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In Vitro Assessment of Two Systemic Fungicides Against the Mango Pathogen of Malda, West Bengal, India

KEYWORDS: Mango, Pathogen, Fungicides, Malda.

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ABSTRACT

The aim of this study is to highlight on the use of systemic fungicides (Carbendazim, Mancozeb) toprevent the damage of mango by various fungal pathogen of mangoes and help for better Mango production in Malda. At first, nine fungal organisms (Alternaria sp., Colletotrichum sp., Curvularia sp., Penicilium sp., Fusarium sp., Aspergillus sp.,) are culturedin slants. Concentration of two fungicides namely Mancozeb & Carbendazim are prepared which contain 25 µg/ml weighted Mancozeb & 10µg/ml carbedazim. Mancozeb conc. are control (0), 500, 1500, and 2500. & Carbendazim conc. are control (0), 10,100,1000. Firstly 9 ephendroff tubes are taken. Then in each tube water and mixture of fungicides are poured. In another nine tubes spore suspension are prepared with help of water of the fungal organism. Then I take four groove slides for each fungicide that's mean for each fungal organism's eight groove slides are used. The results shown under electron microscope under 10X that in 0 concentration many germ tubes are formed but in case of Carbendazim 0-1000 concentration germ tubes are increased and incase of Mancozeb 0-2500 concentration germ tubes are decreased.

INTRODUCTION: Mango *(Mangiferaindica* L.) is an important commercial fruit plant of Indo-Pak sub continent and is known to be cultivated for the last 4000-6000 years (Decamdole, 1884, Hill, 1952). It is one of the most important fruit crops and is called "king of fruits". It is the 2nd major fruit crop both in area and production in India. It is grown on an area of 156570 hectares with annual production of 1753907 tons of fruit (Anonymous, 2005-06). Although soil and climatic condition are suitable in India particularly in Punjab and Sindh, diseases are some of the significant causes leading to its low production. Its production remains hampered due to a number of diseases at all stages of development i.e. from nursery to the consumption of fruits and it is estimated that production could be increased by 28% if the crop is protected against various diseases (Rawal, 1998). Among infectious diseases a new disease commonly known as Quick Decline, but technically Collar/Stem rot, has proved to be the most destructive one causing sudden death of plants within days (Mehmood and Gill, 2002, Sial, 2002). The main and visible symptom is sudden collapse of healthy looking trees in days (Ellis, 1997). Lima *et al* 1998 concluded black root rot as the cause of sudden wilt of mango canopies and observed blackened decay giving unpleasant putrid odor from the roots of infected tree due to presence of fungal pathogens. The decline symptoms have been attributed to a variety of different abiotic but mostly biotic agents. However it is not a contradictory problem now a days because *Botryodiplodiatheobromae* fungus considered as the principal responsible for decline problem in many regions (Al-Adawi*et al.,* 2003, Iqbal *et al* 2004, Malik *et al*; 2005 and Al-Adawi*et al.,* 2006) and it enhanced by beetle (*Xyleborusaffin is*), relative humidity above 80% and temperature of 25-31 °C (Rawal, 1998). The pathogen first starts to rot the bark at one point then progresses and finally engulfs the whole stem leading to the plant death (Malik *et al*, 2003). Growers are perturbed over this fatal disease as its incidence in some areas is 7.51 % (Iqbal *et al* 2007) which is highly alarming for future of this precious fruit. Due to the complexity of this emerging threat, it is paramount to undertake investigation in all possible ways on management of this disease.

MATERIALS AND METHODS: At first in for slants four fungal organisms (*Alternaria sp., Colletotrichum sp., Curvularia sp., Penicilium sp., Fusarium sp., Aspergillus sp.,)* are cultured in B.O.D. incubator for seven days, then concentration of two fungicides namely Mancozeb & Carbendazim are prepared which contain 25 µg/ml weighted Mancozeb & 10µg/ml carbedazim. Mancozeb conc. are control (0), 500, 1500, and 2500. & Carbendazim conc. are control (0), 10,100,1000. Firstly 9 ephendroff tubes are taken. Then in each tube water and mixture of fungicides are poured. In another four tubes spore suspension are prepared with help of water of the fungal organism. Then I take four groove slides for each fungicides that's mean for each fungal organism's eight groove slides are used. Like same process another five fungal organisms *(Alternaria alternate, Colletrichum gloesporoides, Colletrichum lindemuthianum, Aspergillus fumigatus, Fusarium moniliforme)* groove slides are prepared.Then under electron microscope under 10X I can see that in 0 conc. Many germ tubes are formed. Then in case of Carbendazim 0-1000 concentration germ tubes are increased and incase of Mancozeb 0-2500 concentration germ tubes are decreased. Then with help of digital camera we collect the pictures of these groove slides. Where spores and germ tubes are exists. Finally I count the germ tubes and spores and formed the result sheets.

