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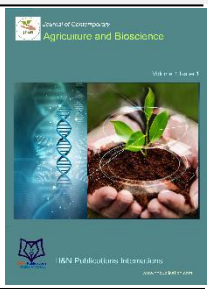

Research Article

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Effect of Bioderma on Diseases and Yield of Jute Varieties in Bangladesh

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A b s t r a c t

Bioderma is a bio-agent containing Trichoderma recently used as bio agent for controlling different diseases of various crops as well as giving good yield. The study was conducted to evaluate the efficacy of bio-derma against field diseases and yield of jute during two crop seasons of 2018 and 2019 at Jute research regional station, Faridpur, Bangladesh. We found that, both of the growing season, the disease infestation was significantly lower in BJC-2142 (1.72% and 2.72%) followed by O-9897 (2.94% and 2.98%), respectively. Disease infestation was higher in exotic variety JRO-524 (6.40% and 7.45%), respectively. The study also showed that all the yield and yield contributing characters were not affected significantly except stick yield (/ha) in which stick yield significantly differed from variety to variety. The effect of bio-derma application was not so effective in controlling field disease of jute as well as yield and yield contributing characters.

Keywords: *Bioderma, bio-agent, control, diseases and yield.*

Introduction

Plant diseases are caused by various biotic and abiotic factors viz. fungi, bacteria, viruses, viroids, phanerogamic parasites, protozoans, and nematodes are taking heavy toll of crops. These pathogens are causing substantial losses in different crops and therefore need to be managed. Several chemicals have been used in the past to manage the diseases caused by various pathogens. No doubt, some degree of control was achieved, but it posed new problems of residual toxicity and development of resistant strains of the pathogens. Delivery of microbial inoculants is being a very attractive option since it would substantially reduce the use of agrochemicals (Berg 2009). Microorganisms play a vital role in cropping systems, particularly plant-growth promoting microorganisms (PGPMs).

Bioderma is a bio-agent containing *Trichoderma* recently used as bio agent for controlling different diseases of various crops as well as giving good yield. Among them, *Trichoderma harzianum* is reported to be most widely used as an effective biological control agent (El-Katathy *et al*., 2001; Szekeres *et al*., 2004; Abdel-Fattah *et al*., 2007). *Trichoderma harzianum* strain T-22 was produced by protoplast fusion between *T*. *harzianum* T-95 and T-12 and this strain was formulated as granular named RootSield® and powder named PlantShield® by Biworks, Geneva, NY. *Trichoderma harzianum* T-22 has efficacy against a wide range of plant pathogenic fungi including, *Botrytis cinerea*, *Fusarium*, *Pythium*, *Rhizoctonia* in many crops such as, corn, soybean, potato, tomato, beans, cotton, peanut, and various trees (Khetan, 2001; Paulitz and Belanger, 2001). *Trichoderma harzianum* strain T-39 is marketed as TRICHODEX, 20P by Makhteshim Ltd. for control of pink rot and stem rot of tomato caused by *Phytophthora erythroseptica* (Etebarian *et al*., 2000) and control of blight disease caused by *Botrytis cinerea* (Paulitz and Belanger, 2001). The biocontrol mechanism in *Trichoderma* is a combination of mechanisms (Howell, 2003; Benítez *et al*., 2004).

Jute affected by various plant pathogens in Bangladesh. Different chemical fungicides are being used for controlling jute diseases which are harmful to human being and environment. The use of biological pesticides as an alternative to synthetic pesticides in agricultural production is rapidly increasing due to public concerns about human health, safety of agri-food products consumed and impact to the environment. In the present study, we highlight the important biological control agents used as bioderma which is a biofertilizer. Although this is not yet used for controlling jute diseases. Therefore, the present study was undertaken to find out eco-friendly management of field diseases of jute and efficacy of bioderma as yield contributing bio-pesticide on jute.

Materials and Methods

The experiment was conducted at Jute research regional station, Faridpur in the two consecutive years (2018 and 2019). Three varieties of jute plant such as O-9897, BJC-2142 and an exotic variety JRO-524 was grown in Randomized Completely Block Design (RCBD) with three replications having unit plot size of (4 m. x 3 m.) = 12 sq.m. at jute research regional station, Faridpur and in a farmer's field. Space between plot to plot and around the field 1.0

m. and between the replications 1.50 m. was maintained. Bioderma was applied as basal dose at 150 g. /plot and Mancozeb (Dithane M-45) sprayed as preventive measures as foliar spray at 20 days after germination. No spray was given to the control. Normal agronomical practices and fertilizer doses were applied as per BJRI recommendation. Observations of disease incidence (%) were recorded from time to time. Besides those following records were taken-

1. Date of sowing and germination,
2. Plant population at harvest,
3. Plant height and base diameter at harvest,
4. Fibre and stick weight/plot.

All data were analyzed by standard statistical method- Statistix 10.

Results and Discussions

Effect of bioderma on disease infestations

The mean performance disease infestations (%) were presented in Table 1. The results indicated that bioderma was shown better performance regarding disease control compare to other treatments. Among the varieties, both the years, the disease infestation was higher in JRO-424 (6.40 and 7.45, respectively). whereas, the lowest infestation (1.72 and 2.72, respectively) was recorded from BJC-2142 (Table 1). Our findings are similar with the findings of several reports on the use of *Trichoderma* species as biological agents against plant pathogens (Harman *et al*., 2004; Zeilinger and Omann, 2007). *Trichoderma* species are common in soil and root ecosystems and are ubiquitous saprobes (Harman *et al*., 2004; Thormann and Rice, 2007; Vinale *et al*., 2008; Kodsueb *et al*., 2008) and they are easily isolated from soil, decaying wood, and other organic material (Howell, 2003; Zeilinger and Omann, 2007). *Trichoderma* species have been used as biological control agents against a wide range of pathogenic fungi e.g. *Rhizoctonia* spp., *Pythium* spp., *Botrytis cinerea*, and *Fusarium* spp. *Phytophthora palmivora*, *P. parasitica* and different species can be used, e.g. *T. harzianum*, *T. viride*, *T. virens* (Benítez *et al*., 2004; Sunantapongsuk *et al*., 2006; Zeilinger and Omann, 2007).

