Int.J.Curr.Microbiol.App.Sci (2018) Special Issue-6: 1422-1426

EXCELLENT PUBLISHERS

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 Special Issue-6 pp. 1422-1426
Journal homepage: http://www.ijcmas.com

Original Research Article

Effect of Biofertilizer on Growth of Ridge Gourd (*Luffa acutangula*)

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A B S T R A C T

The present study on the effect of biofertilizers on growth of ridge gourd was carried out during 2016-17 with 12 treatment combinations, comprising of control, FYM, FYM + RDF, FYM + RDF + Azotobacter + Azosprillum (Seed treatment), FYM + RDF + Azotobacter + Azosprillum (Soil application), FYM + RDF + Azotobacter + Azosprillum (Seed treatment + Soil application), FYM + RDF + Pseudomonas + Trichoderma (Seed treatment), FYM + RDF + Pseudomonas + Trichoderma (Soil application), FYM + RDF + Pseudomonas + Trichoderma (Seed treatment + Soil application), FYM + RDF + Pseudomonas + Trichoderma (Seed treatment + Soil application), FYM + RDF + Azotobacter + Azosprillum + Pseudomonas + Trichoderma (Soil application) and FYM + RDF + Azotobacter + Azosprillum + Pseudomonas + Trichoderma (Seed treatment + Soil application) replicated thrice in a randomized complete block design and analyzed to study the interactions at Agriculture college, V. C. Farm, Mandya, UAS, Bengaluru (Karnataka). The aim of this study was to assess the growth of Ridge gourd with selected biofertilizers under open field condition. Among the different treatment combinations studied, treatment FYM + RDF + Azotobacter + Azosprillum + Pseudomonas + Trichoderma + (Seed treatment + Soil application) recorded maximum plant height, number of leaves, number of vines and number of flowers of ridge gourd.

Keywords

Biofertilizers, Azotobacter, Azospirillum, Trichoderma and Pseudomonas seed inoculation, soil inoculation and seed plus soil inoculation

Introduction

Ridge gourd (*Luffa acutangula*) is one of the most important warm season vegetable which is commercially propagated by seeds. It contains high content of water and nutrients, protein, fat, carbohydrates, minerals and vitamins. The treatment of seeds with biofertilizers or the soil application of biofertilizers does not pollute the soil and also does not show any negative effect to environment and human health. One of the major essential elements for growth of plants is nitrogen and it is provided in the form of synthetic chemical fertilizer (urea). Such chemical fertilizers pose a health hazard and microbial population problem in soil besides beings quite expensive and making the cost of production high. In such a situation the biofertilizers play a major role (Tiwary *et al.*, 1998).

The biofertilizers, are alternate low cost plant nutrient resources which play a vital role in maintaining long term soil fertility substances. The Biological nitrogen fixing microorganisms significantly contribute for nitrogen addition to soil, phosphate solubilizers help in solubilize bound form of phosphorous. These beneficial microorganisms are known to secrete plant growth promoting substances (Venkateeshwarlu, 2008).

Biofertilizers are the formulation of living microorganisms, which are able to fix atmospheric nitrogen in the available form for plants either by living freely in the soil or being associated symbiotically with plants (SubbaRao, 1993). Biocontrol fungi of the genus Trichoderma fungi can utilize a variety of nutrient sources are able to effectively degrade some of them (Harmametal, 2004) biofertilizers function as key player in sustainable agriculture by improving soil fertility, plant tolerance and crop productivity current soil management strategies are mainly dependent on inorganic chemical-based fertilizers, which caused a serious threat to human health and environment. The exploitation of beneficial microbes as biofertilizers has become paramount importance in agriculture sector for their potential role in food safety and sustainable crop production.

Materials and Methods

The present investigation was conducted during January –April 2017 at the Department of Horticulture and Department of Agricultural Microbiology, College of Agriculture, V. C Farm Mandya, UAS, Bengaluru. The experiment was conducted in open field in a randomized complete block design with three replications. Four bio fertilizers viz., Azatobacter, Azospirillum, Psuedomonas and Trichoderma were treated with seeds as well as applied to soil along with FYM and recommended dose of fertilizer. Ridge gourd seeds are treated with above fertilizers are shade dried for 20-30 minutes and the same fertilizers were applied to the soil and mixed properly. Two seeds were sown in each pit of depth 3-5 cm at a spacing of 30 × 30 cm and watered immediately. Standard cultural practices were followed during the entire crop period. Data was recorded for various growth parameters and statistically analyzed using the method of Analysis of Variances at 5% level of significance.

