

Analysis of Physico-chemical Characteristics of Soil from Various Locations of Banda City, Uttar Pradesh, India

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Abstract: *Banda is geographically located at coordinated 25.29° N latitude & 80.20° longitude total area 4,413 km² and population 19, 79,541 censuses (2011) of Banda District. Sampling was done during summer season of April month 2015. Various physico- chemical parameter of each location were analyzed by different technique. The samples were analyzed for Heavy metals using atomic absorption spectrometer. . It can be concluded that the physico-chemical analysis of soil samples under study showed variable concentration of various parameters.*

Keywords: *Physico-chemical Parameters, Soil, Banda City, Uttar Pradesh*

1. INTRODUCTION

Banda, the easternmost district of Bundelkhand in Uttar Pradesh state. It is the district headquarters, and a part of Chitrakoot division. Banda is geographically located at coordinated 25.29° N latitude & 80.20° longitude total area 4,413 km² and population 19, 79,541 censuses (2011) of Banda District. Banda having four Tehsils Nairani, Baberu, Attara, Pailani and eight blocks. Agriculture with the main crops being Paddy rice, wheat and vegetable. Banda is a town of religious culture, historical and archaeological importance situated in the Bundelkhand region. Banda languages are bundeli which has a lexical similarity of 72-91% with Hindi.^[1]

Generally top soil layer contain largest amount of pollutants. The contamination concentration in soil depends on the adsorption properties of soil matter its properties determined by organic matter. Variation of organic matter may be the predominant cause of variation in environment concentration in soil.^[2] Environment factors such as land use temperature rainfall etc can artificially change organic matter content as well heavy metals concentration in soil. The solubility of heavy metal ions in soil was mainly influence by many factors such pH, Conductivity, etc.^[3] Heavy metals occur naturally in the ecosystem with large variations in concentration. In modern times, anthropogenic sources of heavy metals, i.e. pollution, have been introduced to the ecosystem.

The metal contents have been shown to be essential for plants, and lower forms of animal life and even other mammals, the yield of crop depends on fertility and presence of micronutrients and heavy metals in the soil. The soil condition is of great importance, because it is a universal medium for plant growth, which supplies essential nutrients to the plants.^[4]

2. MATERIAL AND METHODS

Sampling was done during summer season of April month 2015. Fifteen soil samples were collected from different location in plastic bags, dried at 60⁰ for 48 hours and fine powder was made up with the help of pistil mortar and sieved it with 2 mm sieve. Various physico- chemical parameter of each location were analyzed by different technique^[5].

2.1. Digestion of Soil Samples for Heavy Metal Analysis

Sieving of the soil was completed with the help of 0.5 mm sieves and was dried for 24 hours after drying it was made cool at room temperature. After drying soil was digested with nitric acid and distilled water. The samples were analyzed for Heavy metals using atomic absorption spectrometer^[6]. The locations of sampling station are shown in table 1.

Table1. List of sampling station in Banda city

S. No.	Sampling Location	Sampling Area	Depth in cm.
1	Union bank of India chhawani (BRS ₁)	Residential area	15 cm.
2	District stadium civil line (BRS ₂)	Residential area	15 cm.
3	Maheswaridevimandir (BRS ₃)	Residential area	15 cm.
4	Babulalchok (BRS ₄)	Residential area	15 cm.
5	Pt. J.N. College (BRS ₅)	Residential area	15 cm.
6	Power house sarvodayanagar (BRS ₆)	Residential area	15 cm.
7	Lokeshkirana store chauk bazaar (BRS ₇)	Residential area	15 cm.
8	Chillaghat (BCS ₁)	Commercial area	15 cm.
9	Naraini (BCS ₂)	Commercial area	15 cm.
10	Ladkapurwa (BCS ₃)	Commercial area	15 cm.
11	Kalyanpur (BCS ₄)	Commercial area	15 cm.
12	Jaspura (BCS ₅)	Commercial area	15 cm.
13	Bisandakhurd (BCS ₆)	Commercial area	15 cm.
14	Dingwahi (BCS ₇)	Commercial area	15 cm.

