European Journal of Biotechnology and Bioscience

E J B B

Volume: 3, Issue: 7, 41-43
July 2015
www.biosciencejournals.com
ISSN: 2321-9122
Impact Factor: 3.742

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Effect of composts and industrial by-products on yield and yield attributes of sugarcane

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Abstract
Field experiment were conducted in sandy loam soil at Mamangalam Village at Chidambaram Taluk, Cuddalore district, Tamil Nadu. The soils of Mamangalam was classified as *Ultic hapludalfs* comes under Pattukottai series having sandy loam texture, the available nutrient status was low in N, medium in P and low in K. In plant crop experiment, treatments consisted of main plot treatments M_1 –Control, M_2 – Farmyard Manure (FYM) @ 25 t ha^{-1}, M_3 – Seasoned Pressmud (SPM) @ 25 t ha^{-1}, M_4 – Biocompost (BC) @ 5 t ha^{-1}. The sub plot treatments were S_1-100% recommended dose of fertilizers (N, P, K @ 275; 62.5; 112.5 kg ha^{-1}) S_2 – S_1 + Lignite Flyash (LFA) @ 25 t ha^{-1} S_3 – S_1 + Humic acid (HA) @ 50 kg ha^{-1}. S_4-S_2 + Humic acid (HA) @ 50 kg ha^{-1}. The design followed was split plot design. The treatments were replicated thrice. The yield attributes and cane yield (t ha^{-1}) also was recorded.

Keywords: FYM, Seasoned pressmud, Biocompost, Flyash, Sugarcane

Introduction
Sugarcane (*Saccharum officinarum*) is an important commercial crop in India, which plays pivotal role in agriculture and industrial economy. Among the sugarcane growing countries, India ranks second in area as well as in production with the cultivable area of 43.89 lakh ha and productivity of 69.9 t ha^{-1} (Sugarcane.dac.gov.in 2016-17). The country requirement by 2025 AD has been projected at 625 million tones thus there is need to raise the productivity levels and sustain same (Sundara, 1998) [10]. Integrated nutrient management (INM) is an efficient and practical way of mobilizing nutrient, accessible and affordable plant nutrient sources, in the working capital assets and in the investment assets of the plant nutrients in order to optimize productivity of the cropping system and economic return of the farmer. INM involves the integrated use of mineral fertilizers together with organic manures/ industrial agricultural wastes in suitable combination complementing each other to optimize input use and maximize production and sustain to same without impairing the crop quality of soil health or any other environmental hazards. It enables gainful utilization of other waste or under utilized renewable resources. The present study was designed to find out nutrient management practices in influencing organics/ industrial by-products and fertilizers on yield attributes and yield of sugarcane.

Materials and Methods
The field experiment was conducted in farmer's field in Mamangalam village (Sandy loam) of Chidambaram Taluk, Cuddalore district, Tamil Nadu. The treatment structure include Main plot treatments M_1 – Control; M_2 – Farmyard manure (FYM) @ 25 t ha^{-1}; M_3 – Seasoned Pressmud (SPM) @ 25 t ha^{-1} and M_4 – Biocompost (BC) @ 5 t ha^{-1}, Sub plot treatments constitute S_1-100% Recommended dose of fertilizer (RDF) (N, P, K @ 275:62.5; 112.5 kg ha^{-1}), S_2 – 100% RDF + Lignite Flyash (LFA) @ 25 t ha^{-1}, S_3 – 100% RDF + Humic acid (HA) @ 50 kg ha^{-1}, S_4-100% RDF + LFA @ 25 t ha^{-1} + HA @ 50 kg ha^{-1}. Doses fixed for various treatments are based on the current recommendation prevailing in this part of region. The yield attributes include number of millable canes at harvest (× 1000 ha^{-1}) and weight of millable cane (kg) was recorded. The individual plots received only recommended dose of N, P_2O_5 and K_2O fertilizers. The crops were grown following the recommended package of practices and harvested at maturity. The cane harvested from each experimental was weighed and recorded in kilogram per plot computed and expressed as tonnes per hectare.

Results and Discussion
The results on the physical and chemical characteristics of soil are given in Table 1.

Table 1: Initial soil properties of the experimental field

Properties	Value
Coarse sand (%)	49
Fine sand (%)	20
Silt (%)	16
Clay (%)	15
Textural class	Sandy loam
Taxonomical classification	*Ultic hapludalfs*
pH	7.12
EC (dS m^{-1})	0.24
Organic carbon (g kg^{-1})	5.45
CEC (c. mol (p+) kg^{-1})	17.1
$KMnO_4$-N (kg ha^{-1})	243.0
Olsen-P (kg ha^{-1})	22.5
NH_4OAC-K (kg ha^{-1})	105.2

Individual cane weight and number of millable cane

The data on individual cane weight (kg) and number of millable cane population (× 1000 ha^{-1}) recorded at harvest were presented in Table 2. Organic manure treatments had significant influence on individual cane weight and number of millable cane. Treatment M_3 (SPM @ 25 t ha^{-1}) recorded maximum individual cane weight of

