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Original Research Article

Physico-chemical Characteristics of NAAM River Watershed (Part - 3) in Parbhani District, India

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A B S T R A C T

The present investigation was carried out to know the phsico-chemical properties of soils at NAAM river watershed (Part-3) of Parbhani district during the year 2015-16. The total length of watershed is 4.2 km and it is divided into seven compartment and three parts viz. 1, 2 and 3. Fifty representative surface soil samples from part -3 of wateshed were collected and evaluated for various phsico-chemical soil properties and nutrient status. The results emerged out from the present investigation revealed these soils are neutral to alkaline in nature, safe in total soluble salt concentration, highly calcareous nature and low in organic carbon content. Further these soils showed variation in fertility status. In general majority of soil samples were categorized as low in available nitrogen and phosphorus, high in potassium and deficient in sulphur

Keywords

Physico-chemical properties, Available nutrient status, NAAM watershed

Introduction

Soil fertility affects considerably the land use of any agro-ecosystem. The inherent fertility of soil is controlled by the set of pedogenic factors that vary from soil to soil and declining soil fertility is the main cause for low land productivity. Present day exploitive agriculture, with involved efforts to increase crop yield has not only depleted our soils of their nutrient reserves, but also resulted in emergency of a number of new nutrient deficiencies (Tripathi *et al.*, 2007). Watershed management has been defined as rational utilization of land and water resources for optimum and sustained production with minimum hazards to natural resources. It essentially relates to soil and water conservation and leads to proper land use as per capability or suitability of soils, protection of land against degradation, maintenance of soil fertility and increasing productivity from all land uses (Gabhane *et al.*, 2006). Information on soil properties and available nutrient status of soils in watershed area will be useful for getting optimum and sustained production with minimum hazards to natural resources. Hence, a comprehensive study was undertaken to know the physico-chemical characteristics of NAAM river watershed in Parbhani district.

Materials and Methods

Study area

Zari is a major village in Parbhani taluka of Parbhani district. Geographically, the Naam river watershed in Zari is situated at 455

above mean sea level between $76^{0}70^{'}$ east longitude and $19^{0}62^{'}$ North latitude. The area is covered by the basaltic lava flows; some layers of the lava flow are hard and compact while others are soft. This area has shallow cover of gravelly sediments over a hard basaltic Lithic or Paralithic contact within 50 to 90 cm surface. The study area comes under assured rainfall zone where tropical climatic conditions often exist.

Collection of soil samples

Fifty surface soil samples from various locations were collected, air dried completely, passed through 2 mm sieve and stored in properly labeled plastic bags. The soil pH, EC, organic carbon, $CaCO_3$ and available K were estimated by the standard procedures as described by Jackson (1973). The available N was analyzed by using alkaline potassium permanganate (Subbaiah and Asija, 1956). Available S was determined by using 0.15 per cent CaCl2 solution (Willams and Steinberg, 1969).

Results and Discussion

The results of study presented in Table 1 showed that the pH of soil varied from 7.33 to 8.82 with mean value of 8.0. Most of soil samples showed alkaline soil reaction (98 %). Presence of sufficient amount of lime may also be responsible for higher soil pH (Jibhakate *et al.,* 2009).

The electrical conductivity of soil ranged from 0.15 to 0.44 dSm^{-1} with an average value of 0.24 dSm^{-1}. The values of electrical conductivity obtained in the present investigation were found within desirable range. The organic carbon content of soil found be varied from 1.6 to 6.0 g kg^{-1} with mean value of 3.72 g kg^{-1} indicating low to moderate status. It was observed that out of 50 samples 30 samples (60%) were low and 18 (36%) were moderate in organic carbon content. This may be due to hot and dry climatic condition often exists in study area which is responsible for accelerated rate of decomposition of organic matter and thus results in low status of organic carbon.

The result clearly matches with the findings of Thangasamy *et al.,* (2005). The free $CaCO_3$ content varied from 45.60 to 192.10 g kg^{-1} (130.04 g kg^{-1}) in indicating calcareous nature of these soils. The result was confirmatory with the finding of Patil (2010).

Data on status of available nutrients are presented in Table 2. The available N was found low (94%) in status in these soils which ranged from 134.84 to 266.56 kg ha^{-1} farm with a mean value of 189.42 kg ha^{-1}. The lower content of nitrogen in this area is associated with hot and dry climate climax, lower organic matter content and low total nitrogen reserve as reported by Malewar (1995) and Waghmare and Takankhar (2007).

The available P content in soils ranged from 6.62 to 13.79 kg ha^{-1} (9.90 kg ha^{-1}) which was also found in low (96%) range. Similar results were reported by Waikar *et al.,* (2004). In case of available K content, it ranged from 264.51 to 956.48 kg ha^{-1} (641.97 kg ha^{-1}) was found sufficient in these soils. This may be due to occurrence of potash rich minerals like mica and feldspar in parent material of the soils. Similar results were reported by Tur *et al.,* (2008).

The available S which ranged from 5.40 to 12.86 mg kg^{-1} was found deficient in 76 per cent samples. The results are in confirmatory with the findings of Saqueebulla *et al.,* (2012).

