitroeffect of different concentrations of fungicides on mycelial growth of*Stemphyliumvesicarium*.**

Fungicides	**Percent inhibition of mycelialgrowth**			
	Concentrations (%)			**Mean**
	0.1	**0.15**	**0.2**	
Carbendazim	96.1	95	97.1	96.06
Mancozeb	80.3	86.9	90.4	85.86
Benomyl	81.6	84.2	86.1	83.96
Copper oxychloride	76.3	79.5	83.8	79.86
Mean	83.57	86.4	89.35	

Values shows are the mean of 3 replicates

2) **In-vitroeffect of different concentrations of fungicides on mycelial growth of*Alternariaporri*.**

Fungicides	**Percent inhibition of mycelialgrowth**			
	Concentrations (%)			**Mean**
	0.1	**0.15**	**0.2**	
Carbendazim	90.2	93	95.5	92.9
Mancozeb	70.9	74	75.2	73.36
Benomyl	78.4	81.3	83	80.9
Copper oxychloride	69.5	71.3	76.6	72.46

Mean	77.25	79.75	82.5	

Values shows are the mean of 3 replicates

Result and Discussion

The observation shows the fungicide inhibit the growth of pathogenic fungi in vitro. In the present study Carbendazim(92.9%)showed maximum inhibition against *Stemphyliumvesicarium*followed by Mancozeb (85.86% inhibition), Benomyl (83.96 % inhibition) and Copper oxychloride (79.86% inhibition). The result indicates that Carbendazim was effective fungicide against for controlling *Stemphyliumvesicarium***.**

Carbendazim (92.9% inhibition) was found most superior against*Alternariaporri*among the tested fungicides followed byBenomyl(80.9% inhibition) and Mancozeb (73.36% inhibition). Copper oxychloride (72.46% inhibition) was least effective percent inhibition against *Alternariaporri.*

Among the different concentrations tested 0.2 percent was very effective against *Stemphyliumvesicarium* (89.35 %) and *Alternariaporri*(82.5 %)

Many workers have documented the efficacy of fungicides against fungal pathogen. Mancozeb 75 WP (@ 0.2%) was found most effective against Stemphylium blight (*Stemphyliumvesicarium*), purple blotch (*Alternariaporri*) of onion and *Alternaria*spp. causing blights in other crops, as earlier reported by several workers (Deshmukh*et al.*, 2007; Pandey*et al.*, 2008; Ilhe*et al.*, 2008 and Pal *et al.*, 2008). Copper oxychloride, carbendazim, chlorothalonil, hexaconozole and difenoconazole have been reported effective in the management of the Alternaria blight and Stemphylium blight of potato, mustard, onion and other crops by Kumari*et al.* (2006) and Gorawar and Hegde (2005).Mancozeb and hexaconazole were found effective fungicides for control of all the three species of A.gossypina, A. alternataand A.macrospora (Meena and Ratnoo, 2014).

Conclusion

The present study clearly shows thatCarbendazim, mancozeb, benomyl and copper oxychloridefungicides weresignificantly control the leaf fungi of garlic and thus could be used for management of *Stemphylim* blight and Purple blotch of garlic.

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