" IN VITRO STUDY OF THE SHEATH BLIGHT OF RICE CAUSED BY RHIZOCTONIA SOLANI "

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ABSTRACT

Diseases sample collected , isolation, purification of *Rhizoctonia solani*. The effect of application of Borogold (combination of Nano Silver Particles Peroxy Acid) on management of sheath blight of rice. Evaluation of "*Bacillus subtilis* ZB87- 1/21 MTCC" for the management of sheath blight of rice.

Evaluation of pesticide (fungicide + insecticide compatibility) against sheath blight of rice Invitro study was conducted in plant pathology Uttaranchal University , Dehradun to control sheath blight of rice by application , of Borogold. The tested Borogold *i.e.*, T3 (Root dipping or three spray of borogold), treatment found highly effective in reducing the disease severity of sheath blight, 17.77% and 62.94% decrease of the disease over control treatment was at par with T1 (Root dipping or two spray of borogold), 18.51% reducing the disease severity and 60.94% decrease disease over control and T2 (Root dipping or two spray of borogold + need based spray of borogold), 19.25% reducing the occurrence of disease and 59.07% decrease the disease over control treatment followed by T6 (No root dipping or two spray or borogold), 34.06% reducing the disease severity and 28.14% decrease the disease over control. T5 (No root dipping or two spray of borogold + need based spray of borogold), 35.55% reducing the disease severity and 25.00% decrease the disease over control, where as the maximum disease severity 47.40% was recorded under T7 (control).

INTRODUCTION

Rice is the most important cereal food crop of India. Rice is the staple food of more than 60.00 per cent of the world's population especially for most of the people of South-East Asia. It occupies about 23.30 per cent of gross cropped area of the country. It plays vital role in the national food grain supply.. India has the largest rice output in the world and is also the second largest exporter of rice in the world. Rice is cultivated at least twice a year in most parts of India, the two seasons being known as Rabi and Kharif seasons. The former cultivation is dependent on irrigation, while the later depends on Monsoon. Rice cultivation plays a major role in socio-cultural life of rural India.

The fungus *Rhizoctonia solani* produced usually long cells of septate mycelium which are hyline within young, yellowish brown. It produced large number of globose sclerotia which initially turn white, late turn brown to purplish brown. Sclerotia serve as a major source of primary inoculums. Wide host range of the pathogen *Rhizoctonia solani* makes management of the disease a different tast. Breeding for resistance through effective has not succeeded dur to lack of suitable clones. So far complete resistance source has not been found against this fungus, mainly because resistance is governed by quantitative trait loci (QTL), *i.e.*, controlled by polygenes. Hence, the disease is being managed by changing the cultural practices by one of chemical fungicide.

MATERIALS AND METHODS

1. Autoclave
2. BOD incubator
3. Compound microscope
4. Hot air oven
5. Forceps
6. Laminar air flow
7. Spirit lamp
8. Water bath
9. Micro wave oven
10. Inoculation needle
11. Cork borer

Media used Potato Dextrose Agar (Riker, and Riker 1936) with the following composition was prepared and used during in vitro studies.

Potato (peeled and sliced)	-	200 g
Dextrose	-	20 g
Agar	-	20 g
Distilled water	-	1000 ml
pH	-	6.0 - 7.0 .

Efficacy of botanical plant extracts on growth of R. solani under in vitro condition

In vitro , extract of different botanical plants were evaluated for their antifungal activity against Rhizoctonia solani.The six botanical plants namely, Neem oil , Neem powder,Karanj oil, Karanj powder, Chili+Garlic and Chili were collected . The extract of each plant species was prepared in cold water by different botanical plant and solvent in 1:1 ratio (w/v) 3.9.1 Cold water extract Botanical plants were thoroughly washed with distilled water and crushed in 1:1 ratio of distilled water in a mortar and pastle individually. Extract was passed through a double layer muslin cloth and then through Whatman‘s filter paper No.1. This filtrate was considered as stock solution. The extracts were mixed aseptically in molten PDA to have final dilutions of 10% and then poured in sterilized petri plates. Sterile distilled water mixed in same dilutions in PDA served as control. Each petri plate was inoculated with 48 - 72 hrs old sclerotia of Rhizoctonia solani and four replications were Maintained. The inoculated plates were incubated at 28±20 ºC. The mycelial growth and sclerotial formation were recorded every 3 days intervasl up to 9 days of the inoculation.