3. RESULT AND DISCUSSION

Physico-chemical characteristic of soil collected from different areas of Banda City and all the results are shown in **table 2**.

3.1. Temp, pH and EC

The temperature of soil greatly affects the physical, biological and chemical processes occurring in soil. Temperature plays a very important role in soil characteristics and seed germination. Temperature regenerates nutrients in higher plants. In the present study, temperature values were observed between 25.7 °C to 33.4 °C. The highest temperature was recorded in 33.4 °C at District stadium civil line (BRS₂) and lowest 25.7 °C at Babulalchok (BRS₄). (Tripathi et al. 2014)^[7] Studies of physico-chemical characteristics of soil in Shahdol District of Vindhya plateau and reported the temperature was observed to be 28.64 °C to 42.28 °C. The measurement of pH shows the acidity and alkalinity of the soil. pH concentration of all the soil samples varied from 6.38 to 7.8. The highest pH is observed 7.8 at sampling location Chillaghat (BCS₁) and minimum value 6.38 at Babulalchok (BRS₄). The measurement of electrical conductivity is for measure the current that gives a clear idea of soluble soil present in the soil. Conductivity depends upon the dilution of soil suspension. The highest EC is recorded in sampling station at 0.10 Lokeshkirana store chauk bazaar (BRS₇) to 0.92 mhos/cm at Ladkapurwa (BCS₃). (Mandal et al. 2010)^[8] studied Nagpur soil and recorded EC 0.21 to 0.49 mhos/cm.

3.2. Nitrogen, Phosphorous and Potassium

Nitrogen is the most fertilizer element. Plant responds quickly to application of nitrogen. This element encourages above ground vegetative growth and gives a deep green colour to the leaves. Plants roots take up nitrogen in the form of NO₃ and NH₄. In the present study, higher amount of nitrogen 29.5 at Bisandakhurd (BCS₆) while 5.1 at District stadium civil line (BRS₂) show less amount of nitrogen. The over increase in N₂ is due to the use of fertilizers which contains high amount of N₂. Phosphorous is a part of every living cell in plant. The every activity of plant such as growth, respiration and reproduction depends upon phosphorous levels. Maximum amount of available phosphorus .75 at site Naraini (BCS₂). Potassium is the third essential fertilizer element. Potassium is essential for photosynthesis, protein synthesis, starch formation and for the translocation of sugars. This is important for grain formation and development. All the root crops are generally give response to application of potassium. In the current study shows 42 mg/kg higher amount in sampling station Maheswaridevimandir (BRS₃). (Tripathi et al. 2014)^[9] studied concentration of Cr, Pb, Cd, Ni, Cu and Fe in soil of Umaria District, Vindhya Plateau, India and reported N, P, K are found to be 8.86 to 41.50 mg/kg, 0.25 to 1.16 mg/kg, 30 to 70 mg/kg.

3.3. Heavy Metal Content of Soil

The heavy metal concentration in the soil sample of Banda district with their means, standard deviations and coefficient variant are presented in table 2. The present investigation of the total content of heavy metals in the soil was restricted to the top. The mean concentration of Pb was ranging between 9.4 to 42 mg/kg at sampling location Pt. J.N. College (BRS₅) from Power house

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sarvodaynagar (BRS6) in soil. Then concentration of Pb recorded was comparatively low in the soil. (Jayashree et al.2012) [10] studied heavy metal contamination in soil in an industrial zone and reported lead concentration 0.5-119 mg/kg. In the present observation the mean concentration of Copper was found ranged between 0.1 mg/kg to 3.1 mg/kg. The concentration of Cu recorded was low at sampling location Naraini (BCS2) and Kalyanpur (BCS4) in soil of study area. (Tripathi et al. 2015) [11] Studied soil of Vindhya Pradesh and reported copper concentration ranged from 0.1 to 87.0 mg/kg. Iron concentration in the soil ranged from 15.7 to 70 mg/kg. Iron is very insoluble under oxidizing condition in soil. (Akpoveta et al. 2010) [12] Studied physic-chemical characteristics and levels of some heavy metals in soil around metal scrap dumps in some parts of delta state, Nigeria and reported iron content 1411 to 1431 mg/kg. In the present observation the mean concentration of copper was found to be ranging between 0.1 to 3.1 mg/kg in irrigated soil [13]. The concentration of Cu recorded was comparatively low 0.1 at sampling location Kalyanpur (BCS4). (In the present observation the mean concentration of Mn was found to be ranging between 0.5 Naraini (BCS2) to 11.5 mg/kg Pt. J.N. College (BRS5) in soil of study area.

