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Screening of fungicides against leaf spot of turmeric caused by *Colletotrichum capsici*

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Abstract

Fungicides are the most common mean for the management of leaf spot of turmeric crop caused by *Colletotrichum capsici* (syd.) Buttler and Bisby. Four fungicides viz., Sixer (Mancozeb 63% W.P. + Carbendazim 12% W.P.), Ridomil gold (Mancozeb 64% w/w + Metalaxyl-M 4% w/w), Carzim 50 (Carbendazim 50% W.P.) and Captab 20% W.P. were screened at 0.2% dose against the pathogen by paper disc method. Amongst the fungicides, Carbendazim 50% @ 0.2 percent showed maximum zone of inhibition (2.43cm) of mycelial growth of the pathogen. Effect of Mancozeb 63%+Carbendazim 12% showed zone of inhibition of 1.53cm in inhibiting the mycelial growth of *C. capsici* and was found next to Carbendazim 50% per cent. Captab 20% (1.34 cm) also showed effective results as compared to mancozeb 64% + metalaxyl-M 4% (0.83 cm) in inhibition of mycelia growth of *Colletotrichum* leaf spot of Turmeric.

Keywords: screening, fungicides, leaf spot, turmeric

1. Introduction

Turmeric (*Curcuma longa* L.) is one of the major spice crops of India belongs to the family Zingiberaceae which is commercially cultivated for its underground rhizomes. It is widely use as spice, dye, and cosmetic and in religious ceremony. India accounts for about 80 per cent of world turmeric production [1]. It ranks fourth in area and second in production. Turmeric is also one of the major spice crops of North Eastern hill region of India. In the region the cultivation of turmeric is undertaken as a cash crop mostly in jhum fields spread over the hills and tribal areas of the entire region. Apart from Improved varieties like Lakadong, Megha Turmeric-1 and a number of local cultivars are exist in northeastern region. The turmeric produced in this region is well known for its high contains of oleoresin and curcumin content.

Turmeric plant is highly prone to several fungal diseases. Among the fungal diseases, leaf spot caused by *Colletotrichum capsici* Syd. Butler and Bisby is the major fungal disease of turmeric resulting to huge losses of 25.83 to 62.12% fresh weight and 42.10 to 62.10% dry weight of mother and finger rhizomes, respectively [2]. The disease is also found to be prevalent in majority of turmeric growing areas of northeastern hill region especially in Manipur. It was found increasing and occurring regularly every year. It has become a major constraint in successful cultivation of turmeric in Manipur. Taking into consideration the economic importance of crop and seriousness of disease prevailing on turmeric, the presence investigation was undertaken to study on Screening of fungicides against leaf spot of turmeric caused by *Colletotrichum capsici*.

2. Material and Methods

2.1 Survey for incidence of diseases

Survey for disease incidence and severity of *Colletotrichum* and *Pestalotiopsis* leaf spot of Turmeric was done at three different district of Manipur viz. Chandanpokpi village of Chandel District, Noney area of Tamenglong district and at Langol area of Imphal west district were turmeric is mostly grown during the month of August to November, 2018

2.2 Isolation and maintenance of pathogen:

Infected leaves of turmeric showing typical symptoms of leaf spot were collected from three different district of Manipur. The fungus causing leaf spot of turmeric was isolated by hyphal tip culture method on Potato dextrose agar (PDA) medium. The pathogen was identified based on its mycelial and conidial characteristics following the standard mycological keys [3] and was maintained separately on PDA medium for further studies.

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2.3 Evaluation of fungicides against *C. capsici* isolate:

A total of four fungicides viz. Mancozeb 63%+Carbendazim 12%, Mancozeb 64% +Metalaxyl-M 4%, Carbendazim 50% and captab which had been reported earlier as effective against the test pathogen (*C. capsici*) by several research workers on different crops including turmeric was included in the present study. The relative efficacy of four recommended fungicides at 0.2 per cent was tested against the isolated pathogen *Colletotrichum capsici* *in vitro* condition by following paper disc method [4, 5, 6].

