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Short Communication

Efficacy of Various Fungicides against Sugarcane Red Rot (*Colletotrichum falcatum*)

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ABSTRACT

Twelve fungicides were tested for control of sugarcane red rot disease (*Colletotrichum falcatum* Went.). In this test three fungicides; Benomyl 50 WP, Folicar and Radomil 75 WP completely (100%) inhibited the growth of fungus at 5, 10, 20 and 50 µg mL^{-1}. The complete inhibition (100%) was also obtained in case of Tilet 250 EC at a concentration of 20 and 50 µg mL^{-1}. Minimum mycelial growth inhibition was observed in case of Nimrod 25 EC at 5 µg mL^{-1} and gradual increase in inhibition was found with increase in concentration. None of other fungicides completely inhibited fungus growth of *C. Falcatum*. The results showed a significant increase in the inhibition of mycelial growth with an increase in fungicidal concentration of 5-50 µg mL^{-1} for all tested fungicides.

Key Words: Sugarcane; *Colletotrichum falcatum*; Red rot; Chemical control

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.), one of the most important cash crop of Pakistan, plays enormous role in the economy of Pakistan. It is grown in the tropical and subtropical regions of world. Due to its wide range of adaptability, it supplies more than 60% of world sugar and basic raw material for Pakistan sugar industry, which is second to textile industry in the country. Molasses are used for the synthesis of alcohol, biocompost etc., while bagasse is used as fodder for farm animals during the winter season, which helps alleviating the shortage of green fodder. Cane crushed material are used as fuel in Pakistan and its juice is very popular among people of Pakistan during the hot summer season. Besides producing a vast agro-industrial base, sugarcane is an important contributor sharing (3.5%) to Gross National Product (Government of Pakistan, 2007). Our sizeable population is also engaged in production and making allied bye-products.

The estimated area under sugarcane in Pakistan is 1029 thousand hectares with an annual production of 54752 thousand metric tones and average yield of 53.21 metric tones (Government of Pakistan, 2007). The per hectare yield in Pakistan is 53.21 metric tones, which is very low than many sugarcane growing countries like Columbia (133.38), Egypt (103.44), Australia (88.30), USA (76.17), Indonesia (70.04), Brazil (86.39), India (64.52), South Africa (59.28), China (58.39) and Thailand (95.24) (Government of Punjab, 1999).

Among various factors responsible for low yield, diseases are the major cause. Over 100 fungi, 10 bacteria, and 10 viruses and about 50 species of nematodes are pests of sugarcane in different parts of the world (Singh & Waraitch, 1981). Red rot, caused by *Colletotrichum falcatum* Went, is an important disease of sugarcane (interspecific hybrids of *Saccharum* L.), which cause severe losses in sucrose yield in many cane growing areas of the world (Singh & Singh, 1988, 1989). In Pakistan it has caused extensive damage in recent past and got the status of the most destructive and an important hazard in the cultivation of sugarcane (Chaudhry *et al.*, 1999).

The endless struggle between varieties and the complexity of disease have led to the development of correspondingly a variety of approaches for control. Fungicides are often a vital part of disease management as they control many diseases satisfactorily (McGrath, 2004). The role of fungicides in modernizing and changing the condition of agriculture is quite significant (Mehta, 1971). The main objective of present studies was to find out comparative efficacy and specificity of the fungicides against the *C. falcatum* Went. to obtain economical control of this disease.

MATERIALS AND METHODS

In this study, twelve fungicides were used to evaluate their comparative fungitoxicity against mycelial growth of *Colletotrichum falcatum* Went. at the concentration levels of 5, 10, 20 and 50 µg mL^{-1}. The

fungicides used were Nimrod 25 EC, Score 250 EC, Topas 100 EC, Beam 75 WP, Spotless 12.5 WP, Tilet 25 EC, Captan 100 WP, Sandofan 60 WP, Rubigan 12 EC, Benomyl 50 WP, Folicar and Radomil 75 WP.

