Effect of bioagents on quality and soil analysis in Ridge gourd two parts of the title are not in harmony with each other. Effect of bioagents on quality of Gourd??? Soil analysis in Gourd??

ABSTRACT

The present investigation entitled effect of bioagents on quality and soil analysis in ridge gourd was carried out during *Kharif*, 2021 and Summer, 2022 at P.G block, College of Horticulture, Rajendranagar, SKLTSHU, Hyderabad. The experiment was carried out with 11 treatments in Randomized Block Design with three replications. The results reported that the T_1 (RDF + *Trichoderma viride*recorded highest in fruit quality, soil parameters and benefit-cost ratio compared to other treatments. Did Trichoderma record highest in fruit quality or ridge gourd?? Sentence is confusing.

Keywords: Ridge gourd, Arka prasan, Trichoderma, Pseudomonas, Bacillus Scientific terms in italics

1. INTRODUCTION

Ridge gourd (*Luffa acutangula*) is one of the most important warm season (which specific season or month??)vegetable which is commercially propagated by seeds. It contains (has)high content of water and nutrients, protein, fat, carbohydrates, minerals and vitamins. In India, gourds are cultivated in an area of 4.52 lakh hectares with a production of 36.16 lakh MT (www.aps.dac.gov.inAnonymous 2019a) and in Telangana the crop is grown in an area of 14,087 hectares with a production of 2.82 lakhs MT and productivity of 20 MT (Anonymous 2019b not mentioned in the bibliography).

Biological Biocontrol agents are the living organisms, which can significantly lower the density of plant pathogens and have become very popular as an alternative to chemical pesticides for management of pests and diseases (O'Brien, 2017).

Biocontrol fungi of the gGenus *Trichoderma*fungi can utilize a variety of nutrient sources and are able to effectively degrade some of them (Harmametal, 2004). Bbiofertilizers functions as a key player in sustainable agriculture by improving soil fertility, plant tolerance and crop productivity.Ccurrent soil management strategies are mainly dependent on inorganic chemical-based fertilizers, which caused a serious threat to human health and environment. UtilizationThe exploitation of beneficial microbes as biofertilizers is of has become paramount importance in agriculturale sector due to for their potential role in food safety and sustainable crop production.

2.Materials and methods

The present investigation was carried out during Kharif,season (2021) and sSummer season, (2022) at P.G block, College of Horticulture, SKLTSHU, Rajendranagar, Hyderabad. The experimental site is situated at a latitude of 17□.32' North, longitude of 78□.40' East and altitude of 542.3 m above mean sea level. The experiment was laid out in randomized block design with eleven treatments replicated three times. The entire experiment was executed on a creeping mesh. The pit size of 60 cm^2 were dug with a spacing of 1.5 × 1.0 m and were kept open for solarization for about 15 days. Good agricultural practices were followed during the entire crop period. The data recorded on quality (of what?), soil analysis (give the methods of analysis used with references)were statistically (which statistical tools were used??) analysed.

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3. Results and discussion

3.1 Quality parameters

The data pertaining to the quality parameters viz.,TSS, ascorbic acid content, reducing sugars, non-reducing sugars, total sugars, chlorophyll content and crude fibreinfluenced by different bioagentswaserecorded.~~viz.,TSS, ascorbic acid content, reducing sugars, non-reducing sugars, total sugars, chlorophyll content and crude fibre as influenced by different bioagents are presented in the~~ (Tables 1 to 3.).

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3.1.1 TSS (°Brix)? Where are the control values before treatment?

The data ~~enunciated~~ on the TSS (°Brix) ~~as influenced~~affected by the ~~effect of~~ bioagents on quality in ridge gourd is presented in Table 1.

From the data it is clear that there was significant differences observed among the treatments with respect to TSS during *Kharif* season.Significantly maximum TSS (4.02) was recorded in T_1~~(RDF + *Trichoderma viride*)~~ followed by T_2~~(RDF + *Pseudomonas fluorescens*)~~(3.78), while the minimum TSS (2.89) was recorded with T_{11} (~~Absolute~~ control).

During the s~~S~~ummer season ~~among all the treatments~~, T_1~~(RDF + *Trichoderma viride*)~~recorded maximum TSS (4.25) followed by T_2~~(RDF + *Pseudomonas fluorescens*)~~(4.01), while the minimum TSS (3.04) was recorded with T_{11} (~~Absolute~~ 100% control).