RESULT & DISCUSSION:

Name of the target organism	Fungicide: Carbendazim concentration (µg/ml)	Field of observations			Statistical data		
		field 1	field 2	field 3	mean	SD	SE (±)
Alternariaalternata (MTCC-8459)		19 (30)	9 (10)	9 (14)	12.33 (18)	12.80 (43.04)	7.40 (24.88)
Alternaria sp.		4 (42)	3 (22)	10 (88)	5.66 (50.66)	35.74 (632.14)	16.25 (18.65)

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Name of the target organism	Fungicide: Carbendazim	Field of observations			Statistical data		
	concentration (µg/ml)	field 1	field 2	field 3	mean	SD	SE (±)
Aspergillusfumigatus(MTCC-1046)		20 (25)	12 (22)	18 (32)	16.66 (26.33)	1.95 (10.10)	2.88 (10.29)
Colletotrichumgloeosporoides(MTCC-4618)		14(23)	10(13)	18(37)	17(21.33)	10.29(49.58)	5.59(28.66)
Colletotrichumlindemuthianum(MTCC-3414)	0	3(20)	6(22)	6(26)	21.66(35.66)	8.30(17.3)	4.80(10.00)
Colletotrichum sp.		7(40)	8(20)	30(86)	15(48.66)	11(44.33)	2.88(10.29)
Curvularia sp.		12(50)	13(48)	9(33)	11.33(43.66)	8.33(23.66)	10.40(12.07)
Fusariummoniliformi(MTCC-2015)		12 (20)	6 (16)	7 (21)	8.33 (19)	1.67 (2.68)	0.97 (1.55)
Penicilium Sp.		28 (69)	20 (72)	15 (39)	21 (60)	16.52 (128.02)	9.55 (74)
Alternariaalternata (MTCC-8459)		22 (30)	9 (12)	7 (20)	12 (21.33)	18.82 (31.43)	10.88 (18.17)
Alternaria sp.		8 (254)	14 (320)	18 (305)	13.33 (293)	9.72 (460.18)	5.62 (266)
Aspergillusfumigatus(MTCC-1046)		3 (30)	3 (16)	6 (24)	4 (17.66)	1.14 (5.91)	0.66 (3.42)
Colletotrichumgloeosporoides(MTCC-4618)		15(21)	20(26)	30(60)	21.66(35.66)	8.30(17.3)	4.80(10.00)
Colletotrichumlindemuthianum(MTCC-3414)	10	5(25)	6(19)	8(28)	6.33(24)	1.38(5.60)	0.80(3.24)
Colletotrichum sp.		10(10)	8(13)	6(12)	2(314.66)	16.66(26.33)	1.13(5.84)
Curvularia sp.		2(252)	4(320)	0(372)	8(11.66)	4(17.66)	0.66(3.42)
Fusariummoniliformi(MTCC-2015)		24 (72)	82 (153)	103 (186)	69.66 (137)	12.11 (27.61)	07 (15.96)
Penicilium Sp.		62 (72)	42 (88)	82 (105)	62 (88.33)	104.68 (153.76)	60.51 (88.88)
Alternariaalternata (MTCC-8459)		4 (20)	4 (23)	13 (30)	7 (24.33)	10.10 (11.38)	5.84 (6)
Alternaria sp.		17 (75)	15 (46)	27 (89)	18.66 (70)	20.10 (184.90)	11.62 (16.88)
Aspergillusfumigatus(MTCC-1046)		5 (23)	14 (22)	7 (16)	8.66 (20.33)	0.12 (1.15)	4.96 (40.20)
Colletotrichumgloeosporoides(MTCC-4618)		1(20)	2(10)	6(12)	3(14)	4.30(8.08)	2.49(4.66)
Colletotrichumlindemuthianum(MTCC-3414)	100	8(19)	7(26)	5(30)	6.66(25)	8.66(20.33)	4.96(40.20)
Colletotrichum sp.		20(70)	12(43)	25(80)	19(64.33)	23.23(47.66)	13.43(27.55)
Curvularia sp.		18(18)	15(15)	23(25)	18.66(19.33)	10.38(11.83)	6(6.84)
Fusariummoniliformi(MTCC-2015)		8 (52)	28 (66)	9 (44)	15 (54)	8.58 (6.95)	13.43 (27.55)
Penicilium Sp.		22 (66)	25 (72)	30 (89)	25.66 (75.66)	6.26 (54.70)	11.62 (16.88)
Alternariaalternata (MTCC-8459)		4 (15)	3 (12)	5 (20)	4 (15.66)	0.38 (6.26)	0.22 (3.62)
Alternaria sp.		1 (26)	0 (39)	4 (48)	1.66 (37.66)	0.38 (6.26)	0.69 (27.18)
Aspergillusfumigatus(MTCC-1046)		2 (16)	2 (4)	1 (4)	1.66 (4.66)	8.58 (6.95)	0.07 (0.88)
Colletotrichumgloeosporoides(MTCC-4618)	1000	1(9)	2(12)	3(7)	2(9.33)	1.14(2.33)	0.66(1.35)
Colletotrichumlindemuthianum(MTCC-3414)		1(3)	1(4)	2(7)	1.33(4.66)	1.66(4.66)	0.67(0.88)
Colletotrichum sp.		0(26)	2(32)	0(12)	0.66(23.33)	0.38(6.26)	0.22(3.66)
Curvularia sp.		40(50)	52(60)	41(75)	44.33(61.66)	0.38(6.26)	0.22(3.62)
Fusariummoniliformi(MTCC-2015)		2 (10)	7 (29)	3 (14)	4 (17.66)	2.68 (38.56)	1.55 (22.29)
Penicilium Sp.		5 (30)	2 (25)	0 (36)	2.33 (30.33)	2.42 (16.64)	1.40 (6.73)
Mancozeb	concentration (ug/ml)	field 1	field 2	field 3	mean	SD	SE (±)
Alternariaalternata (MTCC-8459)		3 (6)	4 (5)	7 (10)	4.66 (7)	1.66 (2.68)	0.96 (1.55)
Alternaria sp.		10 (178)	25 (222)	28 (259)	21 (219.66)	35.74 (632.14)	20.66 (365.40)
Aspergillusfumigatus(MTCC-1046)		8 (42)	15 (52)	10 (39)	11 (44.33)	4.98 (17.80)	2.88 (10.29)
Colletotrichumgloeosporoides(MTCC-4618)		1(21)	2(12)	2(17)	1.66(16.66)	2.17(11.38)	1.26(6.58)
Colletotrichumlindemuthianum(MTCC-3414)	0	2(6)	7(14)	10(29)	6.33(16.33)	63.25(64.45)	36.56(66.29)
Colletotrichum sp.		1(3)	2(18)	8(30)	3.66(17)	4.98(17.80)	2.88(10.29)
Curvularia sp.		6(9)	12(20)	4(12)	11.33(43.66)	1.66(2.68)	0.59(1.55)
Fusariummoniliformi(MTCC-2015)		52 (62)	182 (302)	44 (103)	92.66 (155.66)	63.25 (6335.76)	36.56 (3662.29)
Penicilium Sp.		4 (200)	0 (150)	6 (89)	3.33 (146.33)	3.58 (1188.04)	2.07 (686.73)
Alternariaalternata (MTCC-8459)		2 (3)	5 (8)	3 (10)	3.33 (7)	0.88 (4.98)	0.51 (2.88)
Alternaria sp.		9 (232)	12 (305)	7 (105)	9.33 (214)	2.42 (3937.86)	1.40 (2276.22)
Aspergillusfumigatus(MTCC-1046)		6 (32)	11 (21)	8 (18)	8.33 (23.66)	2.42 (20.88)	1.40 (12.07)

