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Response of *Trichoderma viride* and plant growth promoting Rhizobacteria (PGPR) on growth and yield of chilli cv. Arka Lohit

Pragya Singh and DP Sharma

Abstract
A field experiment was conducted to evaluate the Response of *Trichoderma* and PGPR on Growth and Yield of chilli cv. Arka Lohit. An experiment was carried out at Horticulture Complex, JNKVV Jabalpur (M.P.) during the year 2017-18. Among the various treatments of Trichoderma and PGPR, the combination of all *Trichoderma viride* (TV) + *Pseudomonas fluorescence* (PF) + *Azotobacter chroococcum* (AC) (2.5 kg/ha +2.5 kg/ha +5.0kg/ha) showed better response. The observation was recorded on different growth and yield attributes. The growth and yield of chilli plants were influenced by combined application of Trichoderma and PGPR (*Pseudomonas fluorescence* + *Azotobacter chroococcum)*. The maximum plant height 30 DAT (Day after transplanting) was observed in treatment B3 (*Trichoderma viride* (TV) + *Pseudomonas fluorescence* (PF) + *Azotobacter chroococcum* (AC) 2.5 kg/ha +2.5 kg/ha +5.0kg/ha) (34.94cm), 60 DAT (43 cm), 90 DAT (52.04 cm) and 120 DAT (56.73 cm). The maximum number of branches per plant at last harvest was recorded in treatment B3 (27). The yield parameter like Average fruit weight (8.43 g), Fruit yield per plant (153.47 g) recorded highest in treatment B3 (*Trichoderma viride* (TV) + *Pseudomonas fluorescence* (PF) + *Azotobacter chroococcum* (AC)). Thus combine the use of *Trichoderma* and PGPR proved better in improving growth and yield in chilli.

Keywords: Chilli, *Trichoderma viride*, PGPR, growth and yield

Introduction
Chilli *(Capsicum annuum* L., 2n=24) is one of the most important vegetables as well as spice and a cash crop of India and belongs to the family Solanaceae. Chilli is the second largest commodity after black pepper in international trade. In India, it is an important ingredient in daily cuisine and it is also used in pickles, sauces. Chilli is an indispensable spice, due to its pungency, taste, colour and flavour. Chilli is one of the richest sources of vitamin C and fruits accumulate maximum ascorbic acid when it turns to maturity. Now a day's various currently used biological approaches, use of bio inoculants at seedling stage should be implemented either alone in combination could prove as a promising approach. There are several reports of Trichoderma mediated growth enhancement and development of seedlings of several vegetable crops namely tomato, lettuce, cabbage and chilli (Rabeendran *et al.,* 2000, Joshi *et al*., 2010, Tanwar *et al*., 2010) [4, 6, 5]. *Trichoderma* strains are always associated with plant roots and colonize with plant root to produce compounds that stimulate growth (Harman *et al.,* 2004) [7]. The application of Trichoderma spp. has a positive effect on plant growth and yield in some vegetable crops (Baker, 1989; Chang *et al.,* 1986; Inbar *et al.,* 1994; Poldma *et al.,* 2000). There are various biological ways to improve the yield of crop plants. The use of plant growth promoting bacteria including various groups of soil based bacteria that have the ability to promote the growth of crop plants through increase the plant nutrition. Some PGPR such as *Pseudomonas fluorescence*, *Azotobacter chroococcum* has been reported to improve fertility condition of the soil and beneficial effects on plant yields. In this *Pseudomonas fluorescence* is ubiquitous bacteria in agricultural soils and has many traits that make them well suited as PGPR. Whereas *Azotobacter chroococcum* has beneficial effects on plant growth and yield due to their ability to fix nitrogen (Tejera *et al.,* 2005) [8]. Therefore the present experiment was carried out with the following objectives to find out the Response of *Trichoderma* and PGPR on Growth and Yield of chilli.

Materials and methods
The experiment was conducted at Horticulture complex, Maharajpur, Department of Horticulture. J.N.K.V.V. Jabalpur (M.P.) during *Rabi* season of 2017- 2018. The experiment was laid out in Randomized Complete Block Design (RCBD-factorial) with three replications.

Treatments comprised: B0 (control) No bioinoculant, B1 *Trichoderma viride* (TV) (2.5 kg/ha), B2 *Trichoderma viride* (TV) (2.5kg /ha) + *Pseudomonas fluorescence* (PF) (2.5 kg/ha), B3 *Trichoderma viride* (TV) (2.5kg /ha) + *Pseudomonas fluorescence* (PF) (2.5 kg/ha) + *Azotobacter chroococcum* (5.0 kg/ha). The seedlings were transplanted at 60 cm X 50 cm spacing. Observations on different growth parameters plant height like were taken, a number of branches per plant were counted from the main stem at the time of last harvesting and yields were recorded. The analysis for the experimental was done as per Panse and Sukhatme (1989) [3].

