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Assessment of physicochemical properties in pgricultural land of Gir Sanctuary, Gujarat, India

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Abstract- This research is focused on quantitative physicochemical assessment of Gir sanctuary, Gujarat. Soil samples were collected from two agricultural land belonging to two nesses of Gir sanctuary. Results indicate major variations in Phosphorous and Potassium. Phosphorous content in Lakkadvera ness agricultural land is 11.38 kg/ha and Rebdipat ness agricultural land is 53.50 kg/ha. Potassium content in Lakkadvera ness agricultural land is 385.3 kg/ha and Rebdipat ness agricultural land is 1032.2 kg/ha. Other nutrients, N, S, OC, Cu, Fe, Mn show minor differences. This study provides a quantitative profile of soil nutrients and it will be helpful for future ecology research in Gir sanctuary.

Key words: Gir Sanctuary, Physicochemical Properties, Agricultural Land, Phosphorous, Potassium

INTRODUCTION

The physicochemical properties are some of the most basic indicators for checking the nutrients and components of any soil.¹ They are essential for managing the efficiency of farm.² However anthropogenic and environmental factors affect them.³ Some of the very common physicochemical properties of soil are pH, EC, OC, etc.⁴ EC of soil is an indicator of solute concentration.⁵ pH of soil is the measurement of H⁺ ions.⁶ OC is the carbon compound present in the organic matter of soil.⁷ Gir sanctuary is a protected area, belonging to the three different districts of Gujarat: Junagadh, Gir-Somnath, Amreli. It occupies an area of 1412 km².⁸ It consists mostly of dry deciduous forest.⁹ It is having varied climatic conditions and it is home of 'Asiatic Lion' and the nomads 'Maldhari'.^{10,11,12} These nomads live in 'Ness' and in two

of these locations – 'Lakkadvera' (Gir West) and 'Rebdipat' (Gir East), shows the practice of agriculture. They mainly produce *Arachis hypogaea* during the monsoon season only. As far as the previous studies in the area is concerned, they show phytosociological and ethnobotanical evaluation.^{9,13} There is no work regarding the assessment of soil, focusing on the agricultural practice. This research was initiated with the aim of evaluating the physicochemical properties of agricultural land in the protected area of Gir sanctuary.

MATERIALS & METHODS

For conducting this research in the protected area of Gujarat, an official research permission from 'Gujarat Forest Department' was taken. Soil samples were collected from the agricultural land of two ness of Gir sanctuary - 'Lakkadvera' (Gir West) and 'Rebdipat' (Gir East), by digging 15 cm depth, taking 1 kg amount from both the

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agricultural lands, following the methods of Stock and Goodrich-Blair, 2012.¹⁴ Various soil physiochemical properties were quantitatively evaluated by different methods (Table 1).

Table 1. Methods of soil physicochemical analysis

Parameter	Method	Reference
EC (Electron Conductivity)	EC meter	19
pH (Concentration of H ⁺ ion)	pH meter	20
N (Nitrogen)	Alkaline KMnO ₄	21
P (Phosphorous)	Olsen	22
K (Potassium)	Flame Photometer	23
S (Sulfur)	Turbidity	24
OC (Organic Carbon)	Walkley Black	25
Cu (Copper)	MP AES (Microwave Plasma Atomic Emission Spectroscopy)	26
Fe (Iron)	MP AES (Microwave Plasma Atomic Emission Spectroscopy)	26
Mn (Manganese)	MP AES (Microwave Plasma Atomic Emission Spectroscopy)	26
Zn (Zinc)	MP AES (Microwave Plasma Atomic Emission Spectroscopy)	26

RESULTS & DISCUSSION

Results indicate major variations in two of the nutrients – Phosphorous and Potassium. P content in Lakkadvera ness agricultural land is 11.38 kg/ha and Rebdipat ness agricultural land is 53.50 kg/ha. Phosphorous deficiency causes plants to become small and stunted.¹⁵ K content in Lakkadvera ness agricultural land is 385.3 kg/ha and Rebdipat ness agricultural land is 1032.2 kg/ha. Potassium deficiency can cause the plant to become lower yielding as well as prone to attack by pests and nematodes.¹⁶ Both of these nutrients dictate higher growth and yield in

the agriculture belonging to Rebdipat ness – Gir East. It has been noted that Rebdipat ness is more economically efficient because it gives better yield of *Arachis hypogaea* during monsoon season. They are also in agreement of Laokhowa Wildlife Sanctuary, where phosphorous content in most of the sites was found low.¹⁷ And Calimere wildlife and bird sanctuary, where potassium content in most of the sites was found to be highest.¹⁸ EC, pH, and Zn shows very much similar results in both agricultural lands. N, S, OC, Cu, Fe, Mn shows minor differences. (Table 2) shows results of various physicochemical properties.

Table 2. Results of physicochemical assessment of the agricultural land of Gir sanctuary

Parameter	Agricultural land soil sample taken from Lakkadvera ness – Gir West		Agricultural land soil sample taken from Rebdipat ness – Gir East	
	Value	Unit	Value	Unit
EC	0.32	dS/m	0.37	dS/m
pH	7.23	-	7.27	-
N	338.7	kg/ha	321.2	kg/ha
P	11.38	kg/ha	53.50	kg/ha
K	385.3	kg/ha	1032.2	kg/ha
S	1.20	ppm	3.46	ppm
OC	1.44	%	2.34	%
Cu	2.70	ppm	3.60	ppm
Fe	22.8	ppm	36.00	ppm
Mn	86.8	ppm	92.8	ppm
Zn	1.6	ppm	1.4	ppm

CONCLUSION

The present study deals with the analysis of physicochemical properties with respect to the protected area of Gir sanctuary. To the best of our knowledge this is

the first research of soil in the agricultural land of nomadic ness. This research provides a quantitative profile of various nutrients present in the agricultural land of Gir sanctuary.

Nutrient profile will be useful to the nomads of Gir, because it will help them understand their agriculture better and also to increase their crop yield. This study shows the differences in the Eastern and Western region of this protected area. It will be helpful for future study in this protected area, especially in the ecological aspect.

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