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Efficacy of fungicides and bioagent against fungal pathogens of *Aloe vera*

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Abstract

In the view of the economic and medicinal important of *Aloe vera* crop, The experiment was conducted to manage on control the different pathogen which has cause severe disease in this plants. In this experiment groups are fungicide were used at different concentration viz., Tebuconazole (0.1%) + Dithane M-45 (0.2%), Propiconazole 70WP (0.1%) + Dithane M-45 (0.2%), Propiconazole 70 WP (0.1%) + Tebuconazole (0.1%), Carbendazium (0.1%) + Tebuconazole (0.1%), Carbendazim (0.1%) + Dithane M-45 (0.2) and also biocontrol agent *Trichoderma harzianum* were used under *in vitro* condition to check their efficacy against *Alternaria alternata*, *Curvularia lunata* and *Fusarium oxysporum* on aloe vera crop. Among the tested fungicides Tebuconazole (0.1%) + Dithane M-45 (0.2%), Propiconazole 70WP (0.1%) + Dithane M-45 (0.2%), Propiconazole 70 WP (0.1%) + Tebuconazole (0.1%), Carbendazium (0.1%) + Tebuconazole (0.1%) was found to be the most effective against *Alternaria alternata*, *Curvularia lunata* and *Fusarium oxysporum*. The bioagent *Trichoderma harzianum* was found to be the effective against an tested pathogen.

Keywords: *Alternaria alternata*, *curvularia lunata*, fungicides, bioagent and aloe vera

Introduction

Aloe vera is a perennial, drought-resisting, succulent plant belonging to the Asphodelaceae family. *Aloe vera* plants consist 95% water they are not habitat for cold region. That's the reason they are found in mostly tropical and subtropical region. It is under cultivation in fairly large areas in many parts of India viz., Tamil Nadu, Gujarat, Maharashtra etc. Aloes are often thought to only grow in hot and dry climates but they actually grow in a variety of climates including desert, grassland and coastal or even alpine locations.

The plant *Aloe vera* is used in Ayurveda, Homoeopathic and Allopathic streams for the purpose of making medicines and not only tribal community but also most of the people for food and medicine. The plant leaves contains numerous vitamins, minerals, enzymes, amino acids, natural sugars and other bioactive compounds with emollient, purgative, antimicrobial, anti-inflammatory, anti-oxidant, aphrodisiac, anti-helminthic, antifungal, antiseptic and cosmetic values for health care. This plant has potential to cure sunburns, burns and minor cuts, and even skin cancer. The external use in cosmetic primarily acts as skin healer and prevents injury of epithelial tissues, cures acne and gives a youthful glow to skin, also acts as extremely powerful laxative.

During recent days commercial cultivation of medicinal plants has increased their severe disease problem due to increasing population of different pathogen in the natural level. The *Aloe vera* crop which is infected by the various pathogen to cause diseases like leaf spot, tip rot basal rot, bacterial blight and ring spot. Which can considerable damage are economic part of the plant and reduce the yield and important content in this plant. A few leaf spot and tip rot diseases caused by *Fusarium* spp. were reported from the Nigeria (Ilondu 2013) [13] and Japan (Hirooka *et al.*, 2007), leaf spot caused by *Alternaria alternata* was reported from India (Ghosh and Banerjee, 2014) [10] and leaf spot disease caused by *Curvularia* spp. from India (Avasthi *et al.*, 2015) [2].

Material and methods

In vitro evaluation of fungicides

Poisoned food technique was used to evaluate the above mentioned fungicides against pathogens. Potato dextrose agar medium was prepared and distributed at the rate of 100 ml in 250 ml conical flask, autoclaved 1.05kg/cm² for 15 min. then before solidification of media

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different fungicides with desired concentration were added aseptically in different flasks. These flasks shaken thoroughly and poured 20 ml media in each plate and maintain three replication of each treatment. One set of three plates were poured without any fungicides to serve as a control. After solidification of medium, these plates were inoculated with seven days old pathogens separately. The 5 mm diameter mycelial disc selected from peripheral growth of the plate by sterilized cork borer were used for inoculating the plates by keeping one disc per plate in the centre in inverted position, so as to make the mycelia growth touch the surface medium. The inoculated plates were incubated at room temperature for seven days. The colony diameter of the fungal pathogens on medium was recorded and percent inhibition of each treatment was calculated (Vincent, 1927) by using following formula.

