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STUDIES ON THE NATURE AND PROPERTIES OF SHEATH ROT (*SAROCLADIUM ORYZAE* SAWADA) CAUSING SEED BORNE PATHOGEN ON RICE (*ORYZA SATIVA* L.)

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ABSTRACT
Antibiotic resistance is an increasing problem worldwide. The emergence and spread of multidrug-resistant bacteria to the The incidence of sheath rot was found to be highest in districts of Shimoga, Hassan, Kodagu & chickmagalore districts of southern Rice growing districts of Karnataka. Investigation revealed that out of seven chemicals tested Carbendazium was found to be most effective in reducing both the incidence and severity of sheath rot (16.6 and 13.9 as against 39.2 and 43.5 in check). The vigour index was highest (98.4) in seed as against (54.4) untreated check. Germinating percentage was 85%. The seed treatment was also enhanced grain yield. The present study indicated that seed borne nature of *Sacrocladium Oryzae* and its adverse effect could be checked by use of Carbendazium @ 0.1%.

KEYWORDS: Sheath rot, Seed treatment, Rice and Disease incidence.

INTRODUCTION

Rice is an important food crop of Southern Karnataka. Annual rice production of rice is 3869 tonnes with average productivity of 2.87 tonnes per hectare (Anonymous, 2010). The productivity has declined on account of many production constraints. It is estimated that the rice production loss due to blast alone is to an extent of 28 to 30% in our State. This being the case, sheath rot of rice which is a potential danger to production of rice needs to be contained, with this objective a study was taken up at Zonal Agricultural Research Station, V.C. Farm, Mandya to investigate the incidence of disease, the seed borne nature of the pathogen causing sheath rot (*S.oryzae*) and its control.

MATERIALS AND METHODS

The present investigation was carried out at the Zonal Agricultural Research Station, V.C.Farm, Mandya, during rabi 2008. This station is situated at an altitude of 695 meters above MSL with latitude of 12°-50'-13" North and longitude of 76°-40'-30" East. The soil at the experiment site was red sandy loam with a pH of 7.0, EC 0.814 dSm^{-1}, OC 0.38(%) with low to medium in NPK status. The test variety used was *Mangala*. It is a short duration variety comes to maturity in (110-115 days) having moderately good tillering habit with plant height of about 85-90 cm.

Method of Cultivation

Raising of nursery

The land selected for was ploughed thrice followed by clod crushing and harrowing to bring the soils into fine tilth. The field was leveled and four seed beds of 20 feet length and four feed width with a height of 15 cm were prepared. Fertilizers at the rate of 90 g nitrogen, 45 g phosphorous and 45 g potash were applied to each bed in the form of urea, super phosphate and muriate of potash, respectively in furrows of the seed bed at 3" apart and mixed with soil. Paddy seeds were sown in the furrows and covered with thin layer of soil and beds were irrigated immediately after sowing. Soil moisture was maintained till the germination was complete. Later, the beds were irrigated depending upon the soil moisture. The beds were kept free of weeds by weeding one week prior to transplanting each nursery bed was top dressed with 150 g of Urea. Twenty five days old seedlings were used for transplanting.

Fertilizer application

Urea, Superphosphate and Muriate of potash were used as source of N, P and K, respectively. Urea was applied in three split doses, i.e. 50 per cent at the time of planning. 25 per cent at mazimum tillering and remaining 25 per cent at panicle initiation stage. The entire dose of P and K applied at the time of planting.

Transplanting

Twenty five days old healthy seedlings were uprooted and transplanted in puddle condition with inter row spacing of 15 cm and intra row spacing of 10 cm with two to three seedlings per hill.

Weed control

Butachlor herbicide was broadcasted at the rate of 25 Kg/ha by mixing with sand on third day after transplanting. While applying weedicide water level was maintained uniformly. Hand weeding was done after first and third month after transplanting.

Irrigation

Half an inch of water was maintained in the plots during first ten days after planting. After eleventh day of transplanting the water level was maintained upto 5 cm. the water level of 3-5 cm was maintained for about 10 days before harvesting the crop.