The percent inhibition of mycelia growth was calculated as per the following formula described by Vincent (1947)

$$\text{.Inhibition (\%)} \quad I = \frac{C-T}{C} \times 100$$

Where , C = Diameter of fungus colony (mm) in control plate,

T = Diameter of fungus colony (mm) in treated plate.

EXPERIMENTAL RESULT

Table No: 3.1Application of borogold (combination of nano silver particles peroxy acid) on management of sheath blight of rice

Treatments	Sprays	Quantity
T1	Root dipping-Dipping of rice seedlings for 24 hours in Borogold solution (1.5gm in 1 lit water) + two spray of Borogold- first spray at 30 DAT + second spray at 60 DAT	2gm/lit
T2	Root dipping as per T1 + need based spray of Borogola- one spray at panical initiation (90DAT) + need based spray (one or two spray before or after PI stage)	2gm/lit
T3	Root dipping as per T1 + three spray of Borogold first spray at 30 DAT + second spray at panicle initiation (90 DAT) + third spray at 50% flowering (110 DAT)	2gm/lit
T4	No root dipping- Two spray of Borogold- first spray at 30 DAT + second spray at 60 DAT	2gm/lit
T5	No root dipping- Need based spray of Borogola- one spray at panical initiation (90DAT) + need based spray (one or two spray before or after PI stage)	2gm/lit
T6	No root dipping-Three spray of Borogold first spray at 30 DAT + second spray at panicle initiation (90 DAT) + third spray at 50% flowering (110 DAT)	2gm/lit
T7	Control- No spray	Untreated

Phyto-extracts of ten plant species belonging to different families were evaluated against R.solaniby „Poisoned Food Technique" as suggested by (Grover and Moore, 1962). Fresh healthy plant parts viz., leaves, bulb, finger parts as listed in Table (1) were collected, washed thoroughly with tap water and finally rinsedwith sterile distilled water. Fifty grams of leaves, bulbs and finger parts were mixed with the help of grinder by adding 50 ml distilled water. The extracts were filtered through double layered sterile muslin cloth and collected in 150 ml conical flasks and plugged with non-absorbent cotton. Thus, filtered phyto-extracts autoclaved at 1.2 kg cm-2pressure for 20 minutes before use these phyto-extracts in the poisoned food technique. Autoclaved extracts were individually added in previously sterilized PDA 10 per cent (2 ml extract ±18 ml PDA) at the time of pouring in plates and mixed thoroughly at the time of pouring in the previously sterilized Petri plates. All the plates containing phyto-extracts were inoculated aseptically after solidification by placing a mycelial disc of 5 mm diameter of vigorously growing 7 days old pure culture of R. solani and incubated at temperature (28 ± 2 0C) for 7 days

