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Research Article

PHYSICO-CHEMICAL PROPERTIES AND FERTILITY STATUS OF SOILS OF DUBAHAR BLOCK OF DISTRICT BALLIA, UTTAR PRADESH

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Abstract: A soil fertility study was conducted in ten village of Dubahar Block of Ballia district by taken surface soil sampling. Soil pH of Dubahar block soils were varied from 6.62-8.17, EC value ranged between 0.12 - 0.13, Bd of soils ranged from 1.36 to 1.42, organic carbon status ranged from 0.426-0.90 %, available nitrogen content varied from 315.64 to 406.45 kg ha^{-1}, available phosphorus status ranging from 15.41 to 16.48 kg ha^{-1} and available potassium ranged from 136.64 to 149.69 kg ha^{-1} in the soils studied area. The studied information indicated the lower fertility status for phosphorus and medium for nitrogen and potassium while pH, EC and organic carbon content in considerable range.

Keywords: Soil fertility, pH, nitrogen content

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Introduction

Proper management of soil fertility status demands careful fertilization of constraints of current nutrient deficiency and monitoring changes of soil fertility to predict areas to developing deficiencies. These deficiencies need to be alleviated through sound and proven practices of nutrient, water, crop, energy and soil management. This management of soil fertility vis-à-vis nutrient management at optimum level is one of the key factors in achieving high and sustainable productivity. As a consequence deficiencies of nitrogen, phosphorus, potassium, sulphur, zinc, have been reported to the extent of 89, 80, 50, 41 and 48 % respectively in Indian soils. The deficiency of sulphur and zinc are becoming more widespread and critical. The use efficiency of applied N, P, K and Zn in Indian soil is 30-50, 15-20, 70-80, and 2-5 % respectively. Thus, problems of nutrient deficiencies are aggravated, further because of low use efficiency of applied nutrients, particularly of P and micronutrient. Soil characteristics in relation to evaluation of fertility status of soil of an area are important aspect in context to sustainable agriculture production. Because of imbalance and inadequate fertilizer use coupled with low efficiency of other inputs but needs to soil fertility information for future planning. In view of the fact that present study was undertaken to study the physico-chemical characteristics and fertility status of soils [1-7].

Materials and methods

Site and climatic conditions

Ballia District is the eastern most part of Uttar Pradesh lies between 25°3" and 26°11" North latitude and 89°38" and 84°39" East longitudes. Total geographical area of the district is 2819 sq.km. It occupies an irregular wedge shape tract in interfluvial region of reverse Ganga and Ghaghara which is a part of central Ganga plain. Physiographically the area can be divided into two unit's *i.e.* central uplands region and low land tract along river Ganga and Ghaghara. Main sources of irrigation in the district are through ground water and canal. Dubahar block is located 2.5 km towards east from district head quarter Ballia. Dubahar block is bounded by Ballia tehsil towards west, Belhari tehsil towards East, Hanumanganj tehsil towards west and Bansdih tehsil towards North.

Total geographical area of the block is 159.38 sq. km. Dubahar block lies at 79°21' longitude and 28°12' with an altitude of 252 (meters)/830(feet) above the sea level. The area truly represents the agronomical conditions of north east alluvial plains. The annual rainfall in the district is between 800 and 1.300 mm. (31.50" and 51.58"). The largest rainfall in 24 hours recorded at any station in the district was 32.0 mm. (12.60''). The average maximum (47.5°c) and minimum (1.6°c) temperature have been recorded in the months of June and January respectively. The relative humidity is generally high during the south west mansoon, being 70%. Soil sampling - Sampling sites were carefully chosen taking into consideration the ground cover, micro relief, degree of erosion, surface drainage, proximity to tress. Soil samples were collected from ten villages namely; Chandvak, Dubahar, Arara, Kishunipur, Janari, Nagava, Akahar, Savanrubandh, Udaipura, and Sharaspali away from Dubahar block 13.00 km, 10.00 km, 9.00 km, 8.5 km, 7.00 km, 6.00 km, 6.2 km, 5.00 km, 4.5 km, 4.00km respectively from Dubahar block head quarter. Soil samples were collected with auger and khurpi from at 0-15 cm depth from ten sampling points in each village of Dubahar block. The samples were placed in numbered calico bags, labeled carefully considering the location and depth of soil. Detailed note of the samples were also taken. The samples were transported to laboratory for analysis.

Soil analysis

Soil samples were analyses for pH, E.C, Bulk density (Bd), organic carbon, available N, P and K as per standard procedures. Soil pH was determined by glass electrode pH meter in 1:2.5 soil water suspension [8], E.C. (Electrical conductivity) was determine by EC meter method describe by Kanwar and Chopra, (1999), Bulk density (Bd) of soil samples was determined by using RD bottle. Organic carbon was determined by wet digestion method [9]. Available nitrogen was determined by alkaline potassium permanganate method [10] available phosphorus was determined by 0.5N $NaHCO_3$ and colour develop by ascorbic acid method [11], available potassium was determined N neutral NH_4OAc method described by Muhr *et al*. (1965) [12].

