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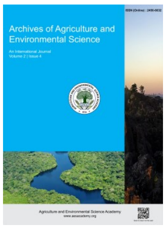

ORIGINAL RESEARCH ARTICLE

Assessment of soil quality at selected sites around Karwi town, Chitrakoot (Uttar Pradesh), India

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ABSTRACT

Every living organism on this planet prioritises food. Sustainable crop production is the need of the present hour to fulfil the basic needs of the large population of the country. The production of any crop, along with many other factors, largely depends on the soil quality of the area. Therefore, the aim of the present study is to ascertain the quality of the soil in the study area. To fulfil the aim of the present study, four sites {Karwi Mafi (SS-1), Karwi (SS-2), Amanpur (SS-3), and Narainpur (SS-4)} were selected around Karwi town, Chitrakoot (Uttar Pradesh), India. The soil samples were collected from the selected sites following the Grab sampling method for 12 months (January 2021 to December 2021). A total of 80 soil samples were collected and analysed for various physical parameters, primary and secondary nutrients, micronutrients, and heavy metals. The results obtained showed that soil moisture ranged from 44.56% to 48.12%. Among all the four sites, the soil quality of SS-03 (pH=6.79±0.03) was observed to be slightly acidic in nature. Phosphorous ranged from 48.10 to 56.53 mg/kg. Similarly, all other studied primary and secondary nutrients were observed in sufficient quantity at all the study sites. The concentration of all the studied micronutrients (Cd, Cu, Mn, Zn, and Fe) ranged from 0.95-1.31 mg/kg, 4.39-5.23 mg/kg, 2.47-3.62 mg/kg, 14.29-21.42 mg/kg, and 4.83-6.01 mg/kg, respectively. Chromium ranged from 0.96 to 1.58 mg/kg. On the basis of the present study, it can be concluded that the quality of soil in the study area is in good condition. The findings of the present study are important as they reveal the soil quality of pure residential and agricultural areas without any anthropogenic or natural dumping of solid or liquid waste.

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INTRODUCTION

Farming is the key source of income in the countryside zones of India. According to the economic survey report of the financial year 2020–21, agriculture contributes the most (almost 20%) of gross domestic product (GDP). To feed the huge population of approximately 1.27 billion, the country requires good agricultural production (Bhutiani and Ahamad, 2019; Paul *et al.*, 2020). The production of any crop, along with many other factors, largely depends on the soil quality of the area. Various types of food and money crops are cultivated in the major geographical parts of India by almost half of its population. Carbon cycling, nutrient, energy, and the climate influenced the agricultural production to a great extent (Lehmann and Kleber, 2015). Soil fertility is maintained by various factors such as organic carbon content, moisture, nitrogen, phosphorous, and potassium content, and other biotic and abiotic factors (Ghosh *et al.*, 2012; Karthikeyan *et al.*, 2019).

Due to the exponential growth of urbanisation and industrialisation, a huge quantity of solid and liquid waste is generated in the country (Raja *et al.*, 2015; Bhardwaj *et al.*, 2020). Only a small percentage of the waste generated in developing countries, such as India, is treated; thus, the remaining waste is directly discharged on the soil, degrading soil quality (Bhutiani and Ahamad, 2018; Zhang and Shen, 2019; Bougnom *et al.*, 2020). To enhance crop production, farmers use various sorts of fertilizers, pesticides, herbicides, insecticides, fungicides, and weedicides, which ultimately degrade the soil quality. The disposal of fly ash on the barren land by the companies to reduce their waste material and by the farmers to enhance crop production is also a cause of degraded soil quality. Dumping of untreated and partially treated solid and liquid waste from domestic and industrial sectors on the ground, use of chemical fertiliser in agriculture and irrigation with wastewater are the major causes of heavy metal pollution of the soil (Bharti and Kamboj, 2018). Heavy metals exert toxic effects both on plants and animals (Kumar and Chopra, 2012). Because heavy metals have the property of bio-magnification, they accumulate, augment, and cause problems in both animals and plants above a certain threshold (Kumar and Chopra, 2012; Sarwar *et al.*, 2019). Soil pollution alters the level of pH and other exchangeable bases, which makes the essential nutrients inaccessible to crops resulting in low agricultural productivity (Gupta *et al.*, 2015; Bhardwaj *et al.*, 2020). According to the FAO (2011), only 8.13% of the world's agricultural land is permanently used for crop production (Abhilash *et al.*, 2016).