Result and discussion

The data presented in Table-1 revealed that the analysis of variance showed a significant difference for all the characters. Among different treatments, the maximum plant height 30 DAT (Day after transplanting) was recorded in treatment B3 (*Trichoderma viride* (TV) + *Pseudomonas fluorescence* (PF) + *Azotobacter chroococcum* (AC) 2.5 kg/ha + 2.5 kg/ha+5.0kg/ha) (34.94cm), 60 DAT (43.00cm), 90 DAT (52.04 cm) and 120 DAT (56.73 cm) followed by B2 (*Trichoderma viride* (TV) (2.5kg /ha) + *Pseudomonas fluorescence* (PF) (2.5 kg/ha). Whereas minimum plant height 30 DAT (29.21 cm), 60 DAT (37.42 cm), 90 DAT (46.19 cm), 120 DAT (51.89 cm) was recorded in B0 (control).The number of branches per plant (27.00) was recorded maximum in treatment B3 (*Trichoderma viride* (TV) + *Pseudomonas fluorescence* (PF) + *Azotobacter chroococcum* (AC) 2.5 kg/ha +2.5 kg/ha +5.0kg/ha) followed by B2 (*Trichoderma viride* (TV) (2.5kg /ha) + *Pseudomonas fluorescence* (PF) (2.5 kg/ha) as compared to (21.87) B0 under control. In respect to Average fruit weight maximum (8.43g) recorded in treatment B3 (*Trichoderma viride* (TV) + *Pseudomonas fluorescence* (PF) + *Azotobacter chroococcum* (AC) 2.5 kg/ha +2.5 kg/ha +5.0kg/ha) followed by B2 (6.46g) (*Trichoderma viride* (TV) (2.5kg /ha) + *Pseudomonas fluorescence* (PF) (2.5 kg/ha) as compared to control (B0) (5.47 g). Data recorded in Table 2 revealed that, the treatment B3 (*Trichoderma viride* (TV) + *Pseudomonas fluorescence* (PF) + *Azotobacter chroococcum* (AC) 2.5 kg/ha +2.5 kg/ha +5.0kg/ha) significantly produced maximum fruit yield per plant (153.47 g) in comparison with the plant under control B0 (101.47 g).

The results of the study showed that combined application *Trichoderma viride* and PGPR (*Pseudomonas fluorescence* (PF) + *Azotobacter chroococcum* (AC)) had a beneficial effect on growth and yield. These findings are in good agreement with Gowda *et al*., (2002) [2] who observed the improved growth, yield and quality of chilli with 75% nitrogen, phosphorous plus 100 % potassium in addition to the inoculation of biofertilizers. Sajan *et al*. (2002) reported that in chilli plants inoculated with *Azotobacter, Azospirillum,* phosphorus solubilizing bacteria (PSB)and VAM in combination with 75% recommended a dose of N, P each and 100 per cent of recommended K recorded maximum plant height, leaf area and dry matter compared to the control. The present findings are also in good agreement with observation of Garikapati and Sivasakthivelan (2013) [1] observed that the effect of bio inoculation with consortium *Viz., Trichoderma viride* + *Pseudomonas fluorescence* + *Azotobacter chroococcum* was much better when compared to dual and single inoculation which enhanced the growth and yield parameters when compared to control thereby improving the soil health. The present study undertaken to evaluate the mixed inoculants of *Trichoderma viride, Pseudomonas Fluorescence* and *Azotobacter chroococcum* on the growth, soil fertility and yield of chilli.

Conclusion

The result of the present study indicated that combined inoculation increases the microbial population over control and significantly increase the soil fertility, growth and yield of chilli so that treatment B3 (*Trichoderma viride* + *Pseudomonas fluorescence* + *Azotobacter chroococcum*) appeared as best- suited combination.

