

Investigation of Effect of Chemical Fertilizers on Soil And Water Environment of Uda-Kishanganj Village of Madhepura District [India].

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Abstract

This paper focuses on analyzing the effect of excessive use of Chemical fertilizers on pH of the soil of Uda-Kishanganj village of Madhepura. Soil pH is a key parameter for crop productivity. Soil pH affects the soil's physical, chemical and biological properties and thus plant growth. The accumulation of excess salts through the application of chemical fertilizers threatens production of crops in this region. Excessive fertilization causes heavy metal accumulation, water eutrophication and animals as per the availability of nutrients. Recommendations of cultivating the particular crop and proper fertilizer will be given. ACP and ALP have been also calculated and compared with tolerable values.

I. INTRODUCTION

The soil macronutrients, Nitrogen (N), phosphorous (P) and potassium (K) are essential elements for crop growth. The application of commercial N, P and K fertilizers has contributed a tremendous increase in yields of agriculture crops that feed the world's population. However, excessive use of these fertilizers has been cited as a source of contamination of surface and ground water. Ideally, application rates should be adjusted based on estimates of the requirements for optimum production at each location because there is high spatial variability of N, P and K within individual agricultural fields.

Excessive sue of fertilizers in agriculture, resulting in a large number of environmental problems because some fertilizers contain heavy metals (C_d & C_r) and high concentrations of radionuclides. The

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concentration of fluorine, selenium and boron in water in increased due to development of soil salinity and dignity.

METHODOLOGY

The research was carried in Uda-Kishanganj village, situated in Southern part of Msdhepurs district. ($25^{\circ}43'3''N;86^{\circ}56'36''E$) Bihar, India, which belongs to the most polluted, environmentally loaded and unhealthy area of this district.

A set of 15 soil samples (0.15-0.20m) in total from 5 locations (3 samples from each field) were collected during April 2016. Soil reaction was determined in a soil solution, 5 gm of soil mixed with 25ml of 0.01M C_aCl_2 , using a pH meter. Acid (ACP) and alkaline (ALP) phosphatase were measured using a method described by Chazijev water samples were collected at five locations of Uda-Kishnaganj village from ponds and tube wells. Collection and water treatment was performed using the methodo- logical guidelines of the Ministry of Environment of India Government.

III RESULTS AND DISCUSSION:

Values of chemical and biological properties of sampling fields are listed in Table-1. Soil pH ranged from 4.6 (Strongly acidic) to 7.2 (neutral). Accordings to the findings in literature, excessive use of inorganic fertilizers can change in the soil reaction from acid to alkaline. We reported a tendency of increasing soil pH with increasing soil pollution.

Activity of soil enzymes was changing according to the soil pollution. Measured values of acid phosphatase ($27.95-196 \mu g p/g/3h$) were low, which is typical for heavy metal polluted soils. The lowest values of ACP and ALP were measured at the most polluted sampling field (locality 5 and 4). It has been recorded that excess use of chemical fertilizers exhibit a toxic effect on enzyme activities, which is discovered as increasing soil enzyme activity with decreasing heavy metal content. So, soil enzymes are suitable as bioindicators to determine toxicological influence of various pollutants on soil quality.

TABLE-1

Biological and Chemical Soil properties of sampling fields.

LOCALITY	ACP	ALP	pH
	$\mu g p/g/3h$		
1.	84.5 ± 0.98	70.50 ± 5.68	4.60 ± 0.09
2.	180 ± 3.56	185 ± 9.80	5.10 ± 0.19
3.	149 ± 3.86	86 ± 4.7	7.20 ± 1.20
4.	48 ± 2.29	196 ± 1.67	5.20 ± 0.34
5.	247 ± 8.98	196 ± 1.67	6.08 ± 0.36

ACP-acid phosphatase : ALP- Alkaline phosphatase.

Values of heavy metals in Uda-Kishanganj village (Tbale-2) show that village is contaminated by Cu, Fe, Mn and Zn in most of the sample of soil. This is due to poor drainage condition and use of chemical fertilizers by the cultivators. This makes the soil alkaline. High values of copper and manganese, which several times exceed the permissible limit values, are the evidence of insufficient protection of environment against penetration of the toxic substances.

TABLE-2

Measured values of metals in water (in $\mu\text{g/L}$)

	Cu	Fe	Mn	Zn
Min	5	6	17.6	36
Max	22	21	32	108
Average	10	9	18	47
SD	5.6	0.9	1.9	6.5
Limit Value	20	22	30	100

SD- Standard deviation

IV CONCLUSION

Growing concern about environmental pollution by excessive use of fertilizers lead to increase in needs to monitor soil nutrients required for crop growth. The sensor network technology will help the soil requirements which will help them take better decisions and preventive measures at the right time. Firstly soil analysis should be performed carefully, after then fertilizer to be given to soil. This will lead to tremendous improvement in the crop productivity. This in turn, will save their time, labour, money and make effective use of resources.

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