Asian Journal of Biological and Life Sciences | Original Research

Evaluation of direct and residual effect of lignite flyash levels and press mud on sugarcane based cropping system

D. Kumarimanimuthuveeral *

Assistant Professor, Department of Agronomy, Annamalai University, Chidambaram, Tamil Nadu, India.

E-mail : dkmveeral@gmail.com Contact No : +91 -

Submitted : 09.05.2014 Accepted : 27.06.2014 Published : 30.08.2014

Abstract

Field experiments were conducted to evaluate the direct and residual effects of lignite flyash at four levels *viz*., 10, 15 and 20t ha^{-1} with or without pressmud an agro industrial by product on Sugarcane CoC 95071 during 2011 and 2012. Lignite flyash @ 10t ha^{-1} with pressmud and RDF exerted a remarkable influence on all the yield attributes, ultimately leading to increased cane yield of 62.5 percent over control. With regard to sole application of lignite flyash, LFA @ 5t ha^{-1} registered significantly the highest values in cane height (2.7m), No. of tillers clump^{-1} (4.7), No. of internodes cane^{-1} (19) and cane yield (19t ha^{-1}) (2010). Hence, from the results, it is concluded that when sugarcane is grown with the addition of press mud @ 12.5 t ha^{-1}+ LFA @ 5 t ha^{-1} + RDF is an economically feasible eco friendly approach to realize better returns for sugarcane growers. The same trend was followed in summer 2012 also. Other growth attributes like LAI and Dry matter production were significantly influenced by the same combination during 2011 and 2012 also. LFA @ 10 t ha^{-1} + Press mud @ 12.5 t ha^{-1} + RDF greatly enhanced the yield and yield attributes of sugarcane and ratoon sugarcane increased over control for the both seasons respectively.

Key words : Lignite fly ash, press mud, industrial wastes.

INTRODUCTION

Sugarcane (*Saccharum officinarum*), an important agro-industry based cash crop of India is being cultivated under varied agro-climatic situations and occupying an area about 3.8 million hectares with an annual cane production of 270 million tonnes. Even though India ranks first in sugarcane area and production in world, the per hectare productivity in India is lesser than countries like Australia, Indonesia and Thailand. However indiscriminate usage of inorganic fertilizer alone in the long run deteriorates soil heath and the excavated cost of this, has practical limitation to the parameters. Also despite the high cost of the traditional FYM is becoming scarce due to reduction in cattle population.

The industrial by products which are otherwise known as waste, contain an array of plant nutrients and these nutrients are dumped unutilized. These wastes could be effectively utilized for improving agricultural production without affecting the soil fertility. Every year Indian thermal power plants produce more than 100 million tons of lignite flyash, which is expected to reach 175 million tons in near future .[1]. Disposal of this huge quantity of lignite flyash is a great problem due to its limited utilization in manufacturing of bricks, cements, ceiling and other civil construction activities. Use of flyash in agriculture provides a feasible alternative for its safe disposal to improve the soil environment and enhance the crop productivity [2]. However, a judicious amendment strategy has to be developed to abate the land pollution from the heavy metals present in it. With this in view, an attempt has been made to utilize these wastes (Pressmud, LFA) in effective manner for improving the productivity of the sugarcane crop.

MATERIALS AND METHODS

The field experiments were conducted in the farmer's field of Neyveli during special season, 2011 and 2012.The experimental soil is deep fairly drained clay with available N (228 kg ha^{-1}), P_2O_5 (12.83 kg ha^{-1}) and K_2O (312.7 kg ha^{-1}).The field experiments were conducted on Sugarcane CoC95071. The weathered lignite fly ash was collected from Neyveli Lignite Corporation Ltd., Neyveli. The press mud was collected from the sugar mill in Sethiathope, Cuddalore district. The experiments comprised of ten treatments *viz*., T_1 Control, T_2 Farmer's practice, T_3 Lignite fly ash@5tha^{-1}+RDF,T_4 Lignite fly ash @ 5 t ha^{-1} + Press mud + RDF, T_5 Lignite fly ash @ 10 t ha^{-1} + RDF, T_6 Lignite fly ash @ 10 t ha^{-1} + Press mud + RDF, T_7 Lignite fly ash @ 15 t ha^{-1} + RDF, T_8 Lignite fly ash @ 15 t ha^{-1} + Press mud + RDF, T_9 Lignite fly ash @ 20 t ha^{-1} + RDF, T_{10} Lignite fly ash @ 20 t ha^{-1} + Press mud + RDF. Experiments were conducted in Randomized block design with three replications. The crop was managed as per recommended package of practices. Data on growth, yield components, yield and economics were recorded.

RESULTS

First crop, sugarcane

The sugarcane growth and yield parameters were significantly superior when LFA 10t ha^{-1} with pressmud and RDF was applied. Among the different levels of LFA with or without pressmud tested, significantly highest cane height (3.4m) and number of tiller clump^{-1} (6.3) were recorded in LFA @ 10t ha^{-1} + pressmud + RDF applied plots. This improvement was mainly due to increased supply of silica content by lignite flyash at all stages. With regard to inter node length and number of internodes per plant, the same treatment was exerted by recording 11.3 cm and 18 respectively. Increased level of LFA @ 10t ha^{-1} with pressmud and RDF recorded significantly highest cane yield of 118t ha^{-1} and closely followed by T_4 LFA @ 5t ha^{-1} + pressmud + RDF. In the second crop (ratoon crop of sugarcane), the same trend was followed. The confirmation trail was also conducted in the same season 2012,the same trend was followed and presented