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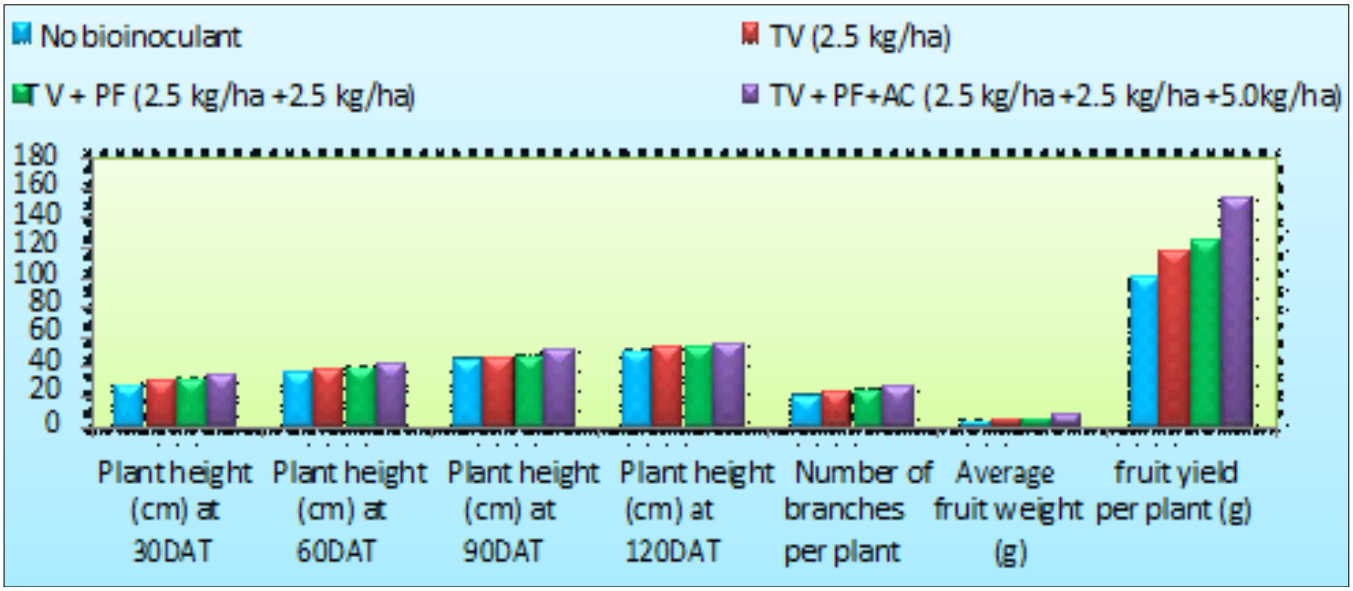

Fig 1: Effect of *Trichoderma viride* (TV) and (PGPR) *Pseudomonas fluorescence* (PF), *Azotobactor chroococcum* (AC)} on Plant height, number of branches per plant, average fruit weight and fruit yield per plant (g)

Table 1: Effect of *Trichoderma viride* (TV) and (PGPR) *Pseudomonas fluorescence* (PF), *Azotobactor chroococcum* (AC)} on Plant height, number of branches per plant, average fruit weight and fruit yield per plant (g)

Treatment	Treatments	Plant height (cm) at				Number of branches per plant	Average fruit weight (g)	fruit yield per plant (g)
		30DAT	60DAT	90DAT	120DAT			
B0	No bioinoculant	29.21	37.42	46.19	51.89	21.87	5.47	101.47
B1	TV (2.5 kg/ha)	31.94	39.46	46.45	54.08	23.90	5.95	117.80
B2	TV + PF (2.5 kg/ha +2.5 kg/ha)	33.06	40.76	48.09	55.09	25.41	6.46	126.07
B3	TV + PF+AC (2.5 kg/ha +2.5 kg/ha+5.0kg/ha)	34.94	43.00	52.04	56.73	27.00	8.43	153.47
S.Em±		0.40	0.20	0.38	0.16	0.27	0.16	2.03
C.D.5% level		1.17	0.58	1.09	0.46	0.78	0.47	5.84

References

1. Garikapati S, Sivasakthivelan P. Studies on influenced of bioinoculant consortium on Chillies and its effect on soil health management. International Journal of Chemical Tech Research. 2013; 5(3):1326-1328.
2. Gowda KK, Sajjan M, Sreeramu BS. Effect of biofertilizers with graded levels of nitrogen and phosphorus on growth, yield and quality of Chillies cv. Byadagi Dabba. Central Coffee Research Institute, 2002, 304-309.
3. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. Indian Council of Agricultural Research, New Delhi, 1989, 145-150.
4. Rabeendran N, Moot DJ, Jones EE, Stewart A. Inconsistent growth promotion of cabbage and lettuce from *Trichoderma* isolates. New Zealand Plant Protection. 2000; 53:143-146.
5. Tanwar A, Aggarwal A, Alpa, Kadiyan N. Enhanced growth and yield of *Capsicum annuum* L. with two endomycorrhizal fungi and other bio inoculants. Journal of Indian Botanical Society. 2011; 90:351-359.
6. Joshi BB, Bhatt RP, Bahukhandi D. Antagonistic and plant growth activity of *Trichoderma* isolates of Western Himalayas. Journal of Environmental Biology. 2010; 31:921-928.
7. Harman GE, Howell CR, Viterbo A, Chet I. *Trichoderma* spp. - Opportunistic avirulent plant symbionts. Nature Reviews Microbiology. 2004; 2:43-56.
8. Tejera N, Lluch C, Martinez-Toledo MV, Gonzalez-Lopez J. Isolation and Characterization of *Azotobacter* and *Azospirillum* strains from the sugarcane rhizosphere. Plant Soil. 2005; 270:223-232.
9. Bade KK, Vidya Bhati, Singh VB. Effect of Organic Manures and Biofertilizers on Growth, Yield and Quality of Chilli (*Capsicum annum*) cv. Pusa Jwala. Int. J Curr. Microbiol. App. Sci. 2017; 6(5):2545-2552.