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Improving sweet corn productivity through azospirillum-enriched farmyard manure

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Abstract

A field experiment was conducted during rabi-2025 at Maris stella college, Vijayawada, Andhra Pradesh to study the effect of enriched farm yard manure on growth and yield of sweetcorn. The experiment consisted of treatments T1: 100% RDF, T2:50% RDF+ Enriched FYM with *Azospirillum*, T3:50% RDF +Enriched FYM with *Azospirillum*+ PSB, T4:75% RDF+ Enriched FYM with *Azospirillum*+ PSB, T5:100% RDF+ Enriched FYM with *Azospirillum*+ PSB.

The results revealed that among different treatments, growth parameters such as plant height, number of leaves, leaf area, leaf area index and dry production and its accumulation in different plant parts were significantly higher with application of T₅(100% RDF +Enriched FYM with *Azospirillum*+ PSB) resulted in higher fresh cob yield and green fodder yield.

Keywords: Sweet corn, *Azospirillum*, Plant height, Yield, FYM

1. Introduction

Sweetcorn (*Zea mays var saccharata*) is a maize variety that stands out as one of the most popular types of maize, primarily used for human consumption. This variety has been selectively bred to enhance its natural sugar level making it highly flavored. As a result sweetcorn also known as "sugar corn" "maize variety specifically developed for its Increased sweetness It is widely consumed as a fresh cob, profound food etc.

Biofertilizers contain beneficial microorganisms that promote plant growth by increasing the availability of atmospheric nitrogen, phosphorus and other essential elements in the soil. Microorganisms like *Azospirillum* play an important role in nitrogen fixation & improving soil fertility. It enhances root growth improve nutrient uptake & contribute to better crop yield.

Phosphorus solubilizing bacteria plays an essential role in transforming the insoluble forms of phosphorus into a form that plant can absorb. PSB represent 1 to 50 percent of the total microbial population in soil. Combination of PSB along with organic manure & biofertilizers results in increasing of microbial activity & enhance nutrient efficiency. PSB represents an eco-friendly and cost-effective approach for improving the growth, yield and sustainability of sweetcorn.

Jeevamrutham and Dashaparni are potent cow based, & botanical natural farming formulations that, when applied to sweetcorn, act as bio enhancers to improve soil health, plant immunity, & crop yields. These inputs promote sustainable, chemical- free cultivation.

Combining FYM & *Azospirillum*, biofertilizers in sweetcorn

cultivation creates a synergism that enhances growth, improves nutrient availability and yield through INM.

2. Materials and Methods

A field experiment study was carried out in experimental form of Division of Agronomy, during rabi 2025 at Maris stella college, Vijayawada, Andhra Pradesh [Lat 16.500584°, long 10.660063°]

The type of soil in the experimental field is red soil [Reddish brown] Regarding chemical properties, the soil is acidic in nature (pH 5-6.5), low in EC [0.22dsm] and low in Carbon content (0.35%) Availability of the Nitrogen is low, medium, availability of Phosphorus & Potassium. The experiment was laid out in a randomized complete block design with 5 replications.

There were 5 treatments consisting of T1, T2, T3, T4, T5. The sweetcorn variety was selected for the study which were sown by line sowing method with spacing [65 cmx30 cm] on 23/12/26 & harvested on [] from the experimental field by selected five plants randomly. Then we have recorded the plant height from ground level to the tip of the plant with fully opened leaves and no. of leaves per plant were counted at 20 days interval. the selected plants uprooted from the interval random rows of a plot at 20 days interval. The dry matter production of the plants was determined from the five randomly selected plants by separating the leaf, stem and reproductive parts of the plants. The separated parts were oven dried at 75°C to determine the total dry matter production.

The cobs were harvested from all plants of the plot & determined the total fresh cob yield per plot & expressed in

kg/plot and using this fresh cob yield was worked out & expressed in quintal/hectare (qha⁻¹). The green fodder yield per hectare was calculated by using the green fodder yield per plot and then expressed in quintal per hectare.

The economics was worked out based on the prevailing market price for the existing market year. Statistical interpretation of the data was conducted via Fisher ANOVA, according to the procedures described by Panse & Sukhatme.