2.4 Paper disc method:

For paper disc method scraped the mycelial growth of *C. capsici* from 7 day old culture plate and mixed with cooled PDA medium under aseptic condition. Then a sterile filter discs (Whatman filter paper no. 1, 6 mm diameter) were impregnated with fungicide solutions and placed on the agar surface using sterilized forceps. These plates were incubated at 28 ± 1°C until the radial growth of control plate was fully

grown. Plates with filter paper discs without any fungicide served as control. Growth inhibition was assessed by the presence of inhibition zone around the filter paper disc. Diameter of inhibition zone was measured and compared with control.

3. Results

About 14.2% of Turmeric was recorded to be infected by leaf spot caused by *Pestalotiopsis* sp. in Chandanpokpi village of Chandel district while no incidence was recorded for *Pestalotiopsis* leaf spot in Noney area of Tamenglong district and at Langol area of Imphal west district. *Colletotrichum* leaf spot were found to be prevalence in all the area survey and was recorded to be the major foliar disease in all the area surveyed and maximum disease incidence of about 35.4% was recorded in Chandanpokpi village while 29.5% and 25.8% incidence were recorded in Noney area and at Langol area respectively.

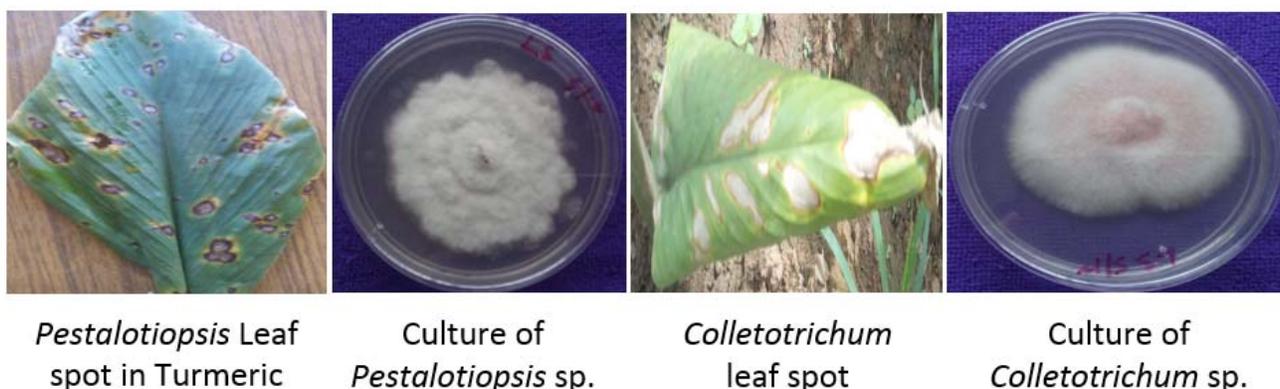


Fig 1

Among the four fungicides viz. Mancozeb 63%+Carbendazim 12%, Mancozeb 64% +Metalaxyl-M 4%, Carbendazim 50% and Captab screened by paper disc method (Table 1 and Plate 1). Carbendazim 50% per cent @ 0.2 per cent was found significantly effective in inhibiting the mycelial growth

(2.43cm) of the pathogen. Effect of Mancozeb 63%+Carbendazim 12% showed an inhibition zone of 1.53cm was found next to Carbendazim 50% percent. Inhibition zone recorded for Captab and Mancozeb64%+Metalaxyl-M4% was 1.33 cm and 0.83 cm, respectively.

Table 1: *In vitro* efficacy of fungicide against *C. Capsici* (Paper disc method)

Treatments	Formulations	Dose (%)	Inhibition zone (cm)*
Control		-	-
Sixer (Mancozeb 63%+Carbendazim 12%)	75% WP	0.2	1.53
Ridomil gold (Mancozeb 64% +Metalaxyl-M 4%)	68% WW	0.2	0.83
Carzim 50 (Carbendazim 50%)	50% WP	0.2	2.43
Captab	20% WP	0.2	1.33
SEm±			0.06
CD(P=0.05)			0.33