Table.1 Physico- chemical properties of soils at NAAM river watershed

Sample no.	pH	EC	OC	Free $CaCO_3$	Sample no.	pH	EC	OC	Free $CaCO_3$
		dSm^{-1}	g kg^{-1}					dSm^{-1}	g kg^{-1}
1.	7.94	0.34	4.8	106.10	28.	8.02	0.15	5.8	98.00
2.	7.82	0.22	1.7	156.24	29.	7.85	0.18	2.8	146.50
3.	7.90	0.19	5.0	192.10	30.	7.33	0.15	4.9	158.22
4.	8.56	0.18	3.5	148.12	31.	7.82	0.18	3.5	176.10
5.	7.86	0.41	1.6	182.01	32.	8.00	0.22	2.2	172.22
6.	7.85	0.29	2.7	176.71	33.	7.92	0.23	3.4	174.16
7.	8.06	0.25	2.9	178.05	34.	8.00	0.32	2.8	104.32
8.	7.89	0.37	6.0	80.00	35.	8.68	0.22	2.8	186.43
9.	8.05	0.39	3.3	45.60	36.	7.95	0.24	6.0	88.00
10.	8.04	0.35	2.9	136.00	37.	7.85	0.18	4.9	158.48
11.	8.01	0.22	3.7	146.13	38.	7.88	0.32	4.8	148.68
12.	8.02	0.24	3.7	92.34	39.	7.92	0.36	3.7	140.00
13.	7.95	0.22	2.5	151.00	40.	7.82	0.39	2.2	138.10
14.	7.91	0.19	4.8	121.06	41.	8.00	0.17	2.1	130.08
15.	7.90	0.16	3.9	146.22	42.	8.60	0.30	4.1	144.16
16.	8.12	0.18	4.2	132.10	43.	8.22	0.27	3.1	82.11
17.	8.00	0.16	4.9	168.16	44.	8.10	0.20	2.6	128.42
18.	7.94	0.25	3.5	72.21	45.	8.15	0.15	3.6	86.43
19.	7.78	0.21	2.7	112.04	46.	8.16	0.21	4.8	114.00
20.	7.94	0.16	3.9	160.14	47.	7.92	0.16	3.0	128.16
21.	7.81	0.19	3.0	138.40	48.	8.42	0.18	2.4	134.51
22.	7.90	0.20	4.3	62.12	49.	8.82	0.15	3.9	100.09
23.	8.22	0.23	4.6	188.33	50.	7.80	0.19	5.5	146.00
24.	7.76	0.43	4.9	154.72	Range	**7.33-8.82**	**0.15-0.44**	**1.60-6.00**	**45.60-192.10**
25.	8.52	0.19	3.7	172.32	average	**8.00**	**0.24**	**3.72**	**130.04**
26.	7.85	0.22	3.8	140.00					
27.	8.68	0.44	4.6	164.11					

Table.2 Available nutrient status of soils at NAAM river watershed

Sample no.	Available nutrients				Sample no.	Available nutrients			
	N	P_2O_5	K	S		N	P_2O_5	K	S
	Kg ha^{-1}			mg kg^{-1}		Kg ha^{-1}			mg kg^{-1}
1.	260.28	9.55	535.36	10.33	28.	169.34	8.55	591.56	7.21
2.	141.12	11.67	851.20	5.50	29.	203.84	10.59	692.16	8.68
3.	153.66	10.00	650.72	9.20	30.	266.56	7.99	631.68	8.25
4.	163.07	10.41	533.12	12.00	31.	172.48	13.79	589.12	8.86
5.	213.24	9.14	418.80	5.04	32.	208.56	8.10	583.52	6.86
6.	175.61	10.15	544.48	8.61	33.	147.39	10.78	704.48	8.51
7.	137.98	10.26	872.48	9.60	34.	206.97	9.81	815.36	6.46
8.	194.06	10.52	812.00	5.73	35.	203.84	6.77	672.20	6.16
9.	166.20	10.85	627.20	5.46	36.	153.66	6.62	730.24	8.96
10.	159.93	9.89	786.24	9.12	37.	200.70	7.78	702.24	10.26
11.	150.52	9.18	414.40	12.16	38.	235.20	7.58	933.40	7.33
12.	166.20	9.96	532.00	7.16	39.	166.20	9.67	927.30	12.86
13.	141.12	11.67	289.35	9.66	40.	213.24	9.18	806.40	5.90
14.	134.84	11.30	875.16	7.00	41.	194.43	9.96	667.50	9.92
15.	156.80	11.49	664.17	11.16	42.	169.34	7.99	747.04	7.31
16.	166.20	12.56	264.51	10.53	43.	208.56	9.59	956.48	11.36
17.	163.07	10.48	577.92	11.33	44.	172.48	10.63	548.80	7.80
18.	244.60	9.92	364.16	5.29	45.	176.84	11.60	588.00	8.25
19.	241.47	9.59	294.04	5.51	46.	244.60	9.11	741.40	11.86
20.	178.75	10.22	588.00	12.06	47.	266.56	9.74	456.90	6.33
21.	254.01	8.46	565.60	8.88	48.	232.06	7.58	585.70	6.56
22.	260.28	11.97	580.40	9.22	49.	150.52	`10.41	590.24	12.46
23.	134.84	8.98	280.00	9.21	50.	216.38	10.85	286.72	9.21
24.	219.52	8.47	265.42	12.00	Range	**134.84-266.56**	**6.62 - 13.79**	**286.72-956.48**	**5.04-12.86**
25.	141.12	12.71	560.00	7.36	average	**189.42**	**9.90**	**641.97**	**8.59**
26.	197.56	12.60	693.28	7.66					
27.	175.61	9.29	758.24	5.79					

It can be concluded that soils of soils of NAAM river watershed area are neutral to alkaline, safe in total soluble salt concentration, low in organic carbon content and highly calcareous in nature. The soils showed variation in fertility status. In general majority soil samples were categorized as low in N and P, high in potassium and deficient in sulphur.

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