



In-vitro Evaluation of Fungicides against Leaf Spot and Flower Blight of Marigold

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Marigold belonging to family Asteraceae, are most common in plant kingdom. It is an important commercial ornamental plant and garden flower. It is found in different colours and different fragrance. Yellow colour is most common. Leaf spot and flower blight is serious disease of marigold causing yield loss in crop. The present investigation was carried out with an objective to study the efficacy of new fungicides available in the market in *in-vitro* condition. Eleven fungicides such as azoxystrobin, tebuconazole, azoxystrobin + tebuconazole, difenoconazole, azoxystrobin + difenoconazole, tebuconazole + sulphur, wet sulphur, mancozeb, metalaxly, chlorothalonil, chlorothalonil + metalaxly were evaluated at the concentration of 0.1%, 0.15%, 0.1%, 0.1%, 0.1%, 0.15%, 0.25%, 0.3%, 0.2%, 0.3%, and 0.3% respectively. It has been found that combination of azoxystrobin + tebuconazole recorded mycelia growth inhibition of (97.30%) followed by tebuconazole + sulphur (95.95%) and Metalaxly of 95.05%. The least inhibition of 18.47% was recorded by wettable sulphur. Further the effectiveness of new fungicides may be tested under field condition against *Alternaria zinniae*.

Keywords: *Fungicides; marigold; alternaria; Odisha; azoxystrobin + tebuconazole.*

1. INTRODUCTION

Marigold (*Tagetes erecta L.*) is one of the most popular and important annual commercial plant growth for both private and commercial use throughout the year. The native of marigold is considered to be both the central and south America, especially Mexico.

It occupied prominent place in floriculture, both in area and production in comparison to other flower, marigold gained popularity amongst garden and flower dealers on account of its easy cultivation and widely adoptability to diverse soil and climatic condition. its habit of profuse flowering, wide spectrum of attractive colours, shape and size, good keeping quality and long shelf life attracted attention of flower growers. it is extensively used on religious and social function.

There are two categories of marigold. African marigold (*Tagetes erect L.*) and French marigold (*Tagetes patula L.*) Marigold flower and petals are of economic importance. flowers are sold loose in the form of garland [1] and its petals are used for decoration and extraction of xanthophyll pigment which has become one of the sources of edible colour of processing food product, for poultry feed and also used for extraction of oil which is used in perfume industry, also its oil acts as a repellent to flies (mainly *T. signata* and *T. Minuta*). Marigold flowers are useful in reducing inflammation, wound healing and as an antiseptic. historically, Marigold was used to treat various skin diseases, ranging from skin ulcerations to eczema internally. the soothing effects of marigold are used for stomach ulcers and inflammation. its intercropping has resulted in significant reduction of several phytosanitary problems in some crops and therefore, it is used in crop rotation as well as intercrop to control certain plant parasitic nematodes as trap crop [1]. Now a day's floriculture is a remunerative avocation for the rural peoples. The income received from a hectare of marigold cultivation is much more than the income either from cereal or pulse crops.

Marigold crop is affected by several diseases caused by fungi, bacteria, and viruses. Major fungal diseases of marigold are *Alternaria* leaf spot (*Alternaria tagetica*, *Alternaria zinnia* or *Alternaria alternata*) wilt or stem rot (*Phytophthora cryptogea*) damping off (*Rhizoctonia solani*), flower bud rot /flower blight (*Alternaria dianthi*)

powdery mildew (*Oidium sp.* And *leveillulataurica*) viral diseases are mosaic (cucumber mosaic virus) and aster yellows. among these diseases *Alternaria* leaf spot /blight incited by *Alternaria tagetica* /*Alternaria* [2] is an economically important and widely distributed disease of marigold and other flowering crops, causing considerable quantitative as well as qualitative losses.

The characteristics and diagnostic symptoms of disease are necrotic lesions on leaves initial chlorotic to brown spot (1-3 mm) which gradually enlarge and coalesce and later turn dark brown with brownish purple margins, spots dry after becoming perforated in the centre, resulting in early blight of affected leaves. similar lesions also develop on stem, pedicels, calyx and petals. plants have numerous lesions under moist conditions. marigold is attacked by *Alternaria* leaf spot / blight disease causing considerable reduction in yield and quality that affects market value of marigold flowers [2-4].

The yield losses in the range of 50 to 60 per cent [2,5] (Rantna and Shukla, 2002) and 100 per cent reduction in flower pigments due to *Alternaria* leaf spot by *Alternaria spp.* are reported [1,4,6].

2. MATERIALS AND METHODS

All the fungicides were tested at specified concentrations by adopting the poisoned food technique. The required concentrations of chemicals were prepared and incorporated into sterilized cooled potato dextrose agar medium [7].

