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# Assessment of soil macro and micro nutrients from different village in Jasra block of Prayagraj district, (U.P), India

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**Abstract**
The research finding was done on Soil Health of Jasra Block of Prayagraj District of Uttar Pradesh in 2020. Nine sampling points in different villages were selected for the analysis. Soil samples were collected at depths of 0-15, 15-30 and 30-45 cm. The study revealed that in Jasra Block. Chemical properties of Soil pH value ranged from 7.05 to 7.69 and the highest value was recorded in village Ghurpur ($V_4$) and lowest in village Amreha ($V_1$). The Electrical conductivity ranged from 0.19 to 0.45 ds $m^{-1}$ most of the crops were suitable for cultivation. The value of Organic Carbon (%) varied from 0.43 to 0.56%, Nitrogen content was found from 319.397 kg $ha^{-1}$ to 446.545 kg $ha^{-1}$, phosphorus content from 19.333 kg $ha^{-1}$ to 48.333 kg $ha^{-1}$, Potassium content of from 214.587 kg $ha^{-1}$ to 408.227 kg $ha^{-1}$, Sulphur content from 0.288 ppm to 0.396 ppm, Copper availability ranged from 0.242 ppm to 0.860 ppm and Zinc availability ranged from 0.222 ppm to 0.896 ppm. During the course of investigation responded appropriate chemical properties of soil Jasra Block villages Ghurpur and Manpur have more fertile soil which gives higher yields of crops as compare to other villages. Most of the farmers cultivate of paddy, wheat, maize, millet, pulses, potato, sugarcane *etc* and advice to adopt suitable management practices and provide proper nutrition to soil health.

**Keywords:** Soil macro, micro nutrients, soil health

## Introduction
Soil is the important natural resources which need to be properly and scientifically utilized for improving the productivity and economic condition of the nation. Soil is the thin layer on earth surface which is formed before the drawn of human civilization and it regulates the nutritional status by that means reach the socio-economic condition of any biosphere. Soil is a mixture of organic matter, minerals, gases, water and living organisms where together support life. The main function of soil is water storage, supply of nutrients for plant and purification and make modification in environmental conditions. It has also a biological system of living organisms as well as some other components (Sehgal, 1996) [1]. Soil is the most vital and precious natural resource that sustains life on the earth. It takes almost 1000 years to produce an inch of topsoil (Chandra and Singh, 2009). The rate of soil quality degradation depends on land use systems, soil types, topography, and climatic conditions. Among these factors, inappropriate land use aggravates the degradation of soil physicochemical and biological properties (Singh *et al.*, 1995). The terms soil quality and soil health are often used and therefore quality of soil is also becoming quite important. Soil quality also referred as soil health, is defined as "the capacity of a specific kind of soil to function within ecosystem and land use boundaries to sustain biological productivity, maintains environmental quality and sustain plants, animals, and human health" (Doran and Parkin, 1994) [4]. In Uttar Pradesh most of area is covered by deep layer of alluvial soil spread by rivers of Ganga system. The fertility range of alluvial soil from sandy to clayey loam where southern part of Uttar Pradesh soil is mixed red and black or red-to-yellow. Yamuna originated from Yamunotri glacier of Uttar kashi it is second largest tributary river Ganga and important river of India. It has four main tributaries in the Himalayan region: Rishi Ganga, Hanuman Ganga, Tons and Giri (Upadhyay, 2013).

## Materials and Methods
The district Prayagraj is located at 25°47.3034N latitudes and 81°87.8357E longitudes. It covers an area of 5482 km².

This district lies in the southern part of the state in the Gangetic plain and adjoining Vindhyan Plateau of India. River Ganga and Yamuna flow through the district and it covered an area of 7,261 km2 with nine tehsils and 28 blocks. The The district area represents alluvial, as well as hard rock. District is bifurcated by river Yamuna and Vindhyan hills. Physio-graphically district is characterized with Ganga and Yamuna plain and Vindhyan plateau. The samples were collected through random selection from the villages under study with the help Soil auger and a meter scale. Jasra block were selected in Prayagraj district having variation in slope/topography, colour and cropping pattern and behaviour and in each block nine villages were selected for the study (V1, V2, V3, V4, V5, V6, V7, V8, and V9). The geographical coordinates (latitude and longitude) of each village were noted down using an electronic GPS device with 1m precision. Furthermore, from each village three samples of increasing depth (d1, d2, d3) *viz*., 0 to 15 cm, 15-30 cm and 30 to 45 cm were collected. The detailed standard protocols were followed given in table.1.