The highest TSS content of the fruit was recorded in T_1~~(RDF + *Trichoderma viride*) was~~ due to the application of NPK. ~~significantly increased the TSS in fruit~~. TSS content ~~significantly~~ increased with the nitrogen application which helped in vigorous vegetative growth and imparted deep green colour to the foliage and favoured photosynthetic activity of the plants. The greater accumulation of food material *i.e*carbohydrates in the fruit lead~~ing~~ to increase in TSS content. Similar results have been reported by Tripathy,*et al*. (2013) in O~~o~~nion, Diriba-Shiferaw,*et al*. (2014) in G~~g~~arlic and Sharma (2014) in O~~o~~nion.

3.1.2 Ascorbic acid content (mg/100g)? Where are the control values before treatment?

The data presented in Table 1shows ~~revealed~~ that during the Kharifseason, ~~significantly~~ maximum ascorbic acid content (13.33) was observed with T_1~~(RDF + *Trichoderma viride*)~~followed by T_2~~(RDF + *Pseudomonas fluorescens*)~~recording the ascorbic acid content of 12.~~.~~25. The minimum ascorbic acid content (8.27) was recorded with T_{11} (100% ~~Absolute~~ control).

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During the s~~S~~ummer season, ~~significantly~~ maximum ascorbic acid content (13.65) was observed with T_1~~(RDF + *Trichoderma viride*)~~and was at par with T_2~~(RDF + *Pseudomonas fluorescens*)~~recording the ascorbic acid content of 13.39. The minimum ascorbic acid content (8.48) was recorded with T_{11} (~~Absolute~~ control).

The highest ascorbic acid content was recorded in T_1~~(RDF + *Trichoderma viride*)which was~~ due to the availability of sufficient quantities of various nutrient sources resulting in production of more photosynthates, consequently synthesizing more vitamin ' C' content. Similar findings are comparable with Thriveni,*et al*. (2015) in B~~b~~itter gourd and Rathod,*et al*. (2018) in R~~r~~idge gourd.

Table 1. Effect of bioagents on TSS (°Brix) and ~~,~~ ascorbic acid content (mg/100g) of R~~r~~idge gourd during ~~—~~*Kharif*, 2021 and Summer, 2022

Treatments	TSS (^{o} Brix)		Ascorbic acid content (mg/100g)	
	Kharif 2021	**Summer 2022**	**Kharif 2021**	**Summer 2022**
T_1 : RDF + *Trichoderma viride*(5 kg/ha)	4.02	4.25	13.33	13.65
T_2 : RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	3.78	4.01	12.25	13.39
T_3 : RDF + *Bacillus subtilis* (5 kg/ha)	3.66	3.89	12.61	12.97
T_4 : 75% RDF + *Trichoderma viride*(5 kg/ha)	3.70	3.85	10.18	10.55
T_5 : 75% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	3.68	3.72	9.26	10.32
T_6 : 75% RDF + *Bacillus subtilis* (5 kg/ha)	3.64	3.77	9.12	9.49
T_7 : 50% RDF +*Trichoderma viride*(5 kg/ha)	3.60	3.65	8.65	8.85
T_8 : 50% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	3.44	3.58	8.39	8.53
T_9 : 50% RDF + *Bacillus subtilis* (5 kg/ha)	3.57	3.65	8.55	9.98
T_{10} : RDF (100:100:50 NPK kg/ha)	3.52	4.00	10.34	10.81
T_{11} : Absolute control	2.89	3.04	8.27	8.48
SEm±	**0.06**	**0.06**	**0.16**	**0.16**
CD (P=0.05)	**0.16**	**0.17**	**0.46**	**0.48**

3.1.3 Reducing sugars (%)? Where are the control values before treatment?

The data ~~enunciated~~ on the reducing sugars ~~asinfluenced~~affected by the ~~effect of~~ bioagents on quality in ridge gourd is presented in Table 2.

~~From the data it is clear that~~Tthere was significant difference~~s~~ observed among the treatments with respect to reducing sugars during *Kharif* season.~~Significantly~~Mmaximum reducing sugars (4.54 %) were~~as~~ recorded in T_1~~(RDF + *Trichoderma viride*)~~and was at par with T_2 ~~(RDF + *Pseudomonas fluorescens*)~~(4.41 %), while ~~the~~ minimum reducing sugars (2.98 %) were~~as~~ recorded in~~with~~T_{11} (~~Absolute~~ control).

