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RESEARCH ARTICLE

AM FUNGAL INTERACTION WITH PHSOPHOBACTERIA ON THE YIELD OF SUGARCANE WITH GRADED LEVELS OF PHOSPHORUS

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ABSTRACT

The Sugarcane is a known sucrose rich plant in nature requires more amount of nutrient inputs due to long standing period in field. Phosphorus is a immobile element which also required in more amount by sugarcane. In the present research, to provide 'p' and to overcome 'P' deficiency an attempt was made by inoculating AM fungi and phosphobacteria and interestingly all the treatments received either single inoculation or combined inoculation of AM fungi and phosphobacteira significantly improved yield of sugarcane compared with uninoculated control.

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INTRODUCTION

Fertilizers are the major chemical nutrient input constitutes a major component in the production and sugarcane requires more amount of nutrient by virtue of its longer standing period (10 months) in the field. However, the day by day rising cost of fertilizers due to heavy demand is a series constraint in the sugarcane cultivation. The cost of fertilizers accounts for about 25 to 30 per cent of total cost incurred in cane cultivation. Therefore, it is essential to adopt a strategy of nutrient management by the combination of chemical fertilizers and biofertilizers to reduce cost of cultivation and also to minimize the pollution to some extent. Lie in any form cannot exist without phosphorus (P). Most soil cannot sustain high yield, if it is deficient in soil and the phosphorus deficiency is not corrected by any other nutrients (Tandom, 1987). The nutrient P is classified as a macronutrient since its requirement for plant growth in large quantities. Phosphorus is an essential constituent of many organic component of all types organisms, which decides the life of all types of organisms. Although phosphorus is one of the most important macronutrient, most of Indian soils are low in available phosphorus. Numbers of chemical, physical and biological factors are related to influence availability of P in soil.

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The major problem in availability of 'P' and its transformation from soluble form into insoluble form (or) unavailable form. Sorption (fixation), precipitation and immobilization are important transformations that curtail or restrict the P availability in soil either temporarily or permanently (Mohankumar and Mahadevan, 1987). Excess application of chemical fertilizers credits the problem of pollution and deterioration of soil structures. Self –sustainability of soil is lost through continuous application of chemical fertilizers along. It is now proved beyond doubt that VA mycorrhial fungi and phosphobacteria greatly enhance plant growth and improve crop productivity. Using of biofertilizers like VAM fungi and phosphobacteria to maximize yield and to minimize environmental hazards (Rogers R. D and Williams, 1986).Keeping the above views, the present investigation was therefore undertaken to improve the supply of 'P' of using AM fungi.

MATERIALS AND METHODS

The field experiment was conducted in field No. GL 12 garden land A-block of Annamalai University Experimental Farm. The experimental farm is geographically situated at 11°24' North latitude and 79°41' East longitude at an altitude of +5.79 meter above mean sea level, at Annamalainagar, Cuddalore district, Tamilnadu, India.

1. Recommended P_2O_5 (62.5 kg ha^{-1})
2. 75 per cent P_2O_5 (46.9 kg ha^{-1})

3. 50 per cent P_2O_5 (31.3 kg ha^{-1})

Sub treatment

1. Uninoculated
2. AM fungi inoculation alone (*Glomus fasciculatum)*
3. Phosphobacteria inoculation alone (*Bacillus sp.)*
4. AM fungi + Phosphobacteria dual inoculation (*Glomus fasciculatum + Bacillus sp.)*

Crop management

Field preparation: The field was prepared by repeated tractor ploughing to the satisfactory tilth. The clods were broken and field was levelled. The plots were formed with a dimension of 5.0 x 3.0 m. The plot was laid into ridges and furrows with an inter row spacing of 80 cm. 10 tonnes of FYM $acre^{-1}$ was applied before ploughing. The soil based root inoculums of *G.fasciculatum* multiplied in sorghum crop in the green house of Department of Microbiology, Faculty of Agriculture, Annamalai University @200 kg ha^{-1} and the phosphobacteria isolated and multiplied as carrier based inoculums in lignite 2 kg ha^{-1} were used for the study. The seed material, seven-month-old sugarcane COSi 98071, was obtained from E.I.D Parry (India) Ltd., Nellikuppanm and was prepared into who budded setts for use as seed material. Before planting the setts were treated with 0.05 per cent carbendazim as sett treatment.

Urea (46% N), Super phosphate (16% P_2O_5) and muriate of potash (60% K_2O) were the fertilizers used to supply the required quantity of N, P and K respectively. The manuring schedule is 275, 62.5 and 112.5 kgs NPK ha^{-1}. The nitrogen and potassium were applied in four equal split doses viz., ¼ at 60 days, ¼ at 90 days and ¼ at 120 days after planting as top dressings. The different levels of P (100%, 75% and 50% P) as per the treatments were applied as basal at the time of planting. The cane yield per plot was weighted and computed to tonnes ha^{-1} and recorded treatment wise.

RESULTS AND DISCUSSION

The cane yield as influenced by various treatments was recorded on 360 DAP and presented in Table (1). The graded phosphorus levels and microbial inoculations single and combine forms the cane yield. The highest cane yield was recorded in the treatment with 100% application of P with dual inoculation (130.50 t ha^{-1}) and the lower cane yield was recorded in 50% P uninoculated control (120 t ha^{-1}). In the present research inculation of AM fungi and phosphohacteria influence the yield of sugarcane hence the inoculated plants recorded much significant values on yield of sugarcane compared with uninoculated control. In majority of cases the single inoculation of both the organisms with graded levels of 'P' showed on par values on yield and same sort of trend noticed in the case of combined inoculation with graded levels of phosphorus (Omar.SA, 1998). Srihari and Sreenivasa (1995) reported that the dual inoculation of *Glomus macrocarpum* and *Bacillus polymyxa* in chilli shown significant increase in fruit yield compared to single inoculations. In the present investigation, there was significant increase in the yield parameters due to the single inoculation of *G. Fasiculatum* or *Bacillus sp.* or their combination compared to uninoculated plants at each of the three P level. Interestingly in the present study, the dual inoculation recorded increase in cane yield, compared to unioculated control. These results are in agreement with the findings of Tilak *et al.* (1995) who reported that the dual inoculation of *G.fasciculatum* and *B. megaterium* in soyabean recorded 4.3 per cent increase in bean yield compared to uninoculated control.

Table 1. Single and dual inoculations of *G.Fasciculatum and Bacillus Sp.* (Phosphobacteria) on the yield of sugarcane (COSi 98071) with graded levels of phosphorus

Treatments	Yield		
	P levels		
	100%	75%	50%
Control (uninoculated)	121.20	121.00	120.00
G. fasciculatum	130.50	130.18	129.84
Bacillus Sp.+ Phosphbacteria	126.00	125.00	124.50
G. Fasciculatum+ Bacillus Sp.	135.00	134.00	133.20

Summary and Conclusion

The cane yield at 75% and 50% P levels with dual inoculation were greater than the uninoculated control with 100% P and 75% P respectively. Even 50% graded level of 'P' in combination with dual or combined inoculation of AM fungi and phosphobacteria recorded on par values with the 100% application of 'P' and combined inoculation. The present result revealed that a minimum of 25-50% 'P' can be saved by the inoculation of *Glomus fasciculatum* as 'P' mobilize and *Bacillus* as a phosphobacteira – 'P' solubilizer.

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