International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(4): 1936-1938

Received: 12-05-2018
Accepted: 19-06-2018

SA Durgude
Department of Soil Science and Agricultural Chemistry, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

SH Salunkhe
Department of Soil Science and Agricultural Chemistry, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

KR Parihar
Department of Soil Science and Agricultural Chemistry, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

Correspondence
SA Durgude
Department of Soil Science and Agricultural Chemistry, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

Impact of fly ash and bagasse ash on total chlorophyll content and quality of wheat grown in an inceptisol

SA Durgude, SH Salunkhe and KR Parihar

Abstract
A field experiment was conducted during the year 2016-17 at the Post Graduate Institute Research Farm, Mahatma Phule Krishi Vidyapeeth, Rahuri, to study the "Effect of fly ash and bagasse ash on soil properties, yield and quality of wheat in an Inceptisol". The experimental soil belongs to Masala series of Inceptisol order (*Vertic Haplustept*), the soil was moderately alkaline with medium status of organic carbon and high in calcium carbonat content. Low in available N, medium in available P, very high in available K and deficient in Zn and Fe. Application of various levels of fly ash and bagasse ash significantly increased the pH and EC of soil at crown root initiation stage and at harvest stage. The highest total chlorophyll content, observed to be highest in treatment of application of 50 kg ha^{-1} K_2O through bagasse ash along with recommended dose of N and P_2O_5 through chemical fertilizer + 10 t ha^{-1} FYM (T_7). In case of the wheat quality parameters, highest test weight was found in treatment of application of 125% K_2O through bagasse ash along with recommended dose of N and P_2O_5 through chemical fertilizer + 10 t ha^{-1} FYM (T_7), however, slightly improvement in quality parameter like crude protein and gluten contents were observed in application of bagasse ash as compared to fly ash even statistical results obtained non-significant.

Keywords: Fly ash bagasse ash chlorophyll test weigh crude protein gluten

Introduction
Fly ash-a coal combustion residue of thermal power plants has been regarded as the problematic solid waste all over the world. The dust collection system removes the fly ash, as a fine particulate residue, from the combustion gases before they are discharged into the atmosphere.

The management of fly ash has been troublesome in view of its disposal because of its potential of causing pollution of air and water.

Every year Indian thermal power plants produce more than 100 million tones of fly ash, which is expected to reach 200 million tonnes in near future and their disposal is a major problem all over the world due to limited use and possible toxic outcomes. While having look on recent fly ash production (2016-17) in India, we will found it is around 180 million tonnes and its utilization is around 62 per cent.

They revealed that application of coal ash increase the yield of cereal crops to 15 to 20 per cent, sugarcane to 20 to 30 per cent, maize to 40 per cent, red gram to 50 per cent, potato to 25 per cent, plantation crops to 30 per cent, mustard and vegetable to 10 per cent. Besides increasing the yields of crops it also improved nutrient uptake in plants it improves the yield of variety of agricultural crops.

Bagasse ash is one of the organic waste obtained from sugar industries during the process of sugar manufacturing. Bagasse ash poses a significant environmental problem. Sugarcane production in India is over 300 million tons/year leaving about 10 million tonnes of as unutilized and hence, waste material.

Bagasse ash use in agriculture as organic fertilizer for crop production is now-a-days becoming an established practice

Ash from co-combustion of sugarcane bagasse with wood proved to be providing nutrients to plants. Plants grown on ash amended soils achieved greater biomass production compared to control or treatments using other soil amendments.

Material and Methods

Details of field experiment

The representative soil samples were collected plot wise to assess the initial soil fertility status of experimental plot. The experiment was laid out in a randomized block design (Fig. 1) with 10 treatments and 3 replications. The gross plot size was 3.6m. x 3.2m. and net plot size was 3.15m. x 3.0m. The recommended inter row spacing of 22.5 cm was adopted.

