

Physio- Chemical Status of Agricultural Soil of Kanpur Dehat, U.P.

¹Smriti kamal and ²Madhuri Yadav

^{1,2}Department of Zoology, D.B.S. College, CSJM University, Kanpur, India

Corresponding Author: **Smriti Kamal**

Abstract: Agriculture has major contribution in growth of economy of India. India is the biggest country for crop production and provide food for millions of people and animals. This research was conducted during the year 2024-2025 in different villages of Kanpur Dehat, U.P. India. We collected soil sample from different depth like 0-10 cm, 10-25 cm and 25-40 cm. Total 16 samples were collected from different location. This research help in evaluation of physico- chemical status and fertility of agricultural soil of various villages. After analysis of the soil texture and soil color in physical status, while chemical status are pH, EC, OC, N, P, K, Zn, Fe and S. The result of soil showed black colour, loamy and sandy soil which are suitable for Maize, Wheat, Rice, Potato, Garlic and Onion. Chemical properties that pH range 7.1 to 8.9, Electrical conductivity (EC) ranged from 0.72 to 1.59(ds/m). The Soil organic carbon ranged from 0.36 to 0.90 (%). Available nitrogen ranged from 103.5 to 204.15 (kg/ha), available phosphorous ranged from 14 to 29 (kg/ha), available potassium ranged from 96 to 328 (kg/ha), available iron ranged from 8.32 to 32.8 (kg/ha) and available sulphur ranged from 1.82 to 9.63 (ppm). All of these result shows decrease value with increase the depth and these values varied with depth and site. This study shows that soil of Kanpur dehat is good for various crops production.

Key Word- Agricultural soil, Sustainable agriculture, physio – chemical properties

Introduction

Soil play an important role in geo- chemical cycle of environment. It is consist of fine particles of rock by the process of erosion and weathering (Addis, 2014, Yadav *et al.* 2024). Soil word derived from solom, is latin word which means those material in which all living organism make survive to outside and inside (Rajshri *et al.* 2021). It is most important natural resource, which provide a medium for plant growth, food production and fibers (Naphade *et al.* 2021). Healthy soil represent the healthy ecosystem and directly affect the food production, human health, water quality and quantity, climate change, biodiversity and nutritional availability (Manter *et al.* 2017). The physio chemical

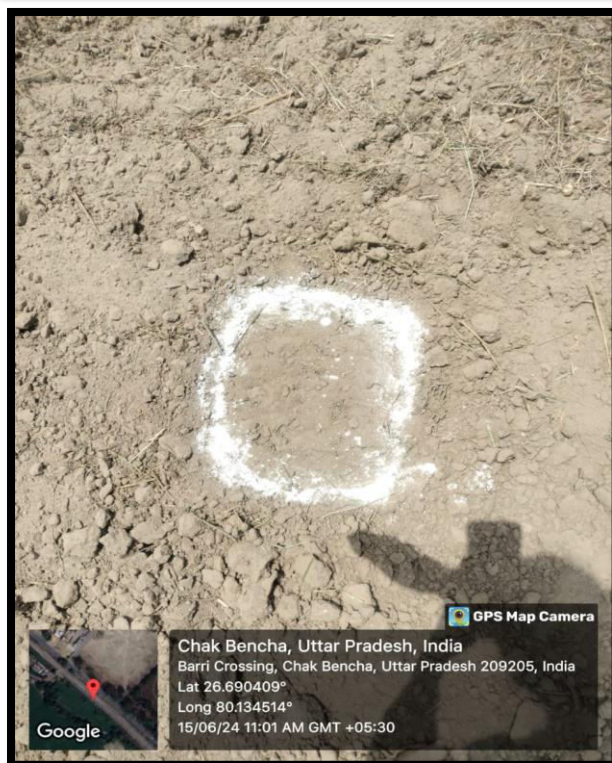
study is very important for management fertility of soil and it is important for agriculture (Sharma *et al.* 2017, Yadav *et al.* 2024). The physical properties of soil depends on organic and mineral composition of soil (Chen *et al.* 2016). Chemical properties of soil depends on decomposer, fertilizers and pesticides. India is the largest producer of wheat , rice, maize and the second largest agricultural land in the word. This research help in determine the condition of physio- chemical condition of soil and provide the insight into the challenges and factor which influence the sustainable agriculture. Understanding of these properties are crucial for sustainable agriculture, preservation of ecosystem health because agriculture contributes 17.5 % India GDP, and 13% of total export. This study aim to determine to influence factor which affect the crop growth.

