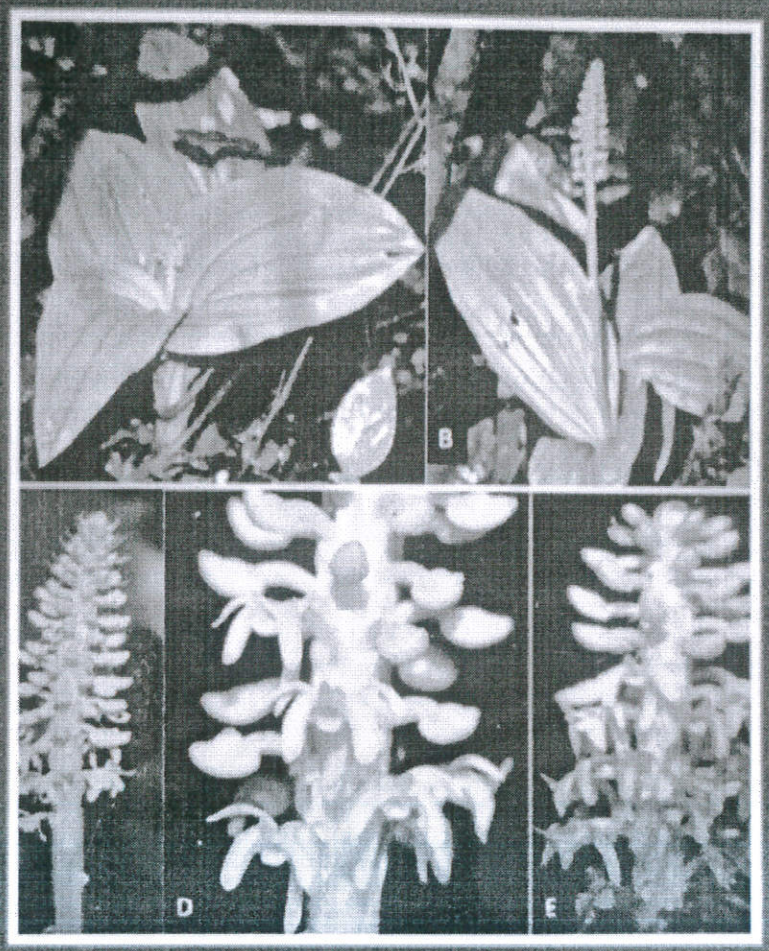
Naldurg

Print ISSN: 0973-1431
Online ISSN: 0976-4755

BIOINFOLET



A Quarterly Journal of Life Sciences

UGC-CARE APPROVED JOURNAL, INDEXED IN WEB OF SCIENCE CITATION INDEX, EXPANDED.

Vol. 18 2021 No. 1A

Arts Science & Commerce College Naldurg

Arts Science & Commerce College Naldurg

BIOINFOLET 18 (1 A) : 96 - 99, 2021

BIOLOGICAL CONTROL OF CHARCOAL ROT OF JOWAR WITH THE USE OF *TRICHODERMA* SPECIES

M.T. Gavali, S.A. Bansode and U. N. Bhale

Research Laboratory, Department of Botany, Arts, Science and commerce college Naldurg, Tq-Tuljapur, Dist-Osmanabad.-413602 (M.S) India.

ABSTRACT

Charcoal rot of jowar (*Sorghum bicolor* L.) is caused by *Macrophomina phaseolina* Tassi (Goid). Attempts have been made during present investigation to manage this disease with the help of *Trichoderma* spp. Antagonistic activities of five *Trichoderma* species viz. *Trichoderma viride, T.koningii, T. virens, T. harzianum* and *T. pseudokoningii* were tested against *M. phaseolina. Almost all* Trichoderma species were found to be antagonist resulting in 42.11 to 68.88 % inhibition in the in vitro growth of the pathogen under laboratory conditions. Under field condition, due to the seed treatment, it minimized the incidence of charcoal rot disease of jowar. It is concluded that the use of effective strains of *Trichoderma* spp can be a useful in integrated management of charcoal rot in jowar.

Key words: Jowar, charoal rot, *Macrophomina phaseolin*a, Dual culture, *Trichoderma* spp,

Introduction

Charcoal rot disease caused by *M. phaseolina, results into* decreased grain yield of sorghum (Pedgaonkar and Mayee, 1990; Narayana Rao et al., 1998) and therefore present investigation was undertaken to evaluate allelopathic potential of *Trichoderma* species for its management.

