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Comparative Accounts Of Seasonal Various in Physicochemical Properties of Soil from Selected Wetlands of Unjha and Visnagar Taluka of Mehsana District

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Abstract--Soil is the one of the most important and precious resources of the nature. Physicochemical properties of the soil may vary through the seasons. The present study deals with study of physicochemical parameters like pH, electrical conductivity, organic carbon, total nitrogen, available phosphorus and available potassium from March 2013 to February 2014. Result showed that all the physicochemical parameters were higher in summer except total nitrogen, which was higher in monsoon season. Some parameters like pH, electrical conductivity and total nitrogen were under permissible limit, while some parameters like organic carbon, available phosphorus and available potassium were above the permissible limit. Mem talav and Narkodi talav were shows excessive concentration of Organic carbon, available phosphorus and available potassium from Unjha and Visnagar taluka respectively, which indicate anthropogenic input due to various activities by local people.

Keywords: wetlands, physicochemical properties, Seasonal variation, soil.

I. INTRODUCTION

Soil is the one of the most important and precious resources of the nature, which is composed of particles of broken rocks that have been altered by chemical and environmental processes that include weathering and erosion. Soil provide as more reliable key for productivity than water qualities¹. Plants depends on soil for nutrient, water and mineral supplement²⁻³. Physicochemical parameters of soil may vary through the seasons which also reflect soil productivity and plant development⁴. Soil organic carbon and soil total nitrogen are identified as factors that essential to soil fertility⁵ and it's also affects nutrient cycling, soil structure and water availability in natural ecosystem⁶. Soil properties have also influence due to any changes in hydrological regime of wetlands⁷.

II. MATERIAL AND METHODS

A. Area of Study

The climatic condition of Unjha and Visnagar taluka are fluctuated with three successive seasons. The maximum temperature has been recorded in the month of May/ June is 45°C, which decreasing in the month of October with minimum temperature reaches up to 18°C. Study area are located between 23°43' and 23°48' North latitude and 72°14' and 72°33' East longitude. Five wetlands were selected each from Unjha and Visnagar taluka viz. Malai talav, Gam talav, Mem talav, Aithor talav, Navapura lake and Bhandu pond, Sharifa talav, Narkodi talav, Nava talav, Jakhad talav respectively.

B. Sample Collection

Soil samples were collected from selected wetlands of two taluka namely Unjha and Visnagar taluka in Mehsana district. Soil sample taken at 0-15 cm depth in polythene begs during three successive seasons (winter, summer and monsoon) of the year from March 2013 to February 2014. For soil analysis, various physicochemical parameters like pH, electrical conductivity (EC), organic carbon (OC), available potassium, available phosphorus and total nitrogen were analysed in laboratory.

C. Physicochemical Analysis of Soil

Soil samples were collected from Malai talav, Gam talav, Mem talav, Aithor talav, Navapura lake from Unjha taluka and Bhandu

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pond, Sharifa talav, Narkodi talav, Jakhad talav, Nava talav from Visnagar taluka. pH was measured by digital pH meter, Electrical Conductivity by EC meter, organic carbon by volumetric method, available potassium by Flame photometric method, available phosphorus by Olsen's method, total nitrogen by Kjeldahl Method⁸.

III. RESULT AND DISCUSSION

During present investigation seasonal variation in various parameters of wetlands soil were observed and discussed as follow-

Table 1: Comparative analysis of seasonal variation in physicochemical properties of soil between two taluka