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

Where,

- PI = Per cent inhibition of mycelia growth
 C = Growth of mycelium in control plates (mm)
 T = Growth of in plates treated with fungicides (mm)

In vitro evaluation of bioagent

Autoclaved medium was poured into the sterilized glass Petriplates and allowed to solidify. The 5 mm diameter disc of the bioagent were cut from peripheral growth of the plate using sterilized cork borer under aseptic condition and placed at one end of the medium. Just opposite to it 5 mm disc of the pathogen was placed at another position 0.5 to 1.0 cm away from edge of Petriplates. For this one week old culture of pathogen and bioagent was taken. Three replications were maintain for each pathogen and control. The mycelial growth of pathogens was measured in treated and controlled plates and per cent inhibition was calculated by the formula suggested by (Vincent, 1927) formula.

$$C - T$$

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

Where,

- I = Per cent inhibition of mycelia growth
 C = Growth of mycelium in control (mm)
 T = Growth of mycelium in treatment (mm)

Result and discussion

In present studies, The results were recorded from the efficacy of five fungicides viz., Tebuconazole (0.1%) + Dithane M-45 (0.2%), Propiconazole 70WP (0.1%) + Dithane M-45 (0.2%), Propiconazole 70 WP (0.1%) + Tebuconazole (0.1%), Carbendazim (0.1%) + Tebuconazole (0.1%), Carbendazim (0.1%) + Dithane M-45 (0.2) and bioagent *Trichoderma harzianum* against the different fungal pathogen on *Aloe vera*.

Efficacy against *Alternaria alternata*

In an *in vitro* condition, It was revealed from the table 1. All the treatment were found to be significantly superior over control. The (T₂) Tebuconazole 0.2% + Dithane M-45 0.2%, (T₃) Propiconazol 70 WP 0.1%+ Dithane M-45 0.2%, (T₄) Propiconazole 70WP + Tebuconazole 0.2%, (T₅) Carbendazim 0.1% + Tebuconazole 0.2% were significantly superior over all the treatment with 100.00 per cent inhibition of the fungus followed by Carbendazim 0.01% + Dithane M-45 0.02% 71.07 per cent. The bioagent *Trichoderma harzianum* was found to be most effective with 64.03 per cent inhibition and 30.33 mm colony diameter over control. Similar results were concurrence with the findings of Tekade *et al.* (2009) [16] maximum inhibition was observed in propiconazole, Carbendazim + mancozeb observed 74.8 per cent and *Trichoderma harzianum* 42.6 % growth inhibition was observed. Panwar *et al.* (2013) [15] evaluated fungicide Tebuconazole (0.1%) were 100 per cent growth inhibition was observed, Mancozeb (0.2%) were 74.80 per cent growth inhibition and Carbendazim was observed 73.80 per cent growth inhibition was observed.

Table 1. Efficacy of different fungicides and bioagent against *Alternaria alternata* causing leaf spot of *Aloe vera*

Treatments	chemicals and bioagent	Concentration (%)	Mean diameter after 7 th day (mm)	Per cent growth inhibition
T ₁	Carbendazim + Dithane M-45	0.3	19.33	77.07
T ₂	Tebuconazole + Dithane M-45	0.4	0.00	100
T ₃	Propiconazol 70 WP+ Dithane M-45	0.3	0.00	100
T ₄	Propiconazole 70WP+ Tebuconazole	0.3	0.00	100
T ₅	Carbendazim + Tebuconazole	0.3	0.00	100
T ₆	<i>Trichoderma harzianum</i>	-	30.33	64.03
T ₇	Control	-	84.33	
	'F' test		Sig	
	SE(M) ±		0.79	
	CD (1%)		3.31	