Results and Discussion

It is evident from the tabulated data (Table 1, 2 and 3) that the vegetative growth was significantly affected by different biofertilizers treatments. Growth parameters like higher plant height, number of leaves, number of vines and number of flowers were significantly influenced by the interaction of biofertilizers was observed under RDF + FYM + Azotobacter + Azosprillum + Pseudomonas + Trichoderma Seed treatment + Soil application (T_{12}) and was par with RDF + FYM + Azotobacter + Azosprillum + Pseudomonas + Trichoderma Soil application (T_{11}). This was mainly due to better nutrient uptake by crop and synergistic activities of introduced microorganisms such as Azotobacter + Azosprillum + Pseudomonas + Trichoderma which resulted in better growth of the crop due to more photosynthesis. Perusal of T_{12} in all the table clearly indicates that the maximum plant height, number of leaves, number of vines and flowers. Another treatment RDF + FYM + Azotobacter + Azosprillum + Pseudomonas + Trichoderma (Seed treatment) which retained at par with treatment 11 (RDF + FYM + Azotobacter + Azosprillum + Pseudomonas + Trichoderma + Soil application. These results are in confirmation with the findings of Ragland Jebaraj (1989), Gurubatham *et al.,* (1989) and Balasubramani (1988).

Table.1 Effect of biofertilizers on plant height of ridge gourd at 20, 40 and 60 DAS

	Treatments	Plant height		
		20 DAP	40 DAP	60 DAP
T1	Control	17.00	20.67	39.00
T2	FYM	15.00	20.67	35.33
T3	FYM + RDF	16.33	30.67	40.33
T4	FYM + RDF + *Azotobacter* + *Azosprillum*(Seed treatment)	16.33	33.67	45.00
T5	FYM + RDF + *Azotobacter* + *Azosprillum*(Soil application)	17.00	34.33	50.00
T6	FYM + RDF + *Azotobacter* + *Azosprillum*(Seed treatment + Soil application)	16.67	39.67	55.00
T7	FYM + RDF + *Pseudomonas* + *Trichoderma*(Seed treatment)	15.00	42.67	60.33
T8	FYM + RDF + *Pseudomonas* + *Trichoderma*(Soil application)	17.67	42.33	65.33
T9	T9= FYM + RDF + *Pseudomonas* + *Trichoderma*(Seed treatment + Soil application)	18.00	42.67	70.33
T10	FYM + RDF + *Azotobacter* + *Azosprillum* + *Pseudomonas* + *Trichoderma*(Seed treatment)	18.00	53.00	75.67
T11	FYM + RDF + *Azotobacter* + *Azosprillum* + *Pseudomonas* + *Trichoderma*(Soil application)	18.67	56.67	80.67
T12	FYM + RDF + *Azotobacter* + *Azosprillum* + *Pseudomonas* + *Trichoderma*(Seed treatment + Soil application)	20.67	59.33	86.00
S. Em±		1.14	1.00	1.14
CD@5%		2.28	2.92	3.35