Sr. No.	Physicochemical properties	Unjha taluka					Visnagar taluka					
		1	2	3	4	5	1	2	3	4	5	
1	pH	S	7.18	7.5	7.58	7.4	7.25	7.4	7.25	7.33	7.13	7.13
		M	6.78	6.7	6.9	6.78	6.75	6.73	6.7	6.83	6.58	6.63
		W	6.88	7.05	7.05	7	7	6.83	6.8	6.98	6.78	6.65
2	EC	S	1.33	1.76	2.97	1.54	1.47	1.67	1.31	1.61	1.41	1.23
		M	0.75	1.19	1.96	0.97	0.92	1.01	0.86	0.99	0.72	0.63
		W	0.92	1.33	2	1.15	1.08	1.15	0.99	1.25	0.95	0.8
3	OC	S	0.2	0.29	0.63	0.19	0.26	0.22	0.29	0.39	0.14	0.27
		M	0.38	0.48	1.14	0.36	0.5	0.44	0.49	0.61	0.33	0.5
		W	0.3	0.4	0.89	0.3	0.4	0.37	0.43	0.53	0.24	0.38
4	TN	S	0.38	0.3	1.39	0.26	0.38	0.49	0.38	0.77	0.31	0.34
		M	0.74	0.74	2.18	0.66	0.8	1.14	0.85	1.37	0.7	0.81
		W	0.6	0.59	1.81	0.55	0.7	0.81	0.74	1.24	0.59	0.66
5	P	S	12.91	13.91	26.21	13.34	13.13	16.63	11.89	23.03	12.13	13.81
		M	9.27	10.32	16.41	9.56	9.31	11.28	8.39	18.78	8.73	8.9
		W	8.8	7.96	13.41	7.2	7.36	9.49	6.52	15.37	6.19	6.56
6	K	S	111.8	123	255.8	104.3	133	197.5	174.8	184	86.75	116.3
		M	61	79	162.8	59	77.5	121	127.8	128	38.75	62.25
		W	74.75	91.25	179.8	69.75	96.5	140.5	140.8	142.8	51.5	76.25

*Where, S = Summer, M = Monsoon and W = Winter seasons. Unjha taluka: 1) Malai talav 2) Gam talav 3) Mem talav 4) Aithor talav 5) Navapura lake. Visnagar taluka: 1) Bhandu pond 2) Sharifa talav 3) Narkodi talav 4) Jakhad talav 5) Nava talav

pH: Soil pH considered in to acidic, neutral and alkaline according to its reaction or concentration of H ions . pH value reveals that maximum pH were recorded in summer with mean value range from 7.13 to 7.58, moderate in winter with 6.65 to 7.05 and minimum in monsoon season with mean value range from 6.58 to 6.9. The location Mem talav recorded maximum value 7.58 and the location Gam talav recorded minimum mean value 6.70 from Unjha taluka, while Bhandu pond with maximum 7.4 and Jhakhad talav with minimum mean value 6.58 from Visnagar taluka (Table 1). pH is helps in ensuring availability of plant nutrient like Fe, Mn, Zn and Cu are more available in acidic than alkaline soil. The soil pH range from 6.5 to 7.5 is ideal for plant growth⁵. All the collected data indicated that the value of pH is within permissible range from 6.5 to 8.5 as per BIS (Figure 1).

Electrical Conductivity (ds/m): As per standard, permissible limit of electrical conductivity was range from 0-2 ds/m salt free, 2-8 ds/m slightly saline, 8-15 moderate saline and > 15 highly saline. Electrical conductivity is general measure of the soluble salt

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content of a soil. Conductivity depends upon dilution of soil suspension 5. The higher EC mean value were range from 1.23 ds/m to 2.97 ds/m in summer, medium 0.8 ds/m to 2 ds/m in monsoon and lower 0.63 ds/m to 1.19 ds/m in winter season. Highest and lowest mean values of EC were recorded with 2.97 ds/m and 0.75 ds/m from Mem talav and Malai talav in Unjha taluka, while Bhandu pond and Nava talav with 1.67 ds/m and 0.63 ds/m mean value in Visnagar taluka respectively (Table 1). EC value is also correlated with soil particle size and texture. Values of EC are under permissible limit in selected wetlands of two taluka (Figure 2).