The observed data were analyses statistically as needed. Values of standard deviation among different factors were also worked out.

Results and Discussion

Soil pH and EC

Properties of soil - Chandvak village

pH and EC of soils of Chandvak [Table-1 & 2] was showed that soil pH varied from 7.74 to 8.04 with a mean value of 7.91 and out of 10 samples, 6 samples were slightly alkaline (pH 7.5 to 8) and 4 samples medium alkaline (pH 8.0 to 8.5). The electrical conductivity [Table-2] of soils ranged from 0.127 to 0.136 dSm^{-1} with a mean value 0.131 dSm^{-1}. The maximum value of electrical conductivity was obtained in sample 10 and the minimum value of electrical conductivity (0.130 dSm^{-1}) in sample 5. The bulk density [Table-3] of soils ranged from to 1.27 to 1.53 Mgm^{-3} with a mean value of 1.405 Mgm^{-3} and highest value of bulk density (1.53 Mgm^{-3}) was recorded in sample number 7. Organic carbon status [Table-4] ranged from 0.726-0.858 with an average value of 0.795. The maximum organic carbon content (0.858) was found in sample number 8 and the minimum was found in sample number 3. Available nitrogen content [Table-5] varied from 327.20-373.62 kg ha^{-1} with a mean value of 347.65 kg ha^{-1} and standard deviation ±12.809. The maximum amount (373.62 kg ha^{-1}) was found in the sample number 1 and the minimum (327.20 kg ha^{-1}) was observed in sample number 6. In fact, that N is lost through various mechanisms *viz*. volatilization, nitrification succeeding, denitrification, chemical and microbial fixation, leaching and runoff also. Available phosphorus [Table-6] status ranged from 16.20 -16.90 kg $ha^{-1}$with a mean value of 16.48 kg ha^{-1} and standard deviation ± 0.21. The maximum amount of available phosphorus (16.90 kg ha^{-1}) was found in sample number 10 and minimum (16.20 kg ha^{-1}) was observed in sample 5. Available potassium [Table-7] status in the soils of Chandvak ranged from 134.00–140.05 kg ha^{-1} with a mean value of 136.64 kg ha^{-1} and standard deviation ± 2.17. The maximum status of available potassium (140.05 kg ha^{-1}) was found in sample number 2 and the minimum (134.00 kg ha^{-1}) in sample number 8.

Properties of soil- Dubahar Village

pH and EC of soils of Dubahar [Table-1 & 2] have appeared soil pH [Table-1] varied from 7.96 to 8.15 with a mean value of 8.04, out of 10 samples, 2 samples were slightly alkaline (pH 7.5 to 8) and 8 samples are medium alkaline (8 to 8.5). The maximum soil pH (8.15) was found in sample 5 and the minimum (7.96) was observed in sample 6. The electrical conductivity [Table-2] of soils ranged from 0.130 to 0.137 dSm^{-1} with a mean value of 0.1334 dSm^{-1}. The bulk density [Table-3] of the soils ranged from to 1.26 to 1.50 Mgm^{-3} with a mean value of 1.418 Mgm^{-3}. The highest value of bulk density was recorded in sample number 4 while minimum value was found in sample number 9. Organic carbon status [Table-4] ranged from 0.66-0.846 with an average value of 0.7562 and standard deviation ± 0.071. The maximum organic carbon content was found in sample number 4 and the minimum (1.15) was found in sample number 7. Available nitrogen content [Table-5] varied from 343.19-370.66 kg ha^{-1} with a mean value of 355.23 kg ha^{-1} and standard deviation is ±10.206. The highest value was found in sample number 1 and the minimum was observed in sample number 3, in fact, various way to losses *viz*. volatilization, nitrification succeeding, denitrification, chemical and microbial transformation, leaching and runoff [13] to maintained medium range. Available phosphorus status [Table-6] ranged from 14.08 -16.48 kg ha^{-1} with a mean value of 15.48 kg ha^{-1} and standard deviation ± 0.66. The maximum amount of available phosphorus (16.48 kg ha-1) was found in sample number 8 and minimum (14.08kg ha^{-1}) was observed in sample 10. The available potassium [Table-7] status in the soils of Dubahar ranged from 132.05 – 145.00 kg $ha^{-1}$with a mean value of 141.18 kg ha^{-1} and standard deviation ± 4.07. The maximum status of available potassium (145.00 kg ha^{-1}) was found in sample number 5 & 8 and the minimum (132.05 kg ha^{-1}) in sample number 2.

