__Original Research Article__

Evaluation of soil Fertility and Physico-chemical properties of semi-arid region of eastern Jaipur Rajasthan

Abstract

An investigation on GPS based soil chemical properties and fertility status of three different block and each block 3 villages (Chomu, Sanganer, Shahpura) of Jaipur district was under taken during the year 2021-22. 27 soil samples were collected at three different depth (0-15, 15-30, 30-40 cm) and analysed. Different results were reported. The colour of soil samples changed with the depth. The pH of soils ranged between (pH 7.40 - 7.58). The electrical conductivity of soil of entire studied area were less than 1 dSm^{-1}. The soil organic carbon status was low to medium, ranges from 0.10 to 0.25 % and organic matter ranged 0.17 – 0.43%. The available nitrogen content of entire studied area was low (166.37 to 192.75 kg ha^{-1}). The available phosphorus and potassium content varied in between 13.24 to 37.77 kg ha^{-1} and 146.88 to 232.32 kg ha^{-1}. The available zinc, iron, copper and manganese of soil ranged between 0.56 to 0.32 mg kg^{-1}, 2.23 to 2.97 mg kg^{-1}, 0.40 to 0.67 mg kg^{-1} and 2.17 to 2.95 mg kg^{-1}. The fertility data base would be very useful for extension functionaries, agricultural officers, scientist and above all the farmers for a sustainable crop production.

Key words: Physico-Chemical properties, pH, E.C., O.C., Nitrogen, Potassium, Phosphorus, soil analysis, Jaipur district.

Introduction

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 top soil (Chandra *et al.,* 2009). The most important constituents in soil are organic matter, an appreciable amount of it in soil tremendously increase soil fertility. Decay of organic matter release nitrogen, phosphorus and mineral nutrients in forms available to plant. Organic carbon is also positively correlated with total and available nitrogen in all soil groups. Similarly, the soil reaction (pH) and electrical conductivity have marked effect on plant growth (Verma *et al*., 1980).

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Micro nutrients are also essential for crop growth but are not regularly applied in the soil along with the common fertilizers used by the farmers. Their removal from the soil had been for centuries without any systematic replenishment (Sharma *et al.*, 2008).

Micronutrient deficiencies were first reported at the end of the 19th century and today it is well known that the extensive areas of our soils are in capable of supplying plants with sufficient amount of micro nutrients. The application of fertilizer in the soil having only major nutrients, the loss of micronutrients thought plant uptake and leaching, the decreasing proportion of farm yard manure and other organic manures in comparison with fertilizers and several other factors collectively contribute towards the deficiency of micronutrients in soils (Rattan *et al*., 2009).

Materials and Methods

The soil samples will be collected from various villages at least 10 k.m. apart from different blocks of Jaipur district having variation in slope/topography, colour and cropping pattern and behavior. Three depth-wise samples viz., 0 to 15 cm, 15 to 30 cm and 30 to 45 cm will be collected and analyzed. Samples will be collected only from the open places. Separate sampling calendar has been made for each parameter to be studied. The samples will be analysed for morphological, phsico-chemical properties. A sample collection sheet is prepared for proper tagging and packing of the samples on the site. Jaipur is the capital city as well as the largest city of state of Rajasthan. Geographically, Jaipur district lies at Longitude 26°9’1.24” N and latitude75°7’8.73” E. Total geographical area of the district is 11,06,148 ha. or 11061.48 sq km. The total Gross Cropped Area of the city is 8,48,313 ha with Net Sown Area being 6,63,167 ha out of which only 3,02,428 ha is Net Irrigated Area. Jaipur district falls in agro-climatic zone 3-A semi-arid eastern plain zone. The district is characterized with mild winter and hot summer. The mean maximum & minimum temperature of the area is 40.6 Degree centigrade and 6.2 Degree centigrade respectively. The temperature fluctuates as high as 47 degrees centigrade in the month of May & June and as low as 1.0 Degree centigrade in the month of January. Jaipur district receives around 650 mm rainfall annually and hence the climate here is typically humid. Monsoon occurs from June till September. Heavy rains and thunderstorms are observed in the monsoon season. Throughout the year, the temperature remains on the higher side.

