

Bio-efficacy and phytotoxicity study of pyraclostrobin 133g/l + epoxyconazole 50 g/l SE(Opera 18.3% SE) against Sigatoka leaf spot disease of banana caused by *Mycosphaerella musicola*

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ABSTRACT

Two to three sprays of pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3%)@0.15% effectively controlled the Sigatoka leaf spot disease but this treatment was as par with propiconazole 0.1 per cent. The next best treatments were pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3%)@0.125% and epoxyconazole 7.5%EC. With regard to yield, the treatment propiconazole @ 0.1 % recorded the highest yield of 31.94 t/ha followed by pyraclostrobin 13.3% + epoxyconazole 5% @0.15% (29.95 t/ha) and it was lowest in control. Phytotoxicity symptoms like chlorosis, necrosis, wilting, scorching, hyponasty and epinasty were not noticed in any of the treatments.

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INTRODUCTION

Banana is one of the important tropical fruit crop. Banana and plantain are grown mostly by small holder producers and play an important socio-economic role in many developing countries of the tropics. They are particularly well suited for intercropping and mixed farming system. They are major importance to food security as well as providing a valued source of income through local and international trade. In terms of gross value of production, banana and plantains are the fourth most important global food crop after rice, wheat and corn and is produced in tropical and subtropical regions of

developing economics. In India, banana crop is well suited in the regions of humid tropics to humid sub tropics and semiarid subtropics and from the sea level upto an elevation of 1500 m above mean sea level. The cultivation of banana has also been extended where ever the water sources are available. It is one of the important fruit crop, as it is the source of regular income for small and marginal farmers and the crop is good responds to management system. Banana crop is affected by many diseases caused by fungi, bacteria, viruses and nematodes. Sigatoka leaf spot is one of the most widespread diseases of banana. The disease occurs in all parts of the world wherever banana is cultivated. Hence, the present

investigation was undertaken to find out the effective measures for the management of Sigatoka leaf spot disease.

MATERIAL AND METHODS

An experiment was conducted during 2013-15 at K.R.C. College of Horticulture, Arabhavi, Gokak Tq, Belgaum district (UHS, Bagalkot). There were eight treatments viz., T₁ Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3% SE) 0.1%, T₂ - Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3% SE) 0.125%, T₃ Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3% SE) 0.15%, T₄ epoxyconazole 7.5% EC (Opus 7.5% EC) 0.2%, T₅ Pyraclostrobin 20% WG (Headline) 0.1%, T₆ Propiconazole 0.1%, T₇ Mancozeb 75% WP 0.2% and control. Each treatment was replicated three times in a Randomized Block Design. Susceptible cultivar Rajapuri (AAB) was planted in the month of November 2013 with a spacing of 1.8 x 1.8m. Crop received recommended dose of fertilizer (Anonymous, 2010). Spraying was taken when the disease was observed on few plants. Totally two and three sprays were taken for plant crop and I ratoon crop, respectively. Observations were recorded with respect to Sigatoka leaf spot index at different intervals. A 0-6 scale was followed for scoring the disease index (Gauhl *et al.*, 1993).

where, 0= No symptoms

1= Less than 1 per cent of lamina with symptoms

(only streaks and/ or upto 10 spots)

2=1 to 5 per cent of lamina with symptoms

3=6 to 15 per cent of lamina with symptoms

4=16 to 33 per cent of lamina with symptoms

5=34 to 50 per cent of lamina with symptoms

6=51 to 100 per cent of lamina with symptoms

Observations were also recorded with pertaining to yield parameters viz., bunch length, bunch width, hands/bunch, number of fingers in 3rd hand, fruits/bunch, bunch weight (kg/plant), yield (t/ha) and phytotoxicity.

