Effect of Liquid organic manures on the performance ofSweet corn(*Zea mays L. saccharata*)

ABSTRACT

A field experiment was conducted during*rabi* 2022at Block D of the College Farm, Agriculture College, Naira. The experiment was laid out in Split-plot design withthree main plots.M_1:100% RDF (180-60-60 NPK Kg ha^{-1}) + FYM @10 t ha^{-1}, M_2:75% RDF (135-45-45 NPK Kg ha^{-1}) + FYM @10 t ha^{-1}. M_3:0% RDF- Controlandfour sub-plotsS1: Liquid azospirllum+PSB+KRB+ZnSB+@1.25 L ha-1 each at knee high stage,S2: Vermiwash spraying twice @5% at knee high and tasseling to silking stages, S3: Panchagavya spraying twice @3% at knee high and tasseling to silking stages andS4: Drava Jeevamrutham spraying twice @10% at knee high and tasseling to silking stages Results revealed that100% RDF (180-60-60 NPK Kg ha-1) + FYM @10 t ha-1 (M_1) recorded maximum fresh cob yield(16409 kg ha^{-1}) and stover yield (17481 kg ha^{-1}).Among the subplots, : Liquid azospirllum+PSB+KRB+ZnSB+@1.25 L ha-1 (S_1) recorded maximum fresh cob yield (14091 kg ha^{-1}) and stover yield (15623 kg ha^{-1}). The interaction effect of different doses of RDF and liquid biofertilizers on fresh cob yield, stover yield and HI was found to be nonsignificant. Hence, it can be concluded that different doses of RDF and liquid biofertilizers are advantageous for weet corn cultivation on sandy loam soils of North costal region.

Keywords:Biofertilizers, FYM, Panchagavya, fresh cob yield and Harvest Index

Introduction

Sweet corn (*Zea mays L. saccharate*) is an important type of specialty corn cultivated across the globe as well in India. It is hybridized maize specially bred to increase sugar content and also known as “Sugar corn”. Nevertheless, it is mainly grown for its exceptional quality such as 14-20 % of sugar, 10-11% of starch, 3% of water-soluble polysaccharides and 70 % of water besides a good number of vitamins and minerals (Oktem and Oktem, 2005). The nutritional values of sweet corn, makes it a better component in culinary purposes and the human diet (Swapna *et al.,* 2020). It also has health benefits as it contains carotenoids such as xanthophyllous, lutein and zeaxanthin which improve the health of the eyes (Ozata, 2019). Additionally, it includes healthy concentrations of various essential B-complex vitamins, including thiamine, niacin, pantothenic acid, folates, riboflavin, and pyridoxine (Dilip and Aditya, 2013).

Sweet corn is the best alternative crop of maize for Indian farmers. Due to its increased commercial worth in the worldwide market, farmers prefer to cultivate. It is an intensive crop; hence more fertilizers are needed for beneficial crop yield. Hence, there is a need for betternutrient management.

Imbalance application of chemical fertilizers showed significant negative influence on soil pH, acidification/ salinization, and growth of beneficial micro-organisms which resulted in poor crop growth and yield. It is necessary to develop improved nutrient management practices in order to improve crop growth with incurring less harm to the environment (Manoj *et al.*, 2020; Krasilnikov *et al.,* 2022). Sweet corn being an exhaustive crop it's very difficult to supply entire nutrients organically to produce a profitable crop hence, combination of inorganic fertilizers and organic sources of nutrients might be helpful.

Application of inorganic fertilizers along with farm yard manure (FYM) increased the nutrient availability to crops which resulted in higher values of all growth parameters, yield attributes and yield of sweet corn (Prusty *et al.,* 2022). FYM acts as a reservoir for chemical fertilizers and soil moisture which aids in increasing the nutrient use efficiency of crops.

Usage of the liquid organic manures and biofertilizers got a lot of attention among scientists and farmers in recent years as they proved effective in increasing the absorption and translocation of nutrients by the crops. Liquid organic manures are rich in macronutrients, micronutrients, growth regulators and other beneficial substances which directly influence the growth and yield of the crops and also play a major role in sustaining soil fertility. The application of liquid organic fertilizers along with recommended fertilizers increases the ear size of sweet corn (Isaias, 2022). However, chlorophyll content and root length were significantly improved by the application of nutrition in a combination *i.e.*, 125% RDF (Inorganic fertilizers), FYM (organic)@ 5t ha^{-1}, PSB (liquid biofertilizer) and *Azospirillum* liquid biofertilizer at the departmental farm of Soil Science and Agricultural Chemistry, College of Agriculture, Latur (Jadhav *et al.* 2019). Whereas, Darwin *et al.* (2018) concluded that the performance of sweet corn was considerably increased with the combined application of organic manures with biomax (*Azatobacter*sps, *Azospirillum* and PSB) which resulted in higher sweet corn yield, better post-harvest quality and improved soil health.Ramesh *et al.* (2018) evidenced that the higher growth and yield, plant height, Leaf Area Index (LAI), cob length, cob diameter and number of grains per cob were recorded with the application of liquid organic manure *i.e.*,*Jeevamrutha* @ 5%. Application of liquid organic manures like *Jeevamrutha*, *Panchagavya*and *Sanjeevak*improved the quality parameters of sweet corn at experimental farm, Faculty of Agriculture, Annamalai University (Khuwaja*et al.,* 2018)