3. Result and Discussion

3.1 Effects of enriched FYM on growth attributes

3.1.a. Plant height

Plant height and number of leaves per plant was significantly influenced by application of T₅ (100% RDF+ Enriched FYM with *Azospirillum* +PSB) (Table 1). However, treatment receiving the application of T₅ (100% RDF+ Enriched FYM with *Azospirillum*+ PSB) (30,70,168,184), T₄ (75%RDF+ Enriched FYM with *Azospirillum*+ PSB) (27,65,164,178) were on par with each other. Whereas, application of T₂ (50%RDF+Enriched FYM with *Azospirillum*) recorded significantly least plant height and leaf area per plant at different growth stages.

Plant height was significantly higher at 20,40,60 DAS and at harvest due to application of T₅ (100% RDF+ Enriched FYM with *Azospirillum* + PSB). Application of higher levels of nitrogen and enriched farm yard manure resulted in increased availability of major nutrients like nitrogen, phosphorus and potassium. These nutrients have shown the effect on cell multiplication and elongation, thereby causing an increase in the stem internodal length which reflected in increased plant height. Further, T₂ (50%RDF+Enriched FYM with *Azospirillum*) (20.4,50,133,156) recorded significantly lower plant height over the other treatments due to lower available nutrients.

Table 1: Plant height of sweet corn at different growth stages as influenced by the application of enriched farm yard manure with *Azospirillum*.

Treatments	Plant height (cm)			
	20DAS	40DAS	60DAS	At harvest
T1	25.0	59.8	150	169.5
T2	20.4	50	133	156
T3	23	57	148	170
T4	27	65	164	178
T5	30	70	168	184
S.Em. (±)	1.05	2.10	3.25	3.60
C.D(P=0.05)	3.15	6.30	9.75	10.80

3.1.b. Number of leaves per plant, leaf area and leaf area index

On performing different treatments, greater number of leaves per plant, large leaf area per plant and leaf area index were observed with the application of T₅ (100%RDF+Enriched FYM with *Azospirillum* +PSB). However, application of T₅ (100%RDF+Enriched FYM with *Azospirillum* +PSB), T₄ (75%RDF+Enriched FYM with *Azospirillum*+PSB) were on par with each other. Whereas, application of T₂ (50%RDF+Enriched FYM with *Azospirillum*) recorded significantly least number of leaves per plant, medium leaf area per plant and leaf area index at different growth stages. The increased number of leaves per

plant, leaf area and leaf area index might be due to timely supply of nutrients particularly nitrogen which is required for vegetative growth of plant. The FYM acts as a source of organic manure in the development of physical properties of the soil like porosity, aeration and water holding capacity. The application of biofertilizers to soil enhances biological nitrogen fixation and improve the ability of phosphorus which supports strong vegetation growth. The minimum number of leaves, leaf area and leaf area index in T₂ (50%RDF+Enriched FYM with *Azospirillum*) treatment is obvious, due to the least availability of nutrients needed for production of greater number of leaves.

Table 2: Number of leaves per plant in sweet corn at different growth stages as influenced by the application of enriched farm yard manure with *Azospirillum*.

Treatments	Number of leaves per plant			
	20 DAS	40 DAS	60 DAS	At harvest
T1	5.5	9.1	12.2	12.8
T2	5.2	8.6	11.4	12.0
T3	5.8	9.5	12.8	13.3
T4	6.0	10.0	13.5	14.0
T5	6.3	10.5	14.2	14.8
S.Em. (±)	0.12	0.18	0.22	0.25
C.D(P=0.05)	0.35	0.54	0.66	0.72

3.1.c. Dry matter production

The maximum amount of dry matter production is observed in the treatment with the application of T₅ (100%RDF+Enriched FYM with *Azospirillum*+ PSB). Whereas least dry matter production was observed in the treatment with the application of T₂ (50% RDF+ Enriched FYM with *Azospirillum*) compared to the other treatments. However, T₅ (100% RDF+ Enriched FYM with *Azospirillum*+ PSB) which is on par with T₄ (75% RDF+ Enriched FYM with *Azospirillum*+ PSB).

