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EFFECT OF BIO-AGENTS AGAINST STEM ROT OF CLUSTERBEAN CAUSED BY *Sclerotium rolfsii*

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Abstract: *Clusterbean or guar (Cyamopsis tetragonoloba L.)Taub.Synonym Cyamopsis psoralioides DC is cultivated in many parts of India and has been known for green fodder, cattle feed, vegetable and green manuring purposes. Stem rot of clusterbean caused by Sclerotium rolfsii Sacc. has become a serious problem in recent years and caused heavy economic loss by reducing yield in Gujarat state. Survey of stem rot disease in Banaskantha district revealed that disease incidence of stem rot was recorded in different tehsils ranging from 4.8 to 9.8 per cent, where maximum being recorded in Dantiwada tehsil (9.8 %) followed by Palanpur (7.6 %), Dhanera (6.2 %), Tharad (5.8 %), and Vav (4.8%). Eight different isolates of Trichoderma spp. and one bacterial species (Pseudomonas fluorescens) were evaluated in vitro against stem rot pathogen of clusterbean. In this method, T. harzianum isolates from Sardarkrushinagar, Junagadh and Navsari appeared as potential antagonists against clusterbean stem rot pathogen.*

Keywords: *Sclerotium rolfsii, Bio-agents, Per cent growth inhibition.*

Introduction

Clusterbean or guar (*Cyamopsis tetragonoloba* L.) classified under the family Leguminous, it has been known for green fodder, cattle feed, vegetable and green manuring purposes. The crop has got a special importance because of gum content in its seed. India is the leading producer of guar and guar gum in the world. Among different diseases stem rot (*Sclerotium rolfsii*) is a serious disease in clusterbean crop. The symptoms of stem rot were the yellowing of lower leaves and gradually wilting of lateral branches. There was whitish mycelial growth creeping around the collar region. The sheathing mycelium quickly produced abundant spherical sclerotia on the surface of the affected plant parts or on the soil surface. Management efforts have been made with limited success, due in part to the extensive host range, prolific growth and ability to produce large number of sclerotia that may persist in soil for several years [1].

Materials and methods

Different antagonists were tested *in vitro* for their antagonistic efficacy against pathogen by dual culture technique [2].

Following bio-agents were evaluated for their antagonism against *S. rolfsii in vitro* by dual culture technique. The test organism and pathogen were grown separately on PDA medium. From seven days old culture 5 mm mycelial disc of the test organism and pathogen were cut aseptically and placed opposite to each other approximately 60 mm apart on Petri plate containing 20 ml PDA. The plates with only pathogen were served as control. Entire the set was incubated at 27 ± 1^{0}C temperature. Observations on radial growth and sclerotial production were measured after seven days.

The per cent growth inhibition (PGI) was calculated by using the formula [3].

$$PGI = \frac{C - T}{C} \times 100$$

Where,

PGI = Per cent growth inhibition

C = Average mycelial growth in control (mm)

T = Average mycelial growth in treatment (mm)

Table 1: List of bio-agents tested against *S. rolfsii in vitro*

Sr. No.	Name of the Antagonist
1.	*Trichoderma harzianum* (Sardarkrushinagar)
2.	*Trichoderma viride* (Sardarkrushinagar)
3.	*Trichoderma harzianum* (Anand)
4.	*Trichoderma viride* (Anand)
5.	*Trichoderma harzianum* (Junagadh)
6.	*Trichoderma viride*(Junagadh)
7.	*Trichoderma harzianum* (Navsari)
8.	*Trichoderma viride*(Navsari)
9.	*Pseudomonas fluorescens*

Results

The hazardous effects of chemicals used in plant disease management have forced the plant pathologists of the world to find out the alternative methods having little or no adverse effect on environment. Notable success of disease management through the use of antagonistic micro-organisms in the laboratory, green house and field has been known during past several years. Making the use of this information, there is a possibility of developing biological management of plant disease. Now the commercial formulations of bio-control agents have gradually becoming available in the country. Isolates of *Trichoderma* spp are well documented as effective bio-control agent in managing many soil-borne pathogens. However, inadequate information on the performance of the antagonists under varying field conditions is a major constraint in large scale adoption of this technology in general.

In the present study, nine different known *Trichoderma* spp. along with *Pseudomonas fluorescens* were tested for their antagonistic efficacy against *S. rolfsii* by dual culture method. The result presented in Table 2 revealed that all the antagonists significantly inhibited the growth of *S. rolfsii* over control.

Out of nine antagonists tested, *Trichoderma harzianum* (Sardarkrushinagar) showed significantly maximum growth inhibition (68.22%) followed by *T. harzianum* (Junagadh) with 60.78 per cent. The next best in order for growth inhibition were *T. harzianum* (Navsari) (58.59%) and *T. viride* (Sardarkrushinagar) (56.44 %). The least growth inhibition was recorded by *T. viride* (Anand) (22.52 %). Although, all the antagonists were found effective in inhibiting the growth of the fungus as compare to control.

It was clear indicative that among all the antagonists evaluated by dual culture method, local strain of *Trichoderma harzianum* (Sardarkrushinagar) proved highly effective antagonist followed by *T. harzianum* (Junagadh), *T. harzianum* (Navsari) and *T. viride* (Sardarkrushinagar) against *S. rolfsii in vitro.*

Table 2: Efficacy of different bio agents on growth and sclerotial production of *S. rolfsii in vitro*

Sr. No.	Test organism	Per cent growth inhibition*	No. of mature sclerotia/plate*
1.	*T. harzianum*(Sardarkrushinagar isolate)	55.97**(68.22)****	9.51***(90.00)****
2.	*T. viride*(Sardarkrushinagar isolate)	48.97 (56.44)	10.72 (114.67)
3.	*T. harzianum*(Anand isolate)	45.67 (50.52)	11.96 (142.67)
4.	*T. viride*(Anand isolate)	28.64 (22.52)	14.34 (205.33)
5.	*T. harzianum*(Junagadh isolate)	51.50 (60.78)	10.68 (113.67)
6.	*T. viride*(Junagadh isolate)	38.59 (38.44)	13.04 (169.67)
7.	*T. harzianum*(Navsari isolate)	50.22 (58.59)	10.48 (109.33)
8.	*T. viride*(Navsari isolate)	37.37 (36.37)	13.33 (177.33)
9.	*Pseudomonas fluorescens*	44.01 (47.81)	12.67 (160.00)
	S.Em.±	0.63	0.18
	C.D. at 5%	1.88	0.53
	C.V. %	2.46	2.62

* Figures indicate average of three repetitions
** Figures indicate arc sin transformed values
*** Figures indicate SQR + 0.5 transformed values
**** Figures indicate re-transformed values

All the nine antagonists tested have significantly inhibited the sclerotial production of *S. rolfsii*. Maximum the inhibition of the sclerotial production was recorded in *Trichoderma harzianum* (Sardarkrushinagar) (90.00) followed by *T. harzianum* (Navsari) (109.33). Least the inhibition of sclerotial production was in *T. viride* (Anand) (205.33).

Maximum mycelium growth inhibition of *S. rolfsii* in *T. harzianum* (52%) as compared to other two isolates of *Trichoderma* spp [4].

Conclusion

Eight different isolates of *Trichoderma* spp. and one bacterial species (*Pseudomonas fluorescens*) were evaluated *in vitro* for their antagonistic efficacy against stem rot pathogen of clusterbean by dual culture method. In this method, *T. harzianum* (Sardarkrushinagar), *T. harzianum* (Junagadh) isolates and *T. harzianum,* Navsari isolate appeared as potential antagonists against clusterbean stem rot pathogen.

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