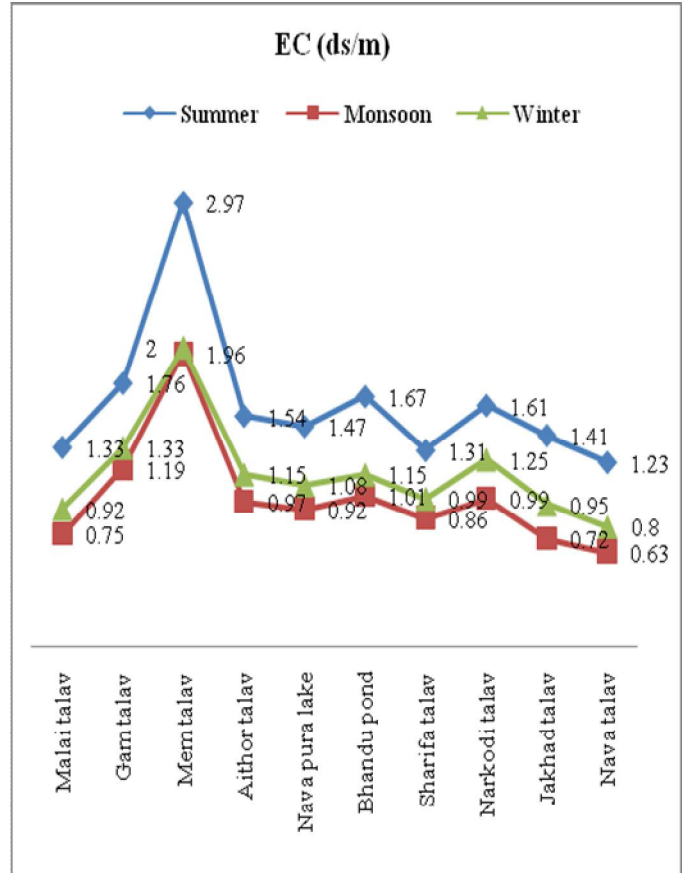
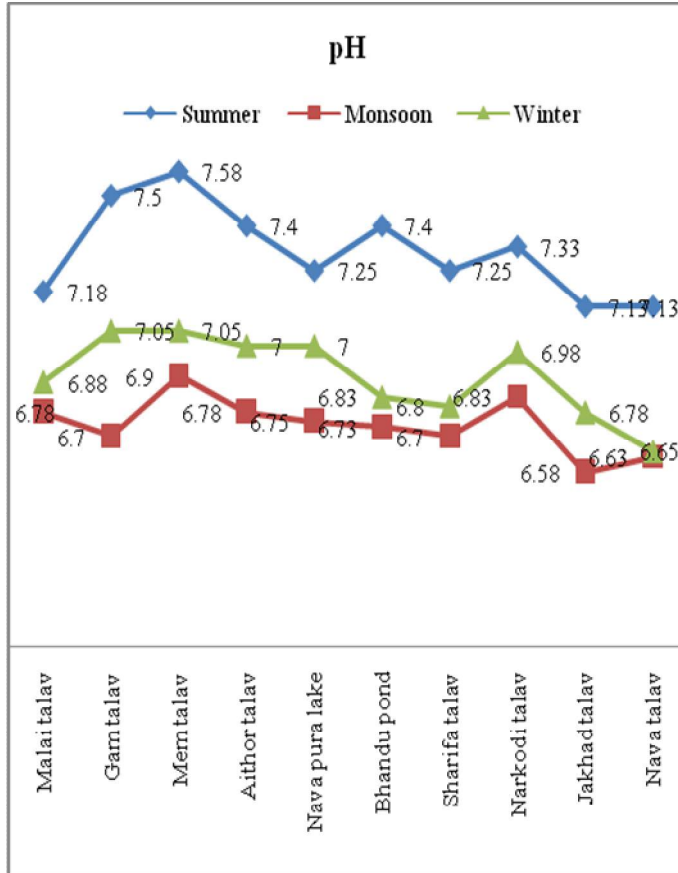