1.27 kg and millable cane population of 123.9 (× 1000 ha^{-1}) in sandy loam soil. In sugar cane production individual cane weight and number of millable canes assure practical significance as they are directly related to productivity. It is an established fact that an increase in tillering ability of sugarcane plant leads to increase in the number of millable canes which is one of the important yield attributes responsible in boosting the productivity of sugarcane (Shahid *et al.*, 2011) [7]. The significant point to be noted was that the application of organic manure is quite obvious as it provide a steady supply of nutrients leading better growth of plants. Moreover, the increased availability of phosphorus and potassium in addition to all other plant nutrients released by the organic manures might have contributed in enhancing yield attributes. The positive impact of availability of individual plant nutrients and humic substances from manure and balanced supplement of nitrogen through inorganic fertilizers might have induced cell division expansion of cell wall, meristematic activity, photosynthetic efficiency and regulation of water intake into the cells, resulting in the enhancement of yield parameters, (Sekar, 2003) [5]. The increase in yield characters of sugarcane may be due to integrated application of pressmud and inorganic fertilizers might be attributed to the reduced tiller mortality resulting in more number of millable cane. Pressmud itself contain 21 per cent organic carbon along with other macro and micronutrients which promote the yield. Pressmud consists of several inorganic and organic nutritional components for the growth of microbes which lead to better nutrient supply and utilization which improve CEC of soils. Pressmud would bring into active improvement of individual cane weight (Bokhtiar *et al.* 2015) [2]. The differences in individual cane weight were significant among industrial by products treatments. LFA @ 25 t ha^{-1} + HA @ 50 kg ha^{-1} (S_4) treatment registered maximum individual cane weight of 1.24 kg and maximum population of 119.8 (×1000 ha^{-1}) in sandy loam soil. The addition of LFA and HA proved superior by registering significantly higher millable cane and individual cane weight in experimental field. The Flyash acts as a soil conditioner and nutrient supply and thereby increases the yield attributes (Vimalkumar *et al.*, 2005). Humic acid regulates plant growth by changing the soil simultaneous adequately with plant nutrients required for plant metabolism in the root zone. It influences the growth of higher plants favourably as measured by increase in cane length (Sellamuthu *et al.* 2004) [6].

Table 2: Effect of organic manures and industrial by-products on individual cane weight (kg) and of millable canes (× 1000 ha^{-1}) at harvest

Main plot / Sub plot	Individual cane weight (kg)					No. of millable canes (× 1000 ha^{-1})				
	Control (M_1)	FYM (M_2)	SPM (M_3)	BC (M_4)	Mean	Control (M_1)	FYM (M_2)	SPM (M_3)	BC (M_4)	Mean
RDF (S_1)	1.12	1.17	1.22	1.16	1.17	105.2	112.5	120.0	111.7	112.3
RDF+LFA (S_2)	1.15	1.26	1.30.	1.21	1.23	109.4	123.8	126.4	117.1	119.1
RDF+HA (S_3)	1.13	1.17	1.23	1.17	1.17	105.8	113.3	121.7	111.9	114.5
RDF+LFA+HA (S_4)	1.16	1.28	1.33	1.22	1.24	110.1	124.6	127.5	117.1	119.8
Mean	1.15	1.22	1.27	1.18	1.20	107.6	118.6	123.9	115.7	116.4

	SEd	CD (p = 0.05)	SEd	CD (p = 0.05)
M	0.01	0.04	1.76	4.31
S	0.03	0.06	2.77	5.73
M × S	0.05	NS	2.77	5.73
S × M	0.06	NS	5.55	NS

Plant cane yield

Among organic manure treatments, M_3 (SPM @ 25 t ha^{-1}) proved superior by recording maximum cane yield of 153.50 t ha^{-1} in sandy loam soil (Table 3). The increase in sugarcane yield due to application of organic manures can be attributed to the increased availability of all major nutrients into soil. Application of pressmud along with inorganic fertilizer, followed by FYM and inorganic fertilizers resulted in higher cane yield. The increase in yield of cane with varying levels of applications of organic sources with inorganics has been reported by Abdul Fatah Soomro *et al.* (2013) [1]. In sugarcane cultivation, the cane yield is the ultimate product that decides the benefit accrued out of it. The higher response of sugarcane may be due to the application of organic manures will be attributed to the availability of plant nutrients in manifolds by the solubilizing effect of the decomposing manures with steady release of plant nutrients over longer periods. The increased soil organic carbon content and consequently improved soil physico-chemical properties may be due to the application of organic manures have contributed to the increased cane yield. The application of manures such as SPM, FYM and BC might have improved to physical condition of soil by reducing bulk density and increasing soil macrospore for

better root proliferation and finally reflected on cane yield (Patil and Shingate, 1981) [4]. The appreciable increase in