$$PGI = \frac{DC - DT}{DC} \times 100$$

Where,PGI = Per cent growth inhibition

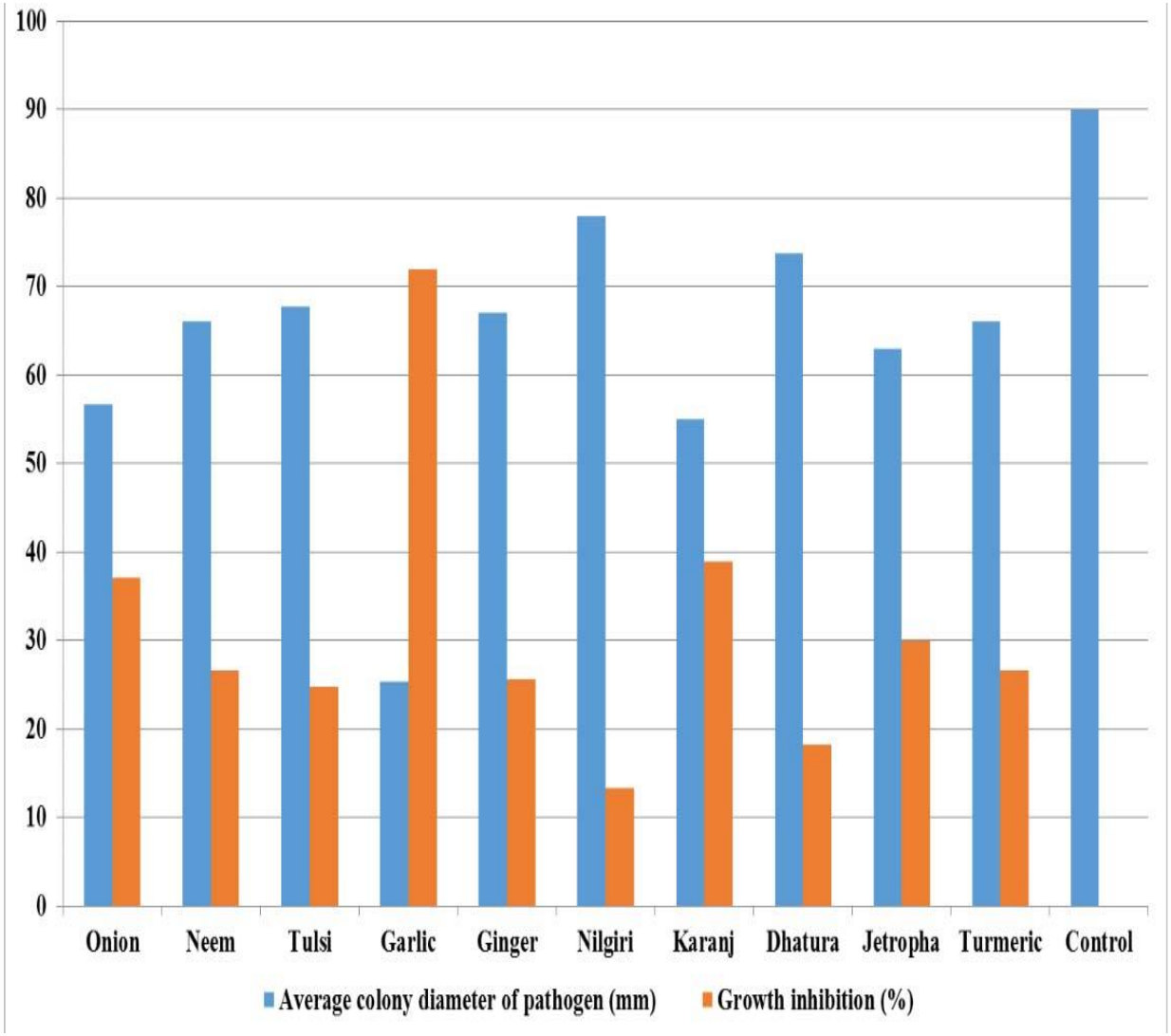
DC = Average diameter of mycelial colony of control setDT = Average diameter of mycelial colony of treated set

List of different botanicals tested for their efficacy against the R. solani in vitro (1 0 % concentration)

