Effect of yield parameters and economics influenced by liquid organic manures on the performance of sweet corn

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Abstract

A field experiment entitled "Effect of Liquid organic manures on the performance of Sweet Corn" was conducted during rabi, 2022-23 at Agricultural College Farm, Naira to evaluate the performance of different liquid organic manures at various nutrient levels. The experiment was laid out in Split-plot design in which different fertilizer levels are taken in main plots and different liquid organic manures are taken on subplots to assess the performance of sweet corn.

The treatment with the application of 100% RDF +FYM recorded the significantly higher yield parameters and yield compared to other treatments and among the liquid organic manures, significantly higher yield parameters are recorded with application of liquid Azospirillum + Phosphorus solubilizing bacteria + Potassium releasing bacteria + Zinc solubilizing bacteria@ 1.25 l ha^{-1} which was at par with application of drava Jeevamrutham spraying twice @ 10%. Significantly higher returns and B:C ratio were recorded with 100% recommended dose of fertilizer +Farm yard manure in mainplots and the liquid Azospirillum+PSB+KRB+ZnSB@ 1.25 l ha^{-1} has recorded significantly higher returns.

Keywords: Sweet corn, Organic manure, Economics.

Introduction

Globally, Maize (*Zea mays* L.) is one of the important cereal crops and it occupies third position next to wheat and rice in its utility and is consumed as food by millions of people, especially in developing countries. It is favourite food of the poorest of the poor on one hand and the richest of the rich on the other. Therefore, it is called as "Queen of cereals". It contributes about 20 per cent of the world's total cereal production. It is one of the most versatile crops in nature, which can be grown over wide range of climatic conditions and has acquired dominant role in farming sector and macroeconomics of Asian region. In India, maize is cultivated across a vast area, with the total area sown being approximately 108.87 lakh hectares during the 2023-24 season and in Andhra Pradesh it is grown in 2.91 lakh hectares and is estimated to produce 19.04 lakh tonnes with an average productivity of 6543 kg ha^{-1}.[5]

Among the maize types, sweet corn (*Zea maysvar. saccharata*) 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[6]. The nutritional values of sweet corn make it a better component for culinary purposes and the human diet[12]. It is necessary to develop improved nutrient management practices in order to improve crop growth with incurring less harm to the environment.

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[10]. Application of liquid organic manures like Jeevamrutha, Panchagavya and Sanjeevak improved the quality parameters of sweet corn[3].

Material and Methods

The present field experiment entitled "Effect of liquid organic manures on the performance of sweet corn" was conducted during *rabi*, 2022-23 at the dryland block of Agricultural College Farm, Naira campus 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 with an altitude of 27 m above mean sea level in the North Coastal Zone of Andhra Pradesh. The weekly mean maximum temperature ranged from 29.7^{0}C to 34.7^{0}C during the crop growth period with an average of 32.1^{0}C. The weekly mean minimum temperature varied from 15.9^{0}C to 26.1^{0}C, with an average of 20.1^{0}C.

During the corresponding period, mean relative humidity ranged from 60.1 to 82.6 per cent with an average of 71.3 per cent. The weekly mean sunshine hours during the crop growth period ranged from 7.2 to 330 and a total of 1047.1 sunshine hours. A total rainfall of 422.9 mm was received during the crop growth period and the remaining amount of water was applied as the crop need in regular intervals. The

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soils are sandy loam in texture, have pH of 7.4, EC (0.052 dSm^{-1} at 25°C) and organic carbon of 0.054 %, available N 226.4 (kg ha^{-1}), available P_2O_5 (17.3 kg ha^{-1}) and available K_2O (238.1 kg ha^{-1}).

The experiment was laid out in Split-plot design with three main plots *viz.* 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} and M_3-0% RDF(Control) and 4 Sub Plots *viz.*, S_1- liquid azospirllum+PSB+KRB+ZnSB @ 1.25 l ha^{-1} each at knee high stage; S_2- Vermiwash spraying twice @ 5% at knee high and tasseling to silking stages; S_3- Panchagavya spraying twice @ 3% at knee high and tasseling to silking stages and S_4- Drava Jeevamrutham spraying twice @ 10% at knee high and tasseling to silking stages. The nutrients are supplied as per the treatments requirement and the liquid organic manures were given by spraying as per requirement. The data regarding yield attributes and yield was recorded as per treatments. Data was analyzed statistically by following standard procedures as suggested by Panse and Sukhatme[9].

Results and Discussion

Among the different doses of RDF, the treatment with 100% RDF+ FYM @ 10 t ha^{-1}had recorded significantly higher number (1.58) of cobs per plant. However, it was at par with 75% RDF+ FYM @ 10 t ha^{-1}. Control recorded significantly lower number (0.94) of cobs per plant and it was significantly inferior to the rest of the treatments studied. None of the liquid organic manures have shown significant influence on number of cobs per plant.Previous studies by Pasha et al[7] and Padma[8] reported similar results.