Plant protection

Carbonfuron 3G was applied at the rate of 20Kg/ha to the plots, one month after transplanting. Spraying of monocrotophos 36 E.C. was taken on 40^{th} and 60^{th} day after transplanting to control the stem borer infestation.

Experimental design and layout

The experiment was laid out in Randomized complete Block Design with three replications. The plot size was 3.0m x 5.0 m. The following treatments were imposed during the crop growth period.

Treatment details:

	Concentration(%)
T1=Bavistin(Carbendazim)	0.10
T2=DM-45(Mancozeb)	0.20
T3=Captafa (Difolatan)	0.20
T4=Beam (Tricyclozole)	0.06
T5=Blitox (Copperoxycloride)	0.20
T6=Calixin (Tridemorph)	0.05
T7=Kavach (Chlorothalonil)	0.20
T8=Untreated check	

Method of Seed treatment

Seed samples were collected randomly from each treatment and were treated with fungicides and control was maintained without treating with any fungicide. The fungicides were used @ 2 g/kg of seed. The liquid formulation; Difolatan and Tridemorph @ 2ml/kg of seed.

One hundred seeds taken from each fungicide treatment were tested along with the control (untreated check) for the presence of *Sarocladium oryzae* using standard blotter method after incubation for seven days and observed under binocular microscope for the presence of pathogen.

Another set of treated seeds along with the untreated check were tested for germination by the between paper method of the international seed testing association rules (ISTA, 1993).

Seed health testing for *Sarocladium oryzae* in paddy seeds

Seed samples drawn randomly in each of the treatments were used for the seed health testing.One hundred seeds from each replication were tested following standard blotter method for the presence of *Sarocladium oryzae*. Twenty five seeds were placed with the help of forceps in each Petri dish and were inoculated at 25±5° C. After seven days of incubation seeds were examined under binocular microscope for the production of typical conidia, spore colour and hyphae, was examined by using compound microscope.

Evaluation of different testing method of sheath rot

Only two treatments were selected i.e., from Carbendazim sprayed treatment and control (unsprayed). They were tested by following testing method viz., blotter method, 2-4 D blotter method and Agar Plate Method (PDA).

a) Blotter method: Twenty five seeds were placed on a triple layer of moist blotters in 10cm diameter petriplate and were incubated for seven days and examined under binocular microscope.
b) 2-4 D, Blotter method. It is the modification over blotter method wherein the paper was wetted with a solution of 0.1 per cent 2-4 Dichlorophenoxyacetic acid (2-4D). The rest of the procedure adopted for blotter method was followed.
c) Agar plate method (PDA) Ten seeds were sown on potato dextrose agar after surface sterilization with 2.0 per cent sodium hypochloride solution for 10 minutes. After seven days colonies were examined for mycelial growth, colour and sporulation.

Artificial induction of sheath rot

Four methods were attempted on rice variety Mangala by using pot culture. Each pot was potted with 25 days old seedling with normal FYM and fertilizer. For each method five pots were kept for inoculation. The methods are as follows.

1. Seed inoculation method: here the infected seeds were kept in between the flag leaf sheath and in emerged sheath
2. Sheath inoculum method: in this method infected sheath were cut into small pieces then kept in between the flag leaf sheath and in emerged sheath.
3. Agar method: the grown up fungus on potato dextrose agar at room temperature and small bits were taken out with the help of sterilized inoculum needle and inserted the fungus in a small hole in each tiller.
4. spore suspension method: fungus grown for ten days at room temperature on potato dextrose agar was scraped of from the surface and mixed in sterilized distilled water to obtain spore suspension one drop of spore suspension was placed by sterilized plastic dropping bottle inside the flag leaf sheath enclosing the unemerged panicle.

