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Efficacy of Biocontrol Agents against *Drechslera setariae* Causing Leaf Spot of Pearl Millet

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A B S T R A C T

Pearl millet (*Pennisetum glaucum* L.) is an important food and forage crop. It is locally known as bajra, combo, sajja, bari, ganti or kambam. Leaf spot disease of pearl millet is a common foliar disease caused by *Drechslera setariae*. A laboratory experiment was conducted to study the antifungal activity of four biocontrol agents *viz*., *Trichoderma harzianum*, *Trichoderma viride*, *Pseudomonas fluorescens* and *Bacillus subtilis* against *Drechslera setariae* employing dual culture technique. All the biocontrol agents checked the growth of the *Drechslera setariae* as compared to control. Maximum growth inhibition was observed in *Trichoderma viride* (72.22 %) followed by *T. harzianum* (67.64 %) and *P. fluorescens* (59.44 %) whereas, *Bacillus subtilis* (45.28 %) showed least growth inhibition among all the biocontrol agents.

Introduction

Pearl millet (*Pennisetum glaucum* L.) locally known as bajra, combo, sajja, bari, ganti or kambam, is an allogamous crop having protogynous nature, It belongs to family in *Poaceae*. It is also called as a *poor man's food grain*, grown as a nutrient rich food source for human consumption as well as a fodder / forage crop in Asia and Africa. The pearl millet grains are very good nutritious and form the staple food or diet of approximately 10 % population in India. It is a good source of high quality protein with superior amino acid profile (11.5%), carbohydrate (59.8-78.2%), fat (4.1-6.4%) and rich in good amount of minerals particularly iron and phosphorus. India is the largest producer of pearl millet, both in terms of area (7.0 million hectares) and production (9.25 million tonnes), with an average productivity of 1250 kg/ha (Anonymous, 2014-15a).

Pearl millet is mainly grown in Rajasthan, Maharashtra, Gujarat, Uttar Pradesh, Haryana, Karnataka, Madhya Pradesh, Tamil nadu and Andhra Pradesh states of the country. Rajasthan is the highest producing state in India, it is cultivated on 40.76 lac hectare area with production 44.56 lac tonne and productivity 1093 kg/ha (Anonymous, 2014-15b). Major pearl millet producing districts of Rajasthan are Bikaner, Barmer, Jhunjhunu,

Jaisalmer, Churu, Jaipur, Alwar, Karoli, Dholpur, Swai Madhopur, and Bharatpur.

Pearl millet encounters number of diseases which attack the crop during its growth, cause yield and economic loss. Among several diseases of pearl millet, Leaf spot disease (*Drechslera setariae*) a major problem and comes every year in almost all the pearl millet growing regions including Rajasthan. The disease is characterized by the presence lesions with dark margins and ash coloured centers of varying in size and sometimes blight the leaves completely. *Drechslera setariae* was isolated from the rotted seeds and infected parts of seedlings. The seed used was obtained from Mysore (Karnataka), India and was found to be infected with *D. setariae*, which has been reported from the United States as seed borne in pearl millet, causing seed rot, blight and leaf spot (Wells and Winstead, 1965; Wells and Burton, 1967). The disease has also been noticed in India by Bhowmik (1972) and Balasubramanian (1980). Use of bio control agents is eco-friendly approach, ecologically safe, ideal, cheap and long lasting method of plant disease management (Butt and Copping, 2000). The aim of the present study was to investigate the bio efficacy of different bio control agents against *Drechslera setariae* causing leaf spot of pearl millet.

Materials and Methods

The bio control agents *viz*., *Trichoderma harzianum, Trichoderma viride, Pseudomonas fluorescens* and *Bacillus subtilis* were evaluated under *in vitro* conditions for their antagonistic effect against *Drechslera setariae* by dual culture technique using potato dextrose agar medium (Mortan and Straube, 1955). 20 ml of sterilized and cooled potato dextrose agar (PDA) medium was poured into sterile petri plates and allowed to solidify.

A five mm disk of test fungus (*Drechslera setariae*) and fungal bio control/ antagonists agents were placed exactly opposite to each other on the petri plate by leaving five mm from periphery. In case of evaluation of bacterial biocontrol agents, one disc of medium with bacterium (5 mm diameter) was taken and put into a test tube containing 10 ml of sterilized water and shaken for 10 minutes. The bacterial isolates were streaked at periphery of petri plates plated with PDA medium and mycelial disc (5mm diameter) of fresh culture of *Drechslera setariae* was placed on the other side of Petri plate. All the petriplates were incubated in a BOD incubator at 27 ± 1 ^{0}C for 10 days. Petri dishes inoculated with test fungal discs alone served as control.

