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Efficacy of Phytoextracts and Essential Oils on the Growth Inhibition of *Fusarium oxysporum* Causing Blossom Blight of Marigold

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Abstract: *In an attempt to find out an economically disease management schedule against Fusarium oxysporum, the causal agent of blossom blight of marigold, 12 different phytoextracts as well as six essential oils were evaluated in two and three concentrations respectively. The leaf extract of Eucalyptus effected significantly highest inhibition (65.96-74.38%) of mycelial growth of the test fungus at both 10% and 20% concentrations over control closely followed by Lantana (60.92-64.47%). Clove oil at all the three concentrations (0.5, 0.75 and 1.0%) was significantly superior in inhibiting growth of test fungus to the tune of 100%.*

Keywords: *Phytoextract, essential oil, Fusarium oxysporum, blossom blight, concentration*

INTRODUCTION

Marigold is also known as the *Tagetes* and belongs to Asteraceae (Compositae) family, a genus that includes about 56 species with a mixture of annuals and perennials and is commercially grown worldwide for loose flowers, source of pigment for poultry feed, landscaping, and medicinal utilities. It has gained popularity because of its adaptability to wide range of soil and climatic conditions, longer blooming period and beautiful flower having long shelf-life. Although it is used to keep pests at bay, but still it is affected by several diseases like blossom blight (*Fusarium oxysporum*), Botrytis blight (*Botrytis cinerea)*, collar rot (*Phytophthora* sp., *Pythium* sp.), powdery mildew (*Oidium* sp., *Leveillula taurica*), flower bud rot (*Alternaria dianthi*), damping off (*Pythium* sp., *Rhizoctonia solani*), flower bud rot (*Alternaria dianthi*), bacterial leaf spot (*Pseudomonas syringae pv. tagetis)*, and a phytoplasmal disease *viz*., Aster yellows. Out of which, blossom blight is the most serious disease of marigold in commercial and home-yard plantings in Odisha and most parts of the world. Phytotoxicity and health hazards are the major consequences of indiscriminate use of chemical fungicides. Hence, the *in vitro* study was conducted to screen the efficacy of different plant extracts and essential oils in order to formulate an alternative, economical and eco-friendly approach for the disease management.

MATERIAL AND METHODS

The diseased flowers showing typical symptoms were collected from the garden maintained by Plant Pathology Department, OUAT, Bhubaneswar. The pathogen was isolated by following the technique of tissue isolation as described by (Riker and Riker, 1936). The infected samples were washed, cut into small bits and surface sterilized with 0.5% sodium hypochlorite for 2 minutes and then washed serially three times in sterile distilled water for 2 minutes each to remove the traces of surface disinfectant. Then the bits were aseptically transferred to sterile petriplates, containing potato dextrose agar medium (Peeled potato:200g, Dextrose: 20g, Agar-Agar: 20g, Distilled water: 1000ml). The petriplates were incubated at 25±1°C for 2-3 days. Pure culture of the fungus was obtained through subculturing. Fresh plant parts i.e. bulbs, leaves were collected from the field, washed and air dried for few minutes. 100 g of each sample was taken with equal amount water (1:1 w/v) and crushed using an electric mixer. The stock solution was prepared by filtering the extract through Whatman's filter paper followed by Seitz filter to prevent bacterial contamination. Pre-standardizing

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experiment was carried out with different concentrations for the essential oils to finalize the concentrations (0.5, 0.75 and 1.0%). The bio-efficacies of the test botanicals and the essential oils against the fungus were evaluated by poisoned food technique (Nene and Thapliyal, 1993). 10, 20 ml of stock solution was mixed with 90, 80 ml of sterile molten potato dextrose agar medium so as to get 10 and 20% concentrations respectively. They were homogenized and autoclaved at 10 psi. Similarly, the appropriate concentrations of oils were emulsified with Teepol @1ml/l, mixed with potato dextrose agar medium and autoclaved. Twenty ml of poisoned media per concentration was poured into separate sterile petridishes, each treatment being replicated thrice. Then 5 mm mycelial disc from the periphery of 8 day-old culture was placed at the middle of the poisoned media. One set of control was maintained without adding any plant extract. After inoculation, the plates were incubated at room temperature. Observations were recorded when the colony diameter in the control reached maximum. The per cent inhibition of the radial growth over the control was computed using the formula (Vincent, 1947):

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

where, I = Per cent inhibition (%)
C = Radial growth in control (mm)
T = Radial growth in treatment (mm)

RESULTS AND DISCUSSION

Among the test botanicals, Eucalyptus yielded the significantly highest inhibition (65.96% and 74.38%) of mycelial growth at 10% and 20% concentrations respectively over control, followed by *Lantana* (60.92% and 64.47%). It was also noticed that *Tridax* and garlic were ineffective in containing the mycelial growth satisfactorily over control (10.67% and 28.10%). The radial growth inhibition affected by the phytoextracts ranged from 10.67-74.38% at 20% concentration. This finding was in agreement with the finding of Tomar and Chandal, 2005 and Chohan *et al*. 2011 (Table 1). Clove oil at three different concentrations (0.5, 0.75 and 1.0%) was found to be significantly superior, inhibiting the radial growth to the tune of 100%. This finding was in agreement with the finding of Melo *et al*. 2013. However, the essential oils of Karanj, Eucalyptus, Neem, Castor and Olive were ineffective (14.91-38.75%) in restricting the mycelial growth even at 1% concentration (Table 2).

Table 1
Effect of phytoextracts on mycelial inhibition of *Fusarium oxysporum*

Sl.No	*Phytoextracts*	*Radial growth of the fungus (mm) 7 days after inoculation*		*Per cent growth inhibition*	
		10%	*20%*	*10%*	*20%*
T1	Neem	52.90	46.00	34.42	42.97
T2	Onion	42.22	30.33	47.66	62.40
T3	Eucalyptus	27.46	20.66	65.96	74.38
T4	Tridax	75.66	72.06	6.21	10.67
T5	Tulsi	50.99	40.00	36.79	50.41
T6	Garlic	63.80	58.00	20.91	28.10
T7	Karanj	43.55	36.19	46.01	55.13
T8	Pudina	37.32	35.55	53.73	55.93
T9	Bitter gourd	33.15	28.83	58.90	64.26
T10	Jamun	34.70	31.55	56.98	60.89
T11	Datura	41.11	35.75	49.03	55.68
T12	Lantana	31.52	28.66	60.92	64.47
T13	Control	80.67	80.67	-	-
CD (p=0.05)		3.54	2.68		

Table 2
Effect of essential oils on mycelial growth of *Fusarium oxysporum*

Sl.No.	*Oils*	*Radial growth of the fungus(mm) 7 days after inoculation*			*Per cent growth inhibition*		
		0.5%	*0.75%*	*1%*	*0.5%*	*0.75%*	*1%*
T1	Neem	71.50	64.68	51.75	10.63	19.15	35.31
T2	Karanj	64.67	49.00	44.25	19.16	38.75	44.68
T3	Clove	0.00	0.00	0.00	100.00	100.00	100.00
T4	Eucalyptus	68.00	56.55	48.54	15.00	29.31	39.32
T5	Olive	74.87	68.07	61.89	6.41	14.91	22.63
T6	Castor	69.66	65.10	56.61	12.93	18.63	29.23
T7	Control	80.00	80.00	80.00	-	-	-
CD (0.05)		2.14	2.11	2.10			

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