

Utilization of Lignite Flyash in Agriculture: A Way to Improve Crop Productivity

Kasinam Doruk

Himalayan University, Jollang, Itanagar, Arunachal Pradesh, India

*Corresponding Author: dorukkasi@gmail.com

Abstract

Flyash is an amorphous mixture of ferroaluminosilicate minerals generated from the combustion of ground or powdered coal at 400 °C and belongs to the coal combustion by-products in power plants produced from bituminous, subbituminous and lignite combustion. Chemically 90-99% of flyash is comprised of Si, Al, Fe, Ca, Mg, Na and K with Si and Al forming the major matrix. The mineralogical, Physical and chemical properties of flyash depend on the nature of parent coal. All these applications are based on the presence of basic mineral elements resembling earth's crust, which makes them excellent substituent for natural materials. It was also realized that flyash addition could also decrease the bulk density of soils, which in turn improved soil porosity and workability and enhanced water retention capacity. Additionally, acidic or alkaline flyash may be of agronomic benefit buffering the soil pH and improving the soil nutrient status, thus increasing plant growth and nutrient uptake. The electrical conductivity of soil also increases with flyash application and so does the metal content. Mixtures of swine manure with flyash proved to increase the availability of Ca and Mg balancing the ratio between monovalent and bivalent cations, which otherwise proves detrimental to the soil. This is of major importance as the presence of Ca can enhance flocculation or aggregation of soil particles, particularly clay, keeping soil friable, thus allowing both water and roots to penetrate hard and compact soil layers.

Introduction

Lignite flyash is a by-product from thermal power station. Flyash, a by-product of coal fired thermal power industries, amounts to about 35-40 % of the coal used by the thermal power plant. Lignite flyash which is a by-product of thermal power unit, called as a waste material can be beneficially utilized for increasing agriculture production. Large quantity of LFA was accumulated annually and only a small quantity of the LFA is supplied to cement factories for use in the production of cement (Maiti *et al.*, 1990). 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 in the industrial wastes like LFA. Agriculture

is the only way and means of utilizing the industrial wastes like LFA, in a controlled manner by combining with organic manures, press mud and crop residues, so that the microbial population will not be affected (Kumarimanimuthu, 2010). LFA contains heavy metals, some heavy metals are considered as essential plant nutrients, hence its rate of application could be minimized (Raghupathy, 1988).

For the purpose of agricultural use, the transport of LFA to faraway places may cost more. So, utilization near the generation source is much beneficial. Hence, the disposal of lignite flyash is one of the major solid waste management problems in the Neyveli thermal power station. Lignite flyash is one of the furnace residues produced, when pulverised coal or lignite was burnt in electric power generating plants. explored the use of Flyash in agriculture (Poonkodi, 1999).

Characteristics of LFA

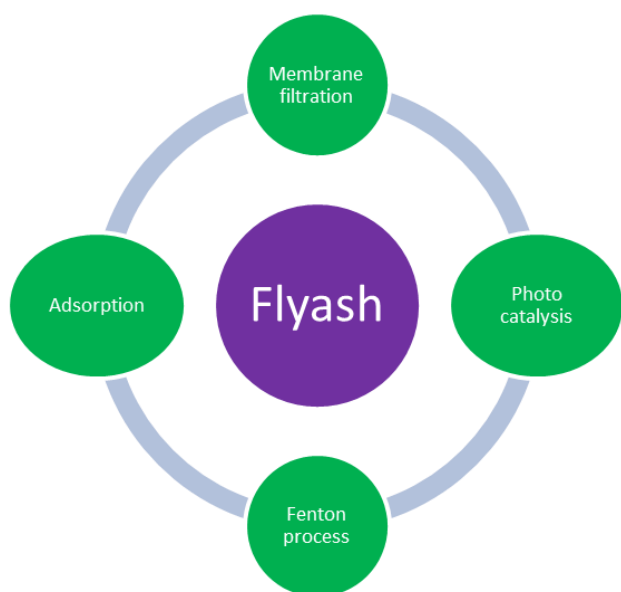
Flyash is an amorphous ferro alumina silicate product from coal fired power station. The analysis of flyash collected from different thermal power station revealed that it contains moderate amounts of P, K, Zn, Fe and B and appreciable amounts of Si, Ca Mg and S and traces of heavy metals viz., Cr, Cd and Pb (Baskar and Selvakumar, 2001) found that flyash contained all naturally existing elements.

The lignite flyash contains a high concentration of toxic heavy metals such as Cu, Zn, Cd, Pb, Ni and Cr (Ravtaray *et al.*, 2003) along with low nitrogen and phosphorus content and pH ranged from 4.5 to 12.0 depending on the S-content of parental coal.

Role of LFA in agriculture

The largescale use of lignite flyash in agriculture and wasteland development holds a potential to increase on an average 15% yield of grains, oil seeds, sugarcane, cotton and about 25-30 % of vegetables resulting another green revolution (Fail and Wochock, 1977). Flyash is the residue obtained when pulverized coal or brown coal (lignite) undergoes combustion in electric power generating plant. Use of lignite flyash in agriculture has been suggested by (Martens, 1971). Compared to traditional soil-conditioning materials as asbestos, flyash seems more advantageous as it is an environmentally safe material, contains plant nutrients and can be used in

biological cultivations. Additionally, it is a low-cost material and thanks to its granular composition, is readily applicable. Flyash is considered as organic fertilizer and soil amendment in agriculture.



Page *et al.* (1980) Showed that application of lignite flyash to variety of agricultural soil resulted in improved soil porosity, workability of the soil, root penetration and the moisture retention capacity. In contract the field studies conducted by Raman *et al.* (1996) revealed that the addition of lignite flyash did not have any significant effect on soil pH or Ec. Singh and Tripathi (1996) noticed that the application of lignite flyash improves the growth and yield characteristics with respect to plant height, branching respect to plant height, branching, leafarea, root nodulation, early flowering and maturity. Record high concentration of nutrients along with admirable physic-chemical properties with LFA grades (Raman *et al.*, 1996).

Conclusion

Flyash is regularly generated as a by-product by coal or thermal power stations. The potential of flyash as a resource material in agriculture and related areas is now a well-established fact. The application of flyash in agricultural usage were differ from the characteristics of fly and soil type. The high concentration of micro nutrient and macronutrient

presents in flyash increases the yield of many crops in agricultural field.

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