Table 1. Effect of bioderma against jute disease in field condition during 2018-2019

Treatments	% diseased plant					
	O-9897		JRO-524		BJC-2142	
	2018	2019	2018	2019	2018	2019
Bioderma	2.94 c	2.98 c	6.40 c	7.45 c	1.72 c	2.72 c
Mancozeb	4.35 b	4.55 b	6.52 b	8.32 b	3.35 b	3.95 b
Control	6.27 a	6.98 a	7.80 a	9.67 a	4.41 a	4.91 a
LSD(0.05)	1.38	1.73	0.90	0.76	1.12	0.56
% CV	11.86	10.32	11.14	11.82	10.67	10.88

Effect of bioderms on yield and yield contributing characters

The effect of bioderma on jute yield and yield contributing characters were presented in Table 2 and Table 3. There was no significant difference ($p>0.05$) in yield contributing characters except the plant population of JRO-524 (Table 2). The variety JRO-524, mancozeb treated plot showed the maximum number of plants (34.00 and 44.08, respectively) which was statistically similar with bioderma treated plots in both of the years. In case of plant height and base diameter, the bioderma treated plot showed better performance in all the examined varieties (Table 2).

In this study there was no significant difference ($p>0.05$) in fibre yield among the varieties but numerically the bioderma treated plots showed better performance in all the experimented varieties.

Table 2. Effect of bioderma on iute yield contributing characters of iute varieties during 2018-2019

Treatments	PP (m^{-1})						PH (m)						BD (mm)					
	O-9897		JRO-524		BJC-2142		O-9897		JRO-524		BJC-2142		O-9897		JRO-524		BJC-2142	
	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
Bioderma	30.66 a	40.65 a	34.00 a	44.04 a	34.00 a	44.10 a	3.06 a	3.26 a	3.01 a	3.21 a	3.07 a	3.26 a	13.33 a	14.32 a	12.71a	13.70a	16.73 a	15.73 a
Mancozeb	31.33 a	41.36 a	34.00 a	44.08 a	35.00 a	45.20 a	3.12 a	3.32 a	2.99 a	3.09 a	3.01 a	3.21 a	13.38 a	14.35 a	12.42a	13.32a	15.82a	16.83a
Control	30.33 a	40.30 a	32.00 b	42.05b	34.00 a	44.08 a	3.14 a	3.14 a	3.13 a	3.32 a	3.07 a	3.26 a	14.59 a	15.49 a	13.65a	14.62a	16.12 a	17.22 a
LSD(0.05)	NS	NS	1.87	1.68	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
% CV	10.32	10.46	9.86	11.52	10.19	8.96	9.64	10.11	11.38	10.92	8.86	11.81	8.08	9.96	10.78	9.95	6.69	7.59

Legend : NS= Not Significant, PP= Plant Population, PH= Plant Height, BD= Base Diameter, FY= Fibre Yield, SY= Stick Yield.

Table 3. Effect of bioderma on yield of jute varieties during 2018-2019

Treatments	FY (tha^{-1})						SY (tha^{-1})					
	O-9897		JRO-524		BJC-2142		O-9897		JRO-524		BJC-2142	
	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
Bioderma	2.95 a	2.97 a	3.66 a	3.69 a	2.59 a	2.69 a	5.76 ab	5.86 ab	6.74 b	6.84 b	5.11 b	5.21 b
Mancozeb	2.84 a	2.86 a	3.60 a	3.65 a	2.50 a	2.55 a	5.68 b	5.78 b	7.17 a	7.36 a	5.93 a	5.99 a
Control	2.48 a	2.49 a	3.56 a	3.54 a	2.44 a	2.42 a	6.39 a	6.49 a	7.26 a	7.27 a	5.77 a	5.87 a
LSD(0.05)	NS	NS	NS	NS	NS	NS	1.10	1.06	0.42	0.23	0.42	0.54
% CV	10.54	9.98	9.49	8.87	10.20	11.50	10.34	9.76	10.88	11.32	10.65	9.92

Legend : NS= Not Significant, PP= Plant Population, PH= Plant Height, BD= Base Diameter, FY= Fibre Yield, SY= Stick Yield.

Significant difference ($p<0.05$) was found in the stick yield among the varieties. Mancozeb treated plots showed the better performance except O-9897 (Table 3).

The benefits of using fungi as mycofungicides and biofertilizers include decreasing the occurrence of plant diseases by inhibiting the growth of pathogens, suppressing the amount of inocula of pathogens, increasing in uptake of nutrients from the soil or atmosphere, and producing bioactive compounds, hormones and enzymes which stimulate plant growth. These benefits maintain and increase the crop production. There are many commercial mycofungicides and fungal biofertilizers available worldwide. Using mycofungicides and fungal biofertilizers offer more environmentally friendly alternatives than chemical fungicides and chemical fertilizers.

Conclusion

From the above results, it could be concluded that the effect of bioderma application was not found to encourage effectiveness in controlling field disease of jute as well as yield and yield contributing characters but exotic variety JRO-524 was more vulnerable to field disease than BJRI released varieties.

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