Azospirillum by adhering to the root surface or the intercellular spaces of the host plant roots, colonize and stimulate plant growth by a variety of functions, including N-fixation and the synthesis of phytohormones such auxins, gibberellins, cytokinins, and nitric oxide that act as signals to stimulate plant growth. PSB solubilizes the fixed form of phosphorous and increased the availability and uptake of phosphorous which resulted in maximum sweet corn yield

(Bezboruah and Duttta, 2021). Application of *Panchagavya* acts as a growth promoter, yield enhancer, fertility booster and disease preventer for both plants and animals therefore, induces drought hardiness in sweet corn as well as in other crops (Kumar *et al.,* 2018). The study therefore conducted to study the effect of liquid organic manures on the performance of sweet corn.

MATERIAL AND METHODS

The field experiment was conducted at dryland block of Agriculture College Farm, Naira of Acharya N.G. Ranga Agricultural University, Andhra Pradesh, which is geographically situated at 18.24^0 N latitude, 83.84^0 E longitudes and at an altitude of 27 m above mean sea level in the North Coastal Zone of Andhra Pradesh. The experiment was laid out in field No.**1**of the College Farm during season of 2022-2023. Greencobsharvestedfromthenetplotwasweighedandexpressedintha^{-1}. Dry fodder yield of net plot was recorded by after sun drying of Stover, weighed and expressed as t ha^{-1}. Harvest index is the ratio of grain yield to the total biological yield (grain +straw)andexpressedinpercentagebyusingtheformulaofDonaldandHumblin(1976) asgivenbelow:

$$\text{Harvestindex}(\%) = \frac{\text{Grainyield}(\text{kgha}^{-1})}{\text{Biological}(\text{Grain}+\text{Straw})\text{yield}(\text{kgha}^{-1})} \text{ X } 100$$

RESULTS AND DISCUSSION

Upon reviewing the data presented in Table 1, it becomes evident that both the main and subplot treatments had a significant impact on the fresh cob yield and stover yield of sweetcorn. However, there was no notable effect observed from the interaction between the main and subplot treatments on the fresh cob yield.

Among the main plots, the highest cob yield was observed in M1, with a value of 16,409 kg ha^{-1}, followed by M_2 with 14,291 kg ha^{-1}, and the lowest yield was recorded in M3 at 7,946 kg ha^{-1}. Regarding the subplots, the highest yield was achieved in S_1, with a value of 14,091 kg ha^{-1}, followed by S_3 (12,968 kg ha^{-1}), S_4 (12,680 kg ha^{-1}), and the lowest yield was recorded in S_2 at 11,789 kg ha^{-1}.

Analyzing Table 1, it becomes apparent that both the main and subplot treatments had a significant influence on the stover yield. The highest cob yield among the main plots was observed in M_1, with a value of 17,481 kg ha^{-1}, followed by M_2 with 14,184 kg ha^{-1}, and the lowest yield was recorded in M3 at 11,688 kg ha^{-1}. Among the subplots, the highest yield was achieved in S_1, with a value of 15,623 kg ha^{-1}, followed by S3 (14,688 kg ha-1), while S4

(14,129 kg ha-1) and S2 (13,186 kg ha-1) were comparable.There was no significant influence of the main and subplot treatments observed on the harvest index.

The highest grain and stover yield recorded in M1 among the main plots can be attributed to the application of a greater amount of nutrients in the field, along with the use of FYM (Farm Yard Manure). This combination resulted in increased nutrient release by microbes and improved nutrient uptake, ultimately leading to higher yields. Similarly, in S1, the highest yield can be attributed to the presence of nutrient solubilizing microbes, which facilitated easy solubilization of nutrients, enhanced nutrient uptake, and consequently increased yield.

CONCLUSION

Based on the above results and discussion it can be concluded that amongthemain plots (M_1) 100% RDF (180-60-60 NPK Kg ha^{-1}) + FYM @10 t ha^{-1}recorded significantly higher fresh cob yield, stover yield and harvest Index. Among the subplots, Liquid azospirllum+PSB+KRB+ZnSB+@1.25 L ha^{-1} each at knee high stage (S_1)recorded significantly higher yieldThe interaction effect of different doses of RDF and liquid biofertilizers on fresh cob yield, stover yield and HI was found to be nonsignificant.. Hence, it can be concluded that different doses of RDF and liquid biofertilizersare advantageous forsweet corn cultivation on sandy loam soils of North costal region.