Efficacy against *Curvularia lunata*

In an *in vitro* condition, It was revealed from the table 2. All the treatment were found to be significantly superior over control. The (T₂) Tebuconazole 0.2% + Dithane M-45 0.2%, (T₃) Propiconazol 70 WP 0.1%+ Dithane M-45 0.2%, (T₄) Propiconazole 70WP + Tebuconazole 0.2%, (T₅) Carbendazim 0.1% + Tebuconazole 0.2% were significantly superior over all the treatment with 100.00 per cent inhibition

of the fungus followed by Carbendazim 0.01% + Dithane M-45 0.02% 85.43 per cent. The bioagent *Trichoderma harzianum* was found to be most effective with 65.35 per cent inhibition and 29.33 mm colony diameter over control. Similar results were found with the Kithan and Daiho *et al.* (2013) [14] who evaluated bioagents and fungicides against *Curvularia lunata*, among these fungicides Carbendazim recorded 51.32 per cent growth inhibition was observed at

0.1% concentration and Mancozeb 64.62 was recorded at 0.2 % concentration and *Trichoderma harzianum* was showed

68.85 per cent growth inhibition.

Table 2: Efficacy of different fungicides and bioagent against *Curvularia lunata* causing leaf spot of *Aloe vera*

Treatments	Chemicals and Bioagent	Concentration (%)	Mean diameter after 7 th day (mm)	Per cent growth inhibition
T ₁	Carbendazim + Dithane M-45	0.3	12.33	85.43
T ₂	Tebuconazole + Dithane M-45	0.4	0.00	100
T ₃	Propiconazol 70 WP+ Dithane M-45	0.3	0.00	100
T ₄	Propiconazole 70WP+ Tebuconazole	0.3	0.00	100
T ₅	Carbendazim + Tebuconazole	0.3	0.00	100
T ₆	<i>Trichoderma harzianum</i>	-	29.33	65.35
T ₇	Control	-	84.67	
	'F' test		Sig	
	SE(M) ±		0.38	
	CD (1%)		1.59	

Efficacy against *Fusarium oxysporum*

In an *in vitro* condition, It was revealed from the table 3. All the treatment were found to be significantly superior over control. The (T₂) Tebuconazole 0.2% + Dithane M-45 0.2%, (T₃) Propiconazol 70 WP 0.1%+ Dithane M-45 0.2%, (T₄) Propiconazole 70WP + Tebuconazole 0.2%, (T₅) Carbendazim 0.1% + Tebuconazole 0.2% were significantly superior over all the treatment with 100.00 per cent inhibition of the fungus followed by Carbendazim 0.01% + Dithane M-

45 0.02% 82.67 per cent. The bioagent *Trichoderma harzianum* was found to be most effective with 65.35 per cent inhibition and 29.33 mm colony diameter over control. Similar results were concurrence with the finding Dar *et al.* (2013) evaluated fungicides Carbendazim recorded 80.5 per cent growth inhibition and Mancozeb 73.2 per cent growth inhibition was observed and Bardiari & Rai (2007) evaluated *Trichoderma harzianum* recorded 64.40 per cent mycelia growth inhibition.

Table.3. Efficacy of different fungicides and bioagent against *Fusarium oxysporum* causing basal rot and leaf rot disease of *Aloe vera*.

Treatments	Chemicals and Bioagent	Concentration (%)	Mean diameter after 7 th day (mm)	Per cent growth inhibition
T ₁	Carbendazim + Dithane M-45	0.3	14.67	82.67
T ₂	Tebuconazole + Dithane M-45	0.4	0.00	100
T ₃	Propiconazol 70 WP+ Dithane M-45	0.3	0.00	100
T ₄	Propiconazole 70WP+ Tebuconazole	0.3	0.00	100
T ₅	Carbendazim + Tebuconazole	0.3	0.00	100
T ₆	<i>Trichoderma harzianum</i>	0.3	32.00	62.05
T ₇	Control	-	84.33	
	'F' test		Sig	
	SE(M) ±		0.42	
	CD (1%)		1.76	

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