RESULTS AND DISCUSSION

Effect of fungicide spray on the incidence and severity of sheath rot

There have been report concerning the possible chemical control of the disease under field condition. Sreenivasan (1981) reported that spraying of Hinosan was found to be the most effective followed by Carbendazim and Mancozeb. Subsequently Raina and Singh (1980) found Carbendazim most effective. in present study , of the seven fungicide tested (Table 1) maximum disease control was observed in plots sprayed with Carbendazim followed by Mancozeb, Difolatan , tricyclozole and Carbendizium was extremely effective compared to all other fungicides. The incidence of sheath rot was 16.6 percent as against 39.2 percent in untreated check. Likewise the severity of sheath rot in plots received Carbendazim spray was 13.9 percent as against 43.5 percent in untreated check. The next immediate most effective chemical namely Mancozeb, recorded 24.0 percent incidence and 24.6 percent severity. Present results are in accordance with those of earlier workers Vijayaraghavan, 1976: Srinivasan, 1981; Viswanathan and Mariappan, (1980).

Effect of sheath rot on seed germination, shoot lenghth, root length and vigour index

Effect of sheath rot on seed germination, shoot length, rot length and vigour index was investigated in seed lots collected from crop subjected to foliar spray by different fungicides. The seed germination was highest and significantly superior from the rest in crop sprayed with Carbendazim (Table 2). Similarly the vigour index was also highest in this treatment. Thus Carbendazim is not effective in controlling the disease but also improves seed germination, vigour index and others.

TABLE 1. Incidence and Severity Sheath rot in Cv. Mangala subjected to different fungicide sprays

Sl. No.	Treatments	Conc. (%)	Per cent	
			Incidence	Severity
1	Carbendazim	0.1	16.6	13.9
2	Chlorothalonil	0.2	30.9	38.7
3	Copper oxychloride	0.2	29.9	29.9
4	Difolatan	0.2	27.5	28.8
5	Mancozeb	0.2	24.0	24.6
6	Tricyclozole	0.06	28.8	28.8
7	Tridemorph	0.05	30.9	33.4
8	Untreated check	-	39.2	43.5
	CD @ 5%		8.11	5.14
	S. Em. ±		2.72	1.72
	C.V. (%)		7.00	11.70

TABLE 2. Effect of sheath rot on Seed germination, shoot length, Root length and Vigour index

Sl. No.	Treatments	Conc. (%)	Seed germination (%)	shoot length(cm)	Root length	Vigour index
1	Carbendazim	0.1	89.66	5.43	5.55	984
2	Chlorothalonil	0.2	79.66	3.83	3.86	612
3	Copper oxychloride	0.2	81.66	4.30	4.40	710
4	Difolatan	0.2	82.76	5.70	4.8	823
5	Mancozeb	0.2	84.66	5.00	5.2	861
6	Tricyclozole	0.06	82.00	4.46	4.5	734
7	Tridemorph	0.05	80.66	4.33	4.5	712
8	Untreated check	-	78.00	3.46	3.53	544
	CD @ 5%		4.45	0.50	0.39	59.34
	S. Em. ±		1.48	0.16	0.12	27.67
	C.V. (%)		3.10	6.40	4.90	4.60

Number of panicles per hill, panicle per m^2 and length of the panicle

The sheath rot also significant effect on Number of panicles per hill, and length of the panicle as evidenced by fungicide sprays to the panicle and there by controlling the disease. As against 7.66 panicle per hill in Carbendizium sprayed plots, it was only 4.00 in untreated check. Similarly there were only 4.00 in untreated check. Similarly there was a great reduction in panicle length in untreated check (15.00) whereas it was 21.33 in Carbendizium sprayed plots. The effect of fungicide spray on number of productive tillers was also tested by Vishwanathan and Narayanaswamy (1993) who found a significant reduction in number of tillers in all the three varieties *viz*., IR -20, Co-43 and IR -50. Combination of Mancozeb and Tricyclozole was very effective in suppressing the bad effect of sheath rot (Table 3).