Materials and Methods

Kanpur dehat located at 26.343 N 79.967 E and area is 3021 km² . This study were divided into four villages from under the district. Total sixteen soil sample collected at different depth of 0-10cm, 10-25cm and 25-40cm at different sites. The collected soil sample process and analyzed the physio- chemical properties of soil by different method like pH, Atomic Absorption and spectrophotometry.

The research was conducted in different villages of Kanpur dehat such as Rasulabad, Bela, Shivli and Bairi. Kanpur dehat is play major role as agricultural district of Uttar Pradesh. In present investigation, soil samples were collected from different villages for study the physico chemical properties.





Result and Discussion

Physical Properties

The result showed that most of the soil of Kanpur Dehat, reflected yellowish, light and dark black soil, light and dark sandy and loamy soil. Soil Texture of soil sample was sandy, loamy and alluvial soil. Result of this parameter is mentioned below (table -1).

Particle density of soil is increase due to increase in soil depth, water quantity and their interaction. The water holding capacity of soil varied from 40% - 85.67%. These variance due to silt, clay and organic carbon. Sandy soil have low water holding capacity, where holding capacity depends on present of pore space. These pores are decreases when depth of soil is increases (Chaudhary *et al.* 2020). Results of this parameter is mentioned below (table - 2).

Table 1. Soil colour and soil texture of different sites of Kanpur

		Soil Colour			
S.No.	Block	Soil Texture	0-10 cm	10-25 cm	25-40 cm
1.	Rasulabad	Sandy soil	Brown	Dark brown	Grey
		Loam soil	Yellow	Dark yellow	Brownish
		Sandy loam soil	Reddish brown	Black brownish	Dark grey
2.	Bairi	Sandy soil	Yellowish brown	Dark Yellow	Brownish
		Alluvial soil	Light yellow	Dark yellow	Dark brown
		Loam soil	Yellowish	Dark Yellow	Brown
3.	Shivli	Loam soil	Light yellow	Reddish yellow	Brown
		Sandy soil	Yellowish	Light Reddish	Yellowish brown
		Loam soil	Light Reddish	Brown	Dark Brown
4.	Bela	Sandy soil	Black	Dark black	Brownish black
		Loam soil	Yellow	Dark yellow	Dark grey
		Sandy loam soil	Black brownish	Black brownish	Dark black

Table 2. Water holding capacity in different soil

		Water holding capacity (%)		
S.No.	Block	0-10 cm	10-25 cm	25-40 cm
1.	Rasulabad	52.35	40.20	63.98
		49.20	435.85	55.35
		31.25	50.48	48.65
2.	Bairi	75.12	65.32	80.32
		70.18	63.52	70.78
		64.80	65.35	95.65
3.	Shivali	638.35	57.27	60.15
		55.32	52.65	72.34
		35.31	62.55	40.31
4.	Bela	65.35	55.35	80.32
		45.32	68.25	70.25
		55.39	72.50	85.30

Chemical properties

pH

Soil pH of Kanpur dehat soil of different villages were found to be varied from 7.1 to 8.9. The soil p^H was increased with increase in depth. The range of pH of different villages parameter is mentioned below (table – 3).

Electrical Conductivity (EC)