Materials and methods

Macrophomina phaseolina was isolated from the tissues of stem of Jowar bearing fungal sclerotia, showing characteristic charcoal rot symptoms. The samples were cut into small pieces (3-5 mm), surface sterilized with 1% $HgCl_2$ for 2 min and then rinsed thrice in sterilized distilled water. The pieces were placed on sterilized Potato Dextrose Agar medium (PDA) in petri dishes (90 mm dia.) and incubated at 28±2°C for 7 days. The fungus was isolated and identified following Subramanin (1971) and deposited at the Department of Botany, Arts, Science and Commerce College Naldurg.

Rhizospheric soil samples of the plants other than sorghum were collected and the fungi therein were isolated by dilution plate technique (Johnson, 1957). The isolated species were identified on the basis of colony characters, growth and structure of mycelium, conidiophores, phialides and conidia (Kubicek and Harman, 2002). All *Trichoderma* spp were purified by hyphal tip technique (Tuite, 1996) and maintained under aseptic conditions.

Antagonistic efficacy of *Trichoderma* species i.e. *Trichoderma viride, T. koningii, T. virens, T. Harzianum* and *T. pseudokoningii* was tested against *M. phaseolina* by dual culture technique (Morton and Stroube, 1955).

All *Trichoderma* species and Mancozeb sensitive and resistant isolates *of M.phaseolina* were inoculated on PDA medium in petri plates at a distance of 90 mm. The plates were incubated at 28 ± 2 °C for seven days. Monoculture plates of

Trichoderma as well as the pathogen (test fungus) Macrophomina phaseolina served as control.

Seven days after incubation, radial growth of test fungus and *Trichoderma* spp were measured. Colony diameter of test fungus in dual culture plate was observed and compared with that obtained in control and per cent inhibition in radial growth (% RGI) was calculated following Vincent (1947).

The intensity of antagonism between each *Trichodema* species and test pathogen was scored on scale of R1 - R5 i.e. R1=*Trichoderma* completely overgrew pathogen (100% over growth); R2 = *Trichoderma* overgrew on two-third area of pathogen's growth (75% over growth); R3 = *Trichoderma* colonizes on half of the pathogen (50% over growth); R4 = *Trichoderma* and the pathogen colonies get into the contact of each other and R5 = Pathogens overgrows *Trichoderma* (Bell et al., 1982).

For field experimentation, highly susceptible sorghum cultivar- CSV8R was used. Seeds were surface sterilized with 0.01% $HgCl_2$ for 3 min, washed thrice in sterile distilled water and treated with a 7d old *Trichoderma* spp @ 2×10^3 cfu g^{-1} seeds. The field experiment was laid out during post-rainy (*rabi*) season of the year 2018-2019. The seeds were sown in 1 m long rows in 5 m x 3 m plots, with three replicates for each treatment. Irrigation to the crop was withheld at flowering stage to induce adequate moisture stress required for development of charcoal rot. Incidence of charcoal rot was recorded at crop maturity (112 d after emergence). Percentage disease incidence (PDI) of charcoal rot was calculated following Das et al. (2008). Statistical analysis of data was performed following Mungikar (1997).

Results and Discussion

Charcoal rot, caused by *M. phaseolina* resulted into premature yellowing of the top leaves followed by leaf drop. Blackish colored colonies with concentric rings were developed. The survival structures (microsclerotia) of the pathogen were observed in the outer tissues. The microsclerotia were in the form of aggregates of dark immature cells. Those were brown in color, smooth and round in shape.

Trichoderma species showed antagonism against Mancozeb sensitive and resistant isolates of *M. phaseolina*, The RGI of sensitive and resistant isolates of the pathogen due to *T. viride* was 68.88 and 57.77 % respectively, due to *T. pseudokoningii* 63.33 and 55.55 % respectively, due to *T. harzianum* 61.11 and 54.44 % respectively, due to T. virens 52.22 and 42.22% respectively and due to T. koningii it was 48.88 and 35.55 % respectively in sensitive and resistant strains of *M. phaseolina* (Table 1). Hence, *T. viride* was found to be the most effective species of *Trichoderma* in inhibiting growth of *M.phaseolina.*

According to modified Bell's scale, among all *Trichoderma* species tested, T. koningii showed strong antagonism against the pathogen. Under field condition, when *M. phaseolina* seeds were inoculated along with Trichoderma species before sowing, charcoal rot of jowar was found to be controlled by *T. viride* (PDI = 40 %) (Table 2).