**Results and Discussion**

The prime objective of the study was to determine the fertility status of soil of various villages in different villages of Jasra block prayagraj district, Uttar Pradesh

As depicted in table 2 statistical accumulation on pH of soil various villages. Significant difference was found due to depth and significant difference was found due to site. The soil pH range was found 7.05 to 7.69 the highest mean value found in Ghurpur ($V_4$) and the lowest mean value found in Amreha (V1) 7.16 similar results was reported by Mourya *et al.*, (2015). As depicted in table 2 statistical accumulation on EC (dS $m^{-1}$) of soil various villages. Significant difference was found due to depth and significant difference was found due to site. The soil electrical conductivity ranges was found 0.19 to 0.45 the highest mean value is found in Ghurpur ($V_4$) 0.45 and the lowest mean value found in Semra Kalbana ($V_3$) (dS $m^{-1}$). Similar results was reported by Tripathi and Misra (2012). As depicted in table.3 statistical accumulation on organic carbon% of soil various villages. Significant difference was found due to depth and significant difference was found due to site. The soil organic carbon% ranges was found 0.43 to 0.56% the highest mean value is found in Ghurpur ($V_1$) 0.53 and the lowest mean value found in Bhamaur 0.44% the organic carbon decrease with increase soil depth it is due to the addition of plant residues and FYM on the surface horizons similar results was reported by Singh *et al.*, (2018). As depicted in 3 statistical accumulations on organic matter (%) of soil various villages. Significant difference was found due to depth and significant difference was found due to site. The soil organic matter (6) ranges was found 0.73 to 0.96 (%) the highest mean value is found in Amreha ($V_1$) 0.91 and the lowest mean value found in Bhamaur 0.75 (%) the organic matter decrease with increase soil depth the low organic matter content in the soil might be attribute to the prevalence of tropical condition similar results was reported by Verma *et al.* (2019).

As depicted in table.4 statistical accumulation on available nitrogen (kg ha') in soil of various villages. Significant difference was found due to depth and significant difference was found due to site. The available nitrogen (kg $ha^{-1}$) in soils ranges was found 266.00 to 279.00 (kg $ha^{-1}$) the highest mean value is found in Ghurpur ($V_4$)and the lowest mean value found in Amreha ($V_8$) the available nitrogen decrease with increase soil depth the available nitrogen content found to be maximum in surface layer and decrease regularly with depth which mainly due to decrease trend organic carbon with depth and cultivation of crops are mainly confined to the surface horizon (Rhizosphere) only at regular interval similar results was reported by Kumar *et al.*, (2012) [14].

As depicted in table.4 the statistical accumulation on available phosphorus (kg $ha^{-1}$) in soil of various villages. Significant difference was found due to depth and significant difference was found due to site. The available phosphorus (kg $ha^{-1}$) in soils ranges was found 14.26 to 17.92(kg $ha^{-1}$) the highest mean value is found in Ghurpur ($V_1$) 16.75 and the lowest mean value found in Semra kalbana 15.24(kg $ha^{-1}$) similar results was reported by Srivastava *et al.*, (2000). As depicted in table 4 statistical accumulation on available potassium (kg $ha^{-1}$) soil of various villages. Significant difference was found due to depth and significant difference was found due to site. The available potassium (kg $ha^{-1}$) in soil ranges was found 150.22 to 225.21(kg $ha^{-1}$) the highest mean value is found in Ghurpur($V_4$) 225.21 and the lowest mean value found in Amreha ($V_1$) 165.21 the available potassium decrease with increase soil depth it might be attribute to more intense weathering, release of liable potassium from the organic residue similar results was reported by Ranveer Singh (2017)**.**

As depicted in table.5 statistical accumulation on available sulphur significant difference was found due to site. The available sulphur (ppm) in soil ranges was (ppm) in soil of various villages. Significant difference was found due to depth and found 8.00 to 12.30 (kg $ha^{-1}$) the highest mean value found in Ghurpur($V_4$) 11.2 and the lowest mean value found in Manakwar($V_2$) 8.60 ppm similar results was reported by Madhu and David (2017).