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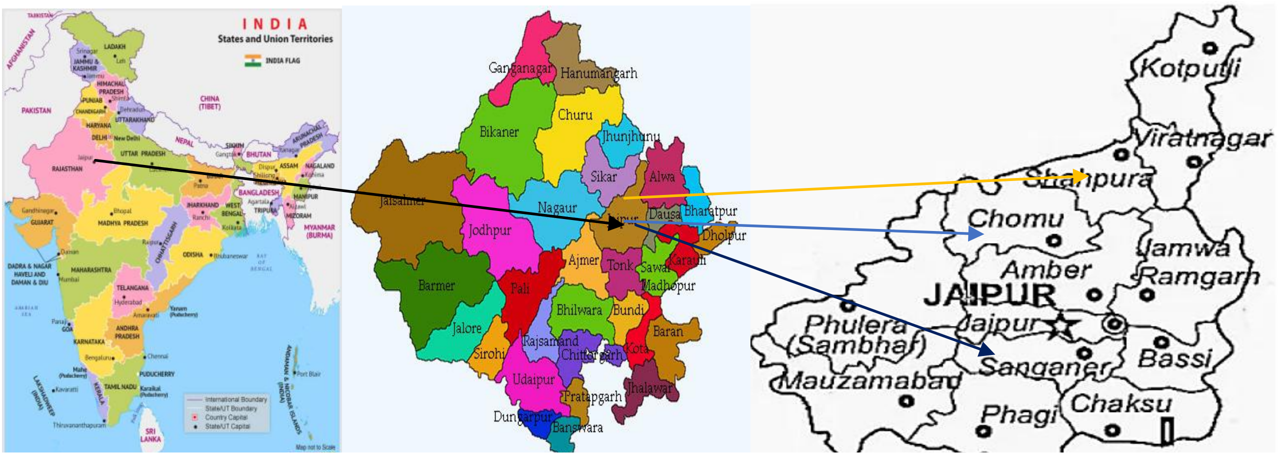

Fig. 1. Sites of study area

List 1: Soil Samples Collection Site

S. No.	Blocks	Village	Latitude (^{0}N)	Longitude (^{0}E)
1.	Chomu (B_1)	Keshav Nagar (V_1)	26.9039^0	75.7844^0
		Morija (V_2)	27.2068^0	75.7582^0
		Nindola (V_3)	27.3185^0	75.7081^0
2.	Sanganer (B_2)	Goner (V_4)	26.8865^0	75.8341^0
		Shrikishanpura (V_5)	26.7998^0	75.8582^0
		Durgapura (V_6)	26.8518^0	75.7862^0
3.	Shahpura (B_3)	Shivpuri (V_7)	26.9426^0	75.7526^0
		Manoharpur (V_8)	26.2994^0	75.9571^0
		Nwalpura (V_9)	26.8103^0	75.8365^0

Collection of Soil Sample:

Soil samples were collected randomly from a site using Khurpi and Phawrah at the depth of (a) 0-15cm, (b) 15-30cm, (c) 30-45 cm. Composite soil samples (by the process of conning and quartering method) was collected by Stratified soil sampling method (Sahrawat *et al*., 2008, 2011; Chander *et al*., 2013) and processed to analyzed the Physico-chemical properties and available nutrient content. The detailed information is as follows. The grid soil samples at desired depth were taken as per the objective of the experiments. Record of latitude and

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longitude were maintained using GPS. The soil samples were collected with Khurpi, Phawrah and Soil Auger.

Process of Soil Sampling: After collecting the soil samples, they were brought to the laboratory. These samples were dried under shade. After that the processing was done as follows: After the air drying under shade the unwanted materials like roots, stones, and others are should be discard. The clods in the sample would be broken by using the wooden mallet. After that the samples should be sieved with 2 mm sieve. Sieved samples should be stored in polybags for further estimation of different Physico-chemical parameters.