Properties of soil- Arara village

pH and EC of soils of Arara [Table-1 & 2] showed that soil pH varied from 8.02 to 8.41 with a mean value of 8.17. The maximum soil pH was found in sample 8 and the minimum (8.02) was observed in sample 4. The electrical conductivity of soils [Table-2] ranged from 0.110 - 0.136 dSm^{-1} with a mean value of 0.1281dSm^{-1}. The maximum value of electrical conductivity was obtained in sample 4 and the minimum value of electrical conductivity (0.110 dSm^{-1}) in sample1. The bulk density [Table-3] of the soils ranged from to 1.23 to 1.50 Mgm^{-3} with a mean value of bulk density 1.364 Mgm^{-3}. Organic carbon status [Table-4] ranged from 1.12-1.44 with an average value of 1.297 and standard deviation is ± 0.107. The maximum organic carbon content (1.44) was found in sample number 10 and the minimum (1.12) was found in sample number 3. Available nitrogen content [Table-5] varied from 304.50-334.60 kg ha^{-1} with a mean value of 315.64 kg ha^{-1} and standard deviation is ±10.189. The highest value was found in sample number 2 and the minimum was observed in sample number 8 it might be attributed that applied N is lost through various mechanisms like NH_3 volatilization, nitrification succeeding denitrification, chemical and microbial fixation, leaching and runoff. Available phosphorus status [Table-6] ranged from 16.22 - 16.88 kg ha^{-1} with a mean value of 16.07 kg ha^{-1} and standard deviation ± 0.48. The maximum amount of available phosphorus (16.88 kg ha^{-1}) was found in sample number 9 and minimum (16.22 kg ha^{-1}) was observed in sample 4. Available potassium status [Table-7] in the soils of Arara ranged from 136.03 – 145.04 kg ha^{-1} with a mean value of 141.30 kg ha^{-1} and standard deviation ± 2.38. The maximum status of available potassium (145.04 kg ha^{-1}) was found in samples number 6 and the minimum (136.03 kg ha^{-1}) in sample number 2.

Properties of soil- Kishunipur village

Soils pH and EC of Kishunipur [Table-1& 2] showed that soil pH varied from 8.02 to 8.30 [Table-1] with a mean value of 8.13 so, the maximum soil pH (8.30) was found in sample 8 and the minimum (8.20) was observed in sample 4. The electrical conductivity [Table-2] of soils ranged from 0.110 to 0.136 dSm^{-1} with a mean value of 0.1281dSm^{-1}. The maximum value of electrical conductivity was obtained in sample 4and the minimum value of electrical conductivity in sample1. The bulk density of the soils [Table-3] ranged from to 1.26 to 1.53 Mgm^{-3} with a mean value of bulk density 1.397 Mgm^{-3}. Highest value of bulk density was recorded in sample number 4 while minimum bulk density was found in sample number 10. Organic carbon status [Table-4] ranged from 0.594-0.78 with an average value of 0.710 and standard deviation ± 0.071. The maximum organic carbon content was found in sample number 2 &10 and the minimum was found in sample number 7. The available nitrogen content [Table-5] varied from 314.55-377.36 kg ha^{-1} with a mean value of 345.34 kg ha^{-1} and standard deviation is ±16.770. The maximum amount (377.36 kg ha^{-1}) was found in sample number 4 and the minimum (314.55 kg ha^{-1}) was observed in sample number 8. All the soil samples were found to be medium (250-560 N kg ha^{-1}) in fact that N is lost through various mechanisms *viz*. NH_3 volatilization, nitrification succeeding denitrification, chemical and microbial fixation, leaching and runoff. The available phosphorus status ranged from 15.22 -16.50 kg ha^{-1} [Table-6] with a mean value of 16.51 kg ha^{-1} and standard deviation ± 0.60. The maximum amount of available phosphorus (16.50 kg ha^{-1}) was found in sample number 2 and minimum (15.22 kg ha^{-1}) was observed in sample 5. Available potassium status [Table-7] in the soils of Kishunipur ranged from 145.03 – 156.00 kg ha^{-1} with a mean value of 149.69 kg ha^{-1} and standard deviation ± 3.32. The maximum status of available potassium (156.00 kg ha^{-1}) was found in sample number 3 and the minimum (145.03 kg ha^{-1}) in sample number 2.

Properties of soil- Janari village

pH and EC of soils of Janari [Table-1&2] was showed that soil pH varied from 7.98 to 8.15 [Table-1] with a mean value of 8.07. The maximum soil pH (8.15) was found in sample 4 and the minimum (7.98) was observed in sample 5. The electrical conductivity [Table-2] of soils ranged from 0.130 to 0.136 dSm^{-1} with a mean value of 0.1327 dSm^{-1}. Maximum value of electrical conductivity was obtained in sample 6 and the minimum value of electrical conductivity in sample 5. The bulk density [Table-3] of the soils ranged from to 1.29 to 1.47 Mgm^{-3} with a mean value of bulk density 1.397 Mgm^{-3}. The highest value of bulk density was recorded in sample number 1. Minimum bulk density (1.29 Mgm^{-3}) was found in sample number 6. Organic carbon status [Table-4] ranged from 0.72-0.964 with an average value of 0.812 and standard deviation ± 0.90.