Figure 1) Comparison of pH values between two taluka

Figure 2) Comparison of EC values (ds/m) between two taluka

Organic carbon (%): Soil organic carbon improves the physical properties of soil. Higher organic carbon content in wetland soil were range between 0.33% to 1.14% in monsoon, 0.24% to 0.89% medium range in winter and 0.14% to 0.63% lower range in summer season. In Unjha taluka, higher content of organic carbon was measured in Mem talav with 1.14% mean value, while 0.61% mean value recorded in Visnagar taluka. The lower level of organic carbon was recorded in Jakhad talav and Aithor talav with the mean value of 0.14% and 0.19% from Visnagar and Unjha taluka respectively (Table 1). Permissible limit of organic carbon are range from > 0.40 low, 0.40 - 0.75 medium and > 0.75 high as per standard. Data reveals that Mem talav from Unjha taluka contain high amount of organic carbon, while rest of selected wetlands are under permissible limit. Availability of soil organic carbon is also depends on topography, hydrological regime, plant community and soil characteristics like pH, temperature and salinity⁹ (Figure 3).

Total nitrogen (%): In the present study total nitrogen was measured higher in monsoon with mean value range from 0.66% to 2.18%, medium in winter with 0.55% to 1.81% and lower in summer with 0.26% to 1.39%. least and greatest mean values of total nitrogen were observed at Aithor talav with 0.26% and Mem talav with 2.18% from Unjha taluka, while at Jakhad talav with 0.31% and Bhandu pond with 1.14% from Visnagar taluka respectively (Table 1 and Figure 4).

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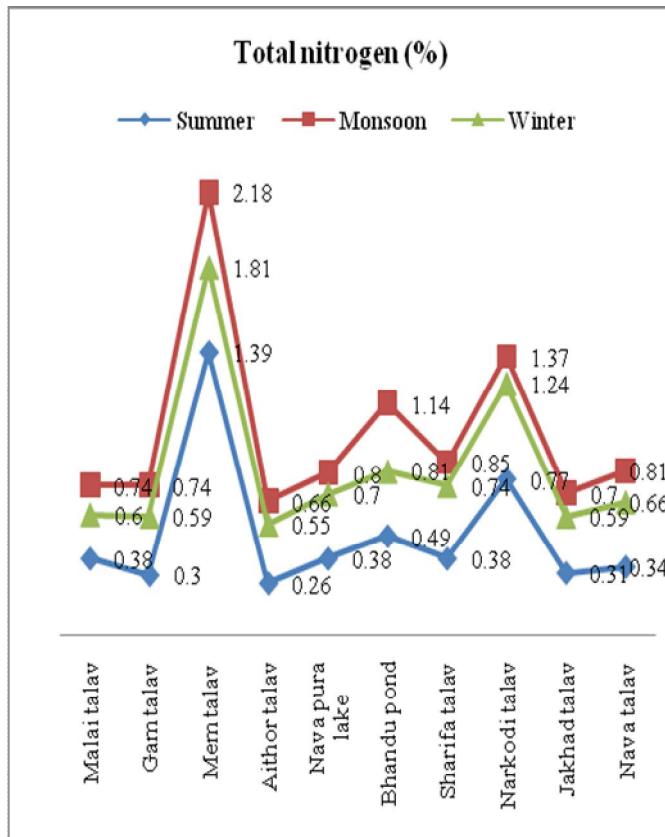
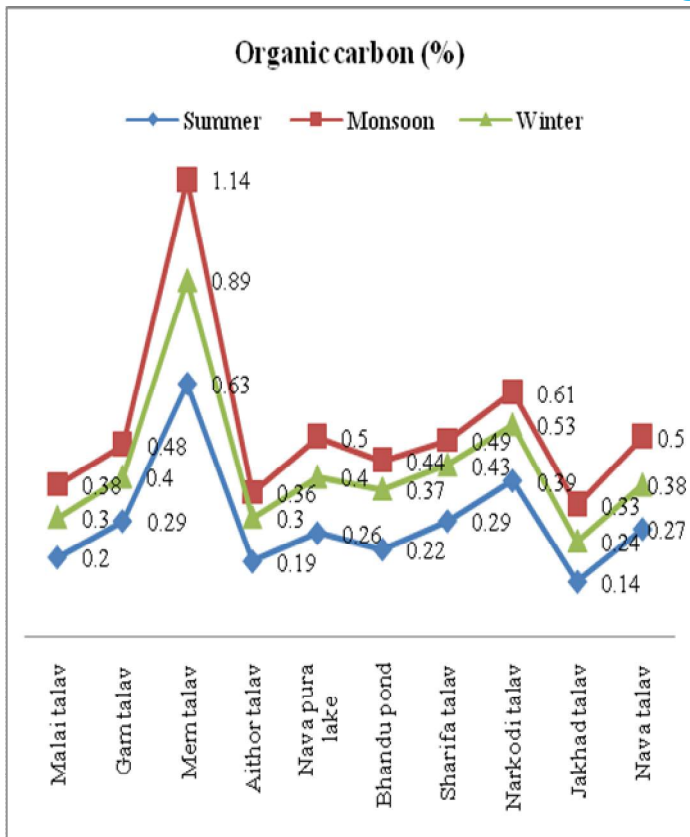