Four replications were maintained for each isolate in a completely randomized design. After, control petriplate reached growth of 90 mm in diameter, the radial growth of pathogen was measured. Observations on width of inhibition zone and mycelial growth of test pathogen were recorded and per cent inhibition of pathogen growth was calculated by using the formula described by Vincent (1947).

$$I = \frac{C - T}{C} X\ 100$$

Where,

I = Per cent inhibition
C = Growth in control
T = Growth in treatment

Results and Discussion

The comparative antifungal activities of four biocontrol agents were assessed against *Drechslera setariae.* The results presented in Table 1 and figure 1 revealed that growth of

the *D. setariae* was significantly checked as compared to control by the antagonistic effect of all the biocontrol agents tested. The biocontrol agents also restricted the growth of *D. setariae* and did not allow it to grow further.

The least growth of the *D. setariae* was observed in *Trichoderma viride* (25.00 mm) followed by *Trichoderma harzianum* (29.13 mm), *Pseudomonas fluorescens* (36.50 mm) and *Bacillus subtilis* (49.25 mm) as compared in control where it was 90.00 mm growth (Table 1 and Fig. 1).

The per cent inhibition of mycelial growth was recorded in *Trichoderma viride* (72.22 %) that was significantly superior to *T. harzianum* (67.64 %) and *P. fluorescens* (59.44 %). However, *Bacillus subtilis* (45.28 %) was found to be least inhibitory (Table 1 and Fig. 1). Not much work has been done on bio control agents or antagonists against leaf spot pathogen (*Drechslera setariae*) of Pearl millets.

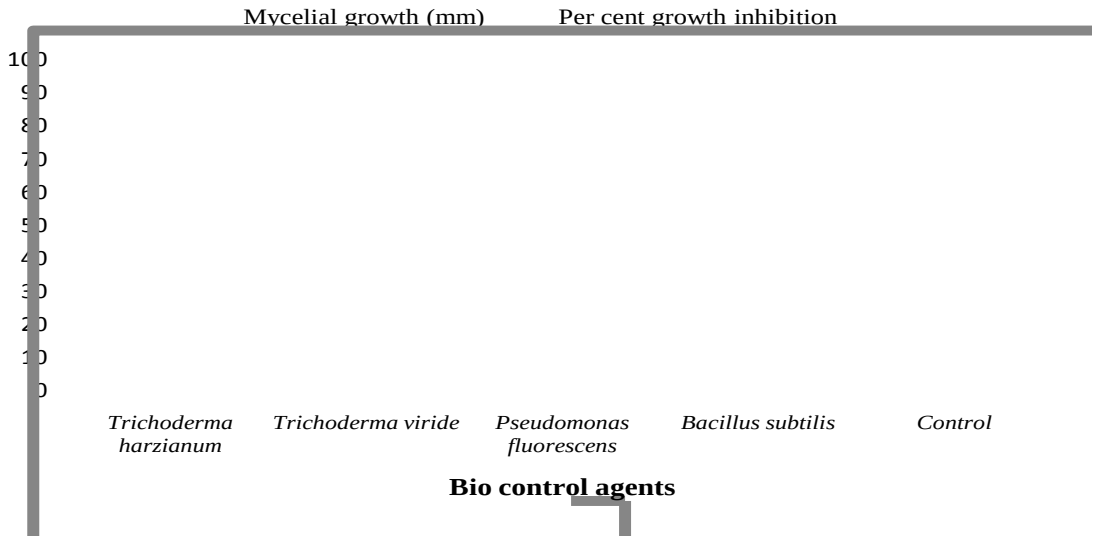
Table.1 Effect of different bio control agents against inhibition of mycelial growth of *Drechslera setariae*

Sr. No.	Bio control agent	Mycelial growth (mm)	Growth inhibition (%)
1	*Trichoderma harzianum*	29.13*	67.64* (55.31)**
2	*Trichoderma viride*	25.00	72.22 (58.18)
3	*Pseudomonas fluorescens*	36.50	59.44 (50.42)
4	*Bacillus subtilis*	49.25	45.28 (42.27)
5	Control	90.00	-
CD (P = 0.05)		1.63	(1.79)
C.V.		2.49	2.84

*Average of four replications

**Data in parentheses are angular transformation.

Fig.1 Effect of different bio control agents against inhibition of mycelial growth of *Drechslera setariae*



Present finding has close concurrence with the finding of Hulagappa (2012) and Kumar *et al.,* (2009) against *Drechslera / Helminthosporium maydis*. Elamathi *et al.,* 2016 also recorded the *Trichoderma viride* as control agent of the brown leaf spot pathogen (*Bipolaris oryzae*) followed by *T. harzianum*.

Khalili *et al.,* (2012) also reported that the *in vitro* antagonism tests revealed that *Trichoderma* sp. significantly inhibited the mycelial growth of *Bipolaris oryzae*. The effective antagonistic activity of *Trichoderma sp.* against *Bipolaris oryzae* was confirmed by the earlier workers (Jha *et al.,* 2004; Harish *et al.,* 2007; Abdel-Fataah *et al.,* 2007 and Franca *et al.,* 2015). *Trichoderma harzianum* and *Pseudomonas fluorescens* were found effective against brown leaf spot disease of paddy caused by *Drechslera oryzae* (Rao *et al.,* 2013). *Pseudomonas fluorescens* strains were found most effective with the highest antagonistic activity against three fungal pathogens *viz*., *F. moniliforme*, *R. solani* and *A. alternate* (Maurya *et al.,* 2014). The antagonistic nature of *Bacillus subtilis*, reduced the mycelial growth of *Helminthosporium maydis* (Muhammad and Amusa 2003; Khamari and Beura, 2014).