**Table 1:** Soil chemical properties and their respective methods for analysis

| S. No. | Parameters | Scientist |
|---|---|---|
| 1 | Soil pH in 1:2.5 Soil/water suspension | Jackson, 1958 |
| 2 | Soil EC (dS $m^{-1}$) in 1:2.5 | Wilcox, 1950 |
| 3 | Organic Carbon (%) | Walkley and Black, 1947 |
| 4 | Available Nitrogen (kg $ha^{-1}$) | Subbiah and Asija, 1956 |
| 5 | Available Phosphorus (kg $ha^{-1}$) | Olsen *et al.*, 1954 |
| 6 | Available Potassium (kg $ha^{-1}$) | Toth and Prince, 1949 |
| 7 | Available Sulphur (ppm) | Bardsley and Lancaster, 1960 |
| 8 | Available Zinc (ppm) | Lindsay and Norvell, 1978 |
| 9 | Available Iron (ppm) | |
| 10 | Available Manganese (ppm) | |

**Table 2:** Soil pH and Soil EC (dS m-1) at different depths (cm) and villages of Jasra block Prayagraj

| Village | Soil pH | | | Soil EC | | |
|---|---|---|---|---|---|---|
| | 0-15 cm | 15-30 cm | 30-45 cm | 0-15 cm | 15-30 cm | 30-45 cm |
| Amreha ($V_1$) | 7.05 | 7.20 | 7.23 | 0.32 | 0.37 | 0.40 |
| Manakwar ($V_2$) | 7.22 | 7.35 | 7.49 | 0.32 | 0.38 | 0.41 |
| Semra Kalbana($V_3$) | 7.32 | 7.43 | 7.52 | 0. 24 | 0.19 | 0.21 |
| Ghurpur ($V_4$) | 7.32 | 7.48 | 7.69 | 0.45 | 0.38 | 0.42 |
| Bhamaur ($V_5$) | 7.25 | 7.32 | 7.52 | 0.29 | 0.33 | 0.39 |
| Gadra ($V_6$) | 7.30 | 7.36 | 7.54 | 0.27 | 0.24 | 0.31 |
| Kachara($V_7$) | 7.05 | 7.20 | 7.23 | 0.32 | 0.37 | 0.41 |
| Manpur($V_8$) | 7.32 | 7.43 | 7.66 | 0.45 | 0.37 | 0.42 |
| Rampur($V_9$) | 7.32 | 7.36 | 7.54 | 0.27 | 0.24 | 0.31 |
| MEAN | 7.23 | 7.34 | 7.49 | 0.33 | 0.32 | 0.37 |
| | F-test | S.Ed.(±) | CD at 5% | F-test | S.Ed.(±) | CD at 5% |
| Due to depth | S | 0.126502 | 0.00002 | S | 0.024 | 0.024 |
| Due to site | S | 0.110764 | 5.7306 | S | 0.064 | 0.00001 |

**Table 3:** Soil Organic carbon (%) and Soil Organic matter (%) at different depths (cm) and villages of Jasra block Prayagraj

| VILLAGE | Soil Organic Carbon (%) | | | Organic Matter (%) | | |
|---|---|---|---|---|---|---|
| | 0-15 cm | 15-30 cm | 30-45 cm | 0-15 cm | 15-30 cm | 30-45 cm |
| Amreha ($V_1$) | 0.48 | 0.49 | 0.51 | 0.91 | 0.92 | 0.87 |
| Manakwar ($V_2$) | 0.49 | 0.47 | 0.45 | 0.84 | 0.80 | 0.77 |
| Semra Kalbana($V_3$) | 0.48 | 0.45 | 0.43 | 0.82 | 0.77 | 0.73 |
| Ghurpur ($V_4$) | 0.56 | 0.54 | 0.51 | 0.96 | 0.84 | 0.80 |
| Bhamaur ($V_5$) | 0.47 | 0.43 | 0.43 | 0.80 | 0.73 | 0.73 |
| Gadra ($V_6$) | 0.51 | 0.45 | 0.44 | 0.87 | 0.77 | 0.75 |
| Kachara($V_7$) | 0.56 | 0.45 | 0.40 | 0.91 | 0.92 | 0.87 |
| Manpur($V_8$) | 0.53 | 0.53 | 0.47 | 0.96 | 0.84 | 0.80 |
| Rampur($V_9$) | 0.51 | 0.45 | 0.44 | 0.84 | 0.80 | 0.77 |
| MEAN | 0.51 | 0.46 | 0.45 | 0.82 | 0.79 | 0.82 |
| | F-test | S.Ed.(±) | CD at 5% | F-test | S.Ed.(±) | CD at 5% |
| Due to depth | S | 0.024 | 0.024 | S | 0.064 | 0.00001 |
| Due to site | S | 0.064 | 0.00001 | S | 0.024 | 0.024 |