Figure 1. *Showing the map of the study area (Source: www.dreamstime.com).*

Keeping in mind the above discussion, the present investigation was carried out to know the status of the soil quality (physicochemical and heavy metals) at the selected sites around Karwi town, in the Chitrakoot region of the Indian state of Uttar Pradesh. This is the first study conducted to analyse the soil quality of the selected study area. The findings of the present study are important as the data provide the soil quality picture under the influence of agricultural practices without any industrial dumping activities.

MATERIALS AND METHODS

Study area

The present study was performed in the part of Chitrakoot that lies in Uttar Pradesh between 80.888842 and 80.935620E longitude and 25.200975 to 25.234520N latitude (Table 1 and Figure 1) in the northern part of Vindhyachal Mountain at the border of Uttar Pradesh and Madhya Pradesh. Kankirili, Kabar, Balui, Rakad, and Padua are the five main types of soil found in the district.

Sample preparation and analysis

The soil samples were collected following the Grab method of sampling once every three months, starting from January 2021 to December 2021, from the selected sites, and then the samples were air-dried. From each site, five samples were collected and then mixed thoroughly, and a representative sample of that particular site was prepared. In this way, 20 samples were collected in each sampling. Therefore, the results presented in this study are the outcome of a total of 80 soil samples. The soil samples were prepared for the analysis following the methodology of NEN (1989). Then the sample was crushed using a mortar and pestle and sieved over a 2 mm sieve. The sieved sample is the fine earth fraction, which is normally used for analysis. Soil samples were analysed for various parameters such as soil moisture (SM), bulk density (BD), particle density (PD), pore space or porosity (PS), water retaining capacity (WRC), electrical conductivity (EC), total organic carbon (TOC), organic matter (OM), pH, nitrate nitrogen (NO_3-N), phosphorous (P), sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), sulphate (SO_4^{2-}), cadmium (Cd), copper (Cu), manganese (Mn), chromium (Cr), zinc (Zn), and iron (Fe) following standard methods of Trivedy and Goel (1984) and Singh *et al.* (1999).

For the analysis of heavy metals and micro-nutrients, the soil samples were first digested with nitric acid (HNO_3) and hydrochloric acid (HCl). After digestion, the selected heavy metal samples were analysed using atomic absorption spectroscopy (AAS-Model no-AA 303, Thermofisher) following the standard methods as described in APHA (2012). Wet oxidation was carried out to release the elements from the soil. Wet oxidation employs oxidising acids like HNO_3-HCl. Use of HCl avoids the volatilization loss of potassium (K) and provides a clear solution. The di-acid oxidation method was used due to its ease of application and being less time-consuming. The list of parameters analysed and the methods used for analysis are given in Table 2.

Table 1. Showing the sampling sites and their co-ordinates.

S.N.	Name and code of the site	Co-ordinates	Description of the site
1	Karwi Mafi (SS-1)	N-25.212390 E-80.935620	Residential and Agriculture area
2	Karwi (SS-2)	N-25.200975 E-80.902404	Residential and Agriculture area
3	Amanpur (SS-3)	N-25.214720 E-80.897254	Residential and Agriculture area
4	Narainpur (SS-4)	N-25.234520 E-80.888842	Residential and Agriculture area

Table 2. Properties of Soil analyzed and standard method used during the study period.

S.N.	Parameters	Method used
1	Soil Moisture (%)	Oven dried method
2	Bulk density (gm/cm3)	Core method
3	Particle Density (gm/cm3)	Graduated Cylinder Method
4	Pore Space or Porosity (%)	
5	Water Retaining Capacity (%)	Gravity method
6	Electrical Conductivity (Ds/cm3)	Using Conductivity meter
7	Total Organic Carbon (%)	Volumetric and colorimetric methods
8	Organic Matter (%)	Volumetric and colorimetric methods
9	pH	Using pH meter
Primary Nutrient		
10	NO_3^-N (Mg/Kg)	Titration method
11	P (Mg/Kg)	Colorimetric methods
12	Na (Mg/Kg)	Flame photometer
13	K (Mg/Kg)	Flame photometer
Secondary Nutrient		
14	Ca (Mg/Kg)	EDTA titration method
15	Mg (Mg/Kg)	EDTA titration method
16	Sulphur	Turbidity metric Method
Micro Nutrients and Heavy metals		
17	Cd (Mg/Kg)	Atomic Absorption Spectrometry (AAS) method
18	Cu (Mg/Kg)	Atomic Absorption Spectrometry (AAS) method
19	Mn (Mg/Kg)	Atomic Absorption Spectrometry (AAS) method
20	Cr (Mg/Kg)	Atomic Absorption Spectrometry (AAS) method
21	Zn (Mg/Kg)	Atomic Absorption Spectrometry (AAS) method
22	Fe (Mg/Kg)	Atomic Absorption Spectrometry (AAS) method