Further, it can be concluded that among the biocontrol agents, *Trichoderma viride* found most effective antagonist against *D. setariae* followed by *T. harzianum* and *P. fluorescens.* Whereas, *B. subtilis* was found to be least effective. All the antagonists significantly checked the growth of *D. setariae* either by over growing or by exhibiting inhibition zones. Both the species of *Trichoderma* showed considerable antimycotic activity by checking the radial growth of *D. setariae*. However, the bacterial bio control agents *viz*., *Pseudomonas fluorescens* and *Bacillus subtilis* proved least effective and cause less mycelial growth inhibition of the test fungus as compare to fungal antagonists.

References

Abdel-Fataah, G.M., Shabana, Y.M., Ismail, A.E. and Rashad, Y.M., 2007. *Trichoderma harzianum*: a biocontrol agent against *Bipolaris oryzae*. *Mycopathol*. 164, 81-99.

Anonymous, 2014-2015a. Ministry of Agriculture, Govt. of India.

Anonymous, 2014-2015b. Department of Agriculture, Govt. of Rajasthan.

Balasubramanian, K. A. 1980. Association of *Drechslera setariae* with downy mildew affected pearl millet. *Curr. Sci*. 49 (6): 233-234.

Bhowmik, T. P. 1972. *Bipolaris setariae* on two new host in India. *Indian Phytopathol*. 25: 590-591.

Butt, T.M. and Copping, L.G. 2000. Fungal biological control agents. *Pesticide Outlook*, pp. 186-191.

Elamathi, P., Madhanraj, P. Panneerselvam, A. and Prabakaran, P., 2017. Antagonistic Activity of Potential Soil Fungi against *Bipolaris oryzae* (Breda de Haan). *International Journal of Current Microbiology and Applied Sciences*, 6(1): 750-754.

França, S.K.S., Cardoso, A.F., Lustosa, D.C., Corsi de Filippi, M.C., Silva G.B. and Soares Ramos, E.M.L. 2015. Biocontrol of sheath blight by *Trichoderma asperellum* in tropical lowland rice. *Sustain. Dev*; 35:317–324.

Harish, S., Saravavakumar, D., Radjacommar, R., Ebenezar, E.G. and Seetharaman, K., 2007. Use of plant extracts and biocontrol agents for the management of brown spot disease in rice. *Biocontrol*, 53(3): 555-567.

Hulagappa, 2012. Studies on maydis leaf blight of maize caused by *Drechslera maydis* (Nisikado) Subram and Jain, M.Sc. thesis UAS, Dharwad, pp.52-62

Jha, M. M., Kumar, S. and Haasan, S. 2004. Response of bioagents against maydis

leaf blight of maize. *Annals of Biology*, 20: 177-179.

Khalili, E., Sadravi, M., Naeimi, S. and Vahid Khosravi. 2012: Biological control of rice brown spot with native isolates of three *Trichoderma* Species *Brazilian Journal of Microbiology*: 297-305

Khamari, B. and Beura, S.K. 2014. Efficacy of bio control agents against maydis leaf blight of maize. *Journal of Plant Protection and Environment*, 11(2): 95-97.

Kumar, S., Rani, A. and Jha, M.M. 2009c. Potential of *Trichoderma* spp. as biocontrol agents against pathogens causing maydis leaf blight of maize. *Journal of Biological Control*, 23(1): 89-91.

Maurya, M.K., Singh, R. and Tomer, A., 2014. *In vitro* evaluation of antagonistic activity of *Pseudomonas fluorescens* against fungal pathogen. *JBiopest*, 7(1): 43-46.

Morton, D. J. and Straube, W. H. 1955. Antagonistic and stimulatory effect of microorganisms upon *Sclerotium rolfsii*. *Phytopathology*, 45: 417- 420.

Muhammad, S. and Amusa, N.A., 2003. *In vitro* inhibition of growth of some seedling blight inducing pathogens by composte inhibiting microbes. *African Journal of Biotechnology*, 2(6): 161-164.

Rao Y, Lal, A.A., Simon, S., Singh, L., 2013. Management of brown spot (*Drechslera oryzae*) of Rice. Annals of Plant Protection Science, 21(2): 450-452.

Vincent, J.M. 1947. Distortion of fungal hyphae in the presence of certain inhibitors. *Nature*. 159: 850.

Wells, H. D. and Burton, G. W. 1967. *Helminthosporium setariae* on pearl millet, *Pennisetum typhoides*, as affected by age of host differences. *Crop Sci.* 7: 621-622.

Wells, H. D. and Winstead, E. E. 1965. Seed borne fungi in Georgia grown and western grown pearl millet seed on safe in Georgia during 1960. *Pl. Dis. Rep.* 49: 487-489.

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