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Evaluation of certain fungicides and Biopesticides against stem rot of Mustard caused by *Sclerotinia sclerotium*

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ABSTRACT
Stem rot of mustard is the most important and serious disease in all over India. It is manly caused bySclerotinia sclerotium. The pathogen was tested with six fungicides and two bio-pesticides. The fungicides manly Propineb, Mencozeb, Sulphur, Thiomethile, Copper oxychloride and Carbendazim and bio-pesticides were Garlic oil and Ginger Oil. All the tested fungicides and bio-pesticides were reduce the growth of pathogen In- Vitro condition except control. Among the tested fungicides Propineb and Mencozeb were found most effective fungicides inhibit the growth of the pathogen is 100%. Sulphur and Thiomethile which were sowed 71.47% and 70.45% inhibition over control respectively. Whereas Copper oxychloride and Carbendazim was least effective showed 41.17% and 47.05% inhibition over control. In-Vitro condition Propineb and Mencozeb was most effective fungicides which were showed minimum disease incidence and maximum yield in both the year of 2017-18 and 2018-19. The minimum disease incidence 9.46 and corresponding yield 23.09 was recorded in 2017-18. Next best order of superiority fungicide were Sulphur, Thiomethile , Copper oxychloride and Carbendazim, which were showed average disease incidence 9.92 to 15.03 and yield from 20.52 to 13.50 q/ ha grain yield. Among the bio-pesticides Garlic oil and Ginger Oil were least effective. Chemical which was showed maximum disease incidence 56.84 and minimum corresponding yield 11.50 q/ha in the year of 2018-2019.
***Key words**: - Fungicides, Carbendazim, bio-pesticides.*

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INTRODUCTION

Mustard is a most important oil seed crop in all over India. Mustard is a third important oil seed crop in the world after Soybean and Palm. [6]. Mustard is belong to family Crucifereae (Brassicaceae). Indian mustard is natural amphidiploids having 36 chromosomes 2n. In this self pollinated but certain amount of pollination 2 – 15% occurs due to insect and other factors. The Brassicaceae crop are grown in tropical as well as temperate zone and perfect cool moist weather during growing period and dry weather during harvesting. Rapeseed - Mustard has low water requirement. Cultivation of mustard is October – November and Feb. – March. The oilseed Brassicae usually contain 38-57% of Erucic acid , 4.7- 30% of Linolenic acid and 20% of Oleic acid, which are the high nutritive value require for human health [4]**.** rapeseeds – mustard group broadly includes Indian mustard, Yellow sarson, brown sarson, raye and toria crops. Indian mustard is a predominantly cultivated in Rajasthan, U.P., M.P. and Gujarat. Mustard is cultivated in mostly under temperate climates. It is also grown in certain tropical and subtropical regions as a cold weather

crops. Mustard crops in known to suffer from a number of Viral, Nematodal, Bacterial and fungal diseases.More than 30 diseases are known to occur on Brassicae crop in India [5]. Among the fungal disease the most important fungal disease is stem rot caused by *Sclerotinia sclerotium.*Sclerotiniarot is more common and sever in temperate and subtropical regions of cool and wet seasons.

MATERIAL AND METHODS

The efficacy of six fungicides and two biopesticides against the pathogen *In-Vitro* was tested by food poisoned technique [1] using PDA medium . Propineb, Mencozeb, Sulphur, Thiomethile , Copper oxychloride and Carbendazim the bio-pesticides garlic oil and Ginger Oil were used in (Table -1).Required quantity of each fungicide was thoroughly mixed with 100ml well sterilized Potato Dextrose agar medium contained 150 ml flask.

Now this medium mixed with fungicides and bio pesticides was poured in Petridish and allow to solidify. These Petri plates were inoculated with 5mm dia. Disc of seven glasses old culture of the pathogen in center of the plate and incubated 25+1^{o}C.Each treatment was replicated thrice with suitable control. The efficacy of fungicides in each treatment and average of three replication were calculated by fallowing formula [2] given below –

$$\text{Percent inhibition over control} = \frac{C - T}{C} \times 100$$

Where,

C = Growth of fungus in control.

T = Growth of fungus in treatment.

In order to find out a suitable control of the disease efficacy of fungicides and bio-pesticides were assessed in field trial during Rabi season 2017-18 and 2018-19. A highly sick field with known history of Sclerotinia stem rot of Mustard was selected. The mustard variety Varuna (T- 59) was sowing in 4x4 m plot size in Randomized block design with 4 replication . the six fungicides *viz*. Propineb(0.3%), Mencozeb(0.2%), Sulphur(0.2%), Thiomethile(0.1%), Copper oxychloride(0.2%) and Carbendazim(0.1%) and two bio-pesticides garlic oil(3%) and Ginger Oil (3%) were used as spray (Table -2). The first spray was done at the onset of disease followed by two more sprays at 10 days intervals. Observation were recorded at 15 days after the final spray. The control plots were sprayed with water for recording the disease incidence Forty randomlyselected plots per plots were examine and the disease incidence in percentage was transformed in to angle and analyzed statistically, was calculated according in the formula give below--

$$\text{Percentage Disease control} = \frac{\text{D I in control} \times \text{D I on treatment}}{\text{D I in control}} \times 100$$

Where,

D = Disease ,I = Intensity

The yield was estimated on plot basis without considering the border rows in Q/ ha.