cane yield due to addition of SPM is attributable for improvement in various growth and yield attributes such as weight and no. of millable cane at harvest (Srivastava *et al.* 2006) [8]. Industrial by-products exhibited significant difference on cane yield. Treatment S_4 (LFA @ 25 t ha^{-1} + HA @ 50 kg ha^{-1}) recorded maximum cane yield of 143.37 t ha^{-1} in sandy loam soil. The Flyash application had greater effect on improving cane yield. The yield attributes were enhanced by Flyash which led to increase in cane yield (Kumari Manimuthuveeral, 2014) [3]. Humic acid is believed to reduce the activity of IAA oxidase and thereby increased the level of IAA in the plant system. Increased internode's elongation leading to more weight is the essential role of IAA and therefore a better response is anticipated in crop and sugarcane is one such crop where the yield is directly related to elongated internodes. The beneficial role of humic acid in improving to sugarcane productivity had been highlighted by Sellamuthu *et al.* (2004) [6].

Table 3: Effect of organic manures and industrial by-products on plant yield of sugarcane (t ha^{-1})

Main plot / Sub plot	Plant cane yield (t ha^{-1})				
	Control (M_1)	FYM (M_2)	SPM (M_3)	BC (M_4)	Mean
RDF (S_1)	117.0	132.1	146.47	127.10	130.4
RDF+LFA (S_2)	120.6	149.0	157.40	135.20	140.55
RDF+HA (S_3)	119.0	134.0	148.20	130.00	133.33
RDF+LFA+HA (S_4)	122.4	152.4	162.30	136.35	143.37
Mean	119.7	140.9	153.50	133.16	136.84
	SEd		CD (p = 0.05)		
M	2.52		6.17		
S	3.58		7.39		
M × S	6.70		NS		
S × M	7.17		NS		

Conclusion

Application of SPM @ 25 t ha^{-1} (M_3) registered significantly higher cane yield and yield-attributes *viz.*, number of millable canes and individual cane weight in sandy loam soil. Similarly, sub plot treatment, LFA @ 25 t ha^{-1} + HA 50 kg ha^{-1} (S_4) recorded maximum cane yield and yield attributes in experimental soil. The basal application of SPM @ 25 t ha^{-1} (M_3) and application of LFA @ 25 t ha^{-1} + HA 50 kg ha^{-1} along with recommended dose of fertilizers (S_4) found to be the best for INM on sugarcane yield and soil fertility in sandy loam soil. The use of organics in conjunction with inorganic fertilizers improved sustainability of crop production.

References

1. Abdul Fatah Soomro, Shamasuddin Tunio, Fateh Chand Odd, Inaitullah Rajper. Integrated effect of inorganic and organic fertilizers on the yield and quality of sugarcane. Pakistan Journal of Botany. 2013; 45(4):1339-1348.
2. Bokhtiar SM, S Roksana, AZM Moslehuddin. Soil fertility and productivity of sugarcane influenced by enriched pressmud compost with chemical fertilizers. SAARC Journal of Agriculture. 2015; 13(2):183-197.
3. Kumari Manimuthuveeral D. Evaluation of direct and residual effect of lignite flyash levels and pressmud on sugarcane based cropping system. Asian Journal of Biological and Life Sciences. 2014; 3(2):125-127.
4. Patil VD, AK Shingate. Studies of the effect of different levels of pressmud cake in combination with various levels of nitrogen on yield and quality of sugarcane (CO 740). Indian Sugar. 1981; 31:187-188.
5. Sekar A. Studies on the evaluation of sugarcane variety and production technologies for animating sugarcane productivity in coastal region of Tamil Nadu, Ph.D. Thesis, Annamalai University, Annamalainagar, Tamilnadu, India, 2003.
6. Sellamuthu KM, M Govindasamy, P Malathi. Influence of humic acid on yield attributes and juice quality of sugarcane (COV92102). Indian Sugar. 2004; 54:275-282.
7. Shahid Z, AU Ahmed, HMR Javeed. Integrated application of fertilizer and biocane (organic fertilizer) to enhance the productivity and juice quality of autumn planted sugarcane (*Saccharum officinarum* L.). African Journal of Agricultural Research. 2011; 6(21):4857-4861.
8. Srivastava TK, MS Pandey, SK Awasthi. Effect of planting materials and nutrient management on growth, yield and rejuvenation of declined sugarcane. Indian J. Agrl. Sci. 2006; 76:103-107.
9. Sugarcane.doc.gov.in 2016/statistics APY.pdf.
10. Sundara B. Sugarcane cultivation, Villas Publishing House Pvt. Ltd., 576, Masjid Road, Jangpura, New Delhi, 1988.
11. Vimal Kumar, Gulah Singh, Rajindra Rai. Fly ash A material for another green revolution Flyash Utilization Programme (FAUP), TIFAC, DST, New Delhi 110016, 2005.