TABLE 3. Effect of sheath rot on No. of panicle / hill, panicle / M^2 and Length of panicle

Sl. No.	Treatments	Conc. (%)	No. of panicle / hill	panicle / M^2	Length of panicle cm
1	Carbendazim	0.1	7.66	197	21.33
2	Chlorothalonil	0.2	4.66	166.66	16.66
3	Copper oxychloride	0.2	5.33	169.00	18.33
4	Difolatan	0.2	7.00	178.66	19.00
5	Mancozeb	0.2	7.33	181.66	20.33
6	Tricyclozole	0.06	6.33	178.00	19.00
7	Tridemorph	0.05	5.66	177.33	17.66
8	Untreated check	-	4.00	166.66	15.00
	CD @ 5%		1.82	14.06	1.07
	S. Em. ±		0.60	4.68	0.35
	C.V. (%)		17.4	4.50	3.36

Effect of fungicide spray on panicle weight, grain weight per panicle and 1000 grain weight

Raju and Singh (1981) recorded the highest grain yield in plots sprayed with Carbendizium, Das and Naik (1992) also scored highest grain yield in Carbendizium sprayed plots. in the present study also the panicle weight , grain weight per panicle and 1000 grain weight were highest in plots sprayed with Carbendizium which was significantly superior from the rest of the chemicals (Table 4).

Effect of fungicidal spray against sheath rot on total number of seeds per panicle, bold, chaffy and diseased seeds

There was significant reduction in total number of seeds per panicle in sheath rot affected plants compared to

healthy ones. All the fungicides field tested were effective in preventing seed losses and reducing chaffy seeds but Carbendizium was most effective in preventing seed losses. The fact that sheath rot increases chaffy ness has been recorded by various workers (Damodara Naidu 1994, Amin *et al* 1974). In fact Damodara (1994) working with four different cultivars noted a significant percent in an experiment on the effect of sheath rot on various fungicides (Table 5).

Inoculations by different methods against Sheath rot

Of the Four inoculation methods, maximum inoculation was obtained in spore suspension method. This was followed by grain inoculation method, sheath inoculation method and agar inoculation method (Table 6).

TABLE 4: Effect of Fungicide sprays against Panicle weight, Grain weight / panicle and 1000 grain weight

Sl. No.	Treatments	Conc. (%)	Panicle weight (g)	Grain weight / panicle (g)	1000 grain weight (g)
1	Carbendazim	0.1	2.04	1.81	24.93
2	Chlorothalonil	0.2	1.54	1.36	20.45
3	Copper oxychloride	0.2	1.62	1.48	23.0
4	Difolatan	0.2	1.81	1.63	23.82
5	Mancozeb	0.2	1.81	1.67	23.96
6	Tricyclozole	0.06	1.74	1.59	23.08
7	Tridemorph	0.05	1.56	1.40	22.22
8	Untreated check	-	1.43	1.26	19.02
	CD @ 5%		0.16	0.10	0.90
	S. Em. ±		0.07	0.04	0.30
	C.V. (%)		5.60	3.80	2.30

TABLE 5. Effect of Fungicidal spray against sheath rot on Total No. seeds / panicle, Bold seeds, Chaffy Seeds and Diseased seeds

Sl. No.	Treatments	Conc. (%)	Total No. seeds / panicle	Bold seeds	Chaffy Seeds	Diseased seeds
1	Carbendazim	0.1	84.76	81.50	1.68	1.51
2	Chlorothalonil	0.2	78.01	67.65	5.30	5.06
3	Copper oxychloride	0.2	80.00	70.64	5.20	4.15
4	Difolatan	0.2	79.36	70.71	4.05	4.60
5	Mancozeb	0.2	82.50	76.65	3.30	2.55
6	Tricyclozole	0.06	78.00	68.65	4.80	4.55
7	Tridemorph	0.05	79.85	69.15	6.15	4.55
8	Untreated check	-	75.95	61.15	7.15	7.64
	CD @ 5%		1.37	1.07	1.02	0.45
	S. Em. ±		0.45	0.35	0.34	0.15
	C.V. (%)		1.00	0.90	12.40	6.00

TABLE 6. Effect of inoculation methods in the incidence of sheathrot

Sl. No.	Method of inoculation	No. of tillers		Percentage of tillers infected
		Inoculated	Infected	
1	Grain inoculation	25	18	72
2	Sheath inoculation	25	17	68
3	Agar Incubation method	25	11	44
4	Spore suspension method	25	22	88

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