Table2. Physico-chemical characteristic of soil collected from different areas of Banda City

Parameter	Temp	pH	EC	N	P	K	Mn	Fe	Co	Cu	Pb	
			mhos/cm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
Residential Site	BRS1	28.2	7.0	0.29	19.7	0.23	29.0	10.2	48.6	0.3	12.3	27.0
	BRS2	33.4	6.60	0.49	5.1	0.62	26.0	6.4	52.9	1.2	34.3	13.4
	BRS3	30.0	7.03	0.68	15.5	0.73	42.0	5.9	15.7	0.2	10.0	19.2
	BRS 4	25.7	6.38	0.79	7.3	0.34	35.0	9.2	55.0	2.0	7.9	21.5
	BRS 5	27.9	7.3	0.76	9.2	0.64	8.3	11.5	70.6	0.3	8.7	9.4
	BRS 6	31.0	7.3	0.73	14.3	0.36	10.5	3.7	36.6	2.5	8.4	42.0
	BRS 7	28.5	7.01	0.10	9.4	0.26	17.2	7.3	48.0	3.1	17.4	14.2
Cropland Site	BCS1	30.0	7.88	0.56	14.3	0.85	18.5	7.2	40.9	1.8	9.6	26.0
	BCS2	31.5	7.39	0.47	5.14	0.75	27.0	0.5	86.4	0.6	12.2	11.2
	BCS3	27.0	6.8	0.92	27.3	0.59	35.4	4.6	48.8	0.5	10.5	15.3
	BCS4	26.8	7.0	0.40	21.4	0.65	26.0	1.5	36.5	0.1	14.6	32.4
	BCS5	29.2	7.7	0.59	11.2	0.49	17.3	7.3	49.2	1.5	19.6	32.7
	BCS6	30.3	7.03	0.86	29.5	0.23	41.7	2.3	42.0	2.3	24.5	18.3
	BCS 7	32.4	7.44	0.47	20.8	0.35	39.0	4.8	53.4	0.8	21.2	26.5
Mean	Mean	29.421	7.133	0.579	15.010	0.506	26.636	5.886	48.900	1.229	15.086	22.079
	S.D.	2.223	0.405	0.229	7.812	0.210	11.122	3.232	16.339	0.978	7.602	9.449
	C.V.	7.555	5.677	39.55	52.045	41.501	41.755	54.91	33.413	79.576	50.391	42.796