Table 1. Fresh cob yield (kg ha^{-1}), Stover yield (kg ha^{-1}) and Harvest index (%) of sweet corn as influenced by different doses of RDF and liquid organic manures

Treatments	Fresh cob yield (kg ha^{-1})	Stover yield (kg ha^{-1})	Harvest index (%)
Fertilizer levels (RDF-180-60-60 kg ha^{-1})			
M_1:100% RDF (180-60-60 NPK Kg ha^{-1}) + FYM @10 t ha^{-1}	16409	17481	48.58
M_2:75% RDF (135-45-45 NPK Kg ha^{-1}) + FYM @10 t ha^{-1}	14291	14184	48.59
M_3:0% RDF- Control	7946	11688	48.58
SEm±	278.24	293.23	0.20
CD (P=0.05)	1092	1151	NS
CV (%)	7.48	7.02	5.6
Four liquid organic manures			
S_1: Liquid azospirllum+PSB+KRB+ZnSB+@1.25 L ha^{-1} each at knee high stage	14091	15623	48.58
S_2: Vermiwash spraying twice @5% at knee high and tasseling to silking stages	11789	13186	48.63
S_3: *Panchagavya* spraying twice @3% at knee high and tasseling to silking stages	12968	14866	48.57
S_4: Drava *Jeevamrutham* spraying twice @10% at knee high and tasseling to silking stages	12680	14129	48.56
SEm±	329.27	423.29	0.22
CD (P=0.05)	978.6	1258	NS
CV (%)	7.67	8.78	6.2
Interaction (M X S) and (S X M)			
CD (P=0.05)	NS	NS	NS

REFERENCES

Bezboruah M and Dutta R. 2021. Effect of integrated nutrient management on growth and yield of summer maize (*Zea mays). International Journal of Chemical Studies*. 9(2): 677-680.

Darwin PH, Hendarto K, Elhivago SR and Yulistiani A. 2018. Effect of organic fertilizer and urea on growth, yield and quality of sweet corn and soil health. *Asian Journal of Agriculture and Biology*. 6(3): 335-344.

Dilip K and Aditya NJ. 2013. Nutritional, Medicinal and Economical importance of Corn: A Mini Review. Res*. J. Pharmaceutical Sci*.2 (7): 7-8.

Donald CM and HumblinJ. 1976. The biological yield and harvest index of cereals as agronomic and plant breeding criteria*. Advances in Agronomy*. 28: 361-405

Isais C and Pena D. 2022. Growth and Yield Performance of Transplanted sweet corn Applied With Organic-Based Foliar Fertilizer. *Journal of positive school psychology.* 6 (3):4387-4393

Jadhav MB, Indulkar, BS, Deshmukh AV and Pawar VS. 2019. Effect of organic and inorganic fertilizers on growth parameters of sweet corn. *Journal of Pharmacognosy and phytochemistry*. 8(5): 1505-1509

Khuwaja S, Durani A, Durrani, H and Ansari, MA. 2018. Effect of solid and liquid organic manures on growth, yield and economics of sweet corn under south Gujarat condition. *International Journal of Pure and Applied Bioscience*. 6(2): 567-574.

Krasilnikov P, Taboada, MA and Amanullah. 2022. Fertilizer use, soil health and agriculture sustainability*. Agriculture*. 120:462.

Kumar, P., Khan, N., Singh, P.D., Singh, Y and Yadav, V. 2018. Panchagavya: Alow cost organic input in organic farming-a review*. International Journal of Chemical Studies*. 6(6): 575-577.

Manoj KN, Uma, V and Kiran, S.C 2020. Significance of liquid organic manures in sustainable crop production. *International Journal of Ecology and Environmental sciences.* 2: 445-449.

Oktem and Oktem. 2005. Effect of nitrogen and intra spaces on sweet corn (*Zea mays Sachharata Sturt*) ear characteristics*. Indian Journal of Plant Sciences*, 4(4): 361-363

Ozata E. 2019. Evaluation of Fresh Ear Yield and Quality Performance in Super Sweet Corn. *Int. J. Life Sci. Biotechnol*, 2(2): 80-94

Prusty M, Swain D., Alim and Ray M. 2022. Integrated nutrient management in sweet corn and its residual effect on green gram in mid-central table land zone of Odisha. *The Pharma Innovation Journal.* 11(3): 102-105.

Ramesh S, Sudhakar, P and ElankaviS. 2018. Effect of organic foliar nutrition on growth and yield of maize *(Zea mays* L.). *International Journal of Research and Analytical Reviews.* 7(5): 64-66

Swapna G, Jadesha G and Mahadevu P. 2020. Sweet corn – a future healthy human nutrition food. *International Journal of Current Microbiology and Applied Sciences.* 9(7): 3859-3865.