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under the following heads:

Per cent disease index (PDI) :

Results of the plant crop revealed that, the treatment

pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3% SE) @ 0.15% effectively controlled the Sigatoka leaf spot disease (6.59% as against 28.45% in control) followed by epoxyconazole 7.5% EC (Opus 7.5% EC) (9.43%), pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3% SE) @ 0.125% (10.77%) and pyraclostrobin @ 0.1% (11.39%). However, the treatment pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3% SE) @ 0.15% was found effective but this treatment was at par with standard check *i.e.*, propiconazole 0.1% (4.38%). After II spray, the treatment pyraclostrobin 13.3% + epoxyconazole 5% @ 0.15% effectively controlled the disease (10.87%) but this treatment was at par with propiconazole @ 0.1% (9.38%). The next best treatments were epoxyconazole 7.5% EC @ 0.2% (15.37% as against 50.18% in untreated control) and pyraclostrobin 13.3% + epoxyconazole 5% @ 0.125% (18.86%). The highest disease intensity (50.18%) was recorded in control (Table1). West (1983) reported that Tilt (propiconazole) gave good control of leaf spot (*Mycosphaerella musicola*). Suharban (1977) studied about the control aspect of leaf spot disease of banana with different fungicides and found that 1 per cent mineral oil (power oil) was effective in controlling leaf spot disease followed by carbendazim (0.1%) and captafol (0.3%).

Results of I Ratoon crop revealed that, the treatment propiconazole @ 0.1% effectively controlled the Sigatoka leaf spot disease (4.35% as against 34.91% in control) followed by pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3% SE) @ 0.15% (7.76% as against 34.91% in control), epoxyconazole (Opus 7.5% EC) 0.2% (8.19%) and pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3% SE) @ 0.125% (8.23%). After II spray, the treatment pyraclostrobin 13.3% + epoxyconazole 5% @ 0.15% effectively controlled the disease (13.99%) but this treatment was at par with propiconazole @ 0.1% (11.24%). The next best treatments were epoxyconazole 7.5% EC @ 0.2% (17.32% as against 49.19% in untreated control) and pyraclostrobin 13.3% + epoxyconazole 5% @ 0.125% (18.09%). After III spray, three sprays of pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3% SE) @ 0.15% at 15 days interval effectively controlled the Sigatoka leaf spot disease (11.65% as against 58.37% in control) but this treatment was at par with propiconazole @ 0.1% (9.29%). The next best treatments were epoxyconazole (Opus 7.5% EC) 0.2% (16.88%), pyraclostrobin 13.3% +

epoxyconazole 5% (Opera 18.3% SE) @ 0.125% (17.51%) and pyraclostrobin 13.3% + epoxyconazole 5% @ 0.1% (22.21%) and pyraclostrobin @ 0.1% (25.87%) Klein (1960) reported that Texaco 522 oil applied to yellow streaks halted further development in to spots, the effectiveness of the oil lasted no more than 24 hours under field conditions. Ramsey *et al.* (1987) reported that propiconazole (100g ai/ha) applied alone reduced the severity of leaf spot.

Phytotoxicity :

Phytotoxicity symptoms like chlorosis, necrosis,

wilting, scorching, hyponasty and epinasty were not noticed in any of the treatments (Table 2).

Yield parameters :

In plant crop, the treatment propiconazole @ 0.1% recorded the maximum bunch length (46.78cm) followed by pyraclostrobin 13.3% + epoxyconazole 5% @0.15% (44.94cm), pyraclostrobin 13.3% + epoxyconazole 5% @0.125% (44.22cm) and pyraclostrobin@0.1% (43.78 cm). While in I ratoon crop, the treatment propiconazole @ 0.1% recorded the maximum bunch length (44.36cm) followed by pyraclostrobin 13.3% + epoxyconazole 5%

Table 1 : Bio- efficacy and phytotoxicity of opera 18.30 per cent SE (pyraclostrobin 133g + epoxyconazole 50g/l SE) against Sigatoka disease of banana

