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THE RESPONSE OF LIGNITE FLYASH, A BY PRODUCT OF THERMAL UNIT ON YIELD AND YIELD ATTRIBUTES OF SUNFLOWER

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ABSTRACT

Investigations were carried out with four levels of lignite flyash viz.,5, 10,15, and 20t ha^{-a} with or without pressmud an agro industrial by product with the objective of studying their influence on sunflower during 2010 (Rabi) and 2011(Summer). This study revealed that lignite flyash @ 5t ha^{-a} with pressmud exerted a remarkable influence on all the yield attributes. It significantly recorded the highest values of plant height (148 cm),capitulam diameter(19.1cm) and seed yield(1994kg ha^{-a}). With regard to sole application of lignite flyash, LFA @ 5t ha^{-a} registered significantly the highest values in plant height (89cm), capitulam diameter (16cm) and seed yield (1415kg ha^{-a}). The same trend was followed in 2011, summer also. From this study it was concluded that application of LFA @ 5t ha^{-a} with pressmud and RDF enhanced the grain yield in sun flower.

INTRODUCTION

Sunflower (*Helianthus annus*) holds great promise as an oil seed crop because of its short duration, photo – insensitivity and wide adaptability to different agro-climatic regions and soil types. It can be grown at any time of the year and can serve as an ideal cash crop during the period when the land is otherwise fallow. Sunflower can play an important role in meeting out the shortage of edible oil in our country (Anonymous, 2008). Lignite fly ash (LFA) has been regarded as a problematic solid waste all over the world. In India, more than 100million ton of LFA is generated annually from coal-based thermal power plants. The production of LFA may likely to exceed 140 million ton per annum by 2020 (Elavazhagan,2011). Today, it is necessary to emphasize that the ***'wastes are resources'*** and therefore their management and utilization is a must in an eco friendly approach. The exponential increase in industries not only consuming larger area of agriculture land, but simultaneously causing serious environmental degradation of natural resources. Wastes originating from these industries like sugar mill industries (pressmud), pharmaceutical industry waste and thermal power units (LFA) are finding their place in today's agriculture. Farm wastes such as farmyard manure, which contains an array of plant nutrients, but they cannot supply throughout the country because of transport facilities and its odour. The sources of organic matter are scarce, due to shortage and non availability of labour to rear animals. In view of the cost factor, there is an imperative need to utilize these industrial wastes to a larger extent, because some of the industrial by products contain major elements which are essential for crop production. Lignite Flyash (LFA), which is a by product of thermal power unit called as a waste material can be beneficially utilized for increasing agriculture production (*Lal et al*., 2007). A quantity of 7-10 mt lignite fly ash accumulated annually and only a small quantity of the lignite fly ash is supplied to the cement factories. `The disposal of LFA is done through land fill and such practice consumed more valuable land areas and the ground water gets contaminated due to leaching of elements present in LFA .Lignite Fly ash, though it is a good source of many nutrients, its use remains unexploited for agriculture. Further, the scope of utilization of lignite fly ash in agriculture, which would go a long way in solving the waste management problems faced by Neyveli Lignite Corporation and coal industries. For the purpose of agricultural use, the transport of fly ash to far-away places may cost more. So utilization near the generation source is much beneficial (CARD, 2011).Industrial waste such as pressmud or filter cake is by product of sugar factories reported to be a valuable resource of plant nutrient and may therefore alter the physical, chemical and biological properties of alter the soil In view of this, utilization of LFA in agriculture could be a viable option.

MATERIAL AND METHODS

The field experiments were conducted in the Experimental farm, Department of Agronomy, Annamalai University, Annamalai Nagar, Tamil Nadu (11ş24'N and 71ş41'E), during 2010-2011. 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}), and organic matter (0.65%).The field experiments were conducted on Sunflower (Co 1) during Rabi 2010 and Summer 2011. The weathered 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 @ 5 t ha^{-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. Standard cultivation practices were adopted. Data on growth, yield and yield components were recorded.

RESULTS AND DISCUSSION

Growth and yield attributes of sunflower

Application of lignite fly ash @ 5 ha ą along with press mud @ 12.5t ha ą to sunflower had a significant effect on plant height of the crop at harvest during Rabi 2010(Table 1). However, all the four levels of lignite fly ash (5, 10, 15 and 20t ha ą) recorded higher values over control (112.5cm) in their effect on plant height.