Twenty ml of medium was poured into 90 mm sterilized Petri dishes and all plates inoculated with actively growing 5 mm mycelia disc of test fungus. Three replications were maintained for each treatment. These plates were incubated at 25±1 °C for seven days and then colony diameter was recorded. The per cent inhibition over control was calculated according to the formula given by Vincent (1947).

$$I = [(C - T) \times 100] / C$$

where,

I = Per cent inhibition of mycelium

C = Growth of mycelium in control

T = Growth of mycelium in treatment

Table 1. Different fungicides with their concentration

Sl. No.	Chemical name	Concentration (%)
T1	Azoxystrobin	0.1
T2	Tebuconazole	0.15
T3	Azoxystrobin+tebuconazole	0.1
T4	Difenoconazole	0.1
T5	Azoxystrobin+difenoconazole	0.1
T6	Tebuconazole +sulphur	0.15
T7	Wet sulphur	0.25
T8	Mancozeb	0.3
T9	Metalaxyl	0.2
T10	Chlorothalonil	0.3
T11	Chlorothalonil+metalxyl	0.3

3. RESULTS

It was seen from the Table 2 that azoxystrobin + tebuconazole recorded maximum mycelia growth

inhibition of 97.30% followed by tebuconazole + sulphur 95.95%. However, the both the fungicides are at par. wet sulphur recorded the least inhibition of 18.47%.

Table 2. In vitro bio-assay of fungicides

Sl. No.	Chemical name	Concentration	Growth inhibition (5%)
T1	Azoxystrobin	0.1	87.38
T2	Tebuconazole	0.15	58.11
T3	Azoxystrobin+tebuconazole	0.1	97.03
T4	Difenoconazole	0.1	81.98
T5	Azoxystrobin+difenoconazole	0.1	75.23
T6	Tebuconazole +sulphur	0.15	95.95
T7	Wet sulphur	0.25	18.47
T8	Mancozeb	0.3	64.41
T9	Metalaxyl	0.2	95.05
T10	Chlorothalonil	0.3	76.58
T11	Chlorothalonil+metalxyl	0.3	85.14
	CD	15.977	
	SE (M)	5.413	

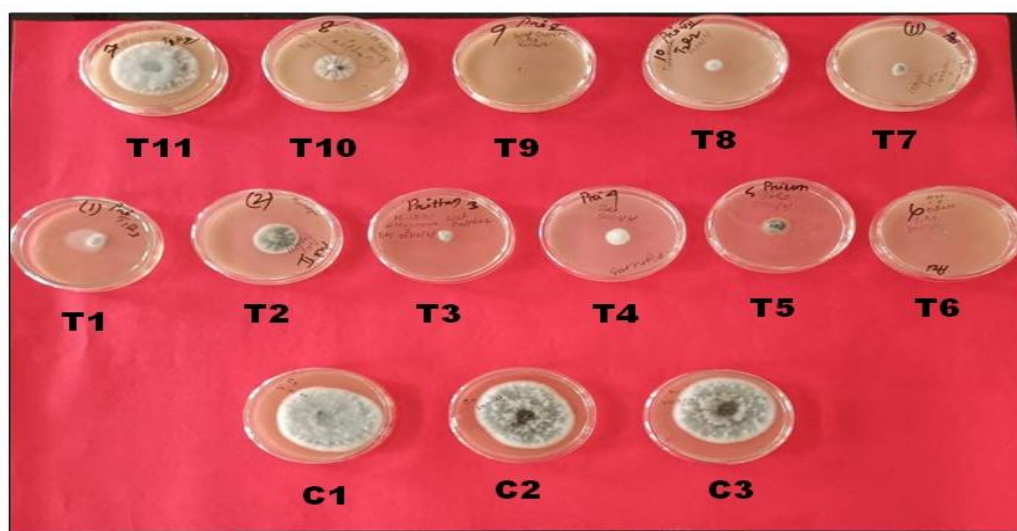


Fig. 1. In vitro bio-assay of fungicides

4. DISCUSSION

The percentage mycelial growth inhibition recorded with all the fungicides tested (azoxystrobin + tebuconazole , tebuconazole + sulphur , metalaxyl), however , azoxystrobin + tebuconazole ,sulphur + metalaxyl were most effective and recorded significantly highest mean mycelial growth inhibition (100.00%) the third and fourth fungicides were metalaxyl (87.38%) and difenconazole (81.98%) .rest of the fungicides also recorded significant inhibition of the test pathogen which ranged form 58.11% (tebuconazole) to 76.58% (Chlorothalonil).

5. CONCLUSION

The *in –vitro* study on the effect of fungicides on the mycelia growth of *Alternaria zinnia* revealed that azoxystrobin + tebuconazole (0.1%) recorded maximum inhibition (97.30%) followed by tebuconazole + sulphur (95.95%) followed by metalaxyl (95.05%). Wet sulphur recorded least inhibition (18.47%). These; fungicides may be trailed under field condition to know more about its efficacy against the pathogen so that it can be recommended in the farmer field condition.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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