All the precautions were followed as the procedure described by Jackson, (1973) and the standard procedure outlined by the Page *et al*. (1982) were used to estimate chemical properties of the soil.

Analysis of soil: The physico-chemical properties and available nutrient content of soil are to be analyzed by the following standard protocols in table number 1.

The implementing design for the experiment was CRD (Completely Randomized Design) which is most flexible and simplest design. It is used when the experimental units are homogenous as it involves two basic principles of the design of the experiment namely Replication and Randomization.

Methods of Analysis: The methods of analysis of different soil parameters are discussed below in table - 1

S.No.	Parameters	Method	Scientist
1.	Soil pH	Digital pH meter	Jackson,1958
2.	Electrical conductivity (dSm^{-1})	Digital EC meter	Wilcox,1950
3.	Organic Carbon (%)	Rapid Titration	Walkley and Black, 1947
4.	Available Nitrogen (kg ha^{-1})	Alkaline potassium permanganate	Subbiah and Asija, 1956
5.	Available Phosphorous (kg ha^{-1})	Colori meter	Olsen *et al.*,1954
6.	Available Potassium (kg ha^{-1})	Flame photometer	Toth and Prince,1949
7.	Micro nutrients (Fe, Cu, Mn, Zn)	DTPA extractable method by AAS	Lindsay and Norvell, 1978

(Source: Jaiswal,2011)

Result and discussion

pH of soil w/v (1:2.5) :- The Table 2 and Figure 1 depicts the statistical analysis on pH of villages and depths which was found to be significant due to depths and due to site. In soil depths the maximum pH was found 8.08 at 30-45 cm in village Goner (V_4) and minimum pH was found 6.22 at 0-15 cm in village Nwalpura (V_9). The increase in pH with depths of soil is

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possibly due to leaching down of salts from upper soil depths to lower soil depths, which is accumulation of salts in lower depths of soil and increase in soil pH. Similar results were reported by Mehta *et al*. (2012), Gill *et al*. (2012) and Maheshwari and Sharma, (2013).

Electrical conductivity (dSm^{-1}) :- The Table 2 and Figure 1 depicts the statistical analysis on electrical conductivity of villages and depths which was found to be significant due to depths and due to site. In soil depths the maximum electrical conductivity was found 0.62 dSm^{-1} at 0-15 cm in village Manoharpur (V_8) and minimum electrical conductivity was found 0.36 dSm^{-1} at 30-45 cm in village Goner (V_4). The low EC may be due to good drainage conditions which favoured the removal of released bases by percolating and drainage water. Similar results were reported by Mehta *et al*. (2012), Gill *et al*. (2012) and Ram *et al*. (2010).

Organic carbon (%) :- The Table 2 and Figure 1 depicts the statistical analysis on organic carbon of villages and depths which was found to be significant due to depths and due to site. In soil depths the maximum organic carbon was found 0.25 % at 0-15 cm in village Nwalpura (V_9) and minimum organic carbon was found 0.10 % at 30-45 cm in village Nindola (V_3). organic carbon content of these soils was found to be and ranging from 0.10 to 0.25. The organic carbon content decreased with depths and this is due to the addition of plant residues surface horizons than in the lower horizons. Similar results were reported by Mehta *et al*. (2012), Gill *et al*. (2012), Maheshwari and Sharma (2013).

Organic matter (%) :- The Table 2 and Figure 1 depicts the statistical analysis on organic matter of villages and depths which was found to be significant due to depths and due to site. In soil depths the maximum organic matter was found 0.43 % at 0-15 cm in village Nwalpura (V_9) and minimum organic matter was found 0.17 % at 30-45 cm in village Nindola (V_3). Organic matter content of these soils was found to be low to medium and ranging from 0.17 to 0.43%. The organic matter content decreased with depths and this is due to the addition of plant residues surface horizons than in the lower horizons. Similar results were reported by Mehta *et al*. (2012), Gill *et al*. (2012), Maheshwari and Sharma (2013).

Available nitrogen (kg ha^{-1}) :- The Table 2 and Figure 2 depicts the statistical analysis on available nitrogen of villages and depths which was found to be significant due to depths and due to site. In soil depths the maximum available nitrogen was found 198.11 kg ha^{-1} at 0-15 cm in village Nwalpura (V_9) and minimum available nitrogen was found 157.56 kg ha^{-1} at 30-45 cm in village Durgapura (V_6). The available nitrogen status in the entire area was found to be low to medium. The reason may be attributed to the fact that nitrogen content is positively correlated with organic matter content which decreases with depths. Similar result were reported by Misnra *et al*. (2014), Dash *et al*. (2018) and Digal *et al*. (2018).

Available phosphorus (kg ha^{-1}) :- The Table 2 and Figure 2 depicts the statistical analysis on available phosphorus of villages and depths which was found to be significant due to depths and due to site. In soil depths the maximum available phosphorus was found 37.77 kg ha^{-1} at 0-15 cm in village Nwalpura (V_9) and minimum available phosphorus was found 13.24 kg ha^{-1} at 30-45 cm in village Morija (V_2). The available P varied from 13.24 to 37.77 kg ha^{-1} in different depths and villages, which is low to medium content of phosphorus in soil. The maximum P content was observed in the surface horizons and decreased with depths. Similar results were reported by Meena *et al*. (2010), Dash *et al*. (2019) and Digal *et al*. (2018).

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Available potassium (kg ha^{-1}) The Table 2 and Figure 2 depicts the statistical analysis on available potassium of villages and depths which was found to be significant due to depths and due to site. In soil depths the maximum available potassium was found 232.32 kg ha^{-1} at 0-15 cm in village Nwalpura (V_9) and minimum available potassium was found 146.88 kg ha^{-1} at 30-45 cm in village Morija (V_2). The available potassium in soil varied in high range (146.88 to 232.32 kg ha^{-1}). The maximum K content was observed in the surface horizons and showed more or less decreasing trend with depths. This might be attribute to more intense weathering, release of liable K from organic residues, application of K fertilizers and upward translocation of K from lower depths along with capillary rise of ground water. Similar results were reported by Urmila *et al*. (2018), Sharma and Chaudhary (2017) and Digal *et al*. (2018).

Available zinc (mg kg^{-1}) :- The Table 2 and Figure 2 depicts the statistical analysis on available zinc of villages and depths which was found to be significant due to depths and due to site. Low values of available zinc were recorded in all the sites. In soil depths the maximum available zinc was found 0.56 mg kg^{-1} at 0-15 cm in village Nwalpura (V_9) and minimum available zinc was found 0.32 mg kg^{-1} at 30-45 cm in village Nindola (V_3). The available zinc in soil varied in high range (0.56 to 0.32 mg kg^{-1}). Low values of zinc may be due to high availability of phosphorus which has an antagonistic effect on zinc. Similar results were reported by Urmila *et al*. (2018) and Singh *et al*. (2013).

Available iron (mg kg^{-1}) :- The Table 2 and Figure 2 depicts the statistical analysis on available iron of villages and depths which was found to be significant due to depths and due to site. Low values of available iron were recorded in all the sites. In soil depths the maximum available ironwas found 2.97 mg kg^{-1} at 0-15 cm in village Nwalpura (V_9) and minimum available iron was found 2.23 mg kg^{-1} at 30-45 cm in village Nindola (V_3). The available iron in soil varied in high range (2.23 to 2.97 mg kg^{-1}). Deficiency of iron in an acidic soil is usually due to the effect of deficiency of another nutrient as in this case, of calcium deficiency and manganese toxicity. Iron values varied significantly with depths. Similar results were reported by Yadav *et al*. (2009) and Singh *et al*. (2013).

Available copper (mg kg^{-1}) :- The Table 2 and Figure 2 depicts the statistical analysis on available copper of villages and depths which was found to be significant due to depths and due to site. Low values of available copper were recorded in all the sites. In soil depths the maximum available copper was found 0.67 mg kg^{-1} at 0-15 cm in village Nwalpura (V_9) and minimum available copper was found 0.40 mg kg^{-1} at 30-45 cm in village Manoharpur (V_8). The available copper in soil varied in high range (0.40 to 0.67 mg kg^{-1}). Low levels of copper may be attributed to high organic matter content while high values may be the result of low soil pH. Similar results were reported by Yadav *et al*. (2009) and Meena *et al*. (2017).

Available manganese (mg kg^{-1}) :- The Table 2 and Figure 2 depicts the statistical analysis on available manganese of villages and depths which was found to be significant due to depths and due to site. In soil depths the maximum available manganese was found 2.95 mg kg^{-1} at 0-15 cm in village Nwalpura (V_9) and minimum available manganese was found 2.17 mg kg^{-1} at 30-45 cm in village Manoharpur (V_8). The available manganese in soil varied in high range (2.17 to 2.95 mg kg^{-1}). Low levels of manganese may be attributed to high organic matter content while high values may be the result of low soil pH. Similar results were reported by Baishya *et al*. (2017) and Meena *et al*. (2017).

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Conclusion :- The present study area the soil pH was acidic to moderately acidic, the main reason is increasing trend of using nitrogenous fertilizer in the area and very normal with respect soluble salt content. Physico-chemical properties of soil to be affected by the management practices adopted by the farmers and the degree of manure and fertilizer usage over a period of time. The variable concentrations of various parameters and irregular distributions of micronutrients may be attributed due to the added fertilizers during the crop production. It is concluded that there is a need of proper nutrition and management approaches for attain optimum economic yield and maintain soil fertility.

References

Baishya, K., Challa, O. and Prasad, J. (2017) Available Micronutrient Status and Their Relationship with Soil Properties of Jhunjhunu Tehsil, District Jhunjhunu, Rajasthan. *Journal of Agricultural Science.* 1(2): 25-32.

Chandra, R. and Singh, S.K. (2009) Study of macro nutrient and physical status of soil in a part of Varuna River in Varanasi, India. *International journal of environmental sciences*, 4(4):468-471.

Chander, P., Middha, R., Jain, S. and Juneja, S. K. (2013) A Comparative Study of Physico-Chemical Parameters of Restored and Unrestored Soils of Two Villages of *Chaksu* Block, Jaipur, Rajasthan. *International Journal of Engineering Technology Science and Research*. (2): 9-13.

Dash, P.K., Mishra, A. and Saren, S. (2019) Vertical distribution of available nutrients in an Eastern Indian Catena. *Annals of Plant and Soil Research*, 21(4): 320-325.

Digal, M., Saren, S., Mishra, A., Dash, P.K., Swain, N. and Acharya, B.P. (2018) Soil fertility status of some villages in Phiringia block of Kandhamal district under North Eastern Ghat agro climatic zone of Odisha, India *Journal of Pharmacognosy and Phytochemistry*; 7(6): 658-662.

Gill, R.S., Kanthaliya, P.C. and Giri, J.D. (2012) Characterization and classification of soils Phalasia block of Udaipur district, Rajasthan. *Agropedology*, 22(1): 61-65.

Jackson, M.L. (1973) *Soil Chemical Analysis*. Oxford IBH Publishing House, Bombay. 38.

Jaiswal, P.C. (2011) Soil, Plant and Water Analysis, 72-132.

Maheshwari and Sharma (2013) Soil Status in Relation to Blast Disease in Jaipur district of Rajasthan, India. *International Journal of Pure & Applied Bioscience*, 1(1): 13-19. *Applied Sciences*, 6(8): 3765-3772.

Mehta, K.M., Shankaranarayana, H.S. and Jaisinghani, C.J. (2012) Study of Pedo Genesis of soils of Jaipur district (Rajasthan). *Soil Science and Plant Nutrition*, 8(5): 32-38.

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Misnra, A., Pattnaik, T.M., Das, D. and Das (2014) Vertical Distribution of Available Plant Nutrients in Soils of Mid Central Valley at Odisha Zone, India, *American Journal of Experimental Agriculture*.7(4): 214-22.

Meena, H.B., Giri, J.D. and Mishra, H.K. (2010) Nutrient availability in soils as affected by physiography in Chittorgarh district, Rajasthan. *Agropedology,* 20(1): 85-87.

Meena, R.S. and Mathur, A.K. (2017) Distribution of Micronutrients in Soil of Garhi Tehsil, Banswara District of Rajasthan. *International Journal of Current Microbiology and Applied Sciences*, 6(8): 3765-3772.

Page, A.L., Millar, R.H. and Kenny, D. R. (1982) Methods of Soil Analysis. *American Society of Agronomy*. Madison, Wisconsin, USA. pp. 1159.

Ram, D., Ram, T. and Subhash, C. (2010) Characterization and classification of flood-prone soils of eastern plains of Rajasthan for their corrective measures. *Journal of the Indian Society of Soil Science*. 58: 228232.

Rattan, A.P., Naidu, M.V.S., Ramavatharam, N. and Rao, G.R. (2009) Characterization, classification and evaluation of soils on different land forms in Ramchandra Puram Mandal of Chittoor district in Andhra Pradesh for sustainable land use planning. *Journal of the Indian Society of Soil Science*. 56: 23–33.

Sharma, P.D. (2008) Nutrient management challenges and options. *Journal of the Indian Society of Soil Science*. 33: 672-675.

Sahrawat, N., Nama, K. S. and Choudhary, K. (2008) Study on Soil Parameters of Selected Sites in Mukundara Hills National Park, Kota, Rajasthan. *Int. J. Pure App. Biosci.* 4 (4): 316-320.

Sharma, K. M. and Chaudhary, H. (2017) Physico Chemical Analysis of Soils of Digod Tehsil, Kota and Their Statistical Interpretation. *International Journal of Science and Research*, 1681-1683.

Singh, S.P., Srivastava, P.C. and Singh, P. (2013) Different forms of sulphur in soils of Udham Singh Nagar district, Uttarakhand and their relationship with soil properties. *Agropedology*, 19(1): 68-74.

Urmila, P., Singh, H.S., Meena, D., Jain, S.C., Kumar, H.K., Amit and Verma, S.N. (2018) Effect of tillage on physico-chemical indices of soil of southern Rajasthan. *International Journal of Chemical Studies*, 6(4): 2490- 2493.

Yadav, R.L. and Meena, M.C. (2009) Available micronutrient status and their relationship with soil properties of Degana soil series of Rajasthan. *Journal of the Indian Society of Soil Science*, 57:90-92.

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Table No.- 2 :- Electrical conductivity (E.C), pH, organic carbon (OC), organic matter (OM), nitrogen (N), phosphorus (P), potassium (K), zinc (Zn), iron (Fe), copper (Cu), manganese (Mn) available of soil in different villages of Jaipur at 0-15 cm, 15-30 cm and 30-45 cm depths.

	Villages	**Depth (cm)**	**EC (dS/m)**	**pH**	**OC (%)**	**OM (%)**	**N (kg/ha)**	**P (kg/ha)**	**K (kg/ha)**	**Zn (mg/kg)**	**Fe (mg/kg)**	**Cu (mg/kg)**	**Mn (mg/kg)**
B_1	**V_1**	**0-15**	0.51	7.17	0.20	0.34	187.92	22.14	180.61	0.43	2.55	0.59	2.05
		15-30	0.45	7.36	0.18	0.31	180.86	20.45	169.80	0.40	2.41	0.56	1.99
		30-45	0.42	7.44	0.16	0.27	171.74	18.30	155.29	0.38	2.58	0.53	1.86
	V_2	**0-15**	0.60	7.24	0.18	0.31	175.36	18.36	175.98	0.41	2.46	0.50	2.75
		15-30	0.55	7.46	0.15	0.25	169.12	15.70	163.33	0.38	2.42	0.48	2.63
		30-45	0.48	7.67	0.12	0.20	162.76	13.24	146.88	0.36	2.39	0.47	2.50
	V_3	**0-15**	0.53	7.10	0.17	0.29	170.17	19.40	203.81	0.42	2.38	0.56	2.80
		15-30	0.48	7.29	0.14	0.24	163.10	17.99	195.30	0.36	2.35	0.53	2.70
		30-45	0.42	7.52	0.10	0.17	158.94	15.62	172.40	0.32	2.23	0.51	2.64
B_2	**V_4**	**0-15**	0.41	6.76	0.19	0.32	193.89	28.92	209.10	0.49	2.95	0.52	2.72
		15-30	0.38	7.91	0.17	0.29	183.09	25.22	197.99	0.47	2.82	0.49	2.59
		30-45	0.36	8.08	0.13	0.22	172.14	22.39	179.84	0.45	2.79	0.47	2.46
	V_5	**0-15**	0.57	6.35	0.24	0.41	198.30	32.44	221.21	0.46	2.88	0.58	2.86
		15-30	0.48	7.47	0.19	0.32	186.33	29.63	217.70	0.44	2.75	0.55	2.72
		30-45	0.42	7.49	0.15	0.25	173.99	26.10	189.56	0.41	2.71	0.53	2.68
	V_6	**0-15**	0.61	7.31	0.18	0.31	178.13	21.15	189.80	0.52	2.45	0.49	2.45
		15-30	0.56	7.43	0.15	0.25	163.44	18.79	175.04	0.47	2.34	0.46	2.31
		30-45	0.52	7.55	0.12	0.20	157.56	15.29	162.16	0.32	2.27	0.44	2.28
B_3	**V_7**	**0-15**	0.53	6.37	0.21	0.36	182.13	30.97	236.64	0.44	2.77	0.60	2.59

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		15-30	0.47	7.59	0.18	0.31	173.44	27.17	224.50	0.41	2.70	0.57	2.46
		30-45	0.42	7.64	0.15	0.25	167.56	24.88	190.99	0.39	2.58	0.56	2.32
	V_8	0-15	0.62	7.25	0.19	0.32	192.21	26.64	217.27	0.49	2.60	0.54	2.34
		15-30	0.60	7.42	0.16	0.27	185.81	22.08	199.69	0.46	2.54	0.41	2.21
		30-45	0.57	7.51	0.13	0.22	178.66	18.51	186.07	0.42	2.41	0.40	2.17
	V_9	0-15	0.51	6.22	0.25	0.43	198.11	37.77	232.32	0.56	2.97	0.67	2.95
		15-30	0.46	7.39	0.22	0.37	192.79	34.21	225.54	0.52	2.90	0.64	2.82
		30-45	0.44	7.52	0.19	0.32	187.37	29.64	208.61	0.48	2.82	0.61	2.73
F-test	**Due to depths** / **Due to site**		S	S	S	S	S	S	S	S	S	S	S
S.Ed. (±)	**Due to depths**		0.04	1.75	0.05	0.15	8.08	3.71	13.15	0.02	0.04	0.02	0.04
	Due to site		0.55	5.42	0.07	0.23	13.11	7.15	39.68	0.03	0.63	0.07	0.42
C.D. at 5%	**Due to depths**		0.007	0.007	0.012	0.038	0.008	0.021	0.003	0.001	0.003	0.006	0.008
	Due to site		0.002	0.004	0.018	0.043	0.009	0.018	0.009	0.002	0.006	0.003	0.006

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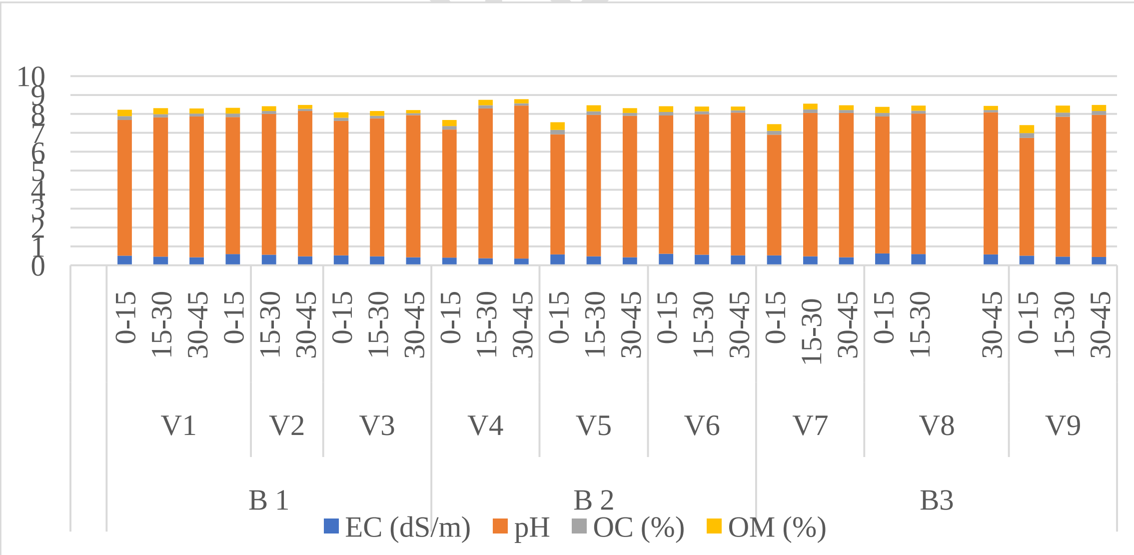

Fig.-2 Fertility status at study area

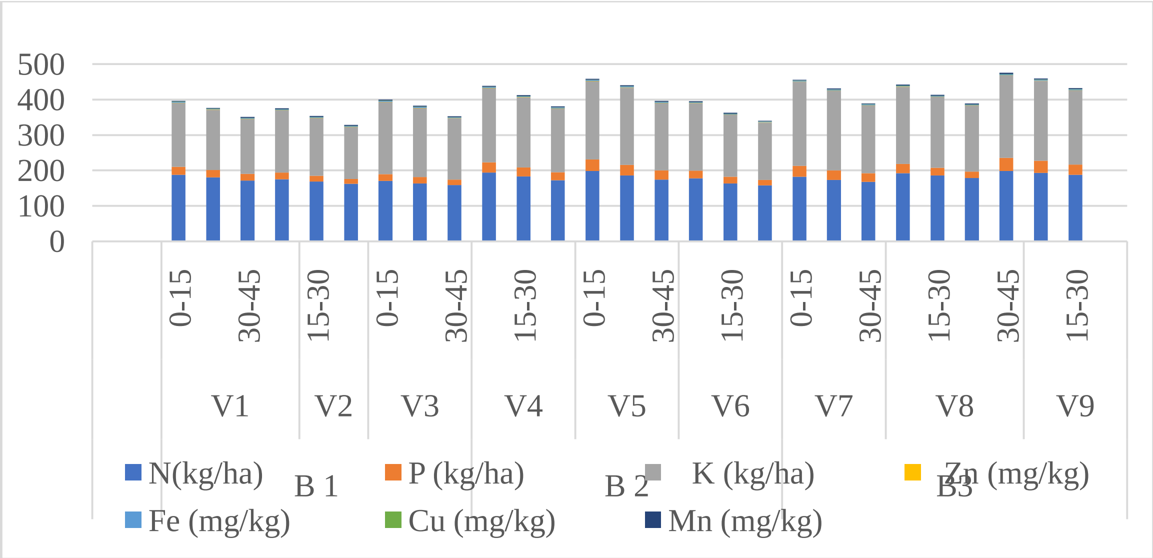

Fig.-3 **Available nutrient at study area**

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