RESULTS AND DISCUSSION

Variation in physicochemical parameters

Average results of the studied physicochemical parameters of all the four sites are presented in Table 3. Water plays a crucial role in the development of crops and, therefore, the determination of soil moisture (SM) is of utmost importance. The availability and transformations of nutrients chiefly depend on SM and soil biological behaviour. During the study period, the minimum average value of SM was found at SS-04 (44.56%±0.20), the maximum was found at SS-01 (48.12%±0.39) and the total average value was found at 46.20%±1.71. In the whole study area, moderate amounts of moisture were found. The moisture quantity also depends on the nature of the soil. The bulk density (BD) of soil is defined as the mass (oven-dry weight) to bulk volume ratio expressed in grammes per cubic cm (g/cm3) or tonnes per cubic metre (t/m3). The BD may be dependent on soil conditions at sampling time. Changes in soil swelling due to changes in SM content can amend the BD. Due to an increase in SM, the volume of soil may increase irrespective of soil mass (remains fixed). BD of a soil sample specifies soil structure and void space and is also affected by texture and structure.

Fine textured mineral soils, sandy soils, and organic soils typically have BD values of between 1.0 and 1.5 g/cm^3, 1.3 to 1.7 g/cm^3, and 0.4 g/cm^3, respectively. On the agricultural land, BD and total pore space are readily changed by tillage operations. During the study period, the minimum average value of BD was found at SS-01 (1.38 gm/cm^3±0.09) while maximum was found at SS-04 (1.80 gm/cm^3±0.03) and the total average value was found 1.64 gm/cm^3±0.18. As per the classification, based on BD, the soil of the study area comes under the sandy category. Particle density (PD) is defined as the ratio of the oven dried mass to volume expressed in gm/cm^3 the soil particles (only solid, no pore space). The magnitude of PD depends on the type of minerals and organic matter in the soil (Madhu *et al.*, 2017). During the study period, the minimum average value of particle density was found at SS-02 (4.40 gm/cm^3±0.13) while maximum was found at SS-03 (5.03 gm/cm^3±0.24) and the total average value was found 4.65 gm/cm^3±0.27. The value of BD for mineral soil is often one-half of PD (Arshad *et al.*, 1997). In the present study, the ration of BD to PD is less than half, indicating the fewer amounts of minerals in the soil, which is also confirmed by the values of BD (sandy soil). Pore space (PS) is the space between neighbouring sand, silt, clay, and clay particles and aggregates. Organic matter reduces the pore space by improving the soil structure. PS is the ratio of space

Table 3. Showing the comparison of physicochemical and heavy metals at all the study sites (n=4).