Table 1. Effect of LFA and press mud on growth and yield attributes of Sugarcane-ratoon sugarcane(2011)

Treatment	Sugarcane-first crop				Ratoon Sugarcane			
	Cane height (m)	No. of tillers clump^{-1}	No of internodes cane?^{1}	Yield (t ha?^{1})	Cane height (m)	No. of tillers clump^{-1}	No of internodes cane?^{1}	Yield (t ha?^{1})
T_1	1.1	3.7	12	74	1.5	6.6	15	76.21
T_2	1.2	4.1	16	80	2.4	7.5	18	83.34
T_3	2.7	4.7	19	88	3.9	7.9	21	91.80
T_4	3.1	6.0	28	114	4.4	9.1	30	118.3
T_5	2.5	4.4	22	82	3.5	7.1	24	85.54
T_6	3.4	6.3	32	118	4.9	9.8	35	123.4
T_7	2.3	4.2	18	76	3.3	7.7	20	79.62
T_8	2.8	5.7	25	100	3.8	8.8	27	103.2
T_9	2.1	4.1	15	70	3.1	7.5	18	73.72
T_{10}	2.3	5.4	22	96	3.3	8.0	25	96.00
SE_D	0.2	0.6	3.0	6.2	0.3	0.7	3.4	6.7
CD p=0.05	0.4	1.2	6.1	12.4	0.6	1.4	6.8	13.4

Table 2. Effect of LFA and press mud on growth and yield attributes of Sugarcane-ratoon sugarcane(2012)

Treatment	Sugarcane-first crop				Ratoon Sugarcane			
	Cane height (m)	No. of tillers clump^{-1}	No of internodes cane?^{1}	Yield (t ha?^{1})	Cane height (m)	No. of tillers clump^{-1}	No of internodes cane?^{1}	Yield (t ha?^{1})
T_1	1.2	3.8	13	77	1.7	6.9	18	79
T_2	1.3	4.3	18	83	2.5	7.8	21	85
T_3	2.8	4.9	21	90	4.1	8.4	23	94
T_4	3.2	6.3	30	117	5.3	9.6	35	120
T_5	2.6	4.5	24	85	3.6	7.6	27	87
T_6	3.5	6.5	35	122	5.3	10.6	38	125
T_7	2.4	4.7	21	80	3.6	8.2	23	82
T_8	2.9	6.2	27	103	4.4	9.4	30	106
T_9	2.2	4.8	18	72	3.3	8.1	21	76
T_{10}	2.4	5.8	25	99	3.9	8.6	28	99
SE_D	0.2	0.6	3.0	7.1	0.4	0.8	3.4	7.1
CD p=0.05	0.4	1.2	6.1	14.3	0.8	1.6	6.8	14.2

in the table 2.Based on above observations, it is concluded that optimum level of *ie* LFA @ 10t ha^{-1} with pressmud and RDF was best for sugarcane - ratoon sugarcane in terms of yield and improving soil fertility. Hence, LFA @ 10t ha^{-1} + pressmud + RDF may be recommended for general adoption of sugarcane farmer under recycling of wastes practices.

DISCUSSION

Application of lignite flyash@10 t ha^{-1} along with pressmud and recommended dose of fertilizers improved the soil organic carbon and nutrient availability which may be attributed to increase in inter node length and number of internodes per plant by enhancing better root growth. The increase in cane yield under these treatments was mainly due to highest availability of nutrients by LFA and pressmud because these wastes are in rich in array of plant nutrients. The better integration of industrial wastes resulted in better utilization of available plant nutrients leading to strong increase in enzymatic activity and indirectly they increase the yield and yield attributes in sugarcane and ratoon sugarcane. This was online with the findings of Kumarimanimuthuveeral, [2], that industrial wastes are having macro and micro nutrients and they are responsible for the yield enhancement. This may be due to the presence of macro and micro nutrients in the LFA, which is essential for silicicolous plants like maize and also press mud which is a very good organic fertilizer, soil ameliorating source for sustaining crops[3] The yield and yield components were positively and significantly influenced by lignite flyash application along with press mud. This treatment excelled other treatments, because the integrated waste utilization or conjunctive use of different nutrient sources is an alternative and characterized by reducing the input of chemical fertilizer, but they accumulate and increase the availability of nutrients, and the released nutrients from the mineralization process has a fertilizing effects on the arable crops [4].

CONCLUSION

From the aforesaid study it was concluded that industrial wastes are dumped in huge and they should be properly utilized to minimize farming cost as well as environmental degradation. In this regard, lignite fly ash a by product of thermal power station was effectively utilized in sugar cane which is considered to be a silicicolous plant and lignite flyash is rich in silica. So that application of lignite flyash along with other sources increased the yield and its components in sugarcane and ratoon sugarcane.

REFERENCES

1. Kesh S, Kalra N, Sharma S K & Chaudhary A.. Flyash incorporation effects on soil characteristics and growth and yield of wheat, *Asia Pacific J Environ Develop*, 2010 **4**:53-69.

2. Kumarimanimuthuveeral, D.. Utilization of industrial wastes in maize based cropping system. TNSCST. 2009 *Stu. pro. rep.* Annamalai Univ.

3. Kumarimanimuthu veeral, D. Evaluation of direct and residual effects lignite fly ash a by product of thermal power unit in rice based cropping system of Cauvery deltaic region. 2012. UGC Major Project., Report, Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar.

4. Abdul Fath Soomro, Shamasuddin Tunio, Feath Chand Oad, Inaitullah Rajper, Effect of supplement inorganic NPK and organic nutrients on sugarcane ratoon crop. *International Journal of Science & Engineering Research,* 2012. Vol (3);10.