Tr. No.	Treatments	Conc. (%)	PDI							
			After I st spray			After II nd spray			After III rd spray	
			PC	IR	Mean	PC	IR	Mean	IR	
T ₁	Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3%SE)	0.1	13.05 (21.16)	8.75 (16.79)	10.90 (18.98)	22.20 (28.09)	22.51 (28.32)	22.36 (28.21)	22.21 (28.13)	
T ₂	Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3%SE)	0.125	10.77 (19.13)	8.23 (16.49)	9.50 (17.81)	18.86 (25.69)	18.09 (25.16)	18.48 (25.43)	17.51 (24.70)	
T ₃	Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3%SE)	0.15	6.59 (16.06)	7.76 (15.95)	7.18 (16.01)	10.87 (19.09)	13.99 (21.92)	12.43 (17.55)	11.65 (19.90)	
T ₄	Epoxyconazole 7.5% EC (Opus 7.5%EC)	0.2	9.43 (17.54)	8.19 (16.39)	8.81 (16.97)	15.37 (23.06)	17.32 (24.58)	16.35 (23.82)	16.88 (24.41)	
T ₅	Pyraclostrobin 20% WG (Headline)	0.1	11.39 (19.68)	15.70 (23.30)	13.55 (21.49)	23.28 (28.84)	24.40 (29.12)	23.84 (28.98)	25.87 (30.56)	
T ₆	Propiconazole 0.1%	0.1	4.38 (11.98)	4.35 (11.96)	4.37 (11.97)	9.38 (17.85)	11.24 (19.51)	10.31 (18.68)	9.29 (17.68)	
T ₇	Mancozeb 75% WP 0.2%	0.2	16.81 (24.19)	17.87 (24.92)	17.34 (24.56)	27.60 (31.71)	29.08 (32.43)	28.34 (32.07)	28.29 (32.09)	
T ₈	Control	-	28.45 (31.65)	34.91 (36.18)	31.68 (33.92)	50.18 (45.15)	49.19 (44.34)	49.69 (44.75)	58.37 (49.85)	
	S.E.±		2.43	1.98		1.08	2.35		1.25	
	C.D. (P=0.05)		7.38	6.01		3.26	7.12		3.80	

Figures in the parenthesis are the angular transformation values

Table 2 : Table showing data on phytotoxicity

Sr. No.	Treatments	Conc. (%)	Days of observation				
			1	3	5	7	10
1.	Pyraclostrobin 13.3g/l + epoxy conazole 50 g/l SE (Opera 18.3%SE)	0.15	0	0	0	0	0
2.	Pyraclostrobin 13.3g/l + epoxyconazole 50g/l SE (Opera 18.3% SE)	0.30	0	0	0	0	0
3.	Untreated control	-					

Table 3 : Bio-efficacy of opera 18.30 per cent SE (Pyraclostrobin 133g + epoxyconazole 50 g/l SE) against Sigatoka leaf spot disease of banana: yield parameters

Tr. No.	Treatments	Conc. (%)	Bunch length(cm)			Bunch width(cm)			Hands/bunch		
			PC	IR	Mean	PC	IR	Mean	PC	IR	Mean
T ₁	Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3%SE)	0.1	42.44	39.67	41.06	35.89	32.00	33.95	7.0	7.22	7.11
T ₂	Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3%SE)	0.125	44.22	41.78	43.00	36.06	36.22	36.14	7.28	7.56	7.42
T ₃	Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3%SE)	0.15	44.94	42.56	43.75	37.36	36.33	36.85	7.53	7.67	7.60
T ₄	Epoxyconazole 7.5% EC (Opus 7.5%EC)	0.2	42.34	42.56	42.45	34.67	35.44	35.06	7.33	7.61	7.47
T ₅	Pyraclostrobin 20% WG (Headline)	0.1	43.78	40.89	42.34	36.81	34.67	35.71	7.47	7.44	7.46
T ₆	Propiconazole	0.1	46.78	44.36	45.57	37.22	35.89	36.56	7.67	8.06	7.87
T ₇	Mancozeb 75% WP	0.2	42.03	39.05	40.54	35.33	33.95	34.64	7.39	7.19	7.29
T ₈	Control	-	38.17	35.17	36.67	32.25	30.50	31.38	6.94	6.70	6.82
	S.E. ±		1.50	1.70			1.52			0.19	
	C.D. (P=0.05)		4.54	NS		NS	NS		NS	0.57	

Table 3 : Contd.....