During the s~~S~~ummer season ~~among all the treatments,~~T_1~~(RDF + *Trichoderma viride*)~~recorded maximum reducing sugars (4.62%) and was at par with T_2~~(RDF + *Pseudomonas fluorescens*)~~(4.57 %), while the minimum reducing sugars (3.07 %) were recorded with T_{11} (~~Absolute~~ control).

3.1.4 Non reducing sugars (%)? Where are the control values before treatment?

~~The data presented in Table 2 revealed that~~ Dduring *Kharif* and s~~S~~ummerseasons, ~~significantly~~ minimum non reducing sugars (1.69 and 1.74 %) were~~as~~ observed with T_1~~(RDF + *Trichoderma viride*)~~, while ~~the~~ maximum ~~non reducing sugars~~(2.10 and 2.15 %) were~~as~~ recorded with T_{11} (~~Absolute~~ control).

3.1.5 Total sugars (%)? Where are the control values before treatment?

The data ~~enunciated~~ on the total sugars affected ~~as influenced~~ by the ~~effect of~~ bioagents on quality in ridge gourd is presented in Table 2.

~~From the data it is clear that t~~There was significant difference~~s~~observed among the treatments with respect to total sugars during the *Kharif* season.M~~Significantly m~~aximum total sugars (6.23%) were~~as~~ recorded in T_1~~(RDF + *Trichoderma viride*)~~and was at par with T_2~~(RDF + *Pseudomonas fluorescens*)~~(6.17%), while the minimum total sugars (5.08 %) was recorded with T_{11} (~~Absolute~~ control).

During the s~~S~~ummer season ~~among all the treatments,~~T_1~~(RDF + *Trichoderma viride*)~~recorded maximum total sugars (6.36 %) and was at par with T_2~~(RDF + *Pseudomonas fluorescens*)~~(6.32 %), while the minimum total sugars (5.22 %) was recorded with T_{11} (~~Absolute~~ control).

The sugar content was highest in T_1~~(RDF + *Trichoderma viride*)~~due to application of nutrients ~~content~~ which enhanced the carbon:nitrogen ratio in the soil which might have increased the sugar content. Similar findings were also observed by Nayak*et al*. (2016) in pointed gourd.

Table 2. Effect of bioagents on reducing sugars (%), non-reducing sugars (%), total sugars (%) of~~R~~ridge gourd during the Kharif, 2021 and Summer, 2022

Treatments	Reducing sugars (%)	Non-reducing sugars (%)	Total sugars (%)

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	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022
T_1: RDF + *Trichoderma viride*(5 kg/ha)	4.54	4.62	1.69	1.74	6.23	6.36
T_2: RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	4.41	4.57	1.83	1.81	6.17	6.32
T_3: RDF + *Bacillus subtilis* (5 kg/ha)	3.67	3.58	1.88	1.90	5.55	5.48
T_4: 75% RDF + *Trichoderma viride*(5 kg/ha)	3.89	3.56	1.76	1.75	5.72	5.37
T_5: 75% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	3.24	3.43	1.94	1.91	5.18	5.34
T_6: 75% RDF + *Bacillus subtilis* (5 kg/ha)	3.25	3.65	1.94	1.84	5.19	5.49
T_7: 50% RDF +*Trichoderma viride*(5 kg/ha)	3.72	4.04	1.85	1.98	5.57	6.02
T_8: 50% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	3.30	3.87	1.87	1.86	5.17	5.73
T_9: 50% RDF + *Bacillus subtilis* (5 kg/ha)	3.38	3.44	1.96	1.97	5.34	5.41
T_{10}: RDF (100:100:50 NPK kg/ha)	3.42	3.58	1.84	1.88	5.26	5.46
T_{11}: Absolute control	2.98	3.07	2.10	2.15	5.08	5.22
SEm±	**0.06**	**0.06**	**0.03**	**0.03**	**0.08**	**0.09**
CD (P=0.05)	**0.17**	**0.18**	**0.08**	**0.08**	**0.25**	**0.26**

3.1.6 Chlorophyll content (DA meter reading)? Where are the control values before treatment?

The data presented in Table 3 revealed that during the Kharifseason ~~significantly~~ maximum chlorophyll content (1.49) was~~ere~~ observed with T_1~~(RDF + *Trichoderma viride*)~~ followed by T_2~~(RDF + *Pseudomonas fluorescens*)~~recording the chlorophyll content of 1.38. The minimum chlorophyll content (0.55) was recorded with T_{11} (~~Absolute~~ control).