Parameters /Site	Site-1	Site-2	Site-3	Site-4	Mean± SD	SE	Median	Sample Variance
SM (%)	48.12±0.39	44.96±0.81	47.16±1.05	44.56±0.20	46.20±1.71	0.86	46.06	2.94
BD (gm/cm^3)	1.38±0.09	1.74±0.03	1.66±0.07	1.80±0.03	1.64±0.18	0.09	1.70	0.03
PD (gm/cm^3)	4.52±0.47	4.40±0.13	5.03±0.24	4.65±0.08	4.65±0.27	0.14	4.58	0.08
PS (%)	69.15±4.23	60.35±1.14	67.03±2.31	61.35±0.76	64.47±4.28	2.14	64.19	18.36
WRC (%)	67.23±1.12	65.49±0.44	62.89±0.30	67.50±0.31	65.78±2.12	1.06	66.36	4.51
EC (Ds/cm^3)	0.97±0.09	0.90±0.05	1.01±0.08	1.06±0.13	0.99±0.07	0.03	0.99	0.00
TOC (%)	0.72±0.06	0.70±0.06	0.71±0.01	0.76±0.03	0.72±0.03	0.01	0.71	0.00
OM (%)	1.23±0.11	1.21±0.11	1.22±0.02	1.31±0.05	1.24±0.05	0.02	1.23	0.00
pH	7.24±0.44	7.16±0.03	6.79±0.03	7.07±0.05	7.06±0.20	0.10	7.11	0.04
Primary Nutrient								
NO_3-N (mg/Kg)	9.18±0.40	8.02±0.13	10.07±0.11	9.56±0.42	9.21±0.87	0.43	9.37	0.76
P (mg/Kg)	56.53±1.02	50.84±0.48	51.88±1.10	48.10±0.54	51.84±3.51	1.76	51.36	12.34
Na (mg/Kg)	22.70±1.24	20.70±0.29	18.56±0.52	19.65±0.92	20.40±1.77	0.88	20.17	3.12
K (mg/Kg)	51.63±1.07	52.26±0.35	50.50±0.50	47.09±0.58	50.37±2.31	1.15	51.06	5.31
Secondary Nutrient								
Ca (mg/Kg)	72.33±0.29	76.90±1.75	67.70±0.41	65.70±0.57	70.66±5.00	2.50	70.01	25.03
Mg (mg/Kg)	67.79±1.35	67.13±0.78	61.94±0.87	63.78±0.33	65.16±2.77	1.39	65.45	7.70
Sulphate	63.95±1.43	59.65±1.16	60.41±0.39	60.34±0.46	61.08±1.94	0.97	60.37	3.76
Micro Nutrients and Heavy metals								
Cd (mg/Kg)	1.31±0.03	1.00±0.05	0.95±0.08	1.03±0.08	1.07±0.16	0.08	1.01	0.03
Cu (mg/Kg)	5.23±0.35	4.78±0.33	4.39±0.20	5.09±0.10	4.87±0.37	0.19	4.93	0.14
Mn (mg/Kg)	3.26±0.37	3.14±0.04	2.47±0.31	3.62±0.12	3.12±0.48	0.24	3.20	0.23
Cr (mg/Kg)	1.58±0.05	1.27±0.06	1.09±0.09	0.96±0.06	1.22±0.27	0.13	1.18	0.07
Zn (mg/Kg)	18.56±0.91	14.29±0.37	21.42±1.10	17.02±0.78	17.82±2.98	1.49	17.79	8.87
Fe (mg/Kg)	6.01±0.17	5.11±0.09	4.90±0.10	4.83±0.07	5.21±0.55	0.27	5.00	0.30

volume between particles to total soil volume. PS is governed by texture and structure. PS is helpful for gas exchange (O_2 and CO_2) and percolation of water. During the study period, the minimum average value of PS was found at SS-02 (60.35% ±1.14) while maximum was found at SS-01 (69.15%±4.23) and the total average value was found 64.47%±4.28. Our results for BD, PD, and PS are in agreement with Verma *et al.* (2019), who observed the BD in the range of 1.05 to 1.17 in the Prayagraj region.

The water retaining capacity (WRC) of the soil is defined as the quantity of water that the soil can retain for a fixed period of time for the consumption of plants. Sandy soil retains water for a short period of time as compared to clay soil (Gabler *et al.*, 2009). During the study period, the minimum average value of WRC was found at SS-03 (62.89%±0.30) while maximum was found at SS-04 (67.50%±0.31) and the total average value was found 65.78%±2.12.WRC is dependent on soil structure, and soil structure, in turn, directly regulates WRC (Singh *et al.*, 2018). For sustainable crop production, management of WRC at its maximum is an important aspect of agronomy. WRC can be maintained by adding organic manure to the soil. Various ions present in the soil impart electrical conductivity (EC) to the soil. During the study period, the minimum average value of EC was found at SS-02 (0.90 Ds/cm^3±0.05) while maximum was found at SS-04 (1.06 Ds/cm^3±0.13) and the total average value was found 0.99 Ds/cm^3±0.07. Singh *et al.* (2018) found less EC in the Prayagraj region of Uttar Pradesh may be due to fewer ions in the soil as compared to the present study area. Although higher values of EC are harmful for soil fertility as they increase the salinity of the soil, moderate values of EC are helpful as the plant uses the nutrients in ionic form. The values observed in the present study show the proper ionic balance in the soil. Organic carbon (OC) is present in the soil as nutrients for the plants and is also helpful in maintaining the soil integrity (Mandal *et al.*, 2020). Soils with OC<0.20% indicate very low fertility; OC=0.21%-0.40% indicates low fertility; OC=0.41%-0.80% indicates medium fertility; and OC> 0.80% is considered as high fertility (Jaiswal, 2006). During the study period, the minimum average value of total organic carbon (TOC) was found at SS-02 (0.70%±0.06) while maximum was found at SS-04 (0.76%±0.03) and the total average value was found 0.72% ±0.03. A similar trend in organic carbon was observed by Sekhar *et al.* (2017) and Mandal *et al.* (2020). The soil of the study area can be considered as highly fertile as per Jaiswal (2006) classification, which is also affirmed by other parameters.