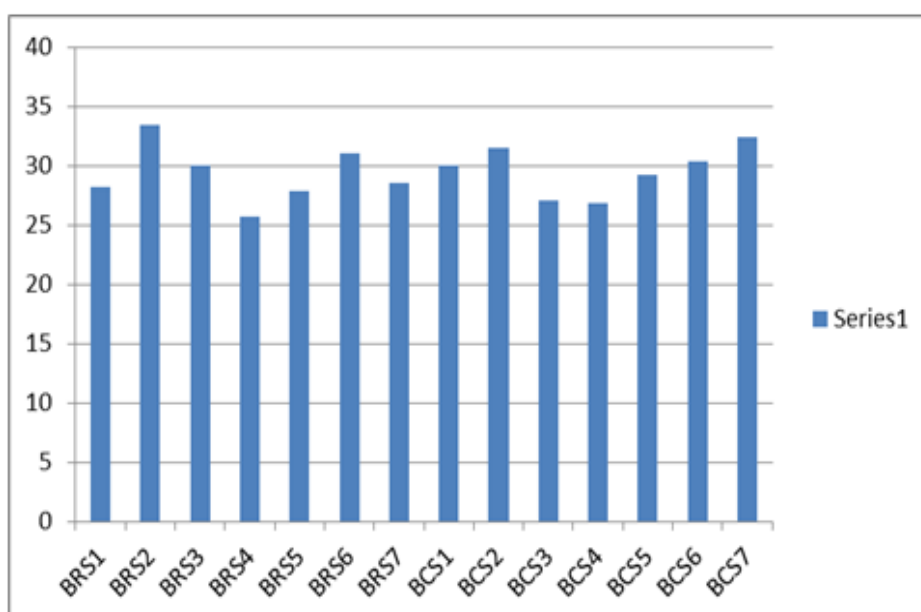


Fig1. Graphical representation of the Temperature

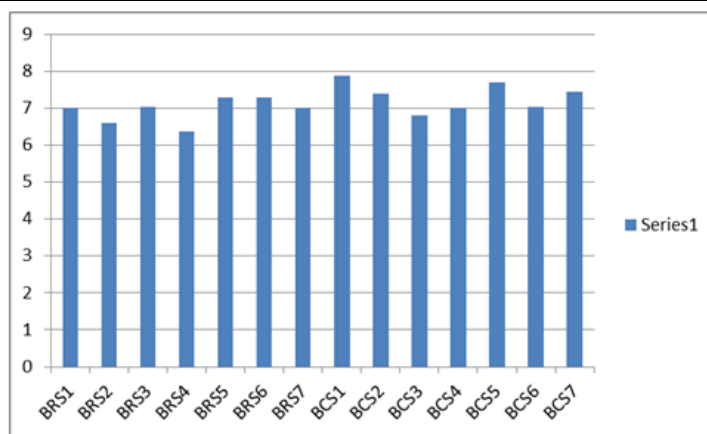


Fig2. Graphical representation of the pH

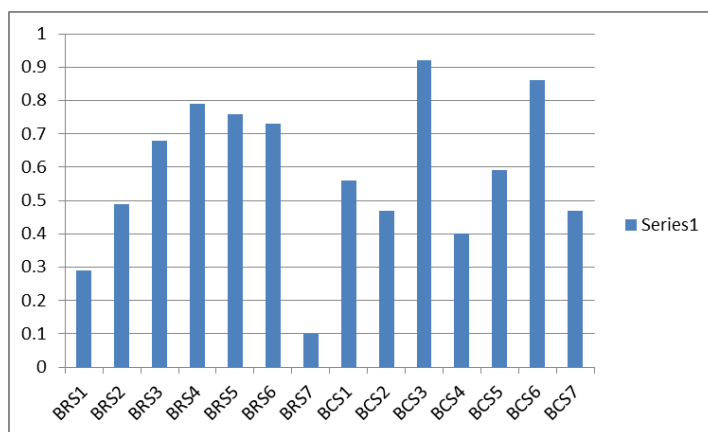


Fig3. Graphical representation of the EC

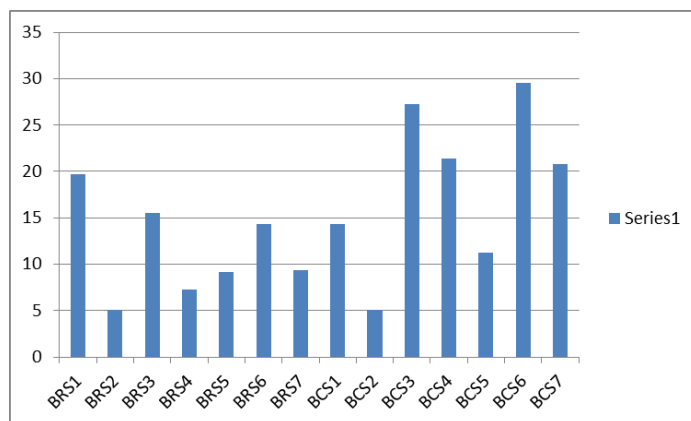


Fig4. Graphical representation of the N

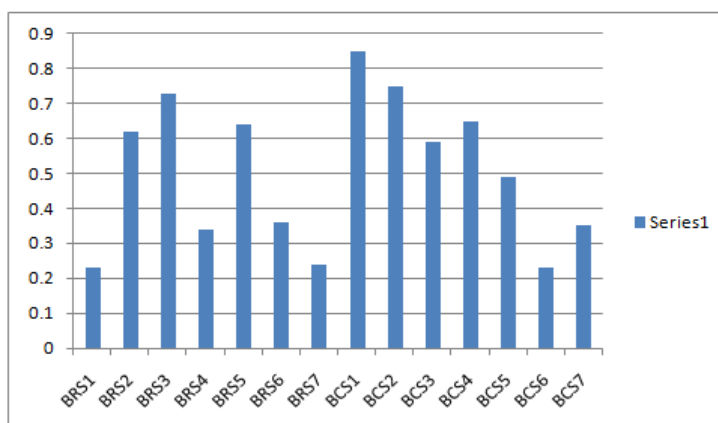


Fig5. Graphical representation of the P

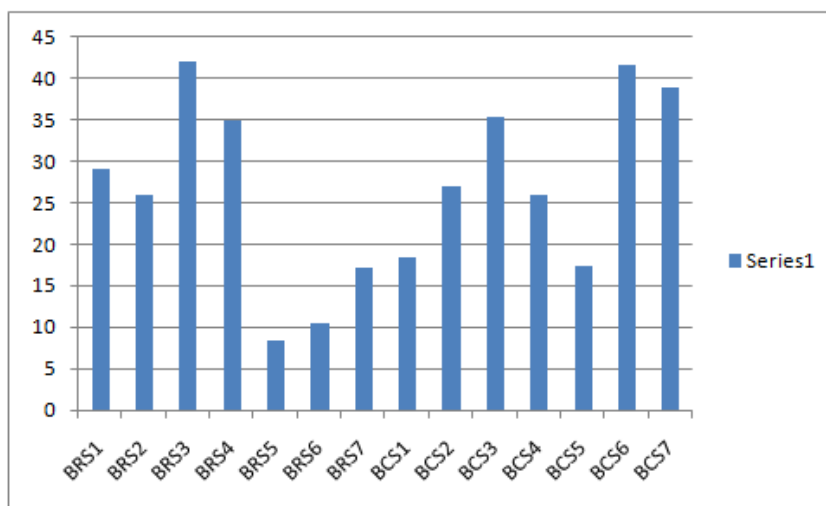


Fig6. Graphical representation of the K

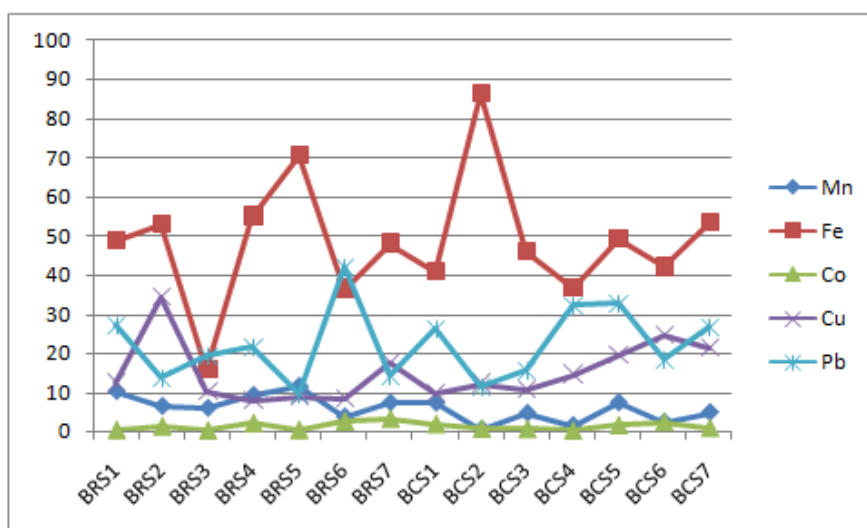


Fig7. Graphical representation of the Heavy Metals

4. CONCLUSIONS

Monitoring of micronutrients in the soil provides efficient way to assess him qualitative and quantitative difference in metal concentration at district locations. It can be concluded that the physico-chemical analysis of soil samples under study showed variable concentration of various parameters. Irregular distributions of micronutrients were recorded during the present investigation which may be attributed to the added fertilizers during the crop formation.

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