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Estimation of Available Nitrogen, Organic Carbon, pH and Correlation Study of the Sampled soil of *Inceptisol* under Janjgir District of Chhattisgarh

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Abstract

A detailed study was undertaken of soil fertility on the basis of correlation between available Nitrogen, Organic Carbon and pH of Inceptisol of Akaltara block, under Janjgir district of Chhattisgarh. After systematic survey, surface (0-15cm) soil samples were collected from 79 villages in Akaltara block covering 1000 sites (10000 ha) using the GPS such that one sample represents each grid of 10 ha. based soil area represented. The samples of the study area were determined for pH and observed in the range of 4.8- 6.70 with the mean value of 5.83 and fall under strongly acidic to neutral in reaction. The organic carbon in all samples exhibited range from 0.23 to 0.66% with an average of 0.48% the Inceptisol of Akaltara block were low to medium in organic carbon content. The results showed that the available nitrogen content ranged from 100.35 to 338.69 kg ha^{-1} with an average of 171.12 kg ha^{-1}.Majority of sampled area fall under low in available nitrogen content. Only 2.30% soil samples were categorized under medium in available nitrogen content. A significant positive correlation was found between pH, organic carbon and available nitrogen.

***Key words**: Correlation study, inceptisol, nitrogen, organic carbon, soil pH*

Introduction

Optimum productivity of any cropping systems depends on adequate supply of plant nutrients. Soil test provides the most accurate information on the availability of various plant nutrients[1]. Soil testing not only group the soil into classes relative to the levels of nutrients for suggesting fertilizer practices but also help in predicting the probability of getting profitable responses, evaluating soil productivity and determining specific soil conditions like alkalinity, salinity and acidity which limits the crop yields. There is need of location specific research attention on delineation of pH, OC and N status, its correlation and their deficiency and sufficiency affecting the crop growth.

Materials and Methods

Total 79 villages of Akaltara block under Janjgir District of Chhattisgarh were included under the study.

The village maps prepared by land revenue records, was obtained from the concerned department. Once these maps were obtained in digital format, suitable soil sampling spots were precisely identified by overlaying systematic grids. The approach roads were overlaid on the map and the exact position of sampling spots (latitude, longitude) were obtained. Once the spots were fixed, they were navigated and the correct spot with the help of global positioning system (GPS) was finalized. Land System maps published by Chhattisgarh InfoTech and Biotech Promotion Society (CHIPS) and Indian Space Research Organization (ISRO) in 2004-05 at the scale of 1:4000 have been used as the cadastral maps for conducting the field survey works. Prior to the actual fieldwork, tentative sampling sites were fixed on the cadastral maps. These sampling sites were set and distributed in such a way that all the agriculturally important land system units are proportionately represented.

Sampling points were pre-determined across a field for a soil type under study at fixed interval systematically across a grid from each of 10 ha area. Considering this unit of 10 ha. as the ultimate unit, such 1000 sites were selected from 79 villages of Akaltara tehsil of Janjgir district. Within each of such sample unit, five samples were randomly taken for further analysis, to represent the 10 hectares area selected under the *Inceptisol* soil. Soil samples collected from the study area were dried and crushed with the help of wooden rod and passed through 2 mm sieve and then used for the determination of soil pH, organic matter, macronutrients content etc. by adopting standard laboratory methods.

Results and Discussion

Soil reaction (pH)

pH estimated from soil samples of Akaltara block (Table 1) showed that nearly 42.90 % samples fall under moderately acidic (5.5-6.0), 29.80 % under slightly acidic (6.0-6.5), 26.30 % under strongly acidic (<5.5) and only 1.00 % were categorized under neutral soil reaction (Table 2). The relative low pH of the soils is due to low base saturation and light textured soil.

