IMPACT OF FLY ASH /POND ASH IN VERTISOLS ON LONG TERM BASIS VIS-À-VIS ON GRAIN YIELD OF SUNFLOWER AND MAIZE AND STATUS OF HEAVY METALS AND ACTIVITY OF RADIO NUCLIDES IN SOIL

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SUMMARY

Fly ash / pond ash has potential for bulk utilization in agriculture as a source of nutrients to plants and as a soil conditioner. The study presents the results on analysis of heavy elements and activity of naturally occurring radionuclides in irrigated vertisols in sunflower-maize cropping sequence over a period of three years (2004-06). The results on final status of heavy elements indicates that the application of either FA/PA has resulted in marginal build up of total Se, AS and Pb in soil. Its content has less in soil treated with pond ash than fly ash. The difference may be attributed to higher content of elements in fly ash than pond ash it was suggested that the content of total Se, As and Pb, in soil increased with increasing level of fly ash application without any carry over of heavy elements . The per cent difference over control was 40,53 and 7 in Se, As and Pb respectively. On the contrary ,addition of organics to either FA/PA helps to decontaminate the level of heavy elements in soil .Further ,application of FA/PA at maximum dose increased the activity of natural radionuclides in soil and the effects could be reduced with combined application of fly ash and FYM. The per cent difference over control was 47,14 and 3 in ^{226}Ra,^{228}Ac and ^{40}K, respectively.

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In India too, much increasingly R & D work is being directed in recent years on the application of fly ash in agriculture sector. Fly ash, being rich in nutrients and of pozzolanic character, offered good potential for agriculture. At College of Agriculture, Raichur, Karnataka, a systematic and in-depth studies on the utilization of fly ash in agriculture sector under various soil types and in varying agro-climatic conditions have been carried out over the past one and half decade, where it has been rather well established that fly ash can be advantageously used in agriculture as soil conditioner, source of essential plant nutrients, in improving important physico-chemical properties of the soil and boosting the crop growth and yields of a variety of crops and for reclamation of waste/degraded lands etc.

In a sequel to the studies made on long term basis (2004-06) for cultivation of sunflower and maize in irrigated vertisols in rotation, keeping the following objectives in view: (i) Safe disposal and gainful bulk utilization of fly ash/ pond ash generated from RSTPS, Shaktinagar. (iii) Study of its effect on growth and yields of various crops specific to this region including the effects on heavy metal status and activity of radionuclides of soil.

MATERIALS AND METHODS

Soil :

Field experiments were carried out on irrigated vertisol belonging to the Raichur series of Typic Haplustert. Composite soil samples collected from the experimental site before the start of experiments were analyzed for various parameters by adopting standard methods (Table 1).

The soil was clay in texture, alkaline in reaction (pH 8.6), low in soluble salt content (0.1 dS/m) and high in organic carbon, available nitrogen and potassium contents. The DTPA extractable Cu, Fe, Mn and Zn content were 1.59, 2.17, 8.13 and 0.90 mg/kg of soil, respectively. The total lead, arsenic and selenium contents were 13.9, 1.2 and 0.9 mg/kg of soil. Field experiments were conducted at Agricultural College Farm, Raichur, Karnataka from 2004 to 2006. Raichur is located in the North Eastern Dry Zone (Zone-1) of Karnataka between 16^0 15' N latitude $77^0$20' E longitudes and at an altitude of 389 meters above mean sea level (MSL).

Fly ash :

Fly ash used in the experiments during 2004 and 2006 was collected from Raichur Super Thermal power Station (RSTPS), Shaktinagar, Raichur. The ash collected from hoppers is designated as fly ash (FA) while the ash collected from settling pond is called as pond ash (PA). Thus, samples collected during 2004, 2005 and 2006 were