SHORT COMMUNICATION

CHARACTERIZATION OF FLY ASH COLLECTED FROM NATIONAL THERMAL POWER PLANT

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Abstract: In this study fly ash collected from the National Thermal Power Corporation (NTPC) Sipat, Bilaspur (C.G.) was characterized for its physical and chemical properties. The fly ash is slightly alkaline in reaction and very low organic carbon content. The presence of various heavy metals elements was in the order of Cr > Pb >Co> Ni. The DTPA extractable micronutrients were in the order of fe>Mn>Zn>Cu where as total N, P, K show the trend as N>K>P. Fly ash used for enhanced crop production depending upon the nature of soil and fly ash.

Keywords: Fly ash, FYM, Macro, Micronutrients

INTRODUCTION

The amount of ash produced annually in India was around 100 million tons during 2005 and is likely to exceed 150 million tons in 2020 and there are few uses for the tonnages produced and the disposal of fly ash has become a significant problem (Ravikumar, *et.al.*, 2008). Fly ash is used in buildings, construction of roads, embankment and cement industries. Its alkaline character and a high concentration of mineral substances have resulted in attempts at using it as fertilizer or amendment to enhance the physico-chemical properties of soil. Apart from necessary nutrients, ashes contain elevated concentration of heavy metals which may disturb the biological properties. Fly ash may either have a positive and negative effect on plant growth and yielding if not used in optimum doses. The effect is determined primarily by chemical composition and the ash dose applied (Kalara *et al.*, 2003).

Fly ash being an amorphous ferro-alumino silicate could be a good amendment for problem soils. Properties of fly ash vary depending on the grade and quality of coal as well as the technology employed in the power station. This study is physical and chemical properties of FYM and fly ash collected from National Thermal Power Plant.

MATERIAL AND METHOD

Fly ash taken from National Thermal Power Corporation (NTPC) Sipat, Bilaspur (C.G.). Fly ash and FYM (Farm Yard Manure) was characterized for various parameters and data are presented in Table 1and 2.

The pH was measured with pH meter using 1:2.5 soil water suspensions (Black, 1965) and EC measurement using conductivity bridge (Black, 1965). N was determined by alkaline permanganate method as described by Subbiah and Asija (1956). P was determined by colorimetric analysis (Jackson, 1978) and K was determined by flame photometer described by Jackson (1978).Available micronutrients Fe, Mn, Cu and Zn and heavy metals (Cr, Ni, Co, Pb) were analyzed using atomic absorption spectrophotometer (Lindsay and Norvell, 1978).

RESULT AND DISCUSSION

Characteristics of fly ash

Physical characteristics

Physical properties of fly ash and FYM presented in table 1. The physical properties of fly-ash vary widely depending on the coal type, boiler type, ash content in coal, combustion method and collector setup. In general fly ash particle are spherical and size distribution with medium. Fly ash generated at NTPC, Sipat, Bilaspur (C.G.) comprise sand, silt and clay are 68%, 28% and 4% (Table 1).its particle and bulk density is density 1.93 and 0.83 (g cm^{-3}).Its low bulk density increases potential for dust formation, which creates the problem of storage and transportation of the fly ash (Sudhir and Naveen, 2006). Water holding capacity (WHC) of fly ash is 49.04 % on weight basis. Fly ash has unusually high surface urea and light texture due to presence of large, porous and carbonaceous particles. Fly ash addition changes physical properties of soil such as texture, bulk density, WHC, hydraulic conductivity and particle size distribution (Sharma.*et.al.*, 2002).

Chemical characteristics

The factors influencing the physical properties are also responsible for wide variation of chemical properties of fly-ash. Fly ash collected from NTPC are pH is alkaline 8.1, EC 0.81 (dSm^{-1}), Cation Exchange Capacity (c mol (p+) kg-1) is 9.16 (Table 2).The concentration of various element in fly ash decreased with increasing particle size and its contain considerable amount of macro and micronutrients. The pH of the fly ash varies depending on the parent coal and type of coal used for combustion affects the

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sulphur content of fly ash (Maiti,*et.al*.,1990).Fly ash contain lower amount of macro nutrients (N,P,K) and higher amount of micronutrients(Fe,Mn,Zn,Cu) (Table 2). DTPA extractable heavy metals Ni, Co, Cr and Pb present in fly ash are are 1.4, 4.4, 36.9 and 4.5 ppm. The cementing effects of fly ash could possibly impede root development by creating hard area near the soil. The soluble calcium of fly ash provides congenial atmosphere for the flocculation of highly dispersed alkali soil particle and organic matter content of this ash provides much needed protective action to stabilize physical environment improved by the calcium (Sharma.*et.al*., 2002).

Table 1. Physical characteristics of fly ash and FYM

Particulars		Fly ash	FYM
Texture	Sand%	68	
	Silt%	28	
	Clay%	4	
Bulk Density(g cm^{-3})		0.83	0.55
Particle Density(g cm^{-3})		1.93	-
Water Holding Capacity (%)		49.04	60.56

Table 2. Chemical characteristics of fly ash and FYM

Particulars	Fly ash	FYM
Soil reaction (pH)	8.1	8.2
Electrical conductivity (dSm-1)	0.18	0.20
Cation Exchange Capacity (c mol (p^+) kg^{-1})	9.16	-
Organic carbon (%)	0.26	2.22
Total N (%)	0.02	0.98
Total P (%)	0.01	0.17
Total K (%)	0.10	0.83
Total Fe (mg.kg^{-1})	3340.00	1086.00
Total Mn (mg.kg^{-1})	320.00	255.00
Total Zn (mg.kg^{-1})	33	163.7
Total Cu (mg.kg^{-1})	11.00	36.00
Total Ni (mg.kg^{-1})	1.4	-
Total Co (mg.kg^{-1})	4.4	-
Total Cr (mg.kg^{-1})	36.90	-
Total Pb (mg.kg^{-1})	4.5	-

CONCLUSION

Fly ash vary widely in its physical and chemical composition, therefore the mode of use in agriculture is different and depends on the characteristics of soil type. Fly ash contain various essential and non essential elements therefore its use for as an amendment and source of nutrients which improves physical and chemical properties of soil further improve yield of crops.

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