Annals of Plant and Soil Research 27(2): 292-294 (2025)
https://doi.org/10.47815/apsr.2025.10468
Short Communication

Analysis of physico-chemical parameters of soil pollution in Kanker, Chhattisgarh

PIYUSH THAKUR[1], PARUL IZHAR[2] AND PRIYANKA CHANDEL[3*]

[1]Department of Chemistry, Faculty of Science and Technology, ICFAI University, Raipur-490042, CG, India

Received: February, 2025; Revised accepted: May, 2025

The soil forms the intermediate zone between the atmosphere and the rock cover of the earth, the lithosphere (Agarwala, A. and Liu,Y. 2015). It also forms the interface between water bodies (hydrosphere) and the lithosphere and thus forming a part of biosphere (Amini, M. et.al 2005). The soil may be defined as the uppermost weathered layer of the earth's crust in which are mixed organisms and products of their death and decay (Jenny, H. 1941) and Lal, R., & Lavelle, P., & Spain, A. V. 2001). It may also be defined as the part of the earth's crust in which plants are anchored (Lehmann, J., & Kleber, M. 2015). The soil is a complex organization being made up of some six constituents' namely inorganic matter, organic matter, soil organisms, soil moisture, soil solution and soil air Bardgett, R. D., & van der Putten, W. H. 2014). Roughly, the soil contains 50-60% mineral matter, 25-35% water, 15-25% air and little percentage of organic matter Lal, R. 2004). Soil pollution is caused by the addition of minerals to soils by man, from the use of agriculture chemicals such as herbicides, fungicides and insecticides, from the dust fall and precipitation and use of fertilizers and contaminated water Zhang, W., Jiang, F., & Ou, J. 2011). It is also caused by the industrial waste, agricultural waste, urban waste, biological pathogens, and radioactive waste Doucet, J., & Zeng, W. 2019). The industrial pollution increases the toxicity levels of the soil. The soluble salt given out as pollutants damages the cultivated farms (Sharma *et al.* 2024). The soil pollution due to sewage is also very high. Several diseases are inflicted in human beings due to pathogenic forms present in the soil (Ghosh, S., & Singh, K. P. 2006), Awomi, V et al 2024). It is the need of time that we have to study the physico-chemical parameters of soil to know its quality (Hossain, M. K., & Hossain, M. I. (2020). Fifteen representative samples were collected from various parts of the city and its physico-chemical analysis have been performed to know its different parameters like Colour, alkalinity content, chloride, sulphate, pH, conductivity, sodium and potassium.

The Kanker district is situated between the longitudes of 20.6 and 20.24 and the latitudes of 80.48 and 81.48 in Chhattisgarh, India. The district has 5285.01 square kilometres in total area. The geographical region of Kanker is diverse and consists of both flat terrain and rolling hills. Over 80% of Kanker is flat, with the majority of the terrain being between 300 and 600 metres above sea level. Both the Mahanadi Plane and the Kotri Plane may be split into these. The research site was chosen to be Kanker. Four samples of agricultural and forestry land were each subjected to a soil analysis. Kanker Community Forest was the chosen woodland, and it is the district of Kanker has a large amount of dry deciduous woodland. For the investigation of the soil in forests, sites with a predominance of mixed forests were chosen, whereas for agricultural land (site I), two sites from Khet (site II) and Bari lands (site III) were chosen. The samples were collected by excavating a 30-cm-deep V-shaped hole. After carefully blending the soil from each location, analyses were carried out. The study was conducted January 2021 to November 2021. Soil samples were collected from various locations in Kanker, Chhattisgarh, for the analysis of physico-chemical parameters. The samples were air-dried, sieved through a 2 mm sieve, and stored in polyethylene bags. Soil pH was measured using a digital pH meter in a 1:2.5 soil-water suspension. Total nitrogen content was determined by the Kjeldahl method. Available phosphorus was assessed using the Olsen method, with results expressed in kg/ha. Organic matter content was evaluated using the Walkley-Black method, while available potassium was measured using a flame photometer after extraction with neutral ammonium acetate.

[*]Corresponding author Email: piyush.thakur25@gmail.com; priyankachandel18@gmail.com,[2]Department of Economics, Kalinga University, Raipur-492101, CG, [3]Molecular Virology Laboratory, District Hospital Balodabazar-Bhatapara–493332, CG,India*

Descriptive statistics was employed to calculate the average and standard error of the data. One-way ANOVA followed by Duncan's multiple range test was applied to compare the average value of pH, Nitrogen, available phosphorus, available potassium and organic matter contains from the classified groups (i.e. I, II and III). Data analyses were carried out using the SPSS (version 20.0). The pH ranges from 6.92 to 6.01, with forest sites having the highest values and khet having the lowest (Table 1). The result of ANOVA showed significant difference among all three sites. Site 1 had significantly higher value of pH i.e. 6.92 as compared with site 2 (6.01) and site 3 (6.39). All pH readings fell within the range of mildly to moderately acidic. Although the pH levels on agricultural land are often less acidic than those in forests, they nevertheless fall beyond the range that is perfect for cultivating crops. This might occur as a result of the acidic composition of the middle mountain soils. Moreover, urea, the most used fertilizer, increases the soil's acidity. The availability of nutrients to the plants decreases with increasing soil acidity.