*Data are mean of three replication

4. Discussion

Fungicides are the most common tools for the management of diseases on various types of crops. *In vitro* testing of fungicides for Preliminary screening and evaluation of the effectiveness of any fungicides to control a specific fungal pathogen is very important. *In vitro* screening or preliminary evaluation of fungicides allows the researcher to distinguish effective from ineffective fungicides and, to select most appropriate fungicides for field study. *In vitro* fungicide screening is also important to determine the minimum or effective dose required to control the fungus, as well as to

detect fungicide resistance. *In-vitro* screenings have been widely implemented in previous studies to determine the efficacy of fungicides towards leaf spot disease of turmeric caused by *Colletotrichum capsici*.

The present study indicated that Carbendazim 50% @ 0.2 percent showed maximum zone of inhibition (2.43cm) of mycelial growth of the leaf spot of turmeric caused by *C. capsici*. Similar results were obtained by [7] who reported that the mycelial growth of *C. Capsici* (2.90cm) against causing leaf spot of turmeric. Carbendazim is having systemic activity acts by inhibiting fungal mitotic microtubule formation

resulting in inhibiting the fungal germ tube development and mycelial growth of *C. Capsici* [8, 9]. Effect of Mancozeb 63%+Carbendazim 12% with an inhibition zone of 1.53cm was found next to Carbendazim 50% [10]. reported that *in vitro* testing of mancozeb against leaf spot of turmeric caused by *C. capsici*, was not effective at 500 ppm, with only 42.96% mycelial growth inhibition, but it was effective at 1500 ppm, with 75% mycelial growth inhibition [11]. Examined the efficacy of different fungicides against *C. gloeosporioides* from mango and found that mancozeb was ineffective in inhibiting the mycelial growth (<40% inhibition). Inhibition zone recorded for Captab and Mancozeb64%+Metalaxyl-M4% was 1.33cm and 0.83cm, respectively. Mancozeb64%+Metalaxyl-M4% was not found effective in inhibiting the mycelial growth of *C. capsici*. This may be due to the fact that it is mostly effective against lower group of fungi (like oomycetes group) but *C. capsici* belongs to ascomycetes group [12]. Also evaluated *in vitro* some fungicides against *Colletotrichum capsici*, causing leaf-spot of turmeric and [13] against *C. Gloeosporioides* causing anthracnose of papaya. The fungicides found effective *in vitro* condition can be further tested under field condition [14].

5. Conclusions

From the study, Screening of fungicides against leaf spot of turmeric caused by *Colletotrichum capsici*, it can be concluded that Carbendazim 50% WP @ 0.2 per cent can effectively control the growth and development of *C. capsici*, the causal agent of leaf spot of turmeric. Through field study this result can further be tested.

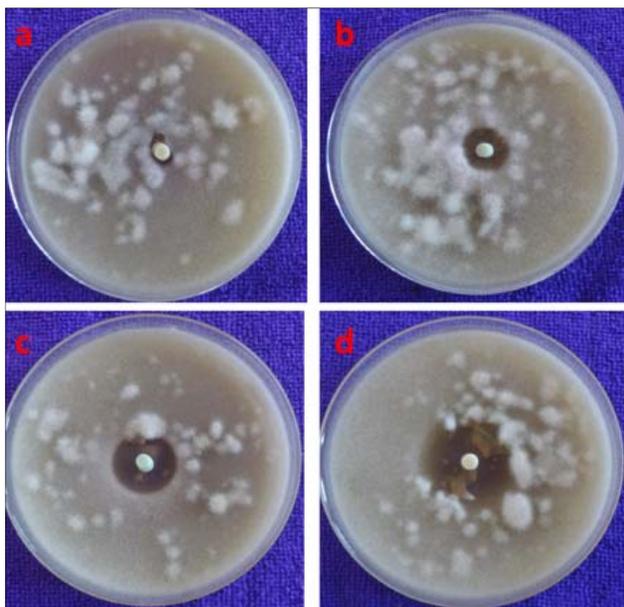


Plate 1: Efficacy of four fungicides against *Colletotrichum capsici*, a. Ridomil gold, b. Captab, c. Sixer and d. Carzim

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