Effect of botanicals against the pathogen *in vitro*

TreatmentNo.	Phyto-extracts	Plants part used	Botanical name	Average diameter of pathogen after 7 days (mm)	Growth inhibition (%)
T_1	Onion	Bulb	*Allium cepa L.*	7.57** (56.67)*	37.03
T_2	Neem	Leaves	*Azadirachta indica L.*	8.12 (66.00)	26.66
T_3	Tulsi	Leaves	*Ocimum sanctum L.*	8.24 (67.67)	24.81
T_4	Garlic	Cloves	*Allium sativum L.*	5.02 (25.33)	71.85
T_5	Ginger	Rhizome	*Zingiber officinalis Rosa*	8.18 (67.00)	25.55
T_6	Nilgiri	Leaves	*Eucalyptus citridora Hook*	8.83 (78.00)	13.33
T_7	Karanj	Leaves	*Pongamia glubra L.*	7.41 (55.00)	38.88
T_8	Dhatura	Leaves	*Datura stamoneum L.*	8.58 (73.67)	18.14
T_9	Jetropha	Leaves	*Jetropha curcas L.*	7.93 (63.00)	30.00
T_{10}	Turmeric	Rhizome	*Curcuma longa L.*	8.12 (66.00)	26.66
T_{11}	Control	--	--	9.48 (90.00)	--
S. Em±				0.09	--
C.D. at 5 %				0.27	--
C.V. (%)				2.01	--

*Figures in parenthesis are original value; **Figures outside parenthesis are $\sqrt{x} + 0.5$ transformed value


100
90
80
70
60
50
40
30
20
10
0
Onion
Neem
Tulsi
Garlic
Ginger
Nilgiri
Karanj
Dhatura
Jetropha
Turmeric
Control
Average colony diameter of pathogen (mm)
Growth inhibition (%)

CONCLUSION

The Bio-efficacy studies *Bacillus subtilis* for the management of sheath of blight of rice revealed that all the treatments were significantly superior to untreated (control) T12 in reducing per cent disease incidence (PDI). The percent disease index ranged from 12.12 per cent in T5Standard check (Hexaconazole- 5%EC), 25DATto 25.25per cent in T1(*Bacillus subtilis ZB87-1/2,* 25DAT @1.5gm/lit), whereas it was maximum 40.06 per cent in T12(control). Minimum disease incidence i.e.

12.12 per cent wasrecorded in T5(Hexaconazole-5%EC), 25DAT which was 69.74 per cent less over control followed by T10(*Bacillus subtilis ZB87-1/2,* 25DAT @1.5gm/lit + *Bacillus subtilis ZB87-1/2,* 50DAT @2.5gm/lit) and T11(*Bacillus subtilis ZB87-1/2,* 25DAT @1.5gm/lit + *Bacillus subtilis ZB87-1/2,* 50DAT @2.5gm/lit +Hexaconazole-5%EC 25DAT +Hexaconazole-5%EC 50DAT) which was12.45 and 15.82respectively.

The tested pesticide *i.e.* ,

T2 (DPX- RAB 55 + Contaf) treatment found at par with T3 (Contaf plus), 31.84% reducing the disease severity and 44.15% decrease disease over control , followed byT1 (Spinetoram 6% + methoxyfenozide30%), 32.58% reducing the disease severity and 42.86% decrease the disease over control,T8 (DPX- RAB 55 + Baan), 33.32% reducing the disease severity and 41.56% decrease the disease over control,T4 (Mantis 75 WP), 34.06%reducing the disease severity and 40.02% decrease the disease over control, T2 DPX- RAB 55, 34.07% reducing disease severity and 40.24% decrease the disease over control,T6 (Spinetoram 6% + methoxyfenozide 30% + baan), 34.81% reducing the disease severity and recorded 38.95% decrease disease over control,T5 Spinetoram 6% + methoxyfenozide 30% + contaf, treatment with 35.55% reducing the disease severity and recorded 37.65% decrease of the disease over control whereas the maximum disease severity 57.02% was observed under control treatment.

The present study concludes that out of ten tested phytoextracts by poisoned food techniques for their inhibitory effect on mycelial growth of R. solani at 10 per cent concentration. The maximum inhibition was found in the clove extracts of garlic (Allium satium L.) (71.85 %) followed by leaf extract of karanj (Pongamia glubraL.) (38.88 %) and bulb extract ofonion (Allium cepa L.) (37.03 %)

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