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During the s~~S~~ummer season, ~~significantly~~ maximum chlorophyll content (1.57) was observed with T_1~~(RDF + *Trichoderma viride*)~~followed by T_2~~(RDF + *Pseudomonas fluorescens*)~~recording the chlorophyll content of 1.40. The minimum chlorophyll content (0.62) was recorded with T_{11} (~~Absolute~~ control).

Application of NPK significantly increased ????~~with the fertilizer application~~ which helped in vigorous vegetative growth and imparted deep green colour to the foliage favouring photosynthetic activity of the plants. There was greater accumulation of food material due to increased photosynthetic activity. Similar results have also been reported by Tripathy,*et al.* (2013) in O~~o~~nion.

3.1.7 Crude fibre content (%)? Where are the control values before treatment?

The data presented in Table 3 revealed that during the Kharifseason, ~~significantly~~ minimum crude fibre (2.15) was observed with T_1~~(RDF + *Trichoderma viride*)~~and was at par with T_2~~(RDF + *Pseudomonas fluorescens*)~~recording the chlorophyll content of 2.24. The maximum crude fibre (2.86) was recorded with T_{11} (~~Absolute~~ control).

During the s~~S~~ummer season, ~~significantly~~ minimum crude fibre (2.10) was observed with T_1~~(RDF + *Trichoderma viride*)~~and was at par with T_2~~(RDF + *Pseudomonas fluorescens*)~~recording the crude fibre of 2.21. The maximum crude fibre (2.79) was recorded with T_{11} (~~Absolute~~ control).

The crude fiber content increased with the advancement of crop growth. The decrease in crude fibre content was due to the increase in succulence by the ~~increased~~ application of nitrogen, potassium, ~~potassium~~increasing??~~in strengthening~~ the thickness of the cell wall. Similar results were obtained by Prabu,*et al.* (2003), ~~in okra.~~ Mani and Ramanathan (1981), Abusaleha (1992) and Naidu,*et al*. (2000) in O~~o~~kra. Similar decrease in crude fibre content with increased ~~of~~ nitrogen was observed or recorded~~obtained~~ by Irene (1990).

Table 3. Effect of bioagents on chlorophyll ~~content~~ and ~~,~~ crude fibre content of R~~r~~idge gourd during the Kharif, 2021 and Summer, 2022

Treatments	Chlorophyll content		Crude fibre content	
	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022
T_1: RDF + *Trichoderma viride*(5 kg/ha)	1.49	1.57	2.15	2.10
T_2: RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	1.38	1.40	2.24	2.21
T_3: RDF + *Bacillus subtilis* (5 kg/ha)	1.23	1.28	2.47	2.43
T_4: 75% RDF + *Trichoderma viride*(5 kg/ha)	1.20	1.25	2.59	2.55
T_5: 75% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	1.17	1.14	2.56	2.50
T_6: 75% RDF + *Bacillus subtilis* (5 kg/ha)	1.18	1.20	2.60	2.51
T_7: 50% RDF +*Trichoderma viride*(5 kg/ha)	1.13	1.19	2.62	2.56

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T_8 : 50% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	0.93	1.06	2.69	2.57
T_9 : 50% RDF + *Bacillus subtilis* (5 kg/ha)	1.15	1.17	2.74	2.70
T_{10} : RDF (100:100:50 NPK kg/ha)	1.29	1.24	2.53	2.46
T_{11} : Absolute control	0.55	0.62	2.86	2.79
SEm±	0.02	0.02	0.04	0.04
CD (P=0.05)	0.05	0.06	0.11	0.11

3.2 PEST AND DISEASE INCIDENCE

3.2.1 Pest incidence **How was pest incidence calculated? Where are the control values before treatment?**

The data presented in Table 4 revealed that there was no significant difference in incidence of observed by using the bioagents on the fruitfly and leaf miner incidence during *Kharif* and Summer season respectively.

3.2.2 Disease incidence **how was disease incidence calculated? What formula?? Where are the control values before treatment?**

3.2.2.1 Downy mildew

The results presented in Table 5 revealed that the effect of bioagents of ridge gourd during experimentation revealed that T_1: RDF+ *Trichoderma viride*was shownsn less (24.18) percent of disease incidence and the highest incidence was observed in treatment was T_{11} Absolute(control (55.10) during the Kharifseason.

