

Original Research Article

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Effect of Consortium of Endophytic Nitrogen Fixing Bacteria in *Suru-Sugarcane* on Yield at Agricultural Research Station-Kasbe-Digraj

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ABSTRACT

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A field experiment was conducted at Agricultural Research Station-Kasbe-Digraj (Dist.-Sangli) Maharashtra, (India) during 2013-15. It was laid out in Randomized Block Design with four replication and six treatments. There were various levels of nitrogen (100%, 50%, 25% and 0%) with P₂O₅, K₂O, PSB, FYM and foliar application of consortium of endophytic nitrogen fixing bacterial with and without combination and set treatment of *Acetobacter diazotrophicus*. The results of experiment revealed that the application of 25% N + foliar application consortium of endophytic bacteria @ 3 L ha⁻¹ 60 days after planting of sugarcane was found beneficial for saving of 75 per cent nitrogen with increase in yield of *suru-sugarcane* (Phule-265).

Introduction

Sugarcane is a sub-tropical crop which is botanically known as *Saccharum officinarum* (2n = 80). Sugarcane is the pride crop of Maharashtra State and plays a vital role in a Agriculture economy. It is long duration i.e., perennial grassy plant that undergoes a series of interdependent but fairly distinct growth phases during its life time. These phases are germination, tillering (together called formative phase), vegetative grand growth, flowering or tasseling and ripening or

maturity. It is favourably adaptable to various soil conditions.

Nitrogen is an essential element for plant growth & development a limiting factor in plant growth. It represents about 2% of the total dry matter. Nevertheless, plants cannot directly access nitrogen gas, which makes up about 80% of the atmosphere. Plants absorb the available nitrogen in the soil through their roots in the form of nitrate and the dependence of crop growth on this element have spawned a massive on this element

industry worldwide (Dobermann, 2007 and Westhoff, 2009).

Endophytes nitrogen fixing bacteria are associative type nitrogen fixers. Mostly iyt is present in sugar containing plants, but they also present in non-sugar plants. *Pennisetum purpureum*, *Ipomea batatas* (Dobereiner and Reis, 1993), *Coffea Arabica* (Jimenez – Salgado *et al.*, 1997), *Eleusine coracana* (Loganathan and Nair, 2003) and *Ananas comosus* (Tapia – Hernandez *et al.*, 2000) these are some examples of non-sugar plants in which endophytic bacteria stay.

Consortium of endophytic bacteria includes various bacteria like, *Acetobacter spp.*, *Agrobacterium spp.*, *Burkholderia spp.*, *Azospirillum spp.*, *Herbaspirillum spp.*, *Azoarcus spp.etc.* Endophytes are defined as microorganisms living inside the plant organs and tissues without causing disease symptoms, have become highly interesting models to study plant microbe interactions (More, 2012).

Keeping these points in consideration, field trial was conducted to enhance the yield and quality of *suru*-sugarcane using 25% N along with consortium of endophytic nitrogen fixing bacteria.

Materials and Methods

The experiment was conducted at Agricultural Research Station-Kasbe-Digraj (Dist.-Sangli) Maharashtra, (India) during 2013-15, the soil was clayey in texture, moderately alkaline in reaction, medium in available nitrogen, phosphorus and sufficient in available potassium. Total 6 treatments including absolute control replicated 4 times. The experiment consists of different levels of nitrogenous fertilizer *viz.* 0, 25, 50 and 100 % of RD along with and without foliar application of consortium endophytic nitrogen

fixing bacteria @ 3 L ha⁻¹ or *Acetobacter diazotrophicus* @2.5 L ha⁻¹ with 500 L water in treatments. The crop was raised following recommended agronomic practices. The recommended dose of chemical fertilizers were applied @250:115:115 kg NPK ha⁻¹ in four splits as per recommendation. Intercultural operations like weeding, spraying of insecticides, fertilizer application and schedule of irrigation for *suru*-sugarcane crop was carefully followed. The crop variety used was CoM- 0265. The data obtained was carefully analyzed and appropriately interpreted as per the methods described in “Statistical Methods for Agricultural Workers” by Panse and Sukhatme, (1985).

Results and Discussion

The results narrated in Table 1 indicate significant impact of consortium of endophytic nitrogen fixing bacteria on top, cane and CCS yield of *suru*-sugarcane. Significantly highest top and cane yield of *suru*- sugarcane were noted in RDF, but treatment 25% N + consortium of endophytic nitrogen fixing bacteria was found statically at par. Lowest top and cane yield were obtained in treatments T₁. These results are also corroborate with reports of More (2012) as they revealed that this might be due to consortium of endophytic bacteria, which may worked with plant system by utilizing their source of energy as sugar from sugarcane plant and assimilated the nitrogen within the plant, which may be immediately utilized for growth and development of sugarcane plant. Thereafter, Oliveira *et al.*, (2002) noted that the fresh cane weight of sugarcane was significantly increased as compared to uninoculated control plot. Muchow *et al.*, (1996) also reported that increased cane yield with increasing levels of nitrogen application and lowering the commercial cane sugar.

The data of cane and top yield of suru sugarcane as influenced by different treatments are presented in the table. The cane yield (114.34 t ha⁻¹) and top yield (10.27 t

ha⁻¹) of sugarcane were significantly increased in treatment T₄ (25% N + consortium of endophytic bacteria foliar spray) over all the treatments.

Table.1 Yield of *suru*-sugarcane as influenced by different treatments (ARS Kasbe-Digranj)

Treatments		Yield of sugarcane (t ha ⁻¹)	
		Cane	Top
T ₁	Absolute control	99.04	8.90
T ₂	RDF (100% N)	105.50	9.51
T ₃	50% N + Set treatment of <i>Acetobacter diazotrophicus</i>	101.16	9.10
T ₄	25% N + Consortium of endophytic bacteria	114.34	10.27
T ₅	0% N + Consortium of endophytic bacteria	93.28	8.38
T ₆	0% N Without consortium of endophytic bacteria	96.62	8.76
SE (±)		2.100	0.198
CD @ 5%		6.329	0.597

The increase in crop productivity may be due to low nitrogen fertilizer application with increased growth of nitrogen fixing bacteria. The similar results were also reported by Muthukumarasamy *et al.*, (1999), Rakkiyappan *et al.*, (2001), Bhalerao *et al.*, (2005), Anitha and Thangaraju (2010).

It is concluded that, the application of 25% N + foliar application consortium of endophytic bacteria @ 3 L ha⁻¹ 60 days after planting of sugarcane was found beneficial for saving of 75 per cent nitrogen which increase in available N content in soil, stage wise total N concentration in leaves and cane, uptake of nutrient, nitrogen use efficiency, B:C ratio (except T₁) and yield of *suru* sugarcane (Phule-265).

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