RESULTS AND DISCUSSION

The result presented in (Table -1) indicated that all the fungicides and bio- pesticides were significantly superior over control in inhibiting the growth of the pathogen *In –vitro*. Propineb and Mancozeb are most effective against the test pathogen as completely inhibit the growth of the pathogen. The next best fungicide was sulphur and by Thiomethile , which were showed 76.47% and 70.5% in habitation over control respectively where as next superiority of fungicides wascopper oxychloride(41.17%).Carbendazim was least effective fungicides which showed (47.05) of percent inhibit was indicate . Among the tested bio-pesticides the ginger oil (35.29) and Garlic oil (35.29) were found to be the least effective and showed lowest inhibiting the growth of pathogen. It is also suggested that the fungicidal treatment provide relatively stable suppression of the disease compared to biological control in all the environment [3].

Table -1: Effect of fungicides and biopesticides on the growth of *Sclerotinia sclerotium In-Vitro.*

S.No.	Fungicides and Biopesticides	Dose %	Av. Diameter of colony (mm) after 10 days	Percentage inhibition over control
1.	Propineb	0.03	00	100
2.	Mancozeb	0.02	00	100
3.	Sulphur	0.02	20	76.47
4.	Thiomethile	0.01	25	70.5
5.	Copper oxychloride	0.02	35	41.17
6.	Carbendazim	0.10	45	47.05
7.	Garlic oil	3.00	55	35.29
8.	Ginger oil	3.00	55	35.29
9.	Control		85	00

C D at 5% = 0.589

The Result was Presented in (table – 2) that the indicateall six fungicides and two bio-pesticides controlled the disease intensity except the field condition.

Table - 2: Effect of spraying fungicides and bio-pesticides on disease intensity and yield by Sclerotinia stem rot of mustard under field condition.

S. No.	Fungicides	Dose %	Disease incidence		Mean	Yield		Mean
			2017- 2018	2018-2019		2017- 2018	2018-2019	
1.	Propineb	0.03	9.46(17.86)	9.98(18.16)	9.72(18.16)	23(28.66)	22(27.97)	22.5(28.31)
2.	Mancozeb	0.02	9.92(18.36)	9.07(17.46)	9.49(17.86)	20.50(26.92)	19.50(26.21)	20.0(26.08)
3.	Sulphur	0.02	11.95(20.24)	12.25(20.45)	12.10(20.36)	17.50(24.73)	18.50(25.48)	18.0(25.10)
4.	Thiomethile	0.01	13.07(21.10)	14.21(22.14)	13.64(21.68)	15.39(23.11)	18.61(25.56)	17.0(24.35)
5.	Copper oxychloride	0.02	14.03(21.98)	14.95(22.76)	14.44(22.38)	14.50(22.38)	18.50(25.48)	16.5(23.58)
6.	Carbendazim	0.10	15.00(22.79)	15.03(22.78)	15.01(22.86)	16.50(23.97)	13.50(21.56)	15.0(22.97)
7.	Garlic oil	3.00	56.32(48.63)	54.95(47.85)	55.63(48.21)	13.50(21.56)	10.50(18.81)	12.0(20.27)
8.	Ginger oil	3.00	55.95(48.40)	56.84(48.98)	56.39(48.67)	12.50(20.70)	11.50(19.73)	12.0(20.27)
9.	Control		60.36(50.95)	62.95(52.48)	61.65(51.73)	8.50(16.95)	7.50(18.98)	8.0(16.43)
			1.90	1.97		0.95	0.97	

The Result was Presented in (table – 2) indicate their effectiveness in managing the disease spraying with Propineb(0.3%) and Mencozeb(0.2%)at the interval of 15 days was more effective in minimized the disease incidence and increase the yield. The maximum yield of 23.08q/ha was obtained with Propineb with corresponding disease incidence was 9.46%. The next best fungicide Mencozeb (0.02%)was which showed average disease incidence is 9.49% and itscorresponding yield 20 q/ha. Next superior fungicides were Sulphur, Thiomethile and Copper oxychloride. Which were showed the average disease incidence 12.10%, 13.64% and 14.49% respectively and its related yield was 18, 17 and 16.5 q/ha. Thiomethile and Copper oxychloride were statistically as per with each other. Among the tested fungicides the Carbendazim proved to be least effective one. Among the tested bio-pesticides Ginger oil was showed the maximum average disease increase (56.39%) and its corresponding yield 12.0 q/ha.

The present finding are close agreement with finding of Singh *et. al.* [7] on the Sclerotinia stem rot of Ajowin and Singh *et. al.* [8] recorded the effect of fungicides and bio-pesticides were against Sclerotinia stem rot of Brinjal.

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