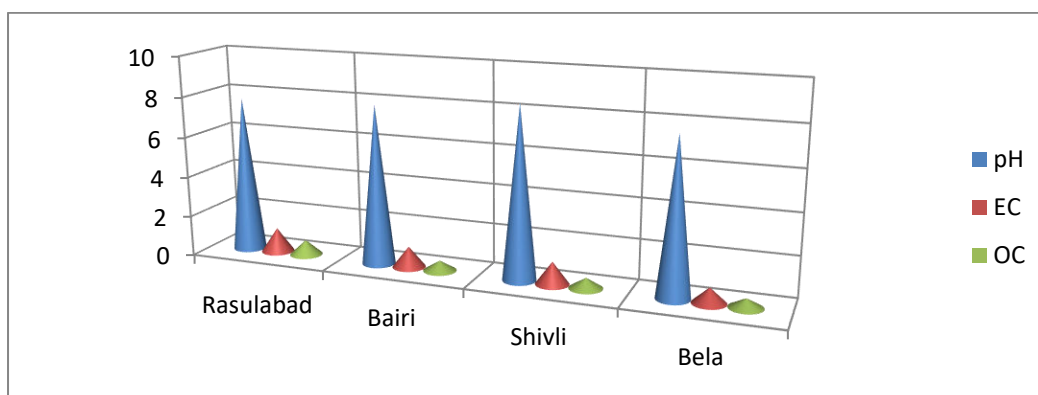
EC of soil samples were varied from range 0.72 to 1.59 ds/m. Hence , all soils are safe for crop production. The low EC showed good drainage condition which is important for removal of released bases by percolating. It was also analyzed by Rathi *et al.* (2018) and Singaravel *et al.* (2006). Results of this parameter mentioned below (Table- 3).

Available Organic Carbon (OC) in soil sample

The soil OC percentage ranges from region, percentage ranges 0.36 to 0.90% at different villages of Kanpur dehat. Soil depth inversely proportional to presence of organic carbon. The range of OC of different villages parameter is mentioned below (Table – 3)

Table-3 pH, Electrical Conductivity, Organic carbon, Nitrogen, Phosphorous, Potassium, Zinc, Iron And Sulphur Values Of Various Land depth In Kanpur dehat

S.No.	Villages	Soil Depth Cm	pH	Electrical conductivity (EC) ds/m	Organic Carbon (OC) %	Nitrogen(N) (kg/ha)	Phosphorous(P) (kg/ha)	Potassium(K) (kg/ha)	Zinc(Zn) (kg/ha)	Iron (Fe) (kg/ha)	Sulphur(S) (ppm)
1.	Rasulabad	0-10	8.2	1.00	0.90	204.15	32	163	6.30	15.35	7.35
		10-25	7.1	1.59	0.50	199.20	25	140	5.15	14.64	4.62
		25-40	7.9	0.98	0.82	150.35	20	103	3.00	12.83	3.32
		Mean	7.73	1.19	0.74	184.56	25.66	135.33	4.81	14.27	5.09
2.	Bairi	0-10	8.4	0.92	0.52	197.35	21	245	3.46	15.92	9.63
		10-25	8.3	0.82	0.60	152.40	17	202	2.10	10.35	5.81
		25-40	7.0	1.32	0.39	100.20	16	121	2.00	8.32	3.58
		Mean	7.9	1.02	0.50	149.98	18	189.33	2.52	11.53	6.34
3.	Shivli	0-10	8.9	1.36	0.36	197.16	19	142	8.32	32.8	7.89
		10-25	8.5	0.92	0.54	172.32	16	117	6.51	22.8	4.32
		25-40	7.9	1.02	0.63	132.42	15	96	2.32	12.6	1.82
		Mean	8.43	1.1	0.51	167.3	16.66	118.33	5.71	22.73	4.67
4.	Bela	0-10	7.8	0.78	0.42	124.5	15	328	2.84	9.26	2.30
		10-25	8.1	0.72	0.54	121.60	14	318	1.10	10.98	3.34
		25-40	7.2	0.76	0.42	103.5	16	300	0.72	8.35	3.45
		Mean	7.6	0.75	0.45	116.53	15	315.33	1.55	9.53	3.03