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Name of the target organism	Fungicide: Carbendazim concentration (µg/ml)	Field of observations			Statistical data		
		field 1	field 2	field 3	mean	SD	SE (±)
Colletotrichumgloeosporoides(MTCC-4618)	500	4(32)	3(28)	6(24)	4.33(28)	1.38(6.14)	0.80(3.55)
Colletotrichumlindemuthianum(MTCC-3414)		4(20)	2(15)	6(18)	4(17.66)	0.88(4.98)	0.51(2.88)
Colletotrichum sp.		120(300)	70(200)	140(280)	110(260)	2.68(5.19)	1.55(3)
Curvularia sp.		1(13)	2(16)	4(20)	2.33(16.33)	2.42(39.37)	1.40(22.76)
Fusariummoniliformi(MTCC-2015)		15 (80)	26 (60)	27 (52)	35.66 (64)	14.44 (79.96)	8.33 (46.22)
Penicilium Sp.		6 (42)	5 (48)	10 (66)	7 (146.33)	2.68 (5.19)	1.55 (3)
Alternariaalternata (MTCC-8459)		10 (25)	4 (12)	4 (9)	6 (15.33)	2.68 (27.80)	1.55 (16.07)
Alternaria sp.		18 (442)	40 (552)	3 (305)	20.33 (433)	133.14 (5886.98)	76.96 (3402.88)
Aspergillusfumigatus(MTCC-1046)		15 (25)	10 (14)	18 (28)	14.33 (22.33)	21.11 (23.56)	12.07 (13.62)
Colletotrichumgloeosporoides(MTCC-4618)	1500	11(40)	13(18)	8(27)	10.66(28.33)	4.44(50.06)	2.57(28.94)
Colletotrichumlindemuthianum(MTCC-3414)		3(14)	10(30)	6(27)	2.66(6.33)	2.68(27.80)	1.55(16.07)
Colletotrichum sp.		20(120)	5(40)	18(105)	14.33(88.33)	0.22(7.88)	0.38(13.63)
Curvularia sp.		6(14)	4(16)	6(19)	5.33(16.33)	133.14(593.18)	76.96(342.88)
Fusariummoniliformi(MTCC-2015)		8 (24)	6 (15)	3 (11)	5.66 (16.66)	3.13 (4.44)	1.81 (2.57)
Penicilium Sp.		9 (25)	8 (32)	10 (54)	9 (28)	0.38 (13.63)	0.22 (7.88)
Alternariaalternata (MTCC-8459)		1 (2)	0 (2)	2 (10)	1 (4.66)	0.38 (1.18)	0.22 (4.73)
Alternaria sp.		40 (108)	52 (200)	35 (152)	42.33 (156.66)	29.34 (1006.20)	16.96 (581.62)
Aspergillusfumigatus(MTCC-1046)		1 (5)	3 (10)	2 (9)	2 (8)	0.38 (2.68)	0.22 (1.55)
Colletotrichumgloeosporoides(MTCC-4618)	2500	2(9)	1(6)	3(12)	2(9)	0.38(3.46)	0.22(2)
Colletotrichumlindemuthianum(MTCC-3414)		6(35)	2(15)	3(8)	3.66(9.33)	0.38(2.68)	0.22(1.55)
Colletotrichum sp.		0(50)	2(56)	3(66)	1.66(50.66)	0.12(1.93)	0.07(1.39)
Curvularia sp.		8(30)	4(25)	6(36)	6(30.33)	0.38(8.18)	0.22(4.73)
Fusariummoniliformi(MTCC-2015)		2 (7)	1 (5)	2 (5)	1.66 (5.66)	0.12 (1.93)	0.07 (1.39)
Penicilium Sp.		2 (32)	0 (42)	2 (52)	1.33 (42)	0.50 (3.84)	0.29 (2.22)