Table-1 Soil pH status of different village of Dubahar block

S	Village									
	Chandvak	Dubahar	Arara	Kishunipur	Janari	Nagava	Akahar	Savanrubandh	Udaipura	Saharaspali
1	7.74	8.01	8.41	8.22	8.09	7.85	7.90	7.09	7.25	7.65
2	7.76	8.03	8.15	8.15	8.03	7.81	7.91	7.16	7.09	7.70
3	7.79	8.09	8.09	8.04	8.04	7.96	7.99	7.46	7.16	7.90
4	7.99	8.04	8.03	8.02	8.15	7.99	8.02	7.81	7.46	7.99
5	8.01	8.15	8.07	8.19	7.98	7.76	7.81	7.55	7.76	7.79
6	7.76	7.96	8.36	8.19	8.02	8.01	7.97	7.58	7.85	7.76
7	7.96	7.99	8.02	8.16	8.06	8.03	7.98	7.85	7.81	7.74
8	8.04	8.02	8.12	8.30	8.07	7.98	8.04	7.99	7.99	7.96
9	8.03	8.04	8.15	7.99	8.12	7.90	8.06	8.02	7.97	7.98
10	8.02	8.07	8.30	8.12	8.15	7.05	8.01	8.01	7.90	7.85
S.D.±	0.187	0.058	0.091	0.008	0.053	0.306	0.071	0.357	0.388	0.115

Table-2 Soil EC (dSm^{-1}) status of different village of Dubahar block

S	Village									
	Chandvak	Dubhar	Arara	Kishunipur	Janari	Nagava	Akahar	Savanrubandh	Udaipura	Saharaspali
1	0.127	0.132	0.132	0.110	0.132	0.130	0.132	0.132	0.132	0.132
2	0.128	0.134	0.131	0.132	0.133	0.129	0.131	0.132	0.132	0.133
3	0.129	0.132	0.132	0.133	0.132	0.129	0.133	0.134	0.130	0.135
4	0.130	0.133	0.130	0.136	0.134	0.130	0.136	0.139	0.134	0.135
5	0.133	0.130	0.132	0.113	0.130	0.128	0.131	0.135	0.138	0.136
6	0.128	0.131	0.134	0.133	0.136	0.133	0.138	0.134	0.139	0.134
7	0.129	0.134	0.136	0.133	0.132	0.130	0.134	0.139	0.139	0.135
8	0.136	0.135	0.132	0.134	0.132	0.130	0.133	0.140	0.133	0.135
9	0.135	0.136	0.133	0.122	0.133	0.131	0.136	0.139	0.139	0.137
10	0.136	0.137	0.134	0.133	0.133	0.136	0.133	0.139	0.138	0.135
S.D. ±	0.0033	0.0021	0.0071	0.0086	0.0015	0.0022	0.0022	0.0039	0.0034	0.0013

Table-3 Bd (Mgm-3) status of different village of Dubahar block

S	Village									
	Chandvak	Dubhar	Arara	Kishunipur	Janari	Nagava	Akahar	Savanrubandh	Udaipura	Saharaspali
1	1.50	1.46	1.27	1.44	1.47	1.44	1.50	1.34	1.318	1.47
2	1.27	1.45	1.26	1.43	1.43	1.43	1.49	1.28	1.32	1.48
3	1.37	1.31	1.23	1.41	1.34	1.40	1.53	1.46	1.32	1.51
4	1.52	1.46	1.50	1.53	1.49	1.33	1.47	1.28	1.34	1.53
5	1.46	1.50	1.33	1.29	1.51	1.52	1.28	1.43	1.52	1.26
6	1.29	1.44	1.49	1.44	1.29	1.29	1.52	1.51	1.50	1.47
7	1.53	1.48	1.43	1.51	1.33	1.42	1.55	1.29	1.42	1.28
8	1.43	1.51	1.28	1.29	1.45	1.37	1.29	1.31	1.45	1.46
9	1.27	1.26	1.36	1.37	1.34	1.29	1.42	1.33	1.43	1.37
10	1.41	1.31	1.49	1.26	1.32	1.38	1.48	1.45	1.27	1.44
S.D.±	0.096	0.085	0.100	0.088	0.0768	0.067	0.090	0.081	0.081	0.088