Table.2 Effect of biofertilizer on number of leaves per plant at 20, 40, 60 DAS

	Treatments	Number of leaves per plant		
		20 DAP	40 DAP	60 DAP
T1	Control	5.33	16.00	26.00
T2	FYM	7.33	17.67	28.33
T3	FYM + RDF	8.00	18.00	28.33
T4	FYM + RDF + *Azotobacter* + *Azosprillum*(Seed treatment)	8.00	19.00	28.67
T5	FYM + RDF + *Azotobacter* + *Azosprillum*(Soil application)	9.00	16.67	29.67
T6	FYM + RDF + *Azotobacter* + *Azosprillum*(Seed treatment + Soil application)	6.67	17.33	31.00
T7	FYM + RDF + *Pseudomonas* + *Trichoderma*(Seed treatment)	7.33	18.00	31.33
T8	FYM + RDF + *Pseudomonas* + *Trichoderma*(Soil application)	7.33	20.67	37.33
T9	T9= FYM + RDF + *Pseudomonas* + *Trichoderma*(Seed treatment + Soil application)	7.33	22.00	37.67
T10	FYM + RDF + *Azotobacter* + *Azosprillum* + *Pseudomonas* + *Trichoderma*(Seed treatment)	7.67	24.00	40.00
T11	FYM + RDF + *Azotobacter* + *Azosprillum* + *Pseudomonas* + *Trichoderma*(Soil application)	8.33	29.00	41.00
T12	FYM + RDF + *Azotobacter* + *Azosprillum* + *Pseudomonas* + *Trichoderma*(Seed treatment + Soil application)	8.33	32.33	44.33
S. Em±		1.14	0.54	0.80
CD@5%		2.28	1.57	2.36

Table.3 Effect of biofertilizers on number of vines and number of flowers per plant at 30 DAS in ridge gourd

	Treatments	Number of vines per plant	Number of flowers per plant
T1	Control	1.67	1.67
T2	FYM	2.33	2.33
T3	FYM + RDF	3.67	3.00
T4	FYM + RDF + *Azotobacter* + *Azosprillum*(Seed treatment)	2.33	3.33
T5	FYM + RDF + *Azotobacter* + *Azosprillum*(Soil application)	2.33	2.67
T6	FYM + RDF + *Azotobacter* + *Azosprillum*(Seed treatment + Soil application)	1.67	2.67
T7	FYM + RDF + *Pseudomonas* + *Trichoderma*(Seed treatment)	3.33	3.67
T8	FYM + RDF + *Pseudomonas* + *Trichoderma*(Soil application)	2.33	4.00
T9	FYM + RDF + *Pseudomonas* + *Trichoderma*(Seed treatment + Soil application)	3.67	4.33
T10	FYM + RDF + *Azotobacter* + *Azosprillum* + *Pseudomonas* + *Trichoderma*(Seed treatment)	3.33	3.33
T11	FYM + RDF + *Azotobacter* + *Azosprillum* + *Pseudomonas* + *Trichoderma*(Soil application)	4.33	4.33
T12	FYM + RDF + *Azotobacter* + *Azosprillum* + *Pseudomonas* + *Trichoderma*(Seed treatment + Soil application)	5.33	5.67
S.Em±		040	0.45
CD@5%		1.17	1.33

In Treatment12, the combination of RDF + FYM + Azotobacter + Azosprillum + Pseudomonas + Trichoderma Seed treatment + Soil application resulted in highest plant height, number of leaves, number of vines and number of flowers. It is noticed that the treatment led to improved uptake of nitrogen, phosphorus and potassium. In treatment T_7 [FYM + RDF + Pseudomonas + Trichoderma (Seed treatment)], T_8 [FYM + RDF + Pseudomonas + Trichoderma (Soil application)], T_9 [FYM + RDF + Pseudomonas + Trichoderma (Seed treatment + Soil application)], T_{10} [FYM + RDF + Pseudomonas + Trichoderma (Seed treatment + Soil application)], T_{11} [FYM + RDF + Azotobacter + Azosprillum + Pseudomonas + Trichoderma(Soil application)], T_{12} [FYM + RDF + Azotobacter + Azosprillum + Pseudomonas + Trichoderma (Seed treatment + Soil application)] combination of Azotobacter and other biofertilizers resulted in approximate values in all plant height, number of leaves, number of vines and number of flowers. This discovers strains of Azotobacter and Azospirillum, are effective in nitrogen fixation and processing genetic information for cube ring pathogens of crop plants, synthesis of plant growth promoting hormones and proteins, enzymes and other factors that improve uptake of essential nutrients by plants utilized in farming this was also confirmed by Pandey and kumar (1989). No biofetilizers are applied in Treatment 1(control) this results in low growth rate in plant height and also in yield when compared to other treatments. From this study, we can conclude that the application of biofertilizers can save up to 30-35% chemical fertilizers usage which also reduces the cost.

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