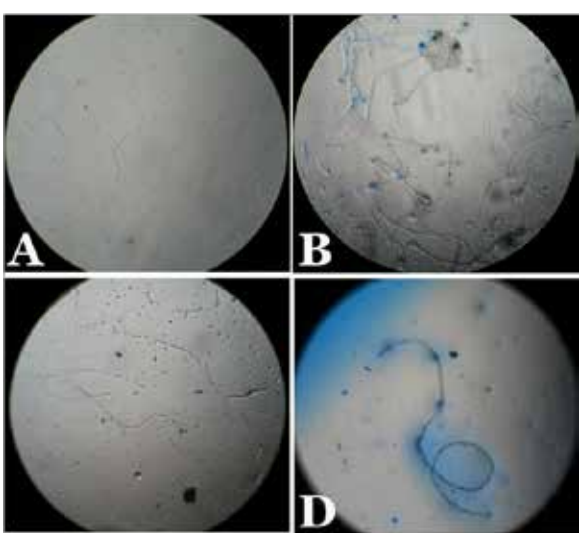

Figure : Photomicrographs of the spore germination assay against the fungicide treatment. (A) Spores of *Fusarium moniliformi* MTCC 2015 by Carbendazim, 10 ug/ml; (B) Spores of *Alternaria alternata* MTCC 8459 by Carbendazim, 0 ug/ml; (C) Spores of *Fusarium moniliformi* MTCC 2015 by Carbendazim, 100 ug/ml and (D) Spores of *Aspergillus fumigatus* MCC 1046 by Mancozeb, 0 ug/ml;

DISCUSSION: On the basis of this above result I can say that germ tube formation from spore in Mancozeb is less than Carbendazim. So, I can assure that Mancozeb is more effective than Carbendazim to play important role against fungal organism which are included in the result sheet.

CONCLUSION: By working on this study I can assure that the concentration of Mancozeb which is used against fungal organisms of mango pathogen is more effective the concentration of Carbendazim is used. So I can suggest the people to used mancozeb which is a fungicide to use against any mango pathogens for their better mango cultivation.

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