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Tr. No.	Treatments	Conc. (%)	No. of fingers in 3 rd hand			Fruits/bunch		
			PC	IR	Mean	PC	IR	Mean
T ₁	Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3%SE)	0.1	11.55	11.67	11.62	82.44	79.00	80.72
T ₂	Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3%SE)	0.125	12.36	12.56	12.46	94.53	92.22	93.38
T ₃	Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3%SE)	0.15	12.36	13.00	12.68	96.50	97.33	96.92
T ₄	Epoxyconazole 7.5% EC (Opus 7.5%EC)	0.2	12.44	12.78	12.61	88.44	89.17	88.81
T ₅	Pyraclostrobin 20% WG (Headline)	0.1	12.42	12.56	12.49	92.97	84.44	88.71
T ₆	Propiconazole	0.1	13.44	14.06	13.75	98.00	98.44	98.22
T ₇	Mancozeb 75% WP	0.2	12.30	12.31	12.31	85.97	80.67	83.32
T ₈	Control	-	11.72	11.36	11.54	77.55	69.67	73.61
	S.E. ±		0.34	0.30		2.67	4.36	
	C.D. (P=0.05)		1.02	0.92		8.10	13.22	

NS= Non-significant

Table 4 : Bio-efficacy and phytotoxicity of opera 18.30 per cent SE (pyraclostrobin 133g + epoxyconazole 50g/l SE) against Sigatoka disease of banana

Sr. No.	Treatments	Conc. (%)	Yield					
			Kg/plant			t/ha.		
			PC	IR	Mean	PC	IR	Mean
T ₁	Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3%SE)	0.1	7.79	7.61	7.70	24.03	23.49	23.76
T ₂	Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3%SE)	0.125	9.22	9.17	9.20	28.46	28.30	28.38
T ₃	Pyraclostrobin 13.3% + epoxyconazole 5% (Opera 18.3%SE)	0.15	9.61	10.00	9.81	29.66	30.24	29.95
T ₄	Epoxyconazole 7.5% EC (Opus 7.5%EC)	0.2	9.00	8.79	8.90	27.77	27.14	27.46
T ₅	Pyraclostrobin 20% WG (Headline)	0.1	8.97	8.49	8.73	27.68	26.19	26.94
T ₆	Propiconazole 0.1%	0.1	10.11	10.59	10.35	31.20	32.67	31.94
T ₇	Mancozeb 75% WP 0.2%	0.2	7.25	7.11	7.18	22.37	21.93	22.15
T ₈	Control	-	6.21	5.92	6.07	19.17	18.27	18.72
	S.E.±		0.38	0.25		1.19	0.84	
	C.D. (P=0.05)		1.16	0.76		3.60	2.54	

@0.15% (42.56cm), pyraclostrobin 13.3% + epoxyconazole 5% @0.125% (41.78cm) and pyraclostrobin @0.1% (40.89cm). The bunch length was lowest (35.17 cm) in control. With regards to bunch width in plant crop, the maximum bunch width (37.36 cm) was recorded in the treatment of pyraclostrobin 13.3% + epoxyconazole 5% @0.125% and propiconazole @0.1% (37.22 cm) and it was lowest in control (32.25 cm). In I ratoon crop, The maximum bunch width (36.33 cm) was recorded in the treatment of pyraclostrobin 13.3% + epoxyconazole 5% @0.15% and it was lowest in control (30.50 cm).

