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Agricultural Depletion of Soil Nutrient in Arable Land

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ABSTRACT
Land degradation is a concept in which the value of the biophysical environment is affected by one more combination of human induced processes acting upon the land. Soil is the essence of life. Agriculturally soil is a region supporting plant life and from which plants obtain their mechanical support and many of their nutrients. As Indian economy is agricultural based, so to ascertain the role of nutrient in soil fertility and plant growth, this base line survey was undertaken. In our country crop production is far below than population density, resulting in large shortage of food stuff. It is estimated that up to 40% of world's agricultural land is seriously degraded. Integrated plan nutrient management (IIPNM) adopted scientifically to ensure greater sustainability in agricultural development which combines economic and efficient traditional and frontier technologies to gain from the symbiosis and synergy of crop soil environment biointeractions.
Key words - : arable, nutrients, solvent extraction, depletion.

INTRODUCTION

Soil is a marvelous substance, a living resource of terrestrial animals, plants and microorganisms. Soils are the fundamental resources supporting agriculture and forestry as well as contributing to the aesthetics of a green planet. Agricultural depletion of soil nutrients through poor farming practice the major cause of land degradation which is global problem related to arable land nutrients. There 17 elements identified as essential for plants growth. Out of these 14 elements are classified into two groups based on their on their amounts needed by the plants.

Soil chemists in the field of agronomy started serious investigation since the beginning of the last century to ascertain the role trace level elements in soil fertility and plant growth. The presence of trace levels of N, Zn, B, Ca, P, C, Cl, Fe, Co, K, Cu, Mg, Cr, Mn, S, Se and V in soil have direct relevance to soil fertility and plant growth. It was reported that the importance of the controlled amount of manganese in the soil and the quality of crop production. Few scientists confirmed the indispensible role of Zn and B in the growth of higher green plants.

In the present article the comparative study of diploid nutrient in arable lands from different areas of Bhopal within one year of period shall be reported. The main objective of the current investigation is twofold firstly, to establish simple but reliable method for trace level analysis, secondly, to ascertain the chemical composition of soil as well as depletion of nutrients. These essential elements are classified into two groups based on their amounts needed by the plant. Micronutrients used by the plants in very small amounts and macronutrients in a very large amounts. Lack of anyone of them in soil can limit plant growth, even when all other nutrients are present in adequate amounts.

EXPERIMENTAL:-

For the collection of soil, variation in slope, color, size, crop growth and management has been taken into account. The soil samples must perfectly represent the area. Five separate sets of composite samples from distant arable areas of different sizes, texture and color were collected twice after an interval of a year.

LABORATORY WORK DONE :-

- Pre treatment, processing and storage of samples.
- Mechanical analysis of soil (texture, size, etc.).
- Water holding capacity of soil (moisture content).
- Determination of E.C. (electrical conductivity).
- Determination of pH.
- Determination of organic carbon.
- Determination of calcium carbonate.
- Determination of nutrient availability.
- Comparison of soil fertility.

Common A/R grade reagents and doubly distilled water were used for solution preparation. Finely ground soil samples were sieved through a 0.2 mm mechanical sieve and dried in an oven at 150^{o} C for 24 hours. 1 gm of dried soil was transferred into a crucible and 10 cc of HNO_3 was carefully added to it. The mixture was slowly

digested on a hot plate inside a fume hood up to a few hours near to dryness. The residue was cooled and then digested for 10-15 min. with a mixture of conc. acids HNO_3, HCl and HF in 1:2:1 ratio. The mixture was heated slowly until dense white fumes stated coming off and volume was reduced to approximately to 5 cc. The crucible was removed from the hot plate and cooled to room temperature before making up the volume of the solution to 50 cc with distilled water. Without soil a solution blank was also prepared in the same way.

Elements in the digested soil sample were separated by solvent extraction involving the selective use of pH, masking agent and the solvent. Atomic absorption spectrometer was used for the determination of few nutrients.

Table-1

SUMMARY OF EXTRACTION CONDITON

M ion	pH	Ligand	Masking agent	Solvent
Cr	6.0	Acac	Boiling solution	MIKB
Co	5.5	2-Nitroso-1naphthol	Na-citrate	CCl_4
Cu	2.3	Dithizone	KI	CCl_4
Fe	4.5	n butylacetone	Conc. Acid	8MHCl
Mg	10.5	Oxine	Butyl amine	$CHCl_3$
Mn	6.4	T.T.A.	1 M $NaBrO_3$	Xylene
Mo	8.8	Oxine	Ascorbic acid	MIBK
Ni	6.5	DMG	Na tartarate/ $Na_2S_8O_3$	$CHCl_3$
V	3.5	ADPC	KH Phthalate	MIBK
Zn	5.5	dithizone	DADC	CCl_4