Fungicidal concentrations were prepared by adding measured quantity of stock solution to the Potato Dextrose Agar medium autoclaved at 1.7 kg cm^{-2} for 15 min. PDA cooled at about 40°C without fungicides served as check. Four culture plates (90 cm) were poured with PDA for each treatment. After the agar medium has solidified, 3 mm agar plugs containing mycelium of *C. falcatum* Went. were cut from the culture plates using sterilized cork borer and were placed in the centre of each agar plate.

These plates were incubated at 30 ± 2°C. The diameter of mycelium growth was recorded after 168 h of incubation. Percent inhibition of *C. falcatum* Went. colonies in each treatment was recorded over the control and calculated by using the following formula:

$$\text{Inhibition of } C.\ falcatum = \frac{\text{Colony Growth in Control} - \text{Colony Growth in treatment}}{\text{Colony Growth in control}} \times 100$$

The data were analyzed by simple Factorial Design (Steel *et al.*, 1996) with four replications was used to determine the difference between individual treatments i.e., fungicide and their doses.

RESULTS AND DISCUSSION

Fungicides are specific in their action and specificity for various genus and species. Analysis of variance showed significant difference in the effectiveness of all tested fungicides, their doses and the interaction between doses and fungicides for the suppression of radial growth of *C. falcatum*.

Fig. 1. Diagrammatical presentation of fungicides and their dose effect on mycelial growth of *Colletotrichum falcatum*

