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NITROGEN AND PHOSPHORUS FIXATION IN TREATED FLYASH USING A MIXTURE OF ANIMAL MANURES

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Abstract: The use of fly ash in agriculture areas such as use for landfill, soil amendment etchave found its negative impact on environment. Similarly, the organic manures obtained from animals, they are enriched with minerals which help in various environmental and geochemical activities. As fly ash is an inorganic substance, it has been found that enhancement of certain components in fly ash can make it suitable as a substitute for soil. In the present research an attempt has been made to introduce different organic manures (animal based) to fly ash at variable ratio so as to enrich the Nitrogen, Phosphorus in the fly ash.

Keywords: Nitrogen, phosphorus, fixation, manures

I. INTRODUCTION

Nitrogen and phosphorus are the two vital parameters to determine the fertility of a soil. In case of Nitrogen, transformation takes place through various processes like ammonization which includes the conversion of proteins to amino acids. The process of ammonification where amino acids are converted into ammonia, releasing large quantity of energy. The organisms involved in this process are known as ammonifiers. This ammonical nitrogen under goes nitrification where ammonium get converted to nitrite (NO_2) which often oxidation produce nitrates along with release of energy(1-4). The nitrogen produced are the most important nutrients for a plant. The plant growth depends directly on the nitrogen in take which in turn generates the metabolic activity of the plant.

Phosphorus is an essential element for nutrition of plant. It takes part in all types of metabolism of plant. It is an essential part of enzyme and structural composition of membrane system of a cell i.e. chloroplast and the mitochondria. In contrast, flyash generated from different power plants, has become a major problem with respect to its utilization and disposal. Attempts have been made to produce building construction materials, bricks, blocks, roads, geomatrixetcfrom

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flyash(5-8). Still a major part of flyash has been left behind which is still remaining unutilized creating different environmental hazards.

Keeping in track, the use of flyash in agricultural areas, in the present research attempts have been made to utilize flyash for landfill, soil amendment etc but practically all these process have found its negative impact on environment. Taking into consideration the organic manures obtained from animals, they are enriched with different constituents which in turn helps in various environmental and geochemical activities.

As flyash is an inorganic substance lacking its composition in terms of NPK in comparison to the soil, it has been found that enhancement of certain components in flyash can make it suitable as a substitute for soil.

In the present research an attempt has been made to activate the flyash using various organic manures (animal based) so as to enrich the Nitrogen, Phosphorus in the flyash, which can be used as a substitute for soil.

II. MATERIALS AND METHOD

In order to enrich the dumped flyash with Nitrogen, Phosphorus, various types of manures were mixed with the flyash at a definite proportion to carry out the easy absorption of N and P. In this aspect, two manures i.e. cow dung and goat dung were taken into consideration. The composition of raw and treated fly ash is given in Table-1 and 2 where as that of cow dung and goat dung are represented in Table- 3.

Table-1 Chemical Composition of raw fly ash

Components	% composition
SiO_2	45.91
Al_2O_3	25.15
Fe_2O_3	5.78
CaO	6.78
MgO	2.61
K_2O	0.98
Na_2O	0.81
P_2O_5	2.09
MnO	0.43
LOI	9.46

Table-2 Chemical Composition of treated fly ash

Components	% composition
SiO_2	46.38
Al_2O_3	27.09

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Fe_2O_3	6.01
CaO	7.78
MgO	2.93
K_2O	1.07
Na_2O	0.99
P_2O_5	2.38
MnO	0.56
LOI	4.81

Table-3:- Composition of Cow & goat Manure (in kg/ton)

	N	**P_2O_5**	**K_2O**
Cow Manure (Lactating and Finishing)	7.78	3.64	1.92
Goat Manure (Sheep Included)	10.88	12.53	14.86

III. RESULT AND DISCUSSIONS

During the analysis of manures, for nitrogen fixation, ammonical nitrogen (NH_3 + NH_4 -N) is quite vital. These forms of nitrogen are soluble in water as well as soil which may get lost from soil as volatile ammonia. Also during rain the runoff carries lots of soluble ammonia once in the soil sample, if NH_4-N get nitrified to nitrate (NO_3), it becomes ready for the uptake of plants. The formation of NO_3 won't get absorbed in soil. The activation of the fly ash sample for nitrogen fixation is carried out on the basis of thermal processing.

Initially, the raw flyash sample is mixed with 5% NaCl solution to prepare an uniform mixture with a slurry mass. The sample is then subjected to drying under sunlight for 2days followed by the mixing of organic manure (Cow Dung) for another 72 hrs. These 72 hrs activation, along with the organic manure gradually enriches the nitrogen concentration of the soil by all possible reactions for nitrogen fixation. The samples were collected in every 4 hrs gap to observe the rise in N_2 concentration in the sample. The detail method is given in Table-4 along with the chemical composition of flyash. After the enrichment of nitrogen, attempt has been made to enrich flyash with phosphorus content. The phosphorus enrichment is carried out using goat dung in the ratio FA : GD is 25 : 1. The nitrogen enriched flyash sample was subjected to mixing to form a uniform active base for phosphorus fixation. As goat dung contains maximum percentage of phosphorus, present in a soluble form, so it is mixed properly to the activated flyash to make it phosphorus rich soil. After the addition of phosphorus bearing organic manure the flyash sample ores subjected to drying initially in sunlight for 6-8 hrs and then 0.05 N HCl solution is mixed to flyashis to convert the phosphorus available in the goat dung to its soluble form. The mixture was kept under drying and mixing for 24 hrs and the final FA obtained is subjected to chemical analysis. The entire data obtained is represented in Table-5.

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Table-4:- FA : CW (25:1)

Time in hrs	% Nitrogen activation
4hrs	0.37
8hrs	0.91
12hrs	1.78
16hrs	2.54
24hrs	3.16
32hrs	4.17
36hrs	5.07
60hrs	6.92
64hrs	7.12
68hrs	8.61
72hrs	8.78

Table-5:- FA : GD (25:1)

Time in hrs	% Nitrogen activation
30mins	1.47
1hrs	2.76
2hrs	4.09
4hrs	6.37
8hrs	8.61
12hrs	12.06
16hrs	15.43
20hrs	18.18
24hrs	18.44

IV. CONCLUSION

The above study revealed that by the application of some general activator, the nitrogen and phosphorus content of flyash can be enhanced. The experimental result shows that by adopting step by step process for nitrogen and phosphorus fixation, it is possible to obtain an activated flyash whose composition is almost equivalent to a fertile soil sample.

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