Journal of Phytology 2009, 1(5): 328–332
© Journal of Phytology, 2009
ISSN: 2075-6240
Available Online: www.journal-phytology.com

REGULAR ARTICLE

SOIL QUALITY OF DEGRADED LAND OF BUNDELKHAND REGION WITH SPECIAL REFERENCE TO JHANSI DISTRICT OF UTTAR PRADESH

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SUMMARY

Present study has been taken to assess the quality of soil in and around Jhansi district of Bundelkhand region of Uttar Pradesh which is also known as ecologically fragile ecosystem. For the present investigation fifteen villages have been selected randomly. Majority of the soil in this area has been found in less nutritive value and not suitable for proper agricultural activities. Results show that pH of the soils varies 6.8 to 8.4; OC 0.07 to 0.78%; and N 0.01 to 0.13% respectively. Available P, K as well as micronutrients viz. Cu, Fe, Mn, Zn are also found less than standard as prescribed by Indian Council of Agricultural Research, New Delhi and not in suitable for agricultural crops.

Keywords: Agricultural crops, Degraded soils, Macronutrients, Micronutrients.

Kiran et al. Soil Quality of Degraded Land of Bundelkhand Region With Special Reference to Jhansi District of Uttar Pradesh. J Phytol 1 (2009) 328-332
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1. Introduction

With the increasing pressure on land for food and wood, the natural balance of soil and environment is affected by deforestation activities which causes serious problem of land degradation (1). Soil is considered as a basic natural resource for plants growth. However, due to increasing biotic interferences and irrational use, this resource base is getting depleted at an alarming rate (2). It has been estimated that about 6600 mt of top soil and 5.4 – 8.4 mt of plant nutrients are washed away to the ocean annually (3). In ecologically fragile zones like Bundelkhand, which has traditionally been a pastoral belt, the problem of land degradation is much severe. Out of 7.04 m ha area of the region, about 5.02 m ha (nearly 70%) suffers from varying degrees of land degradation (4).

The range lands in the region have been exposed to very high grazing pressure against their very low carrying capacity (5, 6). This has not only resulted in to almost barren and poor quality pastures but has also given birth to various socio-economic evils in the region. On the basis of above observation present investigation has been taken to assess the quality of soil in this region so that proper management and sustainable utilization of land could be done.

2. Material and Methods

Bundelkhand agro climate zone is located in south-west corner of Utter Pradesh, India extended between 240 11′ and 260 27′ N latitude and 780 17′ and 810 34′ E longitudes with an average altitude ranging 250-300 m above MSL. The general slope of the zone is forwards north to east in southern part, apart from the regular hill range and small rock out crops on hillocks. In northern part some small rock out crops here and there and high ravines long the river banks are characteristics of this zone. The zone comprises of seven districts of Jhansi and Chitrakoot Dham divisions are Jhansi, Lalitpur, Jaloun, Hamirpur, Mahoba, Banda and Chitrakoot.

The seasons are divided in summer, rainy and winter, temperature vary from 300-340 C, 200-240C and 140-210C respectively. Maximum temperature (470-500C) during May-June and minimum temperature (70C) during December / January have been reported. For the present study 15 villages have been selected randomly from Jhansi district namely: Chirgoun, Badagoun, Babina, Bamour, Bangra, Goursaray, Moth, Mauranipur, Ambabai, Raksa, Simardha, Pal colony, Kochhabhwar, Dailygoun and Bhojla respectively. For the analysis, soils samples have been collected randomly from the depth of 0-15cm from degraded areas of agricultural field from each village. The soil was the oven dried at 1050 C temperatures. The soil analysis work was conducted at the Soil Testing Center, Jhansi as well as departmental laboratory. Following parameters viz. pH, Organic carbon, available P, K, N and micro nutrients (Zn, Fe, Mn, Cu, S) have been considered for analysis. Soil pH was measured in 1:2 soil-water suspensions; Organic carbon was determined by Walkley and Black's wet digestion method (7). Available nitrogen (Alkaline Potassium Permanganate Hydrolysable) was determined by the method of Subbian and Asija (8). Available potassium was extracted by neutral normal ammonium acetate solution and was determined flame photometrically (FP 114, Chemito flame photometer). Olsen's method (9) was followed to determine available phosphorus in the soil. Available micro nutrients (Zn, Fe, Mn, Cu and S) have been analyzed by DTPA method with the help of Atomic absorption spectrophotometer (203 D, Chemito).