Organic matter (OM) is the amount of carbon-based compounds present in the soil. In other words, OM is the material added to the soil from faeces and leftovers of organisms and plants. During the study period, the minimum average value of organic matter (OM) was found at SS-02 (1.21%±0.11) while maximum was found at SS-04 (1.31%±0.05) and the total average value was found 1.24%±0.05. Due to the application of a large amount of manure and due to irrigation with domestic wastewater, OM was found in a higher quantity as compared to the studies performed in Prayagraj (Singh *et al.*, 2018). pH is an important parameter as it maintains the ionic balance in the soil (Tukura *et al.*, 2009; Snober *et al.*, 2011). Ionic balance affects the accessibility of nutrients to the plants. During the study period, the minimum average value of pH was found at SS-03 (6.79±0.03) while maximum was found at SS-01 (7.24±0.44) and the total average value was found 7.06±0.20. Pandeeswari *et al.* (2012) reported that the pH ranges of soil were 5-8.

Variation in primary (Macro) nutrients

Average results of the studied primary (Macro) nutrients parameters of all the four sites are presented in Table 3. Nitrogen is the first primary (macro) and essential nutrient in the soil. Due to its quick response, the use of nitrogen-based fertilisers in agriculture is greater in comparison to other fertilizers. The nitrogen-based fertilisers provide a dark green colour to the leaves of the plants, which enhances the rate of photosynthesis in plants, which speeds up the growth of crops and vegetation (Dwivedi, 2016). Biological material governs the concentration of available nitrogen in soils. Deficiency in rainfall and vegetation results in faster degradation of biological material, leading to nitrogen deficiency (Kumar and Agrawal, 2019). During the study period, the minimum average value of nitrate nitrogen (NO_3-N) was found at SS-02 (8.02 mg/Kg±0.13) while maximum was found at SS-03 (10.07 mg/Kg±0.11) and the total average value was found 9.21 mg/Kg±0.87. Phosphorous is a second macro nutrient found in the soil. Phosphorus plays an important role in plant growth, respiration, photosynthesis, energy storage and transfer, and cell division (Dwivedi, 2016). Aquatic plants use the inorganic phosphorous released by bottom sediments. During the study period, the minimum average value of phosphorous was found at SS-04 (48.10 mg/Kg±0.54) while maximum was found at SS-01 (56.53 mg/Kg±1.02) and the total average value was found 51.84 mg/Kg±3.51. Along with N and P, potassium (K) is also a vital nutrient (third macro nutrient) for the growth and development of plants (Das *et al.*, 2018). Potassium helps in the process of protein synthesis to maintain the water balance in the plant body (Dwivedi, 2016). Soil contains very large amounts of K but only a very small fraction is available for plants (water-soluble and exchangeable-K). During the study period, the minimum average value of potassium (K) was found at SS-04 (47.09 mg/Kg±0.58) while maximum was found at SS-02 (52.26 mg/Kg±0.35) and the total average value was found 50.37 mg/Kg±2.31. In the present study values of K were greater than the values observed by Verma *et al.* (2018) in the Prayagraj region, which shows the less contamination in the study area. During the study period, minimum average value of sodium (Na) was found at SS-03 (18.56 mg/Kg±0.52) while maximum was found at SS-01 (22.70 mg/Kg±1.24) and the total average value was found 20.40 mg/Kg±1.77. All the primary nutrients were found in sufficient quantity at all the four sites, indicating the good health of the soil in the study area.