TABLE-2

ANALYSIS OF THE CHOSEN ELEMENTS IN ALL THE SOIL SAMPLES

Soil no.	Concentration of elements (mg Kg^{-1})													
	B	Cr	Co	Cu	Fe	Mg	Mn	Mo	N	Ni	P	Se	V	Zn
Ar-1	9.5	63	20	30	22500	0.52	395	1.8	130	89	120	0.70	99.8	11
Ar-2	89	150	29	40	45000	0.79	890	0.9	120	135	110	1.35	180	19
Ar-3	9.3	450	41	51	53000	0.94	920	1.5	170	87	195	1.41	232	21
Ar-4	7.5	180	11	10	49000	0.63	990	1.9	280	100	256	0.43	156	10
Ar-5	8.6	120	14.8	42	33400	134	980	1.8	75	38	200	0.52	44	17.2
Ad-1	1.8	32.6	3.5	21	22900	150	40	0.0	0.59	28	40	2.31	22	28
Ad-2	4.3	56	4.8	32	5600	179	270	1.8	1.25	26	68	2.22	28	7.2
Ad-3	2.9	45	10.7	25	10478	182	400	0.7	1.73	63	74	1.20	49	8.5
Ad-4	4.8	72	15	48	24300	19.5	998	0.23	1.82	72	78	2.52	115	9.6
Ad-5	1.5	8.5	21.2	30	29800	9.8	110	0.0	1.93	28	18	1.25	50	3.4

Ar- initial, Ad- final

RESULTS AND DISCUSSION : -

Comparison between the concentration of various nutrients present in soil sample after interval is given in the table. The presence of nearly twenty elements at micro level in soil is necessary as essential nutrient for the growth of plants.

Physicochemical condition of the soil is one of the important parameter that determines if it is able to supply the necessary nutrients to plant. From the result it is evident that with the exception of Mg, Mo and Se, concentration of the remaining nutrients included in this study are much higher in the initial stage. However with the exception of very low levels of N and P in the later, nutrient contents in both the sets are comparable but shows gradual depletion. It is therefore logical to conclude that the lack of plant growth necessarily arises from the deficiency of nutrients in the soil, rather the way these are distributed.

Failure of nutrient uptake by plants may result from a no. of important factors such as :-

1. pH of the soil, if too high, the essential nutrients may remain in the solid form which prevent the available nutrients from being passed on to the plants.
2. Loss of nutrient through soil erosion due to high rainfall.
3. Extremely high drop of temperature during winter and as high as 48^o C in summer

Combined effect of these factors may result in the land being arid (unproductive).

CONCLUSION :-

In our country crop production is far below than population density, resulting in shortage of food stuff. It is suggested that the failure of land to supply the available nutrients for sustainable growth of plants results from infiltration of soil nutrients in soil as soluble matter which are not readily available to the plant. Reports also claim that significant loss of N in the form of NH_3 and P in the form of PO_4 occur unless the soil organic carbon management is done on a routine basis. The analytical data obtained in this investigation should provide an incentive for a depth investigation with the special emphasis on how best the soil pH and Mg content be adjusted for sustainable and increased productivity. Integrated plant nutrient management adopted scientifically to ensure greater sustainability in agricultural development.

Major components of integrated nutrient supply and management system which need attention are: -

- Popularizing biofertilizsers to augment N and P supply.
- Promoting balanced use of chemical fertilizers (NPK) based on soil testing and correction of micronutrients deficiencies in soil. Integration of green manures.
- Promoting agronomic practices that maximize nutrient use.
- Using sewage and sludge and effluents for agriculture.

REFRENCES :-

- Baethgan, W.E. and Alley, M.M. 2009, A manual colorometric method of measuring Ammonium N in soil and plant Kjedahl digest. Comm. Soil Sci. Plant Anal. 20 : 961-969.
- M. Sillaanpaa : Micronutrient assessment on country level. An international study F.A.O. Soils Bulletin 63 FA, Rome 208 (1999).
- Simulating interactive effect of irrigation and Nitrogen on Crop Yield. Sangeeta Lekha and A.K. Singh- Current Science Dec. 2011- 1451-1461.
- Jatola, S.K. Sukhvinder Singh, Chahal G.B. S. Roy, S.S. and Panigraphy. S., soil texture, climate and management effects on plant growth: Field and simulation study. Agric Water Manage 2010, 97, 83-90.
- Gardea- Torresday, J.L. Perlata, J.R. Monnles, M. Rosa, G. de La and Corral-Diaz, Bioaccumlation of Cherominum, Copper and Cadium by Convtvulus arvensis. Impact on plant growth and uptake of nutritional elements- Bioresour Techol, 2004, 92, 229-235.
- Lavelle P. Ecological challenges of soil science. Soil science 165, 73-86 (2000).