3. Results and Discussion

Two main soil groups are Red soil and Black soil. Red soils belong to Ustochrepts, Haplustalfs and Rhodustalfs great groups and alfisols and entisols with excessive permeability, very low moisture retention capacity and low inherent fertility. These soils may be further classified in to two group i. e. Rakar and Parwa in local languages. Black soil is fine texture, highly water retentive and productive and developed under restricted drainage and situated in comparatively low lying areas. These are covered under Chromusterts, Pellusterts and Ustochrepts and order Vertisol and Inceptisol. The black soil group further classified in to Kabar and Mar.

Soil samples from each village were collected randomly and analyzed in the laboratory in respect of physical and chemical characteristics. Data are presented in Table – 1. Trend of pH shows, that the soil of this region is alkaline in nature. 6.8 minimum pH was observed in Chirgoun village and Pal coloney maximum pH was found 8.4 is Simardha, Organic carbon % is very low 0.07% in Bangra village was observed maximum 0.78% in Simardha village. Available Phosphorus also very low was measured in Bamour (4.5 kg/ha) and was highest 45.00 kg/ha in Raksa and Dailey goun. Available Potassium was observed minimum 40.32 kg/ha in Raksa village and was highest 448.0 kg/ha in Bamour.

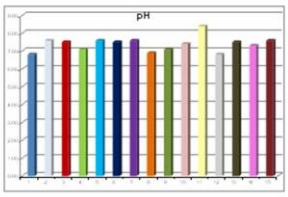


Figure – 2 : pH range of study areas

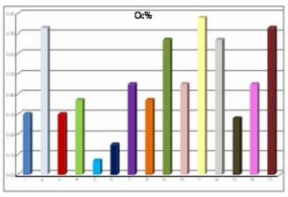


Figure – 3 : Content of OC in study areas

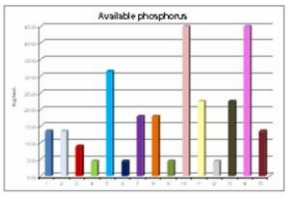


Figure – 4 : Content of available P in study areas

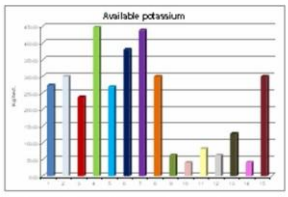


Figure – 5 : Content of available K in study areas

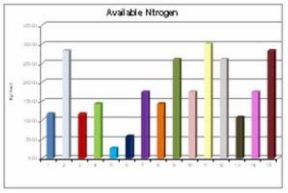


Figure – 6 : Content of available N in study areas

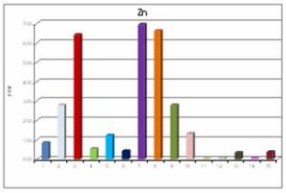


Figure – 7 : Content of Zn in study areas

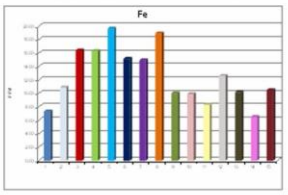


Figure – 8 : Content of Fe in study areas

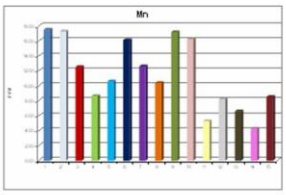


Figure – 9 : Content of Mn in study areas

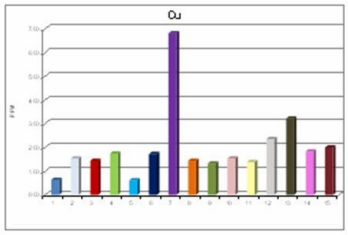


Figure – 10: Content of Cu in study areas

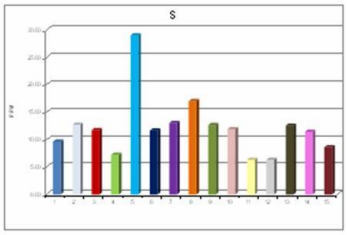


Figure – 11: Content of S in study areas

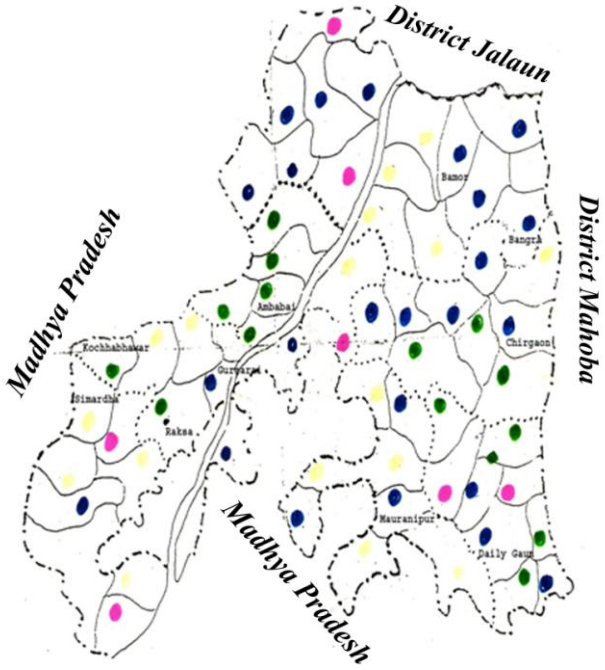
Note : Villages are - 1- Chirgoun, 2- Badagoun, 3 – Babina, 4 – Bamour, 5 – Bangra, 6 – Goursaray, 7 – Moth, 8 – Mauranipur, 9 – Ambabai, 10 – Raksa, 11 – Simardha, 12 - Pal colony, 13 – Kochhabhawar, 14 - Daileygaun and 15 – Bhojla respectively

Table 1. Nutrient contents in soils of Jhansi district, Bundelkhand region, India.Values are mean ± SE (n=3)

