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Efficacy of Fungicides (in Different Concentration) on Sheath Blight Disease Development in Rice

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ABSTRACT

Rice sheath blight, caused by the fungal pathogen Rhizoctonia solani Kuhn [Sexual stage: Thanetophorus cucumeris (Frank) Donk] is one of the major production constraints in rice-growing countries of the world. Under conditions favoring disease, up to 50% of grain yield may be lost. Control may be achieved with fungicides[5], but cost and the potential for development of pathogen resistance make plant genetic resistance preferable. Plants can be induced locally and systemically to become more resistant to diseases through various biotic or abiotic stresses. If integrated properly in plant health management programs, they can prolong the useful life of both the resistance genes and the fungicides presently used Thifluzamide is a member of the carboxamide class of fungicides which is single-site inhibitors of the succinate ubiquinone reductase or succinate dehydrigenase (Sdh) complex in the respiratory chain[3] interfere with fungal respiration via their inhibitory effect on succinate dehydrogenase within the tricarboxylic acid cycle. We have observed Thifluzamide to be effective in controlling rice sheath blight and therefore the fungicide can fit into resistance management system by integrating in spray schedules in potential rice growing tracts.

Key words: *Rhizoctonia solani, Pathogen, Tricarboxylic acid, Thanetophorus cucumeris*

INTRODUCTION

Sheath blight caused by *Rhizoctonia solani* Kühn (teleomorph: *Thanatephorus cucumeris* (A.B. Frank) Donk) is a major constraint (second only to rice blast) to rice production, causing 5-10% yield losses in low land tropical Asia. The pathogen has a wide host range and can infect more than 32 plant families and 188 genera, often infecting legume crops grown in rotation with rice[8]. Sheath blight can be effectively controlled with the application of systemic fungicides. However, bio-fungicides and resistant varieties are the other options of control management but, are not *at par* with chemical control. These fungicides are very popular and are at the peak of its usage which may lead to reduced residual period and efficacy due to increased virulence of *R. solani*.

Nine fungicide (Taqat, Captaf, Contaf Plus, Pulsor, Propiconazole, Ill-Hexacarb, Hexaconazole, Bavistin, and Folicur) were used to evaluate the efficacy against sheath blight disease.

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The different fungicide at recommended concentration (detailed elsewhere in result and discussion) in water (Taqat, Captaf, Contaf Plus, pulsor, Propiconazole, Hexacarb, Hexaconazole, and bavistin, Hexaconazole, Folicur) was sprayed with the help of hand sprayer. Plant of variety swarna were inoculated first and a day after the inoculated plants were sprayed with fungicides.

Rice bran is commercially cheap and nutritionally rich carrier molecule, and can be very easily colonized by *R solani* and therefore can be used for mass multiplication. Colonized rice bran can deposited between the tillers of rice hills with at most ease by passing the inoculum through sieve. Plants at maximum tillering stage were inoculated with the inoculum (*R solani* colonized rice bran) by passing through a sieve (grids size of sieve: 3mm x 3mm).

Growth of runner hyphae originating from inoculum induced lesions at the surface of rice tissue, established penetration structures to produce primary lesion. Soon after 48 hours of inoculation the plots (4 x 4 meter) containing inoculated plants were sprayed with different fungicides (Table 1.) and the control plots were sprayed with water. Observation on infection development (number of tillers infected per hill,) was recorded seven days after inoculation.

Efficacy of fungicide on sheath blight incidence (no. of infected plants /35 observed)

It was observed that inoculated plants in the control plots showed higher frequency of infected tillers per hill as compared to inoculated and fungicide sprayed plants. Thirty five plants / hills were observed for sheath blight infection (Table 1.). Unsprayed plants showed 100% sheath blight incidence. Fungicide sprayed plots in the order of their increasing frequency of number of plants infected out of 35 plants observed are as follows: Thifluzamide (Pulsor S) (42µl/l)), Thifluzamide (Pulsor S) (52µl/l), Thifluzamide (Pulsor S) (62µl/l), Propiconazole (42µl, Taqat (6g/l), Thifluzamide (Pulsor S) (21µl/l), Thifluzamide (Pulsor S) (31µl/l), Hexacarb (1200µl/l), Hexacarb (2400µl/l). Hexaconazole containing fungicides (Taqat) as observed effective at a very high concentration 6g/l .The frequency of plants showing incidence of sheath blight ranged from 3 to 9 out of 35 observed. It was observed that Hexaconazole (1300 µl/l), Hexaconazole (Contaf) (1.5ml, 1ml, 2ml /l) and Hexaconazole containing fungicides (Taqat) (1g, 1.5g and 3g /l) had poor control over sheath blight incidence. Percent incidence of sheath blight in these fungicide sprayed plots ranged from 48.57 to 97.14(Table 1.). Similarly captan (2.10 and 1.34 g/l) and Hexacarb 800µl sprayed plots also showed higher incidence of sheath blight.

Table 1: Efficacy of different fungicide affecting the rice sheath blight incidence (no. of plants /35 observed)

S #	Fungicide	No of Plants		
		Observed	Infected	Incidence (%)
1	Thifluzamide (Pulsor S) 42µl	35	3	8.571429
2	Thifluzamide (Pulsor S) 52µl	35	3	8.571429
3	Thifluzamide (Pulsor S) 62µl	35	4	11.42857
4	Propiconazole 42µl	35	4	11.42857
5	Taqat 6g	35	4	11.42857
6	Thifluzamide (Pulsor S) 21µl	35	5	14.28571
7	Thifluzamide (Pulsor S) 31µl	35	5	14.28571
8	Hexacarb 1200µl	35	8	22.85714
9	Hexacarb 2400µl	35	9	25.71429
1	Hexacarb 1000µl	35	13	37.14286
2	Carbendazim (bavistin) 1000µl	35	14	40
9	Hexaconazole 1300µl	35	17	48.57143
6	Hexaconazole (Contaf) 1.5ml	35	34	97.14286
7	Hexaconazole (Contaf) 1ml	35	31	88.57143
8	Hexaconazole (Contaf) 2ml	35	33	94.28571
13	Tebuconazole 1000µl	35	30	85.71429
11	Taqat 1g/l	35	34	97.14286

10	Taqat 1.5g	35	32	91.42857
12	Taqat 3g/l	35	31	88.57143
2	Captan 2.10g	35	32	91.42857
1	Captan 1.34g	35	33	94.28571
5	Hexacarb 800µl	35	22	62.85714
1	Control-1	35	35	100
2	Control-1	35	35	100
3	Control-1	35	35	100

Thifluzamide is a member of the carboxamide class of fungicides which is single-site inhibitors of the succinate ubiquinone reductase or succinate dehydrigenase (Sdh) complex in the respiratory chain[3] interfere with fungal respiration via their inhibitory effect on succinate dehydrogenase within the tricarboxylic acid cycle.

CONCLUSION

Efficacy of fungicide application on sheath blight development in rice

Inoculated plants in the plots were sprayed with the fungicide Thifluzamide (Pulsor S) (31µl/l), Thifluzamide (Pulsor S) (52µl/l), Thifluzamide (Pulsor S) (42µl/l), Thifluzamide (Pulsor S) 62µl/l, and Hexacarb 2400µl/l affected the sheath blight development by reducing the number of plants, tillers showing sheath blight incidence. These fungicides were also effective in reducing the lesion length and therefore identified as most effective fungicide in reducing the sheath blight infections.

Application of Captan, Carbendazim, Hexaconazole, Tebuconazole did not reduced sheath blight incidence and therefore not suitable for the management of sheath blight of rice.

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