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Consumption Coefficient of Phosphorus By Some Crops in the Soils of Jaunpur District

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Abstract: Assessment potential of heavy metals on pollution of environment has always been concern to environmentalists. Phosphorus has rightly been called "master key" to agriculture as low crop production is due to more often to lack of phosphorus than to the deficiency of any other element except nitrogen. In phosphatic fertilizers this element is present in the form of phosphate or superphosphate salt and it is available to the plant when it is combined with organic matter or with Ca or Mg. Phosphorus is also found in combination with Fe and Al and is present in certain rock minerals as apatite. Plants takeup phosphorus chiefly as HPO_4^{--} and $H_2PO_4^-$ ions and availability of these ions depend chiefly upon the acidity of the ground. They become nearly insoluble in strongly acidic or strongly alkaline soils. The breakdown of phosphate fertilizers produces phosphoric acid in soluble form that is absorbed by plants.

(**Keywords :** *Heavy metal, Soil, Phosphorus, Fertilizer, Nutrient elements*)

Introduction

The impact of heavy metals[1-4] on pollution of environment has always been concern to environmentalists. Phosphatic fertilizers are classified into water soluble, citrate soluble and in-soluble forms. The superphosphate, ammo-nium phosphate and diammonium phos-phate are chiefly water soluble fertilizers. Dicalcium phosphate and basic slag are ci-trate soluble. Rock phosphate fluor and bone meal are insoluble phosphatic fertilizer. Su-perphosphate $Ca(H_2PO_4)_2$& $CaHPO_4$ is water soluble fertilizer. It doesn't affect the soil adversely. It contains mono, di and tricalcium phosphate, gypsum, silica, iron, aluminium sulphate and water. Ammonium phosphate fertilizers contain both nitrogen and phosphorus. The microbial, omnicidal and organic pollutants in soils have attracted much attention of scientists[5-8]. It is rich in phosphoric acid content but comparatively low in nitrogen content. Ammonium superphosphate $NH_4H_2PO_4.Ca_3(PO_4)_2\ (NH_4)_2SO_4$ is the cheapest fertilizer and is a mixture of nitro-gen and phosphatic fertilizers. It contains nitrogen 3-4% and P_20_5 16-18%. Nitrophosphates are hygroscopic. It con-tains nitrogen 13-18% and P_20_5 20%. It is suitable for acidic soils. Carbohydrate me-tabolism proceeds normally only when the organic compounds are esterified with phosphoric acid. Phosphorus plays an im-portant role in energy transformation and participates in fat and protein metabolism. The most obvious effect of phosphorus is on the root system of plants. It promotes the lateral and fibrous roots, which increases the absorbing surface for nutrients. It is essential for seed formation. Phosphorus gives strength to the straw and helps to prevent lodging. Phosphorus increases disease resistance in plants, presumbly due to normal cell development and resulting vigorous growth. Leguminous crops grown under phosphate deficiency conditions may suffer from nitrogen deficiency as well since the nodule bacteria function normally only when plants are supplied with adequate phosphorus. Each organic and inorganic forms of phosphorus occur in soil and both are important to plant as sources of this element.

Experimental
Material and Method

Plants and animals obtain phosphorus from the environment. Phosphorus is a component of nucleic acid, ADP, ATP, NADP, phospholipids etc. It occurs in the soil as rock phosphate apatite, and calcium phosphate. Soils derived from the rock beds righ in phosphates are rich in phosphorus.

We get glucose from photosynthesis of green plants which are the natural first sources of glucose. In addition to glucose, animals also need fats and proteins for their growth. Green plants take phosphorus and nitrogen in the form of salts from the soil and combine with glucose to yield proteins fats and other carbohydrates. Thus green plants are also the source of fat and proteins. In these transformation bacteria and fungi also play an important role as decomposers. They act upon dead bodies of animals and plants and also upon animal wastes such as faeces. As a result of decomposition of dead matter phosphate and phosphoric acid are released. These compounds and the phosphates in the urine of animals pass down in the soil water. The plants use these products again in the formation of complex foodstuffs. Over application hastens ripening but may so reduce the length of the growing period as to reduce productivity.

3. Experimental

The estimation of phosphorus has been done by Olsen's method and Dieckmann& Bayer's[9] technique.