The enhanced nutrient availability and improved plant growth promotion facilitated by specific microbial interactions and adequate nutrients supply gives higher dry matter accumulation in sweet corn and it was observed with the application of T₅ (100% RDF+ Enriched FYM with *Azospirillum*+ PSB). Higher total dry matter production in these treatments might be due to the higher dry matter accumulation of individual plant parts like leaves, stem, and reproductive parts. Apart from this, application of enriched FYM with *Azospirillum*, PSB along with T₁ (100% RDF) resulted in increased availability of nutrients as they are responsible for growth and development leading to higher plant height, leaf area and number of leaves. Application of T₂ (50% RDF+ Enriched FYM with *Azospirillum*) compared to other treatments gives decreased dry matter accumulation and its distribution in leaves, stem and reproductive parts.

3.2. Effect of enriched FYM on grain and stover yield

The maximum fresh cob yield and green fodder yield was obtained with application of T₅ (100%RDF+Enriched with *Azospirillum*+ PSB) over the rest of the treatments performed. While T₂ (50%RDF+Enriched with *Azospirillum*) recorded lowest cob yield and fodder yield. T₅ (100% RDF+ Enriched with *Azospirillum*+ PSB) and T₄ (75% RDF+Enriched FYM with *Azospirillum*+ PSB) were on par with each other.

With optimal and balanced supply of essential nutrients, particularly nitrogen, phosphorus and potassium maximum fresh cob yield and green fodder yield is achieved. Application of T₅ (100% RDF+ Enriched FYM with *Azospirillum*+ PSB) gives maximum yield. Enriched FYM enhances soil structure, boosts organic matter content, and promotes microbial activity, improving nutrient availability and uptake by the roots which leads to better root growth and development, enhancing the plant's ability to absorb water and nutrients, resulting in overall improved plant health. Parameters such as plant height, leaf area index, and dry matter production, as well as yield contributing factors like the number of kernels per cob, number of cobs per plant, and cob weight, thereby increasing the fresh cob yield and green fodder yield are observed when there is improved nutrient uptake and root development. Whereas the lowest cob yield and fodder yield recorded with T₂(50%+Enriched FYM with *Azospirillum*) can be attributed to insufficient nutrient supply due to the reduced fertilizer dose.

3.3 Effect of biofertilizer enriched FYM on economics

Table 3: Yield and economics of sweet corn at different growth stages as influenced by the application of enriched FYM with biofertilizer.

Treatments	Fresh cob yield (qha ⁻¹)	Green fodder yield (qha ⁻¹)	Cost of cultivation (₹ha ⁻¹)	Gross returns (₹ha ⁻¹)	Net returns (₹ha ⁻¹)	B.C
T1	140.6	175.3	46200	158900	112700	3.43
T2	135.2	168.4	45500	150200	104700	3.30
T3	148.9	186.7	47050	170500	123450	3.62
T4	156.4	198.5	47800	183200	135400	3.83
T5	168.8	210.2	48550	196800	148250	4.05
S.Em. (±)	3.2	2.6	-	2650	2650	0.07
C.D(P=0.05)	9.5	7.8	NA	8100	8100	0.20

4. Conclusion

The findings of the study indicates that the application of 100%RDF+Enriched FYM with *Azospirillum*+ PSB resulted in higher fresh cob yield, green fodder yield. combining organic manures like vermicompost, neem cake and compost incorporate the microbes tends to give better results.

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The findings of the study indicates that among the five treatments T₅ (100% RDF+ Enriched FYM with *Azospirillum*+ PSB) resulted in higher fresh cob yield (168.8 qha⁻¹) and green fodder yield (210.2 qha⁻¹). This treatment also resulted in the maximum gross returns (Rs.196800ha⁻¹), net returns (Rs.148250 ha⁻¹) and benefit-cost ratio (4.05), indicating economic profitability.

The treatment T₄ (75% RDF+ Enriched FYM with *Azospirillum* +PSB) was the next best treatment, producing 156.4 qha⁻¹ fresh cob yield and 198.5 qha⁻¹ green fodder yield with a B:C ratio of 3.83.

The treatment T₂ (50% RDF+ Enriched FYM with *Azospirillum*) recorded comparatively lower yield and economic returns, with fresh cob yield of 135.2 q ha⁻¹, net returns of (₹104700 ha⁻¹) and a B:C ratio of 3.30.

Overall, the results indicate that integration of chemical fertilizers with enriched FYM and biofertilizers (*Azospirillum* and PSB) significantly improved the yield and economic returns of sweet corn. The statistical values S.Em. (±) and C.D.at 5% level indicate that the differences among treatments were statistically significant.

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