

Original Research Article

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Assessment of Chemical Properties of Soil from Different Blocks of Buldana District Maharashtra

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ABSTRACT

Keywords

Physico-chemical properties of soil, Buldana, Nitrogen, Phosphorus, Potassium etc.

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The soil samples were collected from three blocks of the Buldana district from two depth viz. 0-15 cm and 15-30 cm for the assessment of the chemical properties of soil of Buldana district, Maharashtra was carried out in 2019-20. Eighteen sampling points in different villages were selected for the analysis. The colour of soil changed between the two depths of 0-15 and 15-30 cm at all the locations. There was also difference in colour of dry and wet soils were dark greyish brown to black. The study revealed that range of particle density was from 2.15 to 2.55 Mgm^{-3} , bulk density from 1.09 to 1.19 Mgm^{-3} , water holding capacity from 57.14% to 91.89 %. The sand, silt and clay ranges were from 19-23 %, 32-40 % and 41-48 % respectively. It includes mean highest percent pore space 61.11 and the lowest percent pore space 51.94. The pH ranges from 6.67 to 8.29. The EC ranges from 0.17 to 0.63 dSm^{-1} . The organic carbon ranges from 0.26 to 0.92 %, & organic matter ranges from 0.31 to 1.57 %, nitrogen ranges from 114.24 to 409.52 kg ha^{-1} , phosphorus ranges from 12.49 to 28.31 kg ha^{-1} , potassium ranges from 120 to 320.2 kg ha^{-1} , calcium ranges from 0.32 to 0.42 (mgg^{-1}), magnesium ranges from 7.90 to 10.25 (mgm^{-1}), iron ranges from 1.6 to 5.33 (ppm), zinc ranges from 0.10 to 1.54 (ppm) and copper ranges from 0.51 to 1.51 (ppm).

Introduction

Soil is a vital resource, can be termed as ‘Soul of infinite life’. The essence of life in the soil is its crop producing capacity *i.e.* the soil productivity largely depends on soil fertility, management practices and climate. These agricultural practices can be managed, while the climate is natural factor which influences

the soil fertility. Therefore, soil fertility is the major component of productivity which primarily deals with nutrient supplying capacity of the soil to the plant. Therefore, it has been always considered to carry out genetic study as well as to find out fertility evaluation for making best use of the soil for crop production. Ensuring food security for the ever-increasing world population has

direct relation with physicochemical property, fertility and productivity of soil. The overall productivity and sustainability of a given agricultural sector is highly dependent up on the fertility and physicochemical characteristics of soil resources (Priyanka *et al.*, 2018). Chemical characteristics of different soils vary in space and time due to variation in topography, climate, physical weathering processes, vegetation cover, microbial activities, and several other biotic and abiotic variables (Tale *et al.*, 2015).

Soil health indicators

The quality of soil is rather dynamic and can affect the sustainability and productivity of land use. It is the end product of soil degradative or conserving processes and is controlled by chemical, physical and biological components of a soil and their interactions (Papendick and Parr, 1992). The chemical properties of the soil are the interactions of various chemical constituents among soil particles and the soil solution. These physical and chemical properties are soil texture, bulk density particle density water holding capacity, soil structure, soil colour, pH, electrical conductivity, cation exchange capacity, organic carbon, organic matter and soil nutrients (divided as macro and micro nutrient)(Nirmal, 2015).

Materials and Methods

The present study entitled “Assessment of physico-chemical Properties of Soil from different blocks of Buldana District of Maharashtra” was carried out during 2019-20 in three stages (Table 1). Soil survey and mapping, collection of samples and their analysis for different soil parameters. The samples were collected periodically from the selected sites at the same time in the *kharif* season. (Rice, Maize, Soybean, Cowpea *etc* crop) grown in this season. Soil samples

have been collected at a depth of 0- 15 cm and 15-30cm at the site. Samples have been collected only from the open places. Sampling dates have been selected in such a way that these represent the major seasons of the year *viz.* autumn, winter, spring, dry summer, and wet summer. Separate sampling calendar has been made for each parameter to be studied. Some of the chemical characteristics like temperature, pH and conductivity have been determined. Soil chemical and physical characteristics of some of the soils of different regions are discussed below (Table 2).