Table - 1
Percent Consumption of Phosphorus in Paddy Crop (0iyza Sativa) and it's Residual Values

Village	Sample number	Before sowing	After harvesting	Consumed P	% consumed
Arjunpur	30	80.25 $kgHa^{-1}$	65.64 kgHe	14.61 $kgHa^{-1}$	18.20%
Kachhaura	35	82.45 $kgHa^{-1}$	69.46 $kgHa^{-1}$	12.99 $kgHa^{-1}$	15.75%
Ratasi	25	85.75 $kgHa^{-1}$	66.79 $kglia^{-1}$	18.96 $kghla^{-1}$	22.10%
Baharipur	40	84.62 $kgHa^{-1}$	67.69 $kgHa^{-1}$	16.93 $kghla^{-1}$	20.35%
Mahada	25	81.35 $kgHa^{-1}$	67.15 $kghla^{-1}$	14.20 $kgHa^{-1}$	17.45%
	155	82.88 $kgHa^{-1}$	67.34 $kgHa^{-1}$	15.54 $kgHa^{-1}$	18.77%

0 a1 area sown with paddy = 40.50 Ha.

Table - 2
Percent Consumption of Phosphorus in Maize Crop (Zea maize) and it's Residual Values

Village	Sample number	Before sowing	After harvesting	Consumed P	% consumed
Arjunpur	30	80.25 $kgHa^{-1}$	63.99 $kgHa^{-1}$	16.26 $kgHa^{-1}$	20.25%
Kachhaura	35	82.45 $kgHa^{-1}$	64.18 $kgHa^{-1}$	18.27 $kgHa^{-1}$	22.15%
Ratasi	25	85.75 $kgHa^{-1}$	65.64 $kgHa^{-1}$	20.11 $kgHa^{-1}$	23.45%
Baharipur	40	84.62 $kgHa^{-1}$	66.55 $kgHa^{-1}$	18.07 $kgHa^{-1}$	21.35%
Mahada	25	81.35 $kgHa^{-1}$	60.93 $kghla^{-1}$	20.42 $kgHa^{-1}$	25.10%
	155	82.88 $kgHa^{-1}$	64.26 $kgHa^{-1}$	18.62 $kgHa^{-1}$	22.46%

Total area sown with maize = 27.00 Ha.

4. Calculation:

Average area of these villages = 27Ha
Hence total area covered by five (5)
villages = 5x27 = 135Ha

About 50% of the total area is covered by gardens, houses, barrel land, and other cultivated crops and 50% is cultivated by paddy and maize, hence.

135/2 = 67.5Ha

Futher about 60% area is cultivated by paddy and 40% by maize hence

67.5 x 60/100 = 6.75 x 6 = 40.50HA
67.5 x 40/100 = 6.75 x 4 = 27.00HA
Now, since 67.34 kg/ha phosphorus remains unconsumed by paddy and 64.26 kg/ha by maize, hence
67.34 x 40.50 = 2727.67 kg
27.00 x 64.26 = 1735.02 kg
Hence Grand total = 272.67 + 1735.02
= 4462.69 kg
Hence unconsumed phosphorus
per Ha =4462.69/67.5 = 66.12 kg/ha

5. Results and Discussion

Data is table 1 & 2 reveal that in Arjunpur, Kachhaura, Ratasi, Baharipur and Mahada villages the percentage of hours consumed by paddy and maize 18.20, 15.75, 22.10, 20.35, 17.45 and .25, 22.18, 23.45, 21.35, 25.10 respectively. The average consumption of these nutrients per hectare are found to be 18.17 22.46 kg separately. Thus through these crops only the average percent contribution of phosphorus to the soil becomes 79.38 kg per hectare, which is significantly large and may lead to a high degree of pollution in soil, water, grain and fodder Thus, among the formers if adequate awareness is not developed, there will be extravagance on one hand and terrible pollution hike on the other hand causing health hazards to the poor villagers. It is also remarkable that small scale farming contributes larger share of phosphorus pollution than the large scale farming. With increasing population of India the small scale farming will dominate upon the large scale farming evolving a greater prospects[10] of pollution leading the situa-tion from bad to worse.

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