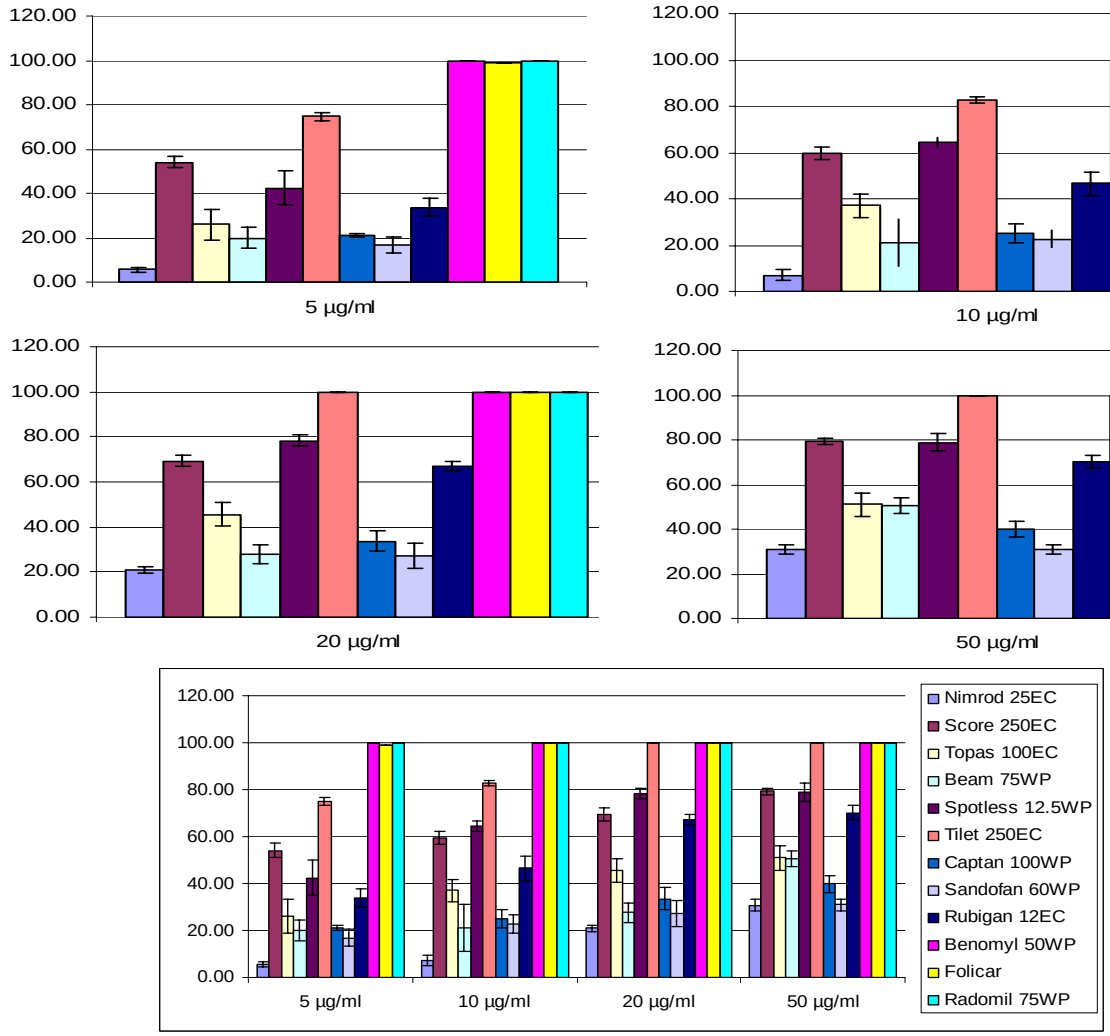

Table I. Effect of different fungicides and their doses on mycelial growth of *Colletotrichum falcatum*

Fungicides	Percent inhibition at different concentrations of Fungicides				
	5 µg mL^{-1}	10 µg mL^{-1}	20 µg mL^{-1}	50 µg mL^{-1}	Mean
Nimrod 25EC	5.78pq	7.08pq	20.92no	30.81klmno	16.15h
Score 250EC	54.16fgh	59.54efg	69.36bcde	79.19bc	65.56c
Topas 100EC	26.01lmno	36.99ijklm	45.66hij	50.98ghi	41.91e
Beam 75wp	19.94no	21.10no	27.75lmno	50.58ghi	29.84f
Spotless 12.5wp	42.49hijk	64.45def	78.32bc	78.84bc	66.03c
Tilet 250EC	74.86bcd	82.66b	100a	100a	89.38b
Captan 100wp	21.10no	25.14lmno	33.53jklmn	39.88ijkl	29.91f
Sandofan 60wp	16.76op	22.54mno	27.17lmno	30.92klmno	24.35g
Rubigan 12EC	33.82jklmn	46.53hij	67.05cde	70.23bcde	54.41d
Benomyl 50wp	100a	100a	100a	100a	100a
Folicar	100a	100a	100a	100a	100a
Radomil 75wp	100a	100a	100a	100a	100a
Mean	49.48d	56.06c	63.91b	69.64a	

CV- 11.60%

Among fungicides under investigation Benomyl 50 WP, Radomil 75 WP and Folicar were found to be most effective in suppressing the radial growth of fungus with 100% inhibition at all concentrations i.e., 5, 10, 20, 50 µg mL^{-1}. While Tilet 250 EC completely suppressed the radial growth of *C. falcatu* at 20, 50 µg mL^{-1} but not at 5, 10 µg mL^{-1} (Table I), whereas no other fungicide gave complete (100%) suppression at any concentration. Nimrod 25 EC was the least effective, which gave 5.78% suppression at 5 µg mL^{-1}.

In case of 10 µg mL^{-1} concentration, minimum inhibition (7.08%) was observed in Nimrod and maximum (100%) in Benomyl 50 WP, Folicar and Radomil 75 WP. A progressive increase in percent inhibition on radial growth of pathogen was observed with increase in the concentration of all the fungicides (Table II).

Benomyl 50 WP, Folicar and Radomil 75 WP were at par in controlling mycelial growth of *C. falcatum* Went. at 5, 10, 20, and 50 µg mL^{-1} and Tilet 250 EC at 20and 50 µg mL^{-1} indicating maximum control, where as Nimrod 25 EC, Sandofan 60 wp and Captan have minimum control of mycelial growth at 5, 10, 20 and 50 µg mL^{-1} (Table I). Lopez-Herreraand Zea – Bonilla (2006) found Benomly, carbendazim and thiophanate methyle at 05 µg mL^{-1} totally inhibited mycelial growth of *Rosellinia necatrix*, at 0.1 µg mL^{-1}, carbendazim and fluazinam inhibited growth by 97% and 84%, respectively in comparison with fungicide-free medium, while Benomyl and thiophanate methyl were found to be less effective (53% & 22%, respectively) 0.1 µg mL^{-1}.

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