Soil sampling

Soil samples were collected from the three different blocks of Buldana district Maharashtra. They are Jalgaon Jamod, Sangrampur and Nandura. Soil samples were collected with the help of Khurpi, Spade and meter scale. In each block, three village selected for sampling and samples obtained from two different depths 0-15 cm and 15-30 cm, totally eighteen soil sample were collected.

Results and Discussion

As presented in table 3 and fig. 1, the highest soil pH 7.82 < 7.67 lowest 6.67 were recorded in villages Vadshingi, Borala and minimum Yerali respectively, at 0-15 cm depth and at 15-30 cm maximum pH 8.21 < 7.80 lowest 7.20 were recorded Vadshingi, Borala and lowest Dahivadi, due to depth and sites EC was found to be significant, and the highest soil EC 0.67 < 0.18 lowest 0.17 were recorded in villages Nimbhora, Rudhana and minimum vadshingi respectively, at 0-15 cm depth and at 15-30 cm maximum EC 0.70 < 0.21 lowest 0.19 were recorded Nimbhora, Rudhana and lowest Vadshingi, due to depth and sites pH was found to be significant, Irrigating in amounts too low to leach salts, or with water high in salts, allows salts to accumulate in the

root zone, increasing EC. Similar results were reported by Dhamak *et al.*, (2014).

As presented in table 4 and fig. 2, the highest soil organic carbon 0.92 < 0.56 lowest 0.26 were recorded in villages Nimgaon and minimum Rudhana respectively, at 0-15 cm depth and at 15-30 cm maximum organic carbon 0.80<0.45 lowest 0.18 were recorded Borala, Nimgaon and lowest Rudhana, due to depth and sites and organic carbon was found to be significant. Increasing the proportion of perennial species in pastures will increase organic carbon in soils Similar results were reported by Priyanka *et al.*, (2018) and the highest soil O.M 1.58< 0.96 lowest 0.44 were recorded in villages Borala, Nimgaon and minimum Rudhana respectively, at 0-15 cm depth and at 15-30 cm maximum O.M 1.37< 0.77 lowest 0.31 were recorded Borala, Nimgaon and lowest Rudhana, due to depth and sites O.M was found to be significant, increase the FYM dose soil organic carbon are maintain, similar results were reported by Brij *et al.*, (2016).

As presented in table 5 and fig. 3, the highest soil available nitrogen 0.92 < 0.56 lowest 0.26 were recorded in villages Nimgaon, and minimum Rudhana respectively, at 0-15 cm depth and at 15-30 cm maximum available nitrogen 0.80 < 0.45 lowest 0.18 were recorded Borala, Nimgaon and lowest Rudhana, due to depth and sites and available nitrogen was found to be significant. the high contain of organic matter increase the level of nitrogen, Similar results were reported by Brij *et al.*, (2016). and the highest soil O.M 1.58 < 0.96 lowest 0.44 were recorded in villages Borala, Nimgaon and minimum Rudhana respectively, at 0-15 cm depth and at 15-30 cm maximum O.M 1.37 < 0.77 lowest 0.31 were recorded Borala, Nimgaon and lowest Rudhana, due to depth and sites O.M was found to be significant, Phosphorus buildup is caused by excessive use of inorganic fertilizer or the use of composts and manures high in phosphorus. High soil phosphorus levels also can threaten streams, rivers, lakes and oceans. Similar results were reported by Ganorkar *et al.*, (2013).

Table.1 The entire study area has been divided into three major regions

S. No.	Block (Tehsil)	Village	Latitude (⁰ N)	Longitude (⁰ E)
01	Jalgaon jamod	1. Borala	76.592025	21.014672
		2. Nimbhora	21.042323	76.564807
		3. Wadshingi	21.010847	76.610408
02	Sangrampur	1. Rudhana	20.580300	76.215450
		2. Vakana	20.536560	76.180490
		3. Warwat	21.034139	76.682293
03	Nandura	1. Nimgaon	20.827417	76.459336
		2. Yerali	20.928619	76.476216
		3. Dahivadi	17.623163	74.529834