Roco and Perez (2001) reported that *Trichoderma* spp. have evolved numerous mechanisms such as which includes competition for space and nutrients, mycoparasitism and production of inhibitory compounds, inactivation of the pathogen enzymes and induced resistance to crops by that are involved in attacking other fungi and reduce the plant diseases. Similar results were reported by Yadav,*et al*. (2013) in Oonion, Shilpa,*et al*. (2022) in Ccabbage and Yogita,*et al*. (2022) in Rridge gourd.

Table 4. Effect of bioagents on pest incidence of ridge gourd during the Kharif, 2021 and Summer, 2022

Treatments	Mean Per cent fruit damage by fruit fly		Mean number of leaf mines per plant	
	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022
T_1 : RDF + *Trichoderma viride*(5 kg/ha)	38.60	24.90	4.26	4.15

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T_2 : RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	38.23	24.25	4.35	4.28
T_3 : RDF + *Bacillus subtilis* (5 kg/ha)	39.36	25.58	4.44	4.49
T_4 : 75% RDF + *Trichoderma viride*(5 kg/ha)	38.58	25.18	4.46	4.24
T_5 : 75% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	39.90	27.59	4.65	4.58
T_6 : 75% RDF + *Bacillus subtilis* (5 kg/ha)	41.60	29.25	4.55	4.45
T_7 : 50% RDF +*Trichoderma viride*(5 kg/ha)	41.54	27.32	4.67	4.35
T_8 : 50% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	40.78	28.64	4.59	4.62
T_9 : 50% RDF + *Bacillus subtilis* (5 kg/ha)	43.85	29.58	4.54	4.59
T_{10} : RDF -100% NPK	40.52	25.24	4.75	4.37
T_{11} : Absolute control	43.90	30.07	4.98	4.79
SEm±	**0.57**	**0.39**	**0.07**	**0.07**
CD (P=0.05)	**NS**	**NS**	**NS**	**NS**

Table 5. Effect of bioagents on disease incidence of ridge gourd during the Kharif, 2021

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	Mean of Ddowny Mmildew %Per cent Incidence
	Kharif 2021
T_1 : RDF + *Trichoderma viride*(5 kg/ha)	24.18
T_2 : RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	25.27
T_3 : RDF + *Bacillus subtilis* (5 kg/ha)	26.46
T_4 : 75% RDF + *Trichoderma viride*(5 kg/ha)	25.10
T_5 : 75% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	26.78
T_6 : 75% RDF + *Bacillus subtilis* (5 kg/ha)	27.36

T_7: 50% RDF +*Trichoderma viride*(5 kg/ha)	26.26
T_8: 50% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	30.69
T_9: 50% RDF + *Bacillus subtilis* (5 kg/ha)	31.61
T_{10}: RDF -100% NPK	48.25
T_{11}: Absolute control	55.10
SEm±	**0.40**
CD (P=0.05)	**1.17**

3.3 Soil analysis

3.3.1 pH? Where are the control values before treatment?

It is clear from Table 6 that pH did not vary significantly with different treatments during *Kharif* and Summer season respectively.

3.3.2 EC (dS/m)? Where are the control values before treatment?

The data presented in Table 6there was no significant difference observed between the treatments during *Kharif* and Summer season respectively.

3.3.3 Organic carbon (%)? Where are the control values before treatment?

It is clear from Table 6 that organic carbon did not vary significantly with different treatments during *Kharif* and Summer season respectively.

Table 6. Effect of bioagents on P^H electrical conductivity (dS/m) and organic carbon (%) of ridge gourd during *Kharif*, 2021 and Summer, 2022 was the pH, EC and organic carbon calculated fro the ridge gourd???