The general recommended fertilizer dose of wheat is 120:60:40 kg ha^{-1} N, P_2O_5 and K_2O respectively along with FYM @10 t ha^{-1}. All the nutrients, fly ash and bagasse and FYM were added in soil as per treatment. The treatment comprised of:

T_1 : Absolute control
T_2 : GRDF (120:60:40 kg ha^{-1} $N:P_2O_5:K_2O$ + 10 t ha^{-1} FYM)
T_3 : GRDF of N & P_2O_5 + 125% K_2O through fly ash
T_4 : GRDF of N & P_2O_5 + 100% K_2O through fly ash
T_5 : GRDF of N & P_2O_5 + 75% K_2O through fly ash
T_6 : GRDF of N & P_2O_5 + 50% K_2O through fly ash
T_7 : GRDF of N & P_2O_5 + 125% K_2O through bagasse ash
T_8 : GRDF of N & P_2O_5 + 100% K_2O through bagasse ash
T_9 : GRDF of N & P_2O_5 + 75% K_2O through bagasse ash
T_{10} : GRDF of N & P_2O_5 + 50% K_2O through bagasse ash

Healthy wheat seeds of variety Samadhan, recently released by university obtained from Chief Seed Sale Counter, M.P.K.V, Rahuri.

The recommended dose of fertilizers for wheat was 120:60:40 kg ha^{-1} N, P_2O_5 and K_2O. The N was given through urea, P through single super phosphate and K_2O through muriate of potash in T_2 treatment, however K_2O was given @ 50, 40, 30 and 20 kg ha^{-1} through fly ash in T_3 to T_6 and bagasse ash in treatments of T_3 to $T_{10,}$ respectively. Organic manures i.e farm yard manure was given @ 10 t ha^{-1} to all the treatments except T_1 treatment (Absolute control).

In order to study the physical and chemical properties of soil, before the beginning of the experiment, a representative composite soil sample was collected from experimental field. Surface soil samples (0-15 cm) were drawn before sowing, at crown root initiation and after harvest of the wheat crop.

Results and Discussion

Total chlorophyll content in fresh tissues of wheat leaves as influenced by application of fly ash and bagasse ash at 45 and 65 DAS are presented in table 1.

Total chlorophyll content in fresh tissue of leaves at 45 DAS was found to be significantly higher in treatment of T_7 (2.07 mg g^{-1}) over all the treatments except T_3 (2.02 mg g^{-1}) which was at par.

Table 1: Total chlorophyll content in fresh plant tissue of wheat as influenced by application of fly and bagasse ash in soil

T. No	Treatment	Total chlorophyll content (mg g^{-1} fresh plant tissue)	
		45 DAS	65 DAS
T_1	Absolute control	1.52	1.62
T_2	GRDF (120:60:40 kg ha^{-1} $N:P_2O_5:K_2O$ + 10 t ha^{-1} FYM)	1.86	1.87
T_3	GRDF of N & P_2O_5 + 125% K_2O through fly ash	2.02	2.08
T_4	GRDF of N & P_2O_5 + 100% K_2O through fly ash	1.93	1.93
T_5	GRDF of N & P_2O_5 + 75% K_2O through fly ash	1.80	1.80
T_6	GRDF of N & P_2O_5 + 50% K_2O through fly ash	1.72	1.79
T_7	GRDF of N & P_2O_5 + 125% K_2O through bagasse ash	2.07	2.13
T_8	GRDF of N & P_2O_5 + 100% K_2O through bagasse ash	1.92	1.95
T_9	GRDF of N & P_2O_5 + 75% K_2O through bagasse ash	1.86	1.84
T_{10}	GRDF of N & P_2O_5 + 50% K_2O through bagasse ash	1.84	1.79
	SE (±)	0.02	0.02
	CD at 5%	0.06	0.08

Total chlorophyll content of fresh tissue of leaves at 65 DAS was found significantly higher in treatment of T_7 (2.13 mg g^{-1}) over all the treatments except T_3 (2.08 mg g^{-1}) which was at par. Increased in the chlorophyll content in leaves of wheat crop due to application of bagasse ash may be due to small quantity of Mg and Fe present in bagasse ash and also in fly ash. Which reflected the role of Mg and Fe in chlorophyll synthesis in leaves. The results are in conformity with the findings of Sheoran (2014) [8].

The test weight, crude protein and gluten content in wheat grain as influenced by application of fly ash and bagasse ash are presented in table 2. And depicted in fig.

The test weight of wheat grain was found significantly higher in treatment of T_7 (45.98 g/1000) over all the treatments. Total crude protein content in wheat grain was found non-significant differences in all the treatments.