Table-4 Organic carbon (%) status of different village of Dubahar block

S	Village									
	Chandvak	Dubhar	Arara	Kishunipur	Janari	Nagava	Akahar	Savanrubandh	Udaipura	Saharaspali
1	0.792	0.84	0.83	0.768	0.792	0.612	0.714	0.504	0.63	0.45
2	0.83	0.78	0.792	0.78	0.816	0.642	0.696	0.576	0.618	0.534
3	0.736	0.756	0.672	0.666	0.846	0.588	0.912	0.534	0.696	0.504
4	0.84	0.846	0.72	0.72	0.774	0.72	0.72	0.552	0.618	0.426
5	0.78	0.84	0.714	0.63	0.72	0.666	0.79	0.63	0.666	0.54
6	0.846	0.66	0.846	0.672	0.84	0.726	0.666	0.72	0.72	0.678
7	0.732	0.68	0.732	0.594	0.762	0.576	0.666	0.66	0.642	0.72
8	0.858	0.738	0.84	0.78	0.964	0.708	0.738	0.738	0.654	0.672
9	0.790	0.684	0.772	0.726	0.816	0.72	0.636	0.678	0.672	0.714
10	0.84	0.78	0.964	0.78	0.846	0.684	0.90	0.612	0.648	0.858
S.D.±	0.012	0.071	0.10	0.071	0.090	0.145	0.201	0.052	0.220	0.048

Table-5 Available nitrogen ($kg\ ha^{-1}$) status of different village of Dubahar block

S	Village									
	Chandvak	Dubhar	Arara	Kishunipur	Janari	Nagava	Akahar	Savanrubandh	Udaipura	Saharaspali
1	379.62	370.66	326.58	364.21	323.18	430.24	310.90	376.93	370.66	357.99
2	339.26	345.60	334.60	345.50	319.52	420.32	297.99	357.29	365.29	335.52
3	349.29	343.19	305.40	334.44	320.55	390.42	301.53	370.39	350.33	349.23
4	339.39	349.60	328.09	377.36	292.82	399.66	332.22	357.49	389.33	337.29
5	360.09	365.36	309.30	348.44	316.55	390.23	326.62	390.23	399.09	352.29
6	327.20	361.21	314.44	356.54	332.25	399.22	296.44	399.36	359.25	369.22
7	345.44	366.66	317.81	332.23	326.52	413.09	335.23	379.73	390.29	327.42
8	360.24	345.44	304.50	314.55	279.21	406.52	325.40	390.29	360.28	326.29
9	340.21	343.52	309.88	339.29	315.81	397.66	334.21	374.29	394.798	327.29
10	341.85	361.09	305.85	340.89	321.90	417.20	297.81	398.59	400.88	349.55
S.D.±	12.809	10.206	10.189	16.770	16.133	12.665	15.615	14.439	18.029	13.917

Table-6 Available phosphorus (kg ha^{-1}) status of different village of Dubahar block

S	Village									
	Chandvak	Dubhar	Arara	Kishunipur	Janari	Nagava	Akahar	Savanrubandh	Udaipura	Saharaspali
1	16.50	15.22	16.8	16.40	15.40	15.22	14.90	15.88	15.28	15.42
2	16.30	15.32	16.5	16.50	14.99	15.85	14.85	15.65	15.45	15.88
3	16.40	15.40	16.4	16.33	15.95	15.78	14.82	15.22	15.92	16.09
4	16.50	16.40	16.2	15.29	15.85	14.93	14.57	15.40	15.25	15.90
5	16.20	15.20	16.5	15.22	16.40	15.09	14.98	15.98	15.44	15.81
6	1630	15.35	16.4	15.95	15.22	15.95	15.15	16.02	15.27	15.65
7	16.40	16.02	16.4	15.85	15.24	15.44	15.20	15.42	15.42	15.44
8	16.50	16.48	16.5	16.40	15.31	15.65	15.35	15.29	15.40	16.05
9	16.80	15.30	16.8	16.50	15.92	15.33	14.90	15.06	15.25	15.92
10	16.90	14.08	16.5	16.33	16.40	15.22	15.25	15.44	15.44	15.44
S.D.±	0.21	0.66	0.48	0.60	0.54	0.58	0.56	0.35	0.19	0.24

Table-7 Available potassium (kg ha^{-1}) status of different village of Dubahar block

S	Village									
	Chandvak	Dubhar	Arara	Kishunipur	Janari	Nagava	Akahar	Savanrubandh	Udaipura	Saharaspali
1	139.08	135.50	139.05	152.00	139.08	139.20	141.00	133.02	139.40	140.30
2	140.05	132.05	136.03	145.03	136.09	140.00	143.00	143.05	142.20	138.20
3	135.05	143.04	141.00	156.00	137.00	139.22	141.05	142.05	145.00	136.32
4	136.08	137.05	142.09	148.05	138.05	142.20	142.00	141.09	146.02	145.40
5	138.00	145.00	142.00	147.00	134.02	145.00	139.02	142.08	141.50	140.00
6	134.02	142.05	145.04	145.08	136.04	141.02	142.44	145.00	138.40	136.80
7	140.03	143.06	142.66	150.53	137.03	142.05	143.05	139.02	139.22	140.50
8	134.00	145.00	143.58	150.09	138.04	148.00	145.03	141.05	140.20	140.22
9	136.08	139.02	140.05	153.09	135.00	142.00	143.02	138.05	138.20	142.00
10	134.02	140.00	141.50	150.05	140.00	138.05	143.00	135.50	140.00	145.00
S.D.±	2.17	4.07	2.38	3.32	1.73	2.83	1.54	3.46	2.55	2.88