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Treatments	P^H		Electrical conductivity (dS/m)		Organic carbon (%)	
	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022
T_1: RDF + *Trichoderma viride*(5 kg/ha)	7.11	7.13	0.297	0.299	0.58	0.59

T_2: RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	7.17	7.19	0.295	0.297	0.57	0.58
T_3: RDF + *Bacillus subtilis* (5 kg/ha)	7.14	7.17	0.294	0.294	0.55	0.56
T_4: 75% RDF + *Trichoderma viride*(5 kg/ha)	7.23	7.25	0.289	0.290	0.52	0.54
T_5: 75% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	7.25	7.25	0.288	0.285	0.50	0.52
T_6: 75% RDF + *Bacillus subtilis* (5 kg/ha)	7.26	7.31	0.287	0.288	0.51	0.53
T_7: 50% RDF +*Trichoderma viride*(5 kg/ha)	7.17	7.22	0.285	0.282	0.49	0.49
T_8: 50% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	7.28	7.29	0.281	0.280	0.47	0.48
T_9: 50% RDF + *Bacillus subtilis* (5 kg/ha)	7.31	7.34	0.284	0.286	0.45	0.47
T_{10}: RDF (100:100:50 NPK kg/ha)	7.23	7.27	0.292	0.294	0.52	0.55
T_{11}: Absolute control	7.36	7.35	0.270	0.272	0.44	0.46
SEm±	**0.11**	**0.11**	**0.004**	**0.004**	**0.01**	**0.01**
CD (P=0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

3.3.4 Available nitrogen (kg/ha)? Where are the control values before treatment?

The data of ~~pertaining to~~ available nitrogen in the soil after harvest as influenced by the effect of bioagents are presented in Table 7.

The data indicated that among the treatments evaluated, ~~significantly~~ maximum available nitrogen content in the soil (269.53 and 268.64) was observed with T_1 ~~(RDF + *Trichoderma viride*)~~which was on par with T_2~~(RDF + *Pseudomonas fluorescens*)~~(268.32 and 265.44) and T_3~~(RDF + *Bacillus subtilis*)~~ (266.78 and 263.05), while the minimum nitrogen content in the soil was recorded with T_{11} ~~(Absolute~~ control) (211.66 and 215.04) during the Kharifand ~~s~~Summer season respectively.

3.3.5 Available phosphorus (kg/ha)? Where are the control values before treatment?

The data on available phosphorus in the soil after harvest as influenced by the effect of bioagents are presented in Table 7.

The data indicated that ~~among the treatments evaluated, significantly~~ maximum available phosphorus content in the soil (33.35 and 35.05) was observed with T_1~~(RDF + *Trichoderma viride*)~~ followed by

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T_2~~(RDF + *Pseudomonas fluorescens*)~~(31.77 and 33.47), while the minimum phosphorus content in the soil was recorded with T_{11} (~~Absolute~~ control)(23.31 and 23.52) during *Kharif* and Summer seasons respectively.

3.3.6 Available potassium (kg/ha)? Where are the control values before treatment?

The data on available potassium in the soil after harvest as influenced by the effect of bioagents are presented in Table 7.

The data indicated that ~~among the treatments evaluated, significantly~~ maximum available potassium content in the soil (203.64 and 206.45) was observed with T_1~~(RDF + *Trichoderma viride*)~~and was on par with T_2~~(RDF + *Pseudomonas fluorescens*)~~(196.31 and 198.87) and T_3~~(RDF + *Bacillus subtilis*)~~ (195.24 and 198.59), while the minimum potassium content in the soil was recorded with T_{11} (~~Absolute~~ control) (149.17 and 154.90) during *Kharif* and Summer season respectively.

Owing to ready release of nutrients in available forms, N, P and K washigherwithRDFtreatmentcomparedtoothertreatments. It may be due to added supply of nutrients and proliferous root system developed under balanced nutrient application resulting in better absorption of water and nutrients along with improved physical environment. Similar findings were reported by Sundar Raman,*et al.* (2000) in Ggherkin.

Table 7. Effect of bioagents on N, P and K of ridge gourd???during *Kharif*, 2021 and Summer, 2022

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Treatments	Nitrogen (kg/ha)		Phosphorous (kg/ha)		Potassium (kg/ha)	
	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022
T_1: RDF + *Trichoderma viride*(5 kg/ha)	269.53	268.64	33.35	35.05	203.64	206.45
T_2: RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	268.32	265.44	31.77	33.47	196.31	198.87
T_3: RDF + *Bacillus subtilis* (5 kg/ha)	266.78	263.05	31.23	32.51	195.24	198.59
T_4: 75% RDF + *Trichoderma viride*(5 kg/ha)	259.02	257.01	30.42	31.82	193.18	197.04
T_5: 75% RDF + *Pseudomonas*	256.86	257.03	30.01	31.48	190.11	190.39