Among the main plots, the treatment with 100% RDF+ FYM @ 10 t ha^{-1} had recorded a higher cob weight with husk (376 g cob^{-1}). However, the control recorded significantly lower cob weight with husk (191 g cob^{-1}) and it was significantly inferior to the rest of the treatments studied.The treatment with application of liquid azospirillum+PSB+KRB+ZnSB@ 1.25 l ha^{-1} each at knee high stage recorded significantly higher cob weight with husk (328g cob^{-1}) and it was statistically at par with application of Panchagavya spraying twice @ 3% at knee high and tasseling to silking stages (304cob^{-1}).The results were in line with Singh et al[11] and Lahay et al[4].

Data recorded on fresh cob yield (kg ha^{-1}) was presented and among the main plots, the treatment with 100% RDF+ FYM @ 10 t ha^{-1} recorded a maximum fresh cob yield (16409 kg ha^{-1}). However, the control recorded significantly minimum fresh cob yield (7946 kg ha^{-1}) and it was significantly inferior to the rest of the treatments studied. Liquid organic manures have shown significant influence on fresh cob yield. The treatment with application of liquid azospirillum+PSB+KRB+ZnSB@ 1.25 L ha^{-1} each at knee high stage recorded significantly higher fresh cob yield (14091 kg ha^{-1}). However, application of Panchagavya spraying twice @ 3% at knee high and tasseling to silking stages (12968 kg ha^{-1}) was on par with Drava Jeevamrutham spraying twice @ 10% at knee high and tasseling to silking stages (12680 kg ha^{-1}) However, application of Vermiwash spraying twice @ 5% at knee high and tasseling to silking stages recorded significantly lower fresh cob yield (11789 kg ha^{-1}). Similar results were recorded by Lahay et al[4] and Khan et al[2].

Among the main plots, the treatment with 100% RDF+ FYM @ 10 t ha^{-1} recorded a maximum stover yield (17481 kg ha^{-1}). However, the control recorded significantly minimum stover yield (11688kg ha^{-1}) and it was significantly inferior to the rest of the treatments studied. Liquid organic manures have shown significant influence on stover yield. The treatment with application of liquid azospirillum +PSB+KRB+ZnSB@ 1.25 l ha^{-1} each at knee high stage recorded significantly higher stover yield (15623 kg ha^{-1}) However, application of Panchagavya spraying twice @ 3% at knee high and tasseling to silking stages (14866 kg ha^{-1}) was at par with Drava Jeevamrutham spraying twice @ 10% at knee high and tasseling to silking stages (14129 kg ha^{-1}).

However, application of Vermiwash spraying twice @ 5% at knee high and tasseling to silking stages recorded significantly lower stover yield (13186 kg ha^{-1}). The results were in close proximity with work conducted by Bodapati et al.

Data on the harvest index of sweet corn as influenced by different doses of RDF and liquid organic manures was presented in table. Neither the different doses of RDF nor the liquid organic manures showed significant influence on harvest index. The interaction effect of different doses of RDF and liquid organic manures on harvest index was found non-significant.

Economics of Sweetcorn: Data recorded on gross returns (Rs. ha^{-1}) and net returns (Rs. ha^{-1}) was presented and among the main plots, the treatment with 100% RDF+ FYM @ 10 t ha^{-1} recorded maximum gross and net returns (Rs. 278953 ha^{-1} and Rs. 205998 ha^{-1} respectively). However, the control recorded significantly minimum gross and net returns (Rs. 39730 ha^{-1} and Rs. -22972 ha^{-1} respectively) and it was significantly inferior to the rest of the treatments studied. The least gross returns in control were due to least price fetched by poor quality cobs and low yeilds. Liquid organic manures have shown significant influence on gross returns (Rs. ha^{-1}) and net returns (Rs. ha^{-1}). The treatment with application of liquid azospirillum+PSB+KRB+ZnSB@ 1.25 l ha^{-1} each at knee high stage recorded significantly higher gross and net returns (Rs. 203729 ha^{-1} and Rs. 136197 ha^{-1}) respectively. However, application of Vermiwash spraying twice @ 5% at knee high and tasseling to silking stages significantly give lower stover yield (Rs. 170475 ha^{-1} and Rs. 98148 ha^{-1}) and it was significantly inferior to the rest of the treatments studied.