The results obtained during present investigation are in agreement to those reported by Faheem et al., (2010), Shalini and Kotasthane, (2007), Arora and Dhurwe (2013) and Sankar and Sharma (2001).

Table 1: Antagoistic activity of *Trichoderma* species against *M. phaseolina.*

Trichoderma Species	*M. phaseolia* Isolates	Antagonistic activity (in *vitro*)			
		Radial Growth : *M. phaseolina* (mm)	Radial Growth *Trichoderma* (mm)	**RGI (%)**	**(R)**
T. viride	S	28	60	68.88	R2
	R	38	50	57.77	R3
T. koningii	S	46	40	48.88	R4
	R	58	30	35.55	R4
T. virens	S	43	45	52.22	R2
	R	52	35	42.22	R3
T. harzianum	S	35	53	61.11	R2
	R	41	47	54.44	R2
T. pseudoko n-ingii	S	33	55	63.33	R2
	R	40	48	55.55	R2
Control	-	90	90	100	-
CD @ p=0.05%		11.37	10.62		

Legends: -S- sensitive, R- resistant and, RGI-radial growth inhibition, (R) - **Bell's scale.**

Table 2: Per cent Charcoal disease incidence in Jowar.

Seed treatment	Perent Disease incidence(PDI)
T. viride	
T. koningii	60 ±2.04
T. virens	50 ±2.12
T. harzianum	47 ±1.02
T. pseudokoningii	44 ±1.01

Values are means of three replications, ± Standard error

It was thus concluded that the *T. viride* is an effective antagonist against *M. phaseolina,* as observed during *in vitro and in vivo* conditions.

References

Arora, M. and Dhurwe, U. (2013.) *Int.J.Curr.Microbiol.App. Sci.,***2(11):** 19.

Bell, D. K., Wells, H. D. and Markham, C. R. (1982). *Phytopathology.* **72(4):** 379

Das, I. K., S. Indira, A. Annapurna, Prabhakar, Seetharama, N. (2008). *Crop Protection,* **27**:1407.

Faheem, A., Razdan, V. K., Mohiddin, F. A., Bhat, K. A. and Saba, B. (2010). *J. Phytol.,* **2(10):** 38.

Johnson, L.A. (1957). *Phytopathology,* **47**:21.

Kubicek, C.P. and Harman, G.E. (2002). *"Trichoderma and Gliocladium : Vol. I. Basic biology, taxonomy and genetics",Harman G.E., C.P. Kubicek* (Eds.) Taylor & Francis e-Library. pp. 8-31.

Morton, D. J. and Stroube, W. H. (1955). *Phytopathology*, **45**: 417.

Mungikar, A. M. (1997). *"An Introduction to Biometry".* Saraswati Printing Press, Aurangabad, pp. 57-63.

Narayana Rao, J.; T. B. Garud; S. Pande, P. Mohan Rao and Deshmukh, R.N. (1998). *International Sorghum & Millet Newsletter No.* **38**: 61.

Pedgaonkar, S. M. and Mayee, C. D. (1990). *Pathology*, **65**:182.

Sankar, P. and Sharma, R. C. (2001). *Indian*

Phytopathology, **54(3)**: 390.

Shalini, S. and Kotasthane, A. S. (2007). *EJEAF Chem.*, **6**: 2272.

Subramanian, C. V. (1971). " *Hypomycetes: an account of Indian species except Cercosporae* ". Indian Council of Agricultural Research, New Delhi. pp. 881.

Tuite, J. (1996). *"Plant Pathological Methods : Fungi and Bacteria*" Burgess Pub. Co. Minneapolis, Minn. USA. pp. 29

Vincent, J. M. (1947). *Nature*, **150**: 850.

Wheeler, H. (1975). *"Plant Pathogenesis".* Academic press, London, UK.

PRINCIPAL
Arts Science & Commerce College
Naldurg, Dist.Osmanabad-413602