Table.2 Soil chemical properties and their respective methods for analysis

S. No.	Parameters	Unit	Methodology	Author's
1.	Soil pH (1:2)	-	Digital pH Meter	Jackson, 1958
2.	Electrical conductivity (1:2)	dS m ⁻¹	Digital Conductivity Meter	Wilcox, 1950
3.	Organic carbon	%	Rapid titration	Walkley, 1947
4.	Organic matter	%	% OM = % OC × 1.724	Van Bemmelen Factor
5.	Available nitrogen	kg ha ⁻¹	Alkaline potassium permanganate	Subbiah and Asija, 1956
6.	Available phosphorus	kg ha ⁻¹	Spectrophotometric	Olsen <i>et al.</i> , 1954
7.	Available potassium	kg ha ⁻¹	Flame Photometric	Toth and Prince, 1949
8.	Exchangeable calcium and magnesium	Cmol (p+) kg ⁻¹	1N Neutral ammonium acetate saturation /EDTA	Cheng and Bray, 1951
9.	Available Sulphur	ppm	Turbidimetric	Chesnin and Yien, 1950

Table.3 Assessment Soil pH (: 2.5 w/v) and EC (dS m⁻¹) at 0-15 and 15-30 cm depths of farmer's field in Buldana district of Maharashtra

Villages	Soil pH			Soil EC (dS m ⁻¹)		
	0-15cm	15-30cm		0-15cm	15-30cm	
Borala	7.67	7.80		0.51	0.63	
Vadshingi	7.82	8.21		0.17	0.19	
Nimbhora	7.52	7.72		0.67	0.70	
Nimgaon	7.50	7.62		0.36	0.50	
Dahivadi	7.05	7.20		0.43	0.55	
Yerali	6.67	7.00		0.34	0.52	
Vakana	7.58	7.68		0.51	0.60	
Rudhana	7.36	7.48		0.18	0.21	
Warwat	7.21	7.50		0.20	0.25	
Mean	7.48	7.58		0.374	0.461	
	F-TEST	S.ED(±)	C.D@0.05%	F-TEST	S.ED(+)	C.D@0.05%
Due to depth	S	0.150064	0.00098	S	0.061283	0.001848
Due to site	S	0.354507	2.806605	S	0.181058	1.13205

Table.4 Assessment of organic carbon (%) and organic matter (%) of farmers field at 0-15 and 15-30 cm depth in Buldana district of Maharashtra

Villages	Organic carbon (%)			Organic matter (%)		
	0-15cm	15-30cm		0-15cm	15-30cm	
Borala	0.92	0.80		1.58	1.37	
Vadshingi	0.42	0.30		0.72	0.51	
Nimbhora	0.38	0.30		0.65	0.51	
Nimgaon	0.56	0.45		0.96	0.77	
Dahivadi	0.42	0.35		0.72	0.60	
Yerali	0.56	0.35		0.98	0.60	
Vakana	0.35	0.20		0.60	0.34	
Rudhana	0.26	0.18		0.44	0.31	
Warwat	0.35	0.22		0.58	0.37	
Mean	0.47	0.35		0.80	0.59	
	F-TEST	S.ED(±)	C.D@0.05%	F-TEST	S.ED(±)	C.D@0.05%
Due to dept	S	0.084853	4.980605	S	0.14535	5.63605
Due to site	S	0.19105	1.370607	S	0.329455	1.48606

Table.5 Assessment of available nitrogen and phosphorus (kg ha⁻¹) in farmer's field at 0-15 and 15-30 cm depth in Buldana district of Maharashtra

Villages	Available nitrogen (kg ha ⁻¹)			Available phosphorus (kg ha ⁻¹)		
	0-15cm	15-30cm		0-15cm	15-30cm	
Borala	409.52	360.09		14.69	12.11	
Vadshingi	188.16	160.00		19.73	15.73	
Nimbhora	168.00	150.20		28.31	22.11	
Nimgaon	248.64	220.10		14.69	12.59	
Dahivadi	188.16	172.00		16.00	14.11	
Yerali	255.36	220.11		12.49	10.42	
Vakana	154.50	130.50		16.88	15.97	
Rudhana	114.24	100.24		16.22	12.14	
Warwat	154.56	151.56		12.28	10.28	
Mean	209.015	184.977		16.7988	14.02	
	FTEST	S.ED(±)	C.D@0.05%	F-TEST	S.ED(±)	C.D@0.05%
Due to depth	S	17.0287	0.000707	S	2.029396	0.000684
Due to site	S	81.8593	7.45608	S	4.24194	4.67605