Maximum organic carbon content was found in sample number 8 and the minimum was found in sample number 7. The available nitrogen content [Table-5] varied from 279.21-332.25 kg ha^{-1} with a mean value of 315.831 kg ha^{-1} and standard deviation is ±16.770. The maximum amount (332.25 kg ha^{-1}) was found in sample number 6 and the minimum (279.21 kg ha^{-1}) was observed in sample number 8 in fact it was attributed that applied N is medium due to the fact that N is lost through various mechanisms like NH_3 volatilization, nitrification succeeding denitrification, chemical and microbial fixation, leaching and runoff. Available phosphorus status [Table-6] ranged from 15.22 -16.40 kg ha^{-1} with a mean value of 15.66 kg ha^{-1} and standard deviation ± 0.54. The maximum amount of available phosphorus (16.40 kg ha^{-1}) was found in sample number 2 and minimum (15.22 kg ha^{-1}) was observed in sample number 6. The available potassium status [Table-7] in the soils of Janari ranged from 134.02 – 140.00 kg ha^{-1} with a mean value of 137.03 kg ha^{-1} and standard deviation ± 1.73. The maximum status of available potassium (140.00 kg ha^{-1}) was found in sample number 10 and the minimum (134.02 kg ha^{-1}) in sample number 5.

Properties of soil- Nagva village

pH and EC of soils of Nagva [Table-1 &2] evident from soil pH varied from 7.05to 8.03 [Table-1] with a mean value of 7.83. The maximum soil pH (8.03) was found in sample 7 and the minimum (7.05) was observed in sample 10. The electrical conductivity [Table-2] of soils ranged from 0.128 - 0.136 dSm^{-1} with a mean value of 0.0191dSm^{-1}. The maximum value of electrical conductivity (0.136 dSm^{-1}) was obtained in sample 10 and the minimum value of electrical conductivity in sample 5. The bulk density [Table-3] of the soils ranged from to 1.29 to 1.52 Mgm^{-3} with a mean value of bulk density 1.38 Mgm^{-3}. The highest value of bulk density (1.52 Mgm^{-3}) was recorded in sample number 5 while minimum value was found in sample number 6 and 9. Organic carbon status [Table-4] ranged from 0.576-0.726 with an average value of 0.66 and standard deviation ± 0.145 .The maximum organic carbon content was found in sample number 6 and the minimum was found in sample number 7. The available nitrogen content [Table-5] varied from 390.23-430.24 kg ha^{-1} with a mean value of 406.45 kg ha^{-1} and standard deviation is ±12.665. The maximum amount (430.24 kg ha^{-1}) was found in sample number 1 and the minimum (390.23 kg ha^{-1}) was observed in sample number 5. The available phosphorus status [Table-6] ranged from 14.93 -15.95 kg ha^{-1} with a mean value of 15.53 kg ha^{-1} and standard deviation ± 0.58. The maximum amount of available phosphorus (15.95 kg ha^{-1}) was found in sample number 6 and minimum (14.93 kg ha^{-1}) was observed in sample 4. Available potassium status [Table-7] in the soils of Nagava ranged from 138.05–148.00 kg ha^{-1} with a mean value of 141.67 kg ha^{-1} and standard deviation ± 2.83. The maximum status of available potassium (148.00 kg ha^{-1}) was found in sample number 8 and the minimum (138.05 kg ha^{-1}) in sample number 10.

Properties of soil- Akahar village

pH of soils of Akahar [Table-1] appeared that varied from 7.90to 8.06 with a mean value of 7.96. The maximum soil pH (8.06) was found in sample 9 and the minimum (7.90) was observed in sample 1. The electrical conductivity [Table-2] of soils ranged from 0.131-0.136 dSm^{-1} with a mean value of 0.1337 dSm^{-1}. The maximum value of electrical conductivity (0.136dSm^{-1}) was obtained in sample 9 and the minimum value of electrical conductivity (0.131dSm^{-1}) in sample 5. The bulk density of the soils [Table-3] ranged from to 1.28 to 1.55 Mgm^{-3} with a mean value of bulk density 1.45 Mgm^{-3}.The highest value of bulk density (1.55 g cm^{-3}) was recorded in sample number 7. The minimum bulk density (1.28 Mgm^{-3}) was found in sample number 5. Organic carbon status [Table-4] ranged from 0.667-0.90 with an average value of 0.671 and standard deviation ± 0.201 .The maximum organic carbon content was found in sample number 5 and the minimum was found in sample number 9. The available nitrogen content [Table-5] varied from 296.44-335.23 kg ha^{-1} with a mean value of 315.83 kg ha^{-1} and standard deviation is ±15.615. The maximum amount (335.23kg ha^{-1}) was found in sample number 7 and the minimum (296.44 kg ha^{-1}) was observed in sample number 6, in fact the lower values due to losses of N through various mechanisms like NH_3 volatilization, nitrification succeeding denitrification, chemical and microbial fixation, leaching and runoff. Available phosphorus [Table-6] status ranged from 14.57-15.35 kg ha^{-1} with a mean value of 15.53 kg ha^{-1}and standard deviation ± 0.56. The maximum amount of available phosphorus (15.35 kg ha^{-1}) was found in sample number 8 and minimum (14.57 kg ha^{-1}) was observed in sample 4. Available potassium status [Table-7] in the soils of Akahar ranged from 139.02 – 145.03 kg ha^{-1} with a mean value of 142.26 kg ha^{-1} and standard deviation ± 1.54. The maximum status of available potassium (145.03 kg ha^{-1}) was found in sample number 8 and the minimum (139.02 kg ha^{-1}) in sample number 5.