Variation in secondary nutrients

Average results of the studied secondary nutrients of all the four sites are presented in table 3. Calcium is required for regular cell division and also regulates plant hormonal activity. Calcium also enhances the quantity and quality of fruits produced by the plants (Ingavale *et al.*, 2012). During the study period, the minimum average value of extractable calcium (Ca) was found at SS-04 (65.70 mg/Kg±0.57) while maximum was found at SS-02 (76.90 mg/Kg±1.75) and the total average value was found 70.66 mg/Kg±5.00. Magnesium is present in the centre of the chlorophyll molecule in the plant tissues. Plants may be deficient in magnesium, which may cause reduced plant growth due to reduced chlorophyll content in plants. During the study period, the minimum average value of extractable magnesium (Mg) was found at SS-03 (61.94 mg/Kg±0.87) while maximum was found at SS-01 (67.79 mg/Kg±1.35) and the total average value was found 65.16 mg/Kg±2.77. Both organic and inorganic forms of sulphur (S) are present in soils. S in organic form is important part of proteins and amino acids. It also helps in the development of vitamins, enzymes, oil content, and seed formation in the plants. During the study period, the minimum average value of sulphate (SO_4^{2-}) was found at SS-02 (59.65 mg/Kg±1.16) while maximum was found at SS-01 (63.95 mg/Kg±1.43) and the total average value was found 61.08 mg/Kg±1.94.

Variation in micronutrients and heavy metals

Average results of studied micronutrients and heavy metals for all the four sites are presented in Table 3. During the study period, the minimum average value of cadmium (Cd) was found at SS-03 (0.95 mg/Kg±0.08) while maximum was found at SS-01 (1.31 mg/Kg±0.03) and the total average value was found 1.07 mg/Kg±0.16. Similar trend in cadmium was observed by Maurya *et al.* (2018). Copper (Cu) helps in the process of photosynthesis and improves the taste of fruits and vegetables. Cu also reduces the chances of ergot disease in cereals. During the study period, the minimum average value of Cu was found at SS-03 (4.39 mg/Kg±0.20) while maximum was found at SS-01 (5.23 mg/Kg±0.35) and the total average value was found 4.87 mg/Kg±0.37. Manganese (Mn) helps in the synthesis of chlorophyll. It also increases the accessibility of Ca and P to the plants. During the study period, the minimum average value of manganese (Mn) was found at SS-03 (2.47 mg/Kg±0.31) while maximum was found at SS-04 (3.62 mg/Kg±0.12) and the total average value was found 3.12 mg/Kg±0.48. During the study period, minimum average value of chromium (Cr) was found at SS-04 (0.96 mg/Kg±0.06) while maximum was found at SS-01

(1.58 mg/Kg±0.05) and the total average value was found 1.22 mg/Kg±0.27. Zinc (Zn) helps in the synthesis of plant growth hormones, enzymes, chlorophyll, and carbohydrate. During the study period, minimum average value of Zn was found at SS-02 (14.29 mg/Kg±0.37) while maximum was found at SS-03 (21.42 mg/Kg±1.10) and the total average value was found 17.82 mg/Kg±2.98. The larger extent of zinc deficiency was attributed to the alkaline soil condition and richness of $CaCO_3$ which might have precipitated zinc as hydroxides and carbonates. Many researchers reported decreased zinc solubility and mobility, and thus decreased zinc availability, in alkaline soil conditions (Ravikumar *et al.*, 2009). Iron acts as a catalyst in the chlorophyll synthesis process and also act as oxygen carrier. During the study period, the minimum average value of Fe was found at SS-04 (4.83 mg/Kg±0.07) while maximum was found at SS-01 (6.01 mg/Kg±0.17) and the total average value was found 5.21 mg/Kg±0.55. Although Zn, Fe, Mn, and Cu were found in higher concentrations, they are helpful in plant growth and development and their origin is also natural as none of the anthropogenic activities contributing these heavy metals to the soil were observed in the study area. Cd and Cr values observed in the study area are not suitable for the better growth of plants and crop yield as their toxicity reduces the translocation of necessary nutrients to crops, resulting in poor growth and poor crop yield (Haider *et al.*, 2021).

Conclusion

The present study of soil quality assessment was carried out at the selected sites around Karwi town, Chitrakoot (Uttar Pradesh), India for 12 months (January 2021 to December 2021) for the quantification of soil health. Moisture was present in a sufficient quantity in the soil of the study area. The water retaining capacity of the study area was observed to be of good quality. Among all the four sites, the soil quality of SS-03 was observed to be slightly acidic in nature. All the studied primary and secondary nutrients were observed in sufficient quantity at all the study sites. All the micronutrients (Cd, Cu, Mn, Zn, Fe) were observed in sufficient quantity at all the study sites. Although in comparison to other studies performed in other places in India, low levels of micronutrients were observed. No anthropogenic source of pollution was detected at all the study sites during the study period, which is also proved by the quantitative estimation of all the selected parameters. No standard for soil quality was found during the literature survey, which shows the lack of attention to the quality of this non-renewable resource. On the basis of the present study, it can be concluded that the quality of soil in the study area is in good condition.

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