Table.6 Assessment of available potassium (kg ha^{-1}) and Calcium(mgg^{-1})in farmer’s field at 0-15 and 15-30cm depth in Buldana district of Maharashtra

Villages	Available nitrogen (kg ha^{-1})			Available phosphorus (kg ha^{-1})		
	0-15cm	15-30cm		0-15cm	15-30cm	
Borala	409.52	360.09		14.69	12.11	
Vadshingi	188.16	160.00		19.73	15.73	
Nimbhora	168.00	150.20		28.31	22.11	
Nimgaon	248.64	220.10		14.69	12.59	
Dahivadi	188.16	172.00		16.00	14.11	
Yerali	255.36	220.11		12.49	10.42	
Vakana	154.50	130.50		16.88	15.97	
Rudhana	114.24	100.24		16.22	12.14	
Warwat	154.56	151.56		12.28	10.28	
Mean	209.015	184.977		16.7988	14.02	
	FTEST	S.ED(±)	C.D@0.05%	F-TEST	S.ED(±)	C.D@0.05%
Due to depth	S	17.0287	0.000707	S	2.029396	0.000684
Due to site	S	81.8593	7.45608	S	4.24194	4.67605

Fig.1 pH and EC (dS m^{-1}) at 0-15 and 15-30 cm depth in farmer’s field

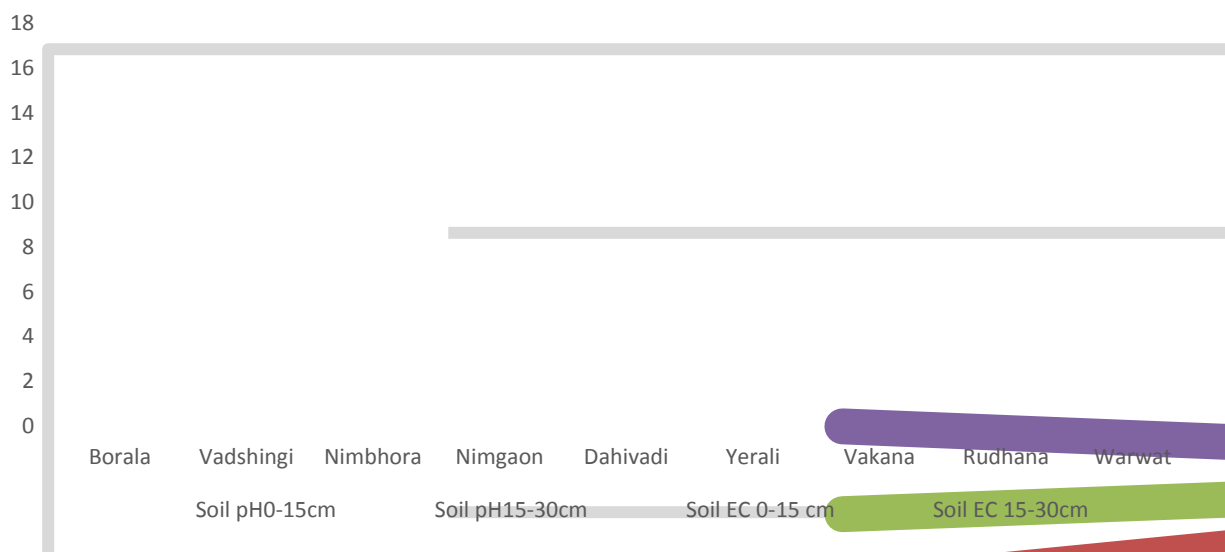


Fig.2 Organic carbon and Organic matter (%) content at 0-15 and 15-30 cm depth of soil in farmer's field