fluorescens (2.5 kg/ha)						
T_6: 75% RDF + *Bacillus subtilis* (5 kg/ha)	255.19	255.54	29.89	30.26	183.74	189.71
T_7: 50% RDF +*Trichoderma viride*(5 kg/ha)	248.91	249.70	26.50	26.66	177.51	180.79
T_8: 50% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	246.58	242.46	25.11	25.32	168.53	170.83
T_9: 50% RDF + *Bacillus subtilis* (5 kg/ha)	245.44	244.95	24.74	26.35	163.46	169.58
T_{10}: RDF (100:100:50 NPK kg/ha)	260.73	260.12	30.52	31.63	194.96	193.62
T_{11}: Absolute control	231.66	235.04	23.31	23.52	149.17	154.90
SEm±	3.40	3.47	0.44	0.45	2.74	2.78
CD (P=0.05)	10.23	10.04	1.33	1.29	8.21	8.08

3.4 Benefit cost ratio

The economics as influenced by the effect of bioagents has been calculated and presented in Table 8.

~~Among the treatments~~D~~d~~uring *Kharif* season, ~~significantly~~T_1~~(RDF + *Trichoderma viride*)~~recorded the highest gross returns (Rs. 3,615,00), net returns (Rs. 2,625,49.60) with benefit cost ratio of 2.65:1, w~~W~~hereas the T_{20} (~~Absolute~~ control) recorded the lowest gross returns per hectare (Rs. 1,071,00), net returns per hectare (Rs. 16,845) with benefit cost ratio of 0.19:1.

During the s~~S~~ummer season, T_1~~(RDF + *Trichoderma viride*)~~recorded the highest gross returns (Rs. 3,706,50), net returns (Rs. 2,711,49.60) with benefit cost ratio of 2.73:1, w~~W~~hereas the T_{20} (~~Absolute~~ control) recorded the lowest gross returns per hectare (Rs. 1,254,00), net returns per hectare (Rs. 34,595) with benefit cost ratio of 0.38:1.

Similar results were also reported by Kavita,*et al*. (2020) in R~~r~~idge gourd.

Table 8.Effect of bioagents on benefit: cost ratio of ridge gourd during *Kharif*, 2021 and Summer, 2022

Treatments	Cost of cultivation (Rs/ha)	Gross income (Rs/ha)	Net returns (Rs/ha)	B:C ratio

	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022
T_1 : RDF + *Trichoderma viride*(5 kg/ha)	98950.40	99500.40	361500	370650	262549.60	271149.60	2.65	2.73
T_2 : RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	98950.40	99500.40	320250	324750	221299.60	225249.60	2.24	2.26
T_3 : RDF + *Bacillus subtilis* (5 kg/ha)	98970.40	99520.40	295050	300450	196079.60	200929.60	1.98	2.02
T_4 : 75% RDF + *Trichoderma viride*(5 kg/ha)	96801.60	97351.60	346200	351750	249398.40	254398.40	2.58	2.61
T_5 : 75% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	96801.60	97351.60	281400	288900	184598.40	191548.40	1.91	1.97
T_6 : 75% RDF + *Bacillus subtilis* (5 kg/ha)	96821.60	97371.60	268800	280500	171978.40	183128.40	1.78	1.88
T_7 : 50% RDF +*Trichoderma viride*(5 kg/ha)	94652.70	95202.70	313950	315900	219297.30	220697.30	2.32	2.32
T_8 : 50% RDF + *Pseudomonas fluorescens* (2.5 kg/ha)	94652.70	95202.70	253200	258750	158547.30	163547.30	1.68	1.72
T_9 : 50% RDF + *Bacillus subtilis* (5 kg/ha)	94672.70	95222.70	233850	237750	139177.30	142527.30	1.47	1.50
T_{10}: RDF (100:100:50 NPK kg/ha)	98850.40	99400.40	287400	293550	188549.60	194149.60	1.91	1.95
T_{11} : Absolute control	90255.00	90805.00	107100	125400	16845.00	34595.00	0.19	0.38

4. Conclusion

From the study it could be concluded that T_1 ~~(RDF + *Trichoderma viride*)~~had shown the positive effect on fruit quality, soil parameters and benefit-cost ratio in ridge gourd compared to other treatments, hence it was proved to be the best treatment in ridge gourd. What were the results for T3 to T10? They are not discussed anywhere.

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