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Studies on prospective adverse effects of successively increasing applications of nitrogenous fertilizers in Indian farming

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ABSTRACT

The mushrooming growth of population has put an enormous thrust on agri-agro activities in developing democratic countries like India. For the production of grain and fodder per demand of public, fertilizers and omnicides are being used in quantities in progression. These supplements to grow more food are consumed by plants only partially and the rest one causes adverse effects on living beings.

In the present work an account of unused nitrogenous fertilizers by plants in crop rotation of one year has been done and through computational approach an assessment of prospective adverse effects on human health has been forecasted.

Key words: Agri-agro, nitrogenous fertilizers, farming.

INTRODUCTION

Recent agricultural practices i.e the use of fertilizers pesticides, herbicides and biocides etc. are employed to increase the soil fertility and crop production to feed an increasing population in a developing country like India. Excessive use of fertilizers by man is one of the major source of environmental pollution.

Fertilizer enriched soil[1] cannot support microbe population. Hence, humus and essential micro and macro-nutrients become efficient in such soils. These soils become poor and can easily be eroded by wind and rain causing more damage to the ecosystem. Long term application of fertilizers on land has also created an adverse ecological effect of aquatic ecosystem because some of them are washed off land into rivers through irrigation, rain etc[1-2].

Successive use of nitrogenous fertilizers to the soil make plants less resistant to disease. The total crop yield increases but there is a decrease in the protein content. It has been found that there is a 25-30% decline in the protein content when corn, maize, gram and wheat are grown on soil fertilized with NPK fertilizers. Balance of amino acid within the protein molecule is disrupted and the quality of protein is thus lowered. Consumption of low quality protein grains lead to malnutrition in human beings. Because of fertilizers use, oversized vegetables and fruits are produced and these are more prone insects and other pests. Chemical fertilizers and made of

noly a few minerals and so they impede the uptake of other minerals and imbalance the whole pattern of plant body.

Nitrogenous fertilizers in excess leads to the accumulation of nitrate ion (NO_3^-) in soil which are transferred to man through plants. Nitrate (NO_3^-) being highly soluble go into drinking water and become toxic, when this concentration exceeds 90ppm. Causes diarrhea and cyanosis (blue-Jaundice) in children. In human body these NO_3^- and NO_3^- are converted to nitriso and nitriso amines which are suspected as agents of stomach cancer. The NO_2^- as pollutant enter into blood stream and combine with haemoglobin which causes methaemoglobinamia. Exceeding of NO_3^- concentration from 10% in blood causes "Blue Bady Syndrome" resulting into child's death[1].

Imbalanced use of nitrogenous fertilizers[3-5] make the soil deficient in micro-nutrients viz. Zn, Co, Fe, Mn, Ni etc. Some of the important factors which are responsible for affecting the soil micro-nutrients are as extensive cultivation of fertilizer responsive high yielding varieties on marginal soil. Large scale deforestation leads to the reduction of organic matter and depletion of soil micro-nutrients.

The adverse ecological effects due to excessive fertilization can be avoided by predecting the mineral nitrogen pool of the soil and nitrogen requirement of the cultivated crops[6].

MATERIAL AND METHODS

The area under study comprise Badlapur Tahsil of Jaunpur district in Uttar Pradesh. The investigated areas are Arjunpur, Kachhaura, Ratasi, Baharipur and Mahada. In the model farm, two crops namely paddy and maize were put to investigation. The nitrogen content of soil was estimated on adding urea fertilizer before sowing after harvesting the crop by applying Kjeldahl's method[7] as used earlier[8].

RESULTS

The average area of each villages under consideration is 27 hectare. Hence total area covered by all these five villages will be = 27 × 5 = 135ha. About 50% of the total area is covered by gardens, houses, barrel land and other cultivated crops and remaining 50% is cultivated by paddy and maize. Hence, 135/2 = 67.5 ha.

Among the total area about 60% area is cultivated by paddy and 40% by Maize.
Hence.

$$\frac{67.5}{100} \times 60 = 40.50\text{ha}$$

$$\frac{67.5}{100} \times 40 = 27.00\text{ha}$$

Now, since 64.46 kg/ha nitrogen remains unconsumed by paddy and 54.39 kg/ha by maize. Hence, total unconsumed nitrogen by paddy crop cultivated over 40.50ha = 64.46×40.50 = 2610.63 kg.

Similarly total unconsumed nitrogen by maize crop cultivated.

over 270.0 ha = 54.39 × 27.0 = 1468.53 kg,
Grand total = 2610.63 + 1468.53 = 4079.16 kg

Hence,
unconsumed nitrogen/ha = 4079.16/67.5 = 60.432 kg/ha

DISCUSSIONS

Under field conditions the urea in soil undergoes changes due to biological activities and is converted into ammonium carbonate and them to nitrates. Nitrate and ammonical forms are absorbed by plants and utilized. The conversion of urea into ammonical and nitrate forms take about 7-14 days. Urea application to soil creates a small loss of calcium from the soil.

Due to regular use of nitrogenous fertilizers, study reveals that in paddy on an average 45% and in maize 40% of nitrogen added to the crop remains unconsumed. Generally, without taking pains in analyzing soil the recommended of high concentration of nitrogen in the soil. Some part of it in the form of different compounds dissolve and

Table 1: Percent consumption of nitrogen in different crops and its residual values

Vilalges	Total no.of samples	Pre-sowing concentration $kgha^{-1}$	Post-sowing concentration $kgha^{-1}$	Consumed nitrogen $kgha^{-1}$	Percentage consumption
Arjunpur					
(a) Paddy	30	13.8	62.46	76.34	55
(b) Maize	30	135.2	54.08	81.12	60
Kachhaura					
(a) Paddy	35	140.5	63.23	77.27	55
(b) Maize	35	132.6	53.04	79.56	60
Ratasi					
(a) Paddy	25	142.8	64.26	78.51	55
(b) Maize	25	135.4	54.16	81.24	60
Baharipur					
(a) Paddy	40	145.5	65.50	80.00	55
(b) Maize	40	136.2	54.48	81.72	60
Mahada					
(a) Paddy	25	148.6	66.87	81.73	55
(b) Maize	25	140.5	56.20	84.30	60
Average value					
(a) Paddy		143.24	64.46	78.78	55
(b) Maize		135.98	54.39	81.59	60

passes through drains polluting the water bodies like ponds, lakes and rivers. The improportionate soil ingredients disturb it's texture, structure, physical and chemical properties. Thus, it is recommended that the soil analysis of the plots should be dully done and fertilizers added in requisite amounts. The situation can be well understood from Table 1.

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