The yield and yield components were positively significantly influenced by lignite flyash application along with pressmud. 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 .When sunflower is grown with by adding Lignite fly ash along with press mud and RDF exerted and contributed to the nutrient requirement of the base crop through combined application of LFA, press mud and RDF. The farmers practice recorded the significantly the least yield attributes. This may be due to severe nutrient stress throughout the crop growth. Application of press mud along with lignite fly ash, and RDF sunflower recorded the highest yield, because of the nutrients supplied by LFA and press mud. This was confirmed with the findings of Kumarimanimuthuveeral, 2009, that for sustainable crop production, integrated use of organic and inorganic fertilizer has proved to be highly beneficial. This may be due to complementary effect of lignite fly ash favoured source sink relationship in sunflower to produce the yield components as well as seed yield. Incorporation of lignite flyash with pressmud and RDF had a

significant effect on capitulam diameter. Of the various levels tried, lignite flyash @ 5t ha ą along with pressmud @ 12.5t ha ą and RDF had a pronounced effect on capitulam diameter as compared to lignite flyash @ 10,15 and 20 t ha ą (16.3,13.4,11.2cm) with pressmud and RDF. The effects of various levels of lignite flyash alone were found to be on par with each other. The influence of different levels of lignite fly ash on seed yield also found to be significant. The highest and the lowest number of seed yield ha^{-1} were recorded by 5t LFA ha ą with pressmud and RDF and control, the values being 1994 and 678kg ha^{-1}respectively. The effect of different levels of LFA on the test weight was found to be non significant. The same trend was followed in summer 2011 in growth and yield parameters in sunflower.Lignite fly ash has potentiality in crop production due to its efficacy in modification of soil health and crop performance. The supply of high concentration of beneficial elements K,Na,Zn,Ca,Mg and Fe) in lignite flyash and pressmud leading to better aeration, root activity and nutrient absorption and the consequent complimentary effects would have resulted in higher yield and yield attributes

CONCLUSION

Taking in to consideration of sunflower, application of lignite flyash @ 10t ha ą along with press mud @ 12.5t ha ą and RDF is a good agronomic practice in augmenting its productivity.

Table 1: Effect of LFA and press mud on Growth and yield attributes of Sunflower (2010)

Treatment	Plant height (cm)	Capitulam diameter (cm)	100 seed weight (g)	Seed yield (kg ha^{-1})
T_1	112.5	10.52	4.8	678
T_2	130	12.5	5.3	1148
T_3	136	16.2	5.2	1415
T_4	148	19.1	5.8	1994
T_5	130	13	5.1	1308
T_6	138	16.3	5.7	1813
T_7	127	11.1	5.06	1216
T_8	132	13.4	5.6	1704
T_9	122	8.1	4.8	1101
T_{10}	124	11.2	5.4	1522
SE_D	2.5	1.1	N.S	115.2
CD p=0.05	5.01	2.01	N.S	230.4

Table 2: Effect of LFA and press mud on Growth and yield attributes of Sunflower (2011)

Treatment	Plant height (cm)	Capitulam diameter (cm)	100 seed weight (g)	Seed yield (kg ha^{-1})
T_1	114	11.2	4.7	681
T_2	133	12.9	5.4	1152
T_3	139	16.7	5.3	1423
T_4	151	19.9	5.7	2001
T_5	133	14.1	5.2	1321
T_6	141	16.9	5.8	1822
T_7	130	11.6	5.2	1222
T_8	135	13.9	5.7	1715
T_9	125	8.6	4.8	1113
T_{10}	128	11.7	5.4	1524
SE_D	3.0	1.3	N.S	114.2
CD p=0.05	6.1	2.61	N.S	228.4

REFERENCES

1. Anonymous. 2008. Effect of nitrogen source, sulphur and boron levels on productivity, nutrient uptake and quality of sunflower. Indian journal of Agronomy, 53 (2): 129-134.
2. Kumari mani muthu veeral, D.2009. Utilization of industrial wastes in maize based cropping system. TNSCST.Stu. pro. rep.Annamalai Univ.
3. Elavazhagan, P.2011.Yield maximization in groundnut through lignite fly ash application.M.Sc.(Ag).Thesis. Annamalai Univ.
4. Lal C. Ram, Nishant, K. Srivastava. Sangeet K. Jha. Awadhesh K. Sinha. Reginald E. Masto. Vetrivel A. Selvi 2007. Management of Lignite fly ash for improving Soil Fertility and Crop Productivity. Environ Manage 40: 438-452.
5. CARD (Centre for Applied research and development) 1997. Soil reclamation of backfilled areas of Neyveli opencast mines. CARD, Neyveli Lignite Corporation, and Faculty of Agriculture, Annamalai University, Tamil Nadu, India.