Available Nitrogen (N) in soil sample

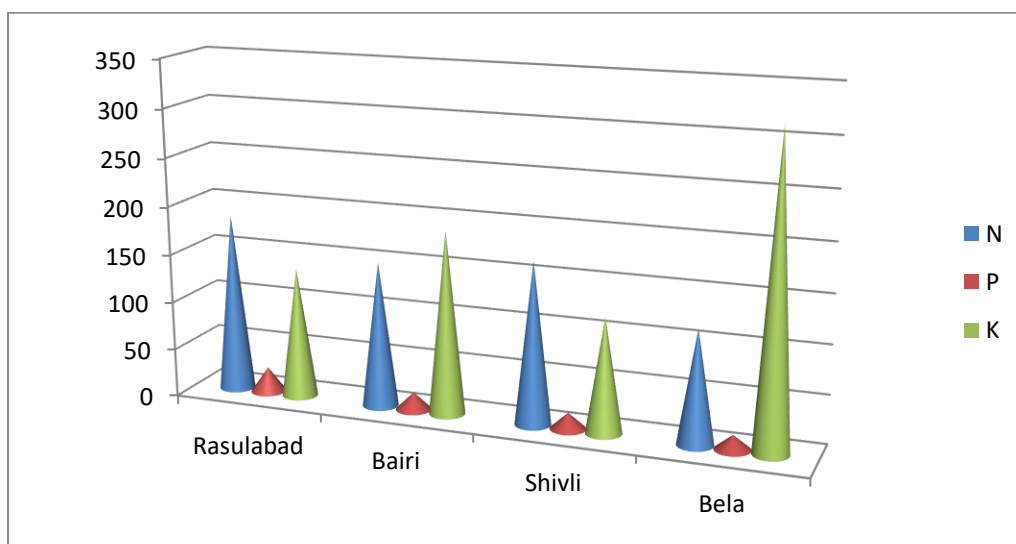
The available nitrogen content of soil sample are ranges from 100.20 to 204.15kg. The soil sample of Kanpur dehat villages were found to be low in nitrogen content. Nitrogen decreased with the increased in soil depth. It means soil depth is inversely proportional to soil depth Bhavya *et al.* (2018) has been also been also find this analysis. The range of N of different villages parameter is mentioned below (Table – 3)

Available Phosphorous (P) in soil

The phosphorous ranges from is 14 to 32 kg/ha in different soil depth. Phosphorous are present in very low amount which enable the soil for higher crop yield. The range of P of different villages parameter is mentioned below (Table – 3)

Available Potassium (K) in soil

The available Potassium in soil ranges from 96.35 to 328 kg/ha. Potassium content decreased with increase soil depth Khandey *et al.* (2018). The range of K of different villages parameter is mentioned below (Table – 3)

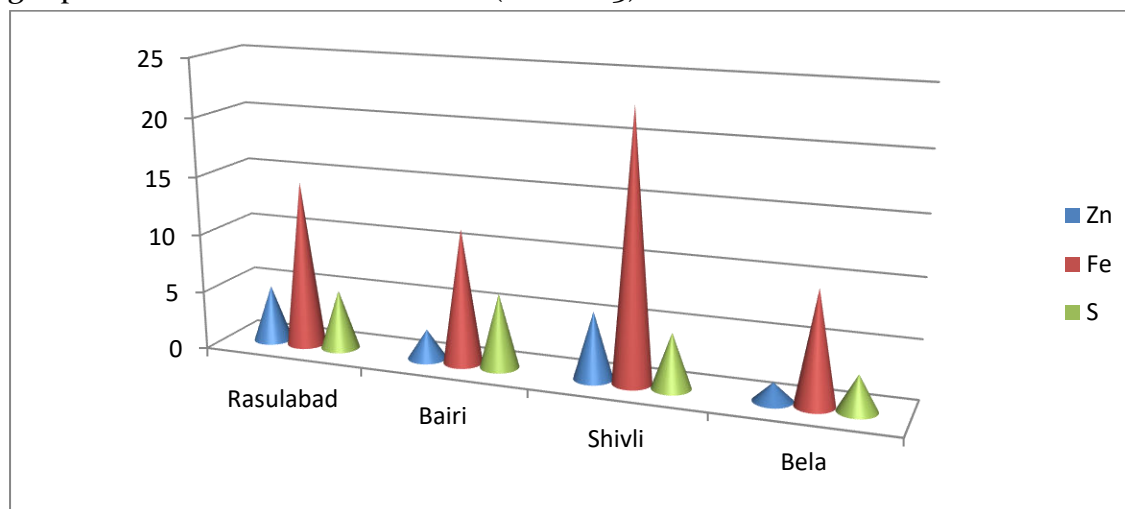


Available Zinc (Zn) and Iron (Fe) in soil

The zinc amount ranges from is 0.72 to 8.32 kg/ha and Iron ranged is 8.32 to 32.8 kg/ha. They help in increased of cop productivity and maintain the fertility of soil. The range of Zn of different villages parameter is mentioned below (table – 3)

Available Sulphur (S) in soil

The available sulphur in soil of different areas and depth which found to be significant. The available amount of (S) are ranges from 1.82 to 9.63 ppm. The range of S of different villages parameter is mentioned below (Table – 3).



