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Impact of bulk utilization of fly ash/pond ash in irrigated vertisols on long term basis vis-à-vis on grain yield of cropping system and micronutrient content in grain

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ABSTRACT

Analysis of fly ash and pond ash collected from Raichur Super Thermal Power Station, Shakhinagar, Karnataka has revealed that the both the ashes contained higher proportion of silt sized particles (40.1 to 50. 2 %). The maximum water. holding capacity of ash ranged from 48.1 to 68.1, pH from 7.9 to 10.5 and EC from 0.34 to 1.00 dS/m. Pond ash had higher WHC than fly ash. However, the pH and EC of pond ash were less as compared to fly ash. The available amount of DTPA extractable Fe, Mn, Cu and Zn varied from 8.7 to 12.5, 10.3 to13.1, 0.3 to 0.6 and 1.0 to 1.5, respectively. Fly ash contained higher amount of available micronutrients than pond ash. The limitation of utilization of fly ash in agriculture was mainly due to presence of reserve alkalinity and high salt content, on the contrary fly ash can be used as an amendment to' improve the soil physical conditions and also as a source of trace elements. Application of fly ash / pond ash at maximum dose significantly increases the concentration of micronutrients in sunflower and maize grains. Further, combined application with FYM at 20 t/ha increased the micronutrient content due to increased solubility of metal ions by forming stable complexes with organic legends. The per cent increase in the concentration of micronutrients in sunflower seeds over control due to application of fly ash @ 40 t/ha varied from 0.7 to 20.8 per cent in Zn, 1.4 to 14.2 per cent in Mn, 0 to 4.3 per cent in Cu and 0.7 to 63.9 per cent in Fe. Similarly. in the succeeding maize grain, the same varied from 5.1 to 34.0 per cent in Zn, 0 to 3.4 per cent in Mn, 17.6 to 34. 7 per cent in Cu and 2.4 to 4.0 per cent in Fe.

Key words : Fly ash, Pond ash, Micronutrients, Crop yield, Soil properties.

The annual fly ash generation in India is expected to exceed 120 million tones by 2010 from the present generation of 80 to 100 million tones per annually. At present only small percentage of (13-15%) fly ash generated in India is being used in cement, ceramic, brick industries and also in asphalting of road, filling of low levels, etc. and the reaming ash is dumped into large ponds near the thermal plants. Such a huge quantity of ash stored in ponds holds a potential threat to the environment if not controlled effectively.

In an attempt to find a solution for disposing of this huge quantity of fly ash scientists all over the world characterized the fly ash from different sources from agricultural point of view and reported that fly ash contained higher proportion of silt sized particle with high water holding capacity. The composition of fly ash is dominated by Si, Al, Ca and Fe followed by K, S and Mg. Abundance of most of the trace elements are comparable to earth's crust (Fisher *et al.*, 1976). The results of studies conducted world wide have clearly indicated that for most soils addition of fly ash input would alter the mechanical composition towards increasing silt content, decrease bulk density, increase water holding capacity and improve nutrient availability (Chang *et al.*, 1997; Campbell *et al.*, 1983 and Martins, 1971), which resulted in higher crop yields. The present investigation was aimed at characterization of fly ash from RSTPS Shakthinagar, Raichur and to study the effect of bulk and long term fly ash /pond ash application on crop yield and micronutrient content of grain.

MATERIALS AND METHODS

Fly ash samples were collected from RSTPS, Shakthinagar Raichur, Karnataka during 2004 to 2006. Both fly ash and pond ash were used in the study. Fly ash was collected directly from the hopper inside the plant and pond ash was collected form the ash pond at the lowest point. Both ashes were analyzed for various physico-chemical parameters like, particle size analysis, water holding capacity, bulk density, pH, EC, organic carbon and available N, P and K contents by following standard procedure recommended for soil (Jackson, 1973 and Black, 1965). The contents of micro nutrients such