S. No.	Name of the villages	pH	OC %	Available phosphorus Kg/ha	Available potassium Kg/ha	Available Nitrogen Kg/ha	Zn ppm	Fe ppm	Mn ppm	Cu ppm	S ppm
01	Chirgoun	6.8±.081	0.20±0.140	12.9±0.290	274.3±0.108	116.8±0.098	.84±0.034	7.30±0.076	17.5±0.082	.64±0.039	9.6±0.14
02	Badagoun	7.27±.109	0.50±0.19	12.9±0.096	300.60±0.49	283.1±.064	2.56±0.257	10.6±0.121	17.4±0.086	1.51±0.28	12.1±0.23
03	Babina	7.53±.064	0.35±0.14	9.84±0.537	236.9±0.13	116.6±0.097	6.37±0.096	16.4±0.086	12.5±0.091	1.51±0.25	11.4±0.27
04	Bamour	7.13±.040	0.39±0.120	4.87±0.359	432.6±0.99	144.2±0.051	0.55±0.032	16.4±0.088	8.65±0.085	1.66±0.19	7.61±0.19
05	Bangra	7.30±.069	0.06±0.061	31.61±0.182	266.4±0.24	28.33±0.167	1.30±0.110	19.5±0.078	10.6±0.251	.64±0.04	29.4±0.14
06	Goursaray	7.30±.052	0.19±0.104	5.31±0.312	379.3±0.05	58.40±0.133	0.44±0.044	15.4±0.082	16.0±0.017	1.76±0.11	11.5±0.11
07	Moth	7.30±.094	0.43±0.072	17.76±0.062	403.4±1.9	174.7±0.075	6.65±0.153	14.8±0.144	12.5±0.096	6.60±0.07	13.1±0.14
08	Mauranipur	6.40±0.128	0.33±0.078	17.88±0.14	300.3±0.02	143.8±0.073	6.59±0.060	18.8±0.085	10.6±0.191	1.49±0.26	17.4±0.18
09	Ambabai	6.50±0.083	0.65±0.049	4.70±0.268	63.72±0.08	261.1±0.041	2.77±0.098	10.2±0.149	17.1±0.147	1.43±0.23	12.5±0.09
10	Raksa	7.37±0.015	0.48±0.059	45.44±0.08	41.60±0.28	174.9±0.037	1.34±0.091	10.1±0.149	16.4±0.080	1.60±0.18	11.6±0.21
11	Simardha	8.40±0.048	0.75±0.021	22.82±0.10	81.24±0.11	301.5±0.063	0.03±0.062	8.63±0.196	5.44±0.141	1.45±0.22	6.43±0.13
12	Pal colony	6.8±0.0815	0.63±0.035	5.17±0.311	63.67±0.07	261.0±0.043	0.13±0.102	12.5±0.104	8.37±0.114	2.40±0.21	6.48±0.11
13	Kochhabhawar	7.23±0.066	0.31±0.046	22.39±0.05	127.8±0.07	107.9±0.066	0.35±0.031	10.3±0.084	6.84±0.247	3.31±0.13	12.3±0.13
14	Dailey gaun	7.07±0.066	0.41±0.035	44.55±0.05	42.05±0.05	175.4±0.052	0.09±0.017	6.80±0.202	4.74±0.325	1.85±0.09	11.4±0.17
15	Bhojla	7.40±0.052	0.69±0.034	13.81±0.05	302.9±0.25	283.1±0.053	0.40±0.056	10.5±0.104	8.80±0.164	2.21±0.19	8.78±0.20

Available Nitrogen was low 27.00 kg/ha in Bagra and maximum available Nitrogen 301.5 kg/ha was measured in Simardha. Available macro nutrients less amount of Zn (0.02 ppm) was low in Simardha and high Zn 6.963 ppmiter Moth, was low Fe was measured 19.63 ppm Bangra village and minimum was measured in 6.532 ppm in Daileygoun., Mn measured high in village 17.52 ppm Chirgoun and minimum 4.27 ppm Daileygoun. Cu measured high (6.832 ppm) in Moth and minimum (0.625 ppm) in Bangra and S was measured high (29.00 ppm) in Bangra and minimum (6.25 ppm) was measured in Pal colony and Kochhabhawer.

Figure 1. Map of Jhansi district showing the soil quality



Courtsey : Soil testing Centre, Jhansi (U.P.)

Nitrogen	Phosphurus	Potassium	Sign
Very Low	Very Low	High	
Very Low	Low	High	
Low	Very Low	High	
Low	Low	High	
Medium	Low	High	

The soil in the area comes under Alfisol group. Predomident soil types are Rakar and Parwa which are the shallow in depth and poor in moisture retension capacity, organic matter and nutrients (10). Most of the soils collected from selected villages showed the low sulphur, organic carbon, nitrogen and phosphorus contents (Table no. - 1) as per standard of ICAR, New Delhi. Some villages shows the low pH and S content are the below of standard given by Indian Council of Agriculture Research. Among the micronutrients, although Zn is less then as per standard limit but good quantity of micronutrients viz Cu, Fe and Mn were found in all selected areas (Figure-2-11). Our study concluded that the soil may not be suitable for agriculture purpose without adding some organic manure and nutrients.

Acknowledgements

The authors thankfully acknowledged the help of Soil Testing Centre, Govt. of UP, Jhansi for their help to laboratory analysis for this study. Ms. Kiran is thankful to UGC, New Delhi for awarding RGNF and financial assistance.

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