Properties of soil- Savanru bandh village

pH of soils of Savanru bandh [Table-1] was varied from 7.09 to 8.02 with a mean

value of 7.65.), out of 10 samples, 5 sample were slightly alkaline (pH 7.5 to 8), 5 samples medium alkaline (pH 8.0 to 8.5). The maximum soil pH (8.02) was found in sample 9 and the minimum (7.09) was observed in sample 1. The electrical conductivity [Table-2] of soils ranged from 0.132 to 0.140 dSm^{-1} with a mean value of 0.1363 dSm^{-1}. The maximum value of electrical conductivity (0.140 dSm^{-1}) was obtained in sample 8and the minimum value of electrical conductivity (0.132 dSm^{-1}) in sample 2. The bulk density [Table-3] of the soils ranged from to 1.28 to 1.46 Mgm^{-3} with a mean value of bulk density 1.36 Mgm^{-3}. The highest value of bulk density (1.46 Mgm^{-3}) was recorded in sample number 3. The minimum bulk density (1.28 Mgm^{-3}) was found in sample number 4. Organic carbon status [Table-4] ranged from 0.504-0.738 with an average value of 0.631 and standard deviation ± 0.052. The maximum organic carbon content was found in sample number 6 and the minimum was found in sample number 4. Available nitrogen [Table-5] content varied from 357.29-399.36 kg ha^{-1} with a mean value of 379.45 kg ha^{-1} and standard deviation is ±14.439. The maximum amount (399.36 kg ha^{-1}) was found in sample number 6 and the minimum (357.29 kg ha^{-1}) was observed in sample number 2 therefore, applied N is medium due to lost through various mechanisms like NH_3 volatilization, nitrification succeeding denitrification, chemical and microbial fixation, leaching and runoff. The available phosphorus [Table-6] status ranged from 15.06-16.02 kg ha^{-1} with a mean value of 15.44 kg ha^{-1} and standard deviation ± 0.35. The maximum amount of available phosphorus (16.02kg ha^{-1}) was found in sample number 6 and minimum (15.06 kgha^{-1}) was observed in sample 9. Available potassium status [Table-7] in the soils of Savanru bandh ranged from 133.02–145.00 kg ha^{-1} with a mean value of 139.99 kg ha^{-1} and standard deviation ± 3.46. The maximum status of available potassium (145.00kg ha^{-1}) was found in sample number 6 and the minimum (133.02 kg ha^{-1}) in sample number 1.

Properties of soil- Udaipura village

Soil pH of Udaipura [Table-1] was varied from 7.09-7.99 with a mean value of 7.62, so that out of 10 samples, 4 sample were slightly alkaline (pH 7.5 to 8) and 6 samples medium alkaline (pH 8.0 to 8.5). The maximum soil pH (7.99) was found in sample 8 and the minimum (7.09) was observed in sample 2. The electrical conductivity of soils ranged from 0.130 - 0.139 dSm^{-1} [Table-2] with a mean value of 0.1354dSm^{-1}. The maximum value of electrical conductivity (0.139 dSm^{-1}) was obtained in sample 9 and the minimum value of electrical conductivity (0.130 dSm^{-1}) in sample3. The bulk density of the soils ranged from to 1.27 to 1.45 Mgm^{-3} with a mean value of bulk density 1.38 Mgm^{-3}.The highest value of bulk density (1.45 Mgm^{-3}) was recorded in sample number 8. The minimum bulk density (1.27 Mgm^{-3}) was found in sample number 10. Organic carbon status [Table-4] ranged from 0.618-0.696 with an average value of 0.661 and standard deviation ± 0.220 .The maximum organic carbon content was found in sample number 6 and the minimum was found in sample number 2 & 4.The available nitrogen content varied from 350.33-400.88 kg ha^{-1} [Table-5] with a mean value of 378.01 kg ha^{-1} and standard deviation is ± 18.029. The maximum amount (400.88 kg ha^{-1}) was found in sample number 10 and the minimum (350.33 kg ha^{-1}) was observed in sample number 3. Available phosphorus status ranged from 15.25 -15.92 kg ha^{-1} [Table-6] with a mean value of 15.41 kg ha^{-1} and standard deviation ± 0.19. The maximum amount of available phosphorus (15.92 kg ha^{-1}) was found in sample number 3 and minimum (15.25 kg ha^{-1}) was observed in sample 4 & 9. Available potassium [Table-7] status in the soils of Udaipura ranged from 138.02 – 146.02 kg ha^{-1} with a mean value of 141.01 kg ha^{-1} and standard deviation ± 2.55. The maximum status of available potassium (146.02 kg ha^{-1}) was found in sample number 4 and the minimum (138.02 kg ha^{-1}) in sample number 9.