Total gluten content of wheat grain was found non-significant differences in all the treatments.

These results are in conformity with findings of Jamil *et al.* (2004) [7] and Khan (2011).

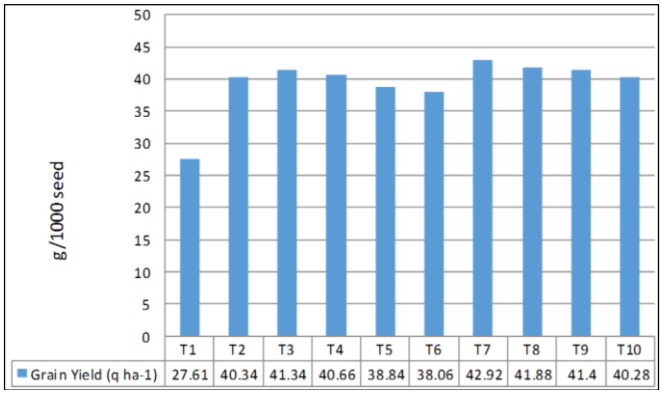

Fig 1: Test weight of wheat grains as influenced by application of fly ash and bagasse ash in soil

Table 2: Quality of wheat as influenced by application of fly and bagasse ash in soil

T. No	Treatment	Quality parameters of wheat grain		
		Test weight (g/1000)	Crude protein (%)	Gluten content (%)
T_1	Absolute control	43.29	11.96	7.03
T_2	GRDF (120:60:40 kg ha^{-1} N:P_2O_5:K_2O + 10 t ha^{-1} FYM)	43.70	12.22	7.11
T_3	GRDF of N & P_2O_5 + 125% K_2O through fly ash	45.93	12.13	7.11
T_4	GRDF of N & P_2O_5 + 100% K_2O through fly ash	44.93	12.04	7.03
T_5	GRDF of N & P_2O_5 + 75% K_2O through fly ash	44.58	12.03	7.07
T_6	GRDF of N & P_2O_5 + 50% K_2O through fly ash	44.32	12.00	7.06
T_7	GRDF of N & P_2O_5 + 125% K_2O through bagasse ash	45.98	12.23	7.14
T_8	GRDF of N & P_2O_5 + 100% K_2O through bagasse ash	45.92	12.15	7.12
T_9	GRDF of N & P_2O_5 + 75% K_2O through bagasse ash	45.35	12.20	7.13
T_{10}	GRDF of N & P_2O_5 + 50% K_2O through bagasse ash	44.78	12.17	7.13
	SE (±)	0.33	0.14	0.05
	CD at 5%	0.98	NS	NS

References

1. Adriano DC, Weber JT. Influence of fly ash on soil physical properties and turfgrass establishment. Journal of Environment and Quality. 2001; 30:596-601.
2. Arnon DI. Copper enzymes in isolated chloroplast, polyphenoxydase in beta vulgaris. Plant Physiology. 1949; 24:1-15.
3. Bakri Al Mustafa AM, Kamarudin H, Bnhussain M, Nizar K, Ratiza AR *et al*. The processing, characterization and properties of fly ash. Reviews on Advanced Materials and Science. 2012; 30:90-97.
4. Carlson CL, Adriano DC. Environmental impacts of coal combustion on residues. Journal of Environment Quality. 1993; 22:227-247.
5. Dhengare SW, Raut SP, Bandwal NV, Khangan A. Investigation into utilization of sugarcane bagasse ash as supplementary cementitious material in concrete. International Journal of Emerging Engineering Research and Technology. 2015; 3:109-116.
6. Dotaniya ML, Datta S, Biswas DR, Dotaniya CK, Meena BL, Rajendiran S *et al*. Use of sugarcane industrial by-products for improving sugarcane productivity and soil health. International Journal of Recycling of Organic Waste in Agricultulture. 2016; 5:185-194.
7. Jamil M, Qasim M, Umar M, Abdus S. Impact of organic wastes (bagasse ash) on the yield of wheat (*Triticum aestivum* L.) in a calcareous soil. International Journal of Agriculture and Biology. 2004; 6:468-470.
8. Sheoran HS. Effect of fly ash application on soil properties: A review. Journal of Agroecology and Natural Resource Management. 2014; 1:98-103.