**Table 4:** Available NPK (kg ha-1) at different depths (cm) and villages of Jasra block Prayagraj

| Village | Available Nitrogen (kg ha-1) | | | Available Phosphorus (kg ha-1) | | | Available Potassium (kg ha-1) | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0-15 cm | 15-30 cm | 30-45 cm | 0-15 cm | 15-30 cm | 30-45 cm | 0-15 cm | 15-30 cm | 30-45 cm |
| Amreha ($V_1$) | 268 | 263 | 267 | 17.92 | 16.30 | 15.11 | 165.21 | 161.29 | 150.22 |
| Manakwar ($V_2$) | 274 | 269 | 260 | 17.82 | 16.31 | 14.28 | 220.7 | 173.56 | 169.31 |
| Semra Kalbana($V_3$) | 275 | 270 | 257 | 16.20 | 15.27 | 14.26 | 192.14 | 188.17 | 175.21 |
| Ghurpur ($V_4$) | 279 | 272 | 268 | 18.15 | 16.46 | 15.65 | 225.21 | 212.65 | 193.33 |
| Bhamaur ($V_5$) | 269 | 265 | 260 | 17.82 | 15.30 | 15.21 | 193.15 | 189.22 | 179.20 |
| Gadra ($V_6$) | 270 | 267 | 259 | 17.20 | 16.21 | 15.32 | 191.32 | 188.54 | 175.65 |
| Kachara($V_7$) | 279 | 266 | 261 | 17.80 | 16.32 | 15.30 | 216.70 | 175.12 | 170.12 |
| Manpur($V_8$) | 277 | 272 | 267 | 18.12 | 16.40 | 15.37 | 221.20 | 195.12 | 188.56 |
| Rampur($V_9$) | 270 | 262 | 257 | 16.50 | 16.40 | 15.14 | 180.22 | 180.00 | 171.11 |
| MEAN | 273 | 268 | 262 | 17.62 | 16.07 | 15.06 | 200.65 | 184.8522 | 174.74 |
| | F-test | S.Ed.(±) | CD at 5% | F-test | S.Ed.(±) | CD at 5% | F-test | S.Ed.(±) | CD at 5% |
| Due to depth | S | 0.064 | 0.00001 | S | 0.064 | 0.00001 | S | 14.2168 | 0.001407 |
| Due to site | S | 0.024 | 0.024 | S | 0.024 | 0.024 | S | 13.056 | 0.000237 |

**Table 5:** Available Sulphur (ppm) at different depths (cm) and villages of Jasra block Prayagraj

| Village | Sulphur (kg ha-1) | | |
|---|---|---|---|
| | 0-15 cm | 15-30 cm | 30-45 cm |
| Amreha ($V_1$) | 10.25 | 9.30 | 8.95 |
| Manakwar ($V_2$) | 9.10 | 8.45 | 8.25 |
| Semra Kalbana($V_3$) | 12.30 | 10.55 | 9.60 |
| Ghurpur ($V_4$) | 12.30 | 11.8 | 9.90 |
| Bhamaur ($V_5$) | 10.3 | 9.10 | 8.65 |
| Gadra ($V_6$) | 9.65 | 8.80 | 8.00 |
| Kachara($V_7$) | 9.22 | 9.01 | 8.77 |
| Manpur($V_8$) | 12.10 | 11.55 | 9.67 |
| Rampur($V_9$) | 10.65 | 9.82 | 8.97 |
| MEAN | 10.25 | 9.30 | 8.95 |
| | F-test | S.Ed.(±) | CD at 5% |
| Due to depth | S | 1.062 | 6.22 |
| Due to site | S | 0.855 | 0.00002 |

## Conclusion

It is concluded from the trial that the soils of Jasra block, Prayagraj are Silty-loam with adequate BD, PD and Pore and Pore Space. It is neutral to low alkaline as favourable Electrical Conductivity For plant growth, fertility high to moderately and low to medium of micronutrients *viz*. Nitrogen, Phosphorus and Potassium. Some sites showed a deficiency in secondary nutrients *i.e.* calcium, magnesium and sulphur. The deficiency of the nutrients can be mitigated by the use of organic and inorganic fertilizers. It is concluded that village Ghurpur and Manpur have more fertile soil which gives higher yields of crops as compare to other villages. Most of the farmers cultivate of paddy, wheat, maize, millet, pulses, potato, sugarcane *etc*., they are required to maintain Soil Health Card according to the guidelines of central and state government for crop cultivation and advise to adopt suitable management practices and provide proper nutrition to soil health. Time to time inventory should be maintained to overcome to the pollution effect in their respective soil.

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