Properties of soil- Saharaspali village

Data related to pH of soils of Saharaspali [Table-1] was varied from 7.65 to 7.99 with a mean value of 7.83. All samples were slightly alkaline (pH 7.5 to 8). The maximum soil pH (7.99) was found in sample 4 and the minimum (7.65) was observed in sample 1. The electrical conductivity [Table-2] of soils ranged from 0.132 to 0.137dSm^{-1} with a mean value of 0.1347 dSm^{-1}. The maximum value of electrical conductivity (0.137 dSm^{-1}) was obtained in sample 9 and the minimum value of electrical conductivity (0.132 dSm^{-1}) in sample1. The neutral to alkaline pH may be attributing to the reaction of applied fertilizer material with the soil colloids, which resulted in the reaction of base cations on the exchangeable complex of the soil. The normal EC may be ascribed to leaching of salts to lower horizons. Similar result was also reported by Sharma *et al*. (2008). The bulk density [Table-2] of the soils ranged from to 1.28 to 1.51 Mgm^{-3} with a mean value of bulk density 1.42 Mgm^{-3}. The highest value of bulk density (1.51 Mgm^{-3}) was recorded in sample number 3. The minimum bulk density (1.28 Mgm^{-3}) was found in sample number 7. Organic carbon status [Table-4] ranged from 0.426-0.858 with an average value of 0.641 and standard deviation ± 0.048. The maximum organic carbon content was found in sample number 10 and the minimum was found in sample number 4. The available nitrogen content varied from 326.29-369.22 kg ha^{-1} with a mean value of 343.20 kg ha^{-1} and standard deviation is ± 13.917. The maximum amount (369.22 kg ha^{-1}) was found in sample number 6 and the minimum (326.29 kg ha^{-1}) was observed in sample number 8. Therefore, it might be attributed that available nitrogen status of soils of Dubahar block falls in the range of medium (250–500) as per ratings suggested by Subbiah and Asija (1956). It is quite obvious that efficiency of applied N is medium due to the fact that N is lost through various mechanisms like NH_3 volatilization, nitrification succeeding denitrification, chemical and microbial fixation, leaching and runoff. Available phosphorus [Table-6] status ranged from 15.42 -16.09 kg ha^{-1} with a mean value of 15.76 kg ha^{-1} and standard deviation ±0.24. The maximum amount of available phosphorus (16.09 kg ha^{-1}) was found in sample number 3 and minimum (15.42 kg ha^{-1}) was observed in sample 1. Available potassium [Table-7] status in the soils of Saharspali ranged from 136.32 – 145.40 kg ha^{-1} with a mean value of 140.47 kg ha^{-1} and standard deviation ± 2.88. The maximum status of available potassium (145.40 kg ha^{-1}) was found in sample number 4 and the minimum (136.32 kg ha^{-1}) in sample number 3.

Conclusion

pH of the soils of Dubahar block varied from 6.62- 8.17 with a mean value of 7.92 village Arara registered maximum and Udaipura minimum. Soils recorded EC value of 0.13 and ranged between 0.12 and 0.13. Bd of soils ranged from 1.36 to 1.42 with a mean value of 1.40. The maximum Pd was found in village whereas minimum in the village Saharaspali. Organic carbon status of soils ranged from 1.03 to 1.33 and mean value was 1.19. Highest percentage of organic carbon was recorded in soils of village Chandvak while lowest was recorded in soils of village Savanru bandh. Available nitrogen content in soils of Dubahar block under study varied from 315.64 to 406.45 kg ha^{-1} with mean value of 315.64 kg ha^{-1} the maximum content was found with the soils of village Nagava and minimum in village Arara. Soils of Dubhar block under study registered mean available phosphorus status of 15.73 kg ha^{-1} ranging from 15.41 to 16.48 kg ha^{-1}. Available potassium status in village Kishunipur recorded maximum status and village Chandvak minimum. The status varied from 136.64 to 149.69 kg ha^{-1} in the soils under study. Therefore, low fertility status for phosphorus and medium fertility status for nitrogen and potassium, organic carbon status in higher, pH and EC was appeared for considerable range.

Application of research- The information related to the particular Block in respect to soil fertility status will be useful to land use planning as well as selection of crop suitability.

Research Category- Soil fertility

Abbreviations- Bd- Bulk density, E.C.-Electrical conductivity

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