Table 1 Range and Mean values of different nutrients in study area

Soil characteristics	Range	Mean	S.D
O.C. (%)	0.23-0.66	0.48	±0.06
pH (1:2.5, Soil water)	4.8-6.70	5.83	±0.38
Available N (kg ha-1)	100.35-338.69	171.12	±38.61

Table 2 Category of soils samples under different pH rating of study area

Soil Reaction	Limit	No. of samples analyzed	% of samples
(strongly)	<5.5	263	26.30%
(moderately)	5.5-6	429	42.90%
(slightly)	6-6.5	298	29.80%
(neutral)	6.5-7.5	10	1.00%
Total		1000	100%

Organic carbon (OC)

Distribution of soil samples with respect to organic carbon content also indicates (Table 3) that about 60.60% samples have low (<0.50 %) and 39.4% medium (0.50-0.75%) organic carbon. Use of almost nil to very low amount of organic wastes like farm yard manure and chemical fertilizers in imbalanced manner are the main reason for poor organic carbon and low productivity of the region. More over high temperature during summer (March to June) prevailing in the area may also be responsible for the rapid oxidation of organic matter, thus resulting in low organic carbon content of these soils. Since organic matter content is an indicator of available nitrogen status of soils, thus the soils of the area are also dominantly low in respect of their available nitrogen.

Table 3 Distribution and categorization of organic carbon of study area

Soil Reaction	Limit	No. of samples analyzed	% of samples
Low	(<0.50)	606	60.60%
Medium	(0.50-0.75)	394	39.40%
High	(>0.75)	0	0%
Total		1000	100%

Available Nitrogen

Considering the soil test rating for available N (<280 kg ha^{-1} as low, 280-560 kg ha^{-1} as medium and >560 kg ha^{-1} as high), majority of the sampled area (97.70 %) fall under low (<280 kg ha^{-1}) in available nitrogen content. Only 2.30% soil samples were categorized under medium (280-560 kg ha^{-1}) in available nitrogen content (Table 4). In this way, almost all the soil samples tested were found to be deficient in N. It is fact that the available N analyzed by alkaline $KMnO_4$ method do notexhibit the exact availability of N in dry soil[4]. It is quite obvious that being a mobile nature and low uptake recovery due to its losses through various mechanism like NH_3 volatilization, nitrification, succeeding, denitrification, chemical and microbial fixation, leaching and runoff[2].

Table 4 Distribution of available nitrogen status in the soils of study area

Soil Reaction	Limit	No. of samples analyzed	% of samples
Low	(<280)	977	97.70%
Medium	(280-560)	23	2.30%
High	(>560)	0	0%
Total		1000	100%

Correlation studies

A significant positive correlation (r = 0.106**) was found between pH and available nitrogen (Table 5). This result shows that available N increased with increase in pH from acidic to near neutral range. Due to favorable microbial activity, the availability of nitrogen becomes maximum at neutral soil reaction. A significant positive correlation (r = 0.114**) was found between organic carbon and available nitrogen (Table 5). There is a definite relation of organic carbon with available nitrogen because organic matter can release the mineralizable nitrogen in the soil. Hence, organic carbon status of the soil can predict the available nitrogen which shows positive relationship[3].

Table 5 Correlation of available nitrogen in the soils of study area

	pH	OC
N	0.106**	0.114**

*Significant at 5% level (0.062)

**Significant at 1% level (0.081)

Conclusion

Thus it can be concluded that the soil of Akaltara block were strongly acidic to neutral in reaction. Soil was low to medium in organic carbon, low in available N content. Hence, soil test is very important aspect with respect to testing of organic carbon and nitrogen for better fertility management. The soils require attention regarding nutrient management practices, using of organic matter content and regular monitoring of soil health for better soil fertility management and crop production.

References

1. Dahnke, W. C. and Olsen, R. A., (1990). Soil Test correlation, calibration and recommendation. In: Soil testing and Plant Analysis, 3rd ed. *Soil Science Society of America* PP : 45-75.
2. De Datta, S. K. and Buresh, R. J., (1989). Integrated N management in irrigated rice. *Advances in Agronomy* **10** :43-169.
3. Kumar, R., Sarkar, A. S., Singh, K. P., Agarwal, B. K. and Karmakar, S., (2009). Appraisal of available Nutrients status in Santhal Paraganas Region of Jharkhand. *Journal of Indian Society of Soil Science*. **57**(3) : 366-369.
4. Subbiah, V. and Asija, G. L., (1956). A rapid procedure for estimation of available nitrogen in soil. *Current Science* **25** : 259-260.