With regards to number of hands/bunch was more (7.67) in the treatment of propiconazole @0.1% followed by pyraclostrobin 13.3% + epoxyconazole 5% @0.15% (7.53) and pyraclostrobin @0.1% (7.47). while in Ist ratoon crop, the number of hands/bunch was more (8.06) in the treatment of propiconazole @0.1% followed by pyraclostrobin 13.3% + epoxyconazole 5% @0.15% (7.67) and epoxyconazole @0.2% (7.61). The number of fingers in third hand was maximum (13.44) in the treatment of propiconazole @0.1% followed by epoxyconazole @0.2% (12.44) and it was lowest in control (11.72) in plant crop. While in I ratoon crop, the number of fingers in third hand was maximum (14.06) in the treatment of propiconazole @0.1% followed by pyraclostrobin 13.3% + epoxyconazole 5% @0.15% (13.00) and it was lowest in control (11.36). The number of fruits/bunch was the highest (98.0) in the treatment of propiconazole @0.1% followed by pyraclostrobin 13.3% + epoxyconazole 5% @0.15% (96.50) and pyraclostrobin 13.3% + epoxyconazole 5% @0.125% (94.53) in plant crop (Table 4). The number of fruits/bunch was the highest (98.44) in the treatment of propiconazole @0.1% followed by pyraclostrobin 13.3% + epoxyconazole 5% @0.15% (97.33) and pyraclostrobin 13.3% + epoxyconazole 5% @0.125% (92.22) in Ist ratoon crop (Table 3).

Yield (kg/plant) :

With regards to yield, the bunch weight was the highest (10.11 kg/plant) in the treatment of propiconazole @ 0.1% followed by pyraclostrobin 13.3% + epoxyconazole 5% @0.15% (9.61kg/plant), pyraclostrobin 13.3% + epoxyconazole 5% @0.125% (9.22 kg/plant), epoxyconazole@0.2% (9.0 kg/plant), pyraclostrobin @0.1% (8.97 kg/plant) and pyraclostrobin 13.3% +

epoxyconazole 5% @0.1% (7.79 kg/plant). The lowest yield was recorded in control (6.21 kg/plant) in plant crop (Table 3). In I ratoon crop, the bunch weight was the highest (10.59 kg/plant) in the treatment of propiconazole@0.1% followed by pyraclostrobin 13.3% + epoxyconazole 5% @0.15% (10.0 kg/plant), pyraclostrobin 13.3% + epoxyconazole 5% @0.125% (9.17 kg/plant) and epoxyconazole@0.2% (8.79 kg/plant). The lowest yield was recorded in control (5.92 kg/plant) (Table 4).

Yield (t/ha) :

In plant crop, the treatment propiconazole@0.1% recorded the highest yield of 31.2 t/ha followed by pyraclostrobin 13.3% + epoxyconazole 5% @0.15% (29.66 t/ha), pyraclostrobin 13.3% + epoxyconazole @0.125% (28.46 t/ha), epoxyconazole@0.2% (27.77 t/ha) and pyraclostrobin@0.1% (27.68 t/ha). The lowest yield (19.17 t/ha) was obtained in the treatment of control. While in I ratoon crop, the treatment propiconazole @0.1% recorded the highest yield of 32.67 t/ha followed by pyraclostrobin 13.3% + epoxyconazole 5% @0.15% (30.24t/ha), pyraclostrobin 13.3% + epoxyconazole @0.125% (28.30 t/ha), epoxyconazole @0.2% (27.14 t/ha) and pyraclostrobin @0.1% (26.19 t/ha). The lowest yield (18.27 t/ha) was obtained in the treatment of control. Ramsey *et al.* (1987) reported that propiconazole (100g ai/ha) applied alone reduced the severity of leaf spot and bunch weights increased as compared with control.

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