Table 1: Shows the values of the physicochemical parameters

S. No.	Parameters	Forest (Site 1)	(Agricultural Land)	
			Khet (Site 2)	Bari (Site 3)
1	Soil pH	6.92	6.01	6.39
2	Total nitrogen (In Percentage)	1.28	0.89	1.48
3	Available phosphorus (Kg/ha)	12.0	24.0	28.0
4	Organic Matter Content (In Percentage)	5.8	3.1	3.4
5	Available Potassium (Kg/ha)	165.66	113.03	239.11

According to the data, bari land has the highest levels of total nitrogen, followed by forests and khet land. The percentages of total nitrogen at the Bari, khet, and Forest sites are, respectively, 1.48%, 0.89%, and 1.28% (Table 1). High levels of soil nitrogen were observed in bari areas, medium levels in forest sites, and low levels in khet lands. The usage of urea in vegetable cultivation may be the cause of the high nitrogen content in bari. For the Bari, khet, and forest locations, the available phosphorus is 28 kg/ha, 24 kg/ha, and 12 kg/ha, respectively (Table 1). The value of phosphorus varied from medium in bari and khet to low in forest, according to the interpretation. The result of ANOVA showed significant difference among all three sites. Site 3 had significantly higher value of i.e. 28 as compared with site 2 (24) and site 1 (12). The availability of phosphorus to crops decreases when pH levels rise in the central mountain area due to poor availability. The results are consistent with the pH readings.

According to the the present work, the organic matter concentration was highest in the forest site (5.8%) and lowest in the khet (3.1%) (Table 1). As long as litter residues continue to collect on the forest floor, the high values observed for organic matter content may be justified. Due to the region's consistent cropping patterns, agricultural land had significantly lower organic matter content.Potassium concentration was found to be much higher in bari land (239.11 kg/ha) than it was in khet (113.03 kg/ha) (Table 1). The result of ANOVA showed significant difference among all three sites. Site 3 had significantly higher value of i.e. 239.11 as compared with site 2 (113.03) and site 1 (165.66). All readings were reported to be in the mid-range, and it was observed that bari had a high potassium concentration.

As a consequence of the data above, it was observed that the soil in kanker has a high potassium availability and medium quantities of nitrogen and organic matter. Low concentrations of phosphorus were observed, which is consistent with the low phosphorus content and acidic character of the middle mountain region of Kanker. The soil has a pH range of slightly acidic to moderately acidic.

REFERENCES

Agarwala, A. and Liu, Y. (2015): Remediation technologies for soil contaminatedsediments. *Marine Pollution Bulletin*; 101(2):483-490.

Amini, M., Afyuni, M., Fathianpour, N., Khademi, H. and Flühler, H.(2005): Continuous soil pollution mapping using fuzzy logical and spatialinter polation. *Geoderma*; 124(3-4):223-233.

Jenny, H. (1941). Factors of Soil Formation: A System of Quantitative Pedology. *Soil Science*, 52(5), 415-429.

Lavelle, P., & Spain, A.V. (2001) Soil Ecology. Springer Science & Business Media, 249-260.

Lehmann, J., & Kleber, M. (2015) The contentious nature of soil organic matter. Nature, 528(7580), 60-68.

Bardgett, R.D., & Van Der Putten, W.H. (2014). Belowground biodiversity and ecosystem functioning. *Nature*, 515(7528), 505-511.

Lal, R. (2004). Soil structure and management: A review. *Geoderma*, 124(1-2), 3-22.

Zhang, W., Jiang, F., & Ou, J. (2011) Global pesticide consumption and pollution: with China as a focus. Proceedings of the *International Academy of Ecology and Environmental Sciences*, 1(2), 125-144.

Doucet, J., & Zeng, W. (2019) Soil contamination with industrial, agricultural, and urban wastes: Risks and management strategies. *Environmental Science & Pollution Research*, 26(21), 21720-21735.

Ghosh, S., & Singh, K.P. (2006) Impact of sewage sludge application on soil health and crop productivity. *Journal of Environmental Quality*, 35(5), 1425-1436.

Hossain, M.K., & Hossain, M. I. (2020) Physico-chemical properties of soils and their impact on soil quality: A review. *Environmental Monitoring and Assessment*, 192(3), 157.

Sharma, S., Joshi, S.P., and Pandey, M., (2024) Physico-chemical characterization of some agricultural soils in Moradabad district, Uttar Pradesh, India. *Annals of Plant and Soil Research* 26(4), 595-604.

Awomi, V., Singh, A.P., Tzudir, l., Nongmaithem, D., Yadav, R, Solo, V., Choudhary, C. S., and Kumawat, L. (2024) Response of sesame (Sesamum Indicum l.) to non-chemical weed management. *Annals of Plant and Soil Research* 26(4): 683-686 https://doi.org/10.47815/apsr.2024.10417