Table 1
Number of cobs per plant, cob weight with husk, fresh cob yield, straw yield and harvest index influenced by fertilizers and liquid organic manures

Treatments	No. of cobs per plant	Cob weight with husk (g)	Fresh Cob yield (kg ha^{-1})	Straw 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}	1.58	376	16409	17481	48.58
M_2- 75% RDF (135-45-45 NPK kg ha^{-1}) + FYM @ 10 t ha^{-1}	1.46	337	14291	14184	48.59
M_3 - 0% RDF- Control	0.94	191	7946	11688	48.58
SEm(±)	0.03	6.14	278.24	293.23	0.20
CD(p=0.05)	0.14	24.13	1092	1151	NS
CV(%)	9.77	7.05	7.48	7.02	5.60
Four liquid organic manures					
S_1 - Liquid azospirillum+PSB+KRB+ZnSB@ 1.25 L ha^{-1} each at knee high stage	1.42	328	14091	15623	48.58
S_2 -Vermiwash spraying twice @ 5% at knee high and tasseling to silking stages	1.26	280	11789	13186	48.63
S_3 -Panchagavya spraying twice @ 3% at knee high and tasseling to silking stages	1.33	304	12968	14866	48.57
S_4: Drava Jeevamrutham spraying twice @ 10% at knee high and tasseling to silking stages	1.29	293	12680	14129	48.56
SEm(±)	0.03	8.12	329.27	423.29	0.22
CD(p=0.05)	NS	24.13	978.6	1258	NS
CV(%)	8.92	8.07	7.67	8.78	6.21
Interaction					
CD(p=0.05)	NS	NS	NS	NS	NS

Table 2
Gross returns, net returns and B:C ratio as influenced by fertilizers and liquid organic manures

Treatments	Gross returns (Rs. ha^{-1})	Net returns (Rs ha^{-1})	B:C ratio
M_1- 100% RDF (180-60-60 NPK kg ha^{-1}) + FYM @ 10 t ha^{-1}	278953	205998	3.41
M_2- 75% RDF (135-45-45 NPK kg ha^{-1}) + FYM @ 10 t ha^{-1}	242954	170338	3.05
M_3 - 0% RDF- Control	39730	-22972	0.58
SEm(±)	2318	2454	0.03
CD(p=0.05)	9103	9636	0.1
CV(%)	5.8	7.2	5.6
Four liquid organic manures			
S_1 - Liquid azospirillum+PSB+KRB+ZnSB@ 1.25 L ha^{-1} each at knee high stage	203729	136197	2.70
S_2 -Vermiwash spraying twice @ 5% at knee high and tasseling to silking stages	170475	98148	2.16
S_3 -Panchagavya spraying twice @ 3% at knee high and tasseling to silking stages	189213	119726	2.46
S4: Drava Jeevamrutham spraying twice @ 10% at knee high and tasseling to silking stages	185433	117077	2.46
SEm(±)	4719	7752	0.06
CD(p=0.05)	14023	23033	0.2
CV(%)	7.59	12.49	7.51
Interaction			
CD (P=0.05)	NS	NS	NS

Data recorded on gross returns (Rs. ha^{-1}) and net returns (Rs. ha^{-1}) was presented and among the main plots, the treatment with 100% RDF+ FYM @ 10 t ha^{-1} recorded maximum gross and net returns (Rs. 278953 ha^{-1} and Rs. 205998 ha^{-1} respectively).

However, the control recorded significantly minimum gross and net returns (Rs. 39730 ha^{-1} and Rs. -22972 ha^{-1} respectively) and it was significantly inferior to the rest of the treatments studied. The least gross returns in control was due to least price fetched by poor quality cobs and low yields. Liquid organic manures have shown significant influence on gross returns (Rs. ha^{-1}) and net returns (Rs. ha^{-1}). The treatment with application of Liquid azospirillum+PSB+KRB+ZnSB@ 1.25 l ha^{-1} each at knee high stage recorded significantly higher gross and net returns (Rs. 203729 ha^{-1} and Rs. 136197 ha^{-1}) respectively.

However, application of Vermiwash spraying twice @ 5% at knee high and tasseling to silking stagessignificantly lower stover yield (Rs. 170475 ha^{-1} and Rs. 98148 ha^{-1}) and it was significantly inferior to the rest of the treatments studied. These results are in conformity with the work of other researchers.

Conclusion

The application of 100% RDF+ FYM @ 10 t ha^{-1} had recorded significantly higher yield attributes and yield among the subplots application of liquid azospirillum+ PSB+KRB+ZnSB@ 1.25 l ha^{-1} which was at par with application of Drava Jeevamrutham spraying twice @ 10%. Higher returns were recorded under100% RDF+ FYM @ 10 t ha^{-1} with liquid azospirillum+PSB+KRB+ZnSB@ 1.25 L ha^{-1}.

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