Conclusion

It was conclude that different soil depth affected the soil physio – chemical properties. This result help to promote the soil health for farmer's crop production, Soil texture showed alluvial, sadly , loam soil. Soil has PH natural to alkaline in nature. Electrical conductivity is medium in soil. More pH show the deficiency of metal in soil, Low EC shows the high productivity of crop as well as High EC range increase due to present of access amount of phosphorous and potassium. Its also included that agriculture soil (wheat, rice and maize), and vegetable soil need the addition of organic carbon , Some chemical fertilizers to maintain soil, fertility, soil health and productivity in the crop region of field.

Acknowledgement

I would like to express my gratitude to my supervisor Dr. Madhuri Yadav for invaluable guidance and support throughout my this research. Her extensive knowledge and experience. I am also thankful Agriculture department, Uttar Pradesh.

Reference

1. Addis, W., and Abebraw, A. (2014). Analysis of Soils Used for Cultivation of Garlic (*Allium sativum* L.), Sci. Technol. Arts Res. J. 3(4):29-35.
2. Bhavya, VP., Kumar, AS., Alur, A., Shivkumar, KM., Shivanna, M. (2018). Soil chemical properties under different Horticultural cropping syatem with different depth. International Journal of Pure and Applied Bioscience. 6(1):1645-1651.

3. Chen, S., Ai, X., Dong, T., Li, B., Luo, R., Ai, Y., Chen, Z., and Li, C. (2016). The Physico- chemical properties and structural characteristics of artificial soil for cut slope restoration in Southwestern China. Scientific Report.
4. Choudhary, S., Swaroop, N., and Thomas, T. (2020). Assessment on Physico-chemical properties of soil from different blocks of Rajsamand district of Rajasthan, India. International Journal of Current Microbiology and Applied Sciences.9(9):1718-1722.
5. Khanday, M., wani, J., Ram, D. and Kumar, S. (2017). Depth wise distribution of available nutrients of soils of horticulture growing area of gander BAL district of Kashmir valley. Journal of Pharmacognosy and Phytochemistry.7(1):19-22.
6. Khanday, MD., Wani, JA., Ram, D., Kumar, S. (2018). Depth wise distribution of available nutrients of soils of horticultural growing areas of Ganderbal district of Kashmir valley. Journal of Pharmacognosy and phytochemistry. 7(1):19-22.
7. Kiran,DL., Krishna, DL., Vivek, SM., Ramteke, DS. (2012) Impact of domestic Wastewater Irrigation on soil properties and Research Publications 2(10): ISSN 2250- 3153.
8. Manter, DK., Delgado, JA., Blackburn, HD., Harmel, D., de Leon AAP., and Honeycut, CW. (2017). Why we need a national living soil repository. National Academy of sciences of the USA. 114:13587-13590.
9. Naphade, M., Sidhu, GS., Patil, VD., Shinde, R. (2021). Assessment of Physico-chemical properties and micro nutrient status of Jalgaon district, Maharashtra status. International Journal of Current Microbiology and Applied Science. 10(03):52-59.
10. Rajshri, S., Sindhu, GS., Patil, VD., Naphade, R. (2018). Evalution of Physico-chemical properties in Hot semi- orid Eco- region of Beed district, Maharashtra. International Journal of Current Microbiology and Applied science 10(03):45-51.
11. Rathi, R., Prakash, R., Rathi, N., Sharma, R. (2018). Effect of different quantity water on chemical properties of soil in Pundri block of Kaithal district. International Journal of pure and Applied Bioscience.6(5):965-973.
12. Singaravel, R., Govindamsamy, R. (2000). Practical manual for soil fertility, fertilizers and manures.
13. Yadav, M., Kamal, S., Sharma, V. (2024). Present status of physico- chemical properties of Agricultural soil of Kanpur. International Journal of Creative Research Thought (IJCRT).12(11) ISSN: 2320-2882.