Figure 3) Comparison of OC (%) values between two taluka

Figure 4) Comparison of TN (%) values between two taluka

Available phosphorus (mg/kg): Based on collected data, available phosphorus content in soil was ranged between 6.19 mg/kg to 26.21 mg/kg. The lower level of available phosphorus was recorded in winter range from 6.19 mg/kg to 15.37mg/kg, medium in monsoon range from 8.39 mg/kg to 18.78 m/kg and higher in summer season range from 11.89 mg/kg to 26.21 mg/kg. In Unjha taluka, available phosphorus has lower and higher means value at Aithor talav with 7.2 mg/kg and Mem talav with 26.21 mg/kg respectively. Similarly, Jakhad talav and Narkodi talav were about 6.19 mg/kg and 23.03 mg/kg mean value as least and greatest value from selected wetlands of Visnagar taluka respectively (Table 1). As per standard, permissible limit of available phosphorus are range from < 10 mg/kg low, 10- 20 mg/kg medium, 21-40 mg/kg high and > 40 mg/kg excessive. Results reveal that Mem talav and Narkodi talav possess higher amount of available phosphorus from Unjha and Visnagar taluka respectively, while other selected wetlands of two taluka has show medium and lower level of available phosphorus. The major sources of phosphorus are domestic sewage, detergents, agriculture effluent with fertilizer¹⁰ (Figure 5).

Available potassium (mg/kg): Physico-chemical analysis of selected wetlands soil indicated that available potassium was greatest in summer with mean value range from 86.75 mg/kg to 255.8 mg/kg, intermediate in winter from 51.5 mg/kg to 179.8 mg/kg and least in monsoon season range from 38.75 mg/kg to 162.8 mg/kg. Higher amount of available potassium were recorded at Mem talav and Bhandu pond with the mean value of 255.8 mg/kg and 197.5 mg/kg from selected wetlands of Unjha and Visnagar taluka respectively. The lower level of available potassium was recorded at Jakhad talav with mean value 38.75 mg/kg and Aithor talav with 59 mg/kg from Visnagar and Unjha taluka respectively (Table 1). Permissible range of available potassium are range started from < 75 mg/kg very low, 75- 150 mg/kg low, 151- 250 mg/kg medium, 251- 800 mg/kg high and > 800 mg/kg excessive amount as per standard. All selected wetlands of two taluka were under permissible limit of available potassium except Mem talav from Unjha taluka (Figure 6). Discarding of house garbage and untreated sewage are the main reason behind higher concentration of potassium in Mem talav.

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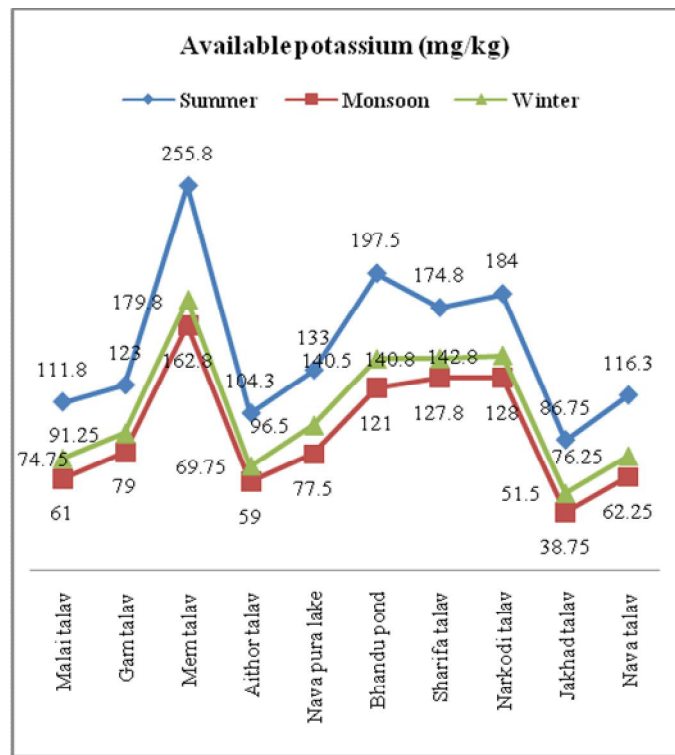
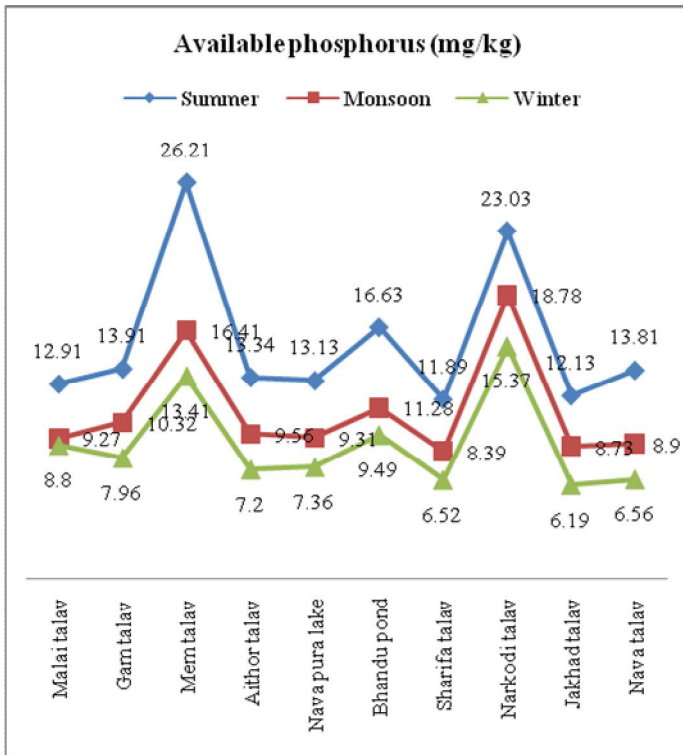


Figure 5) Comparison of P (mg/kg) values between two taluka. Figure 6) Comparison of K (mg/kg) values between two taluka

IV. CONCLUSION

From this study, it shows that pH of all the samples ranged from acidic to alkaline in nature. Electrical conductivity was slightly salty in Mem talav from Unjha taluka, while rest of selected wetlands soil shows salt free in nature. Organic carbon and available potassium were higher in Mem talav, while available phosphorus noted higher in Mem and Narkodi talav, due to agriculture runoff in to the wetlands and its corridor area. So, all the parameters were under permissible limit in all selected wetlands except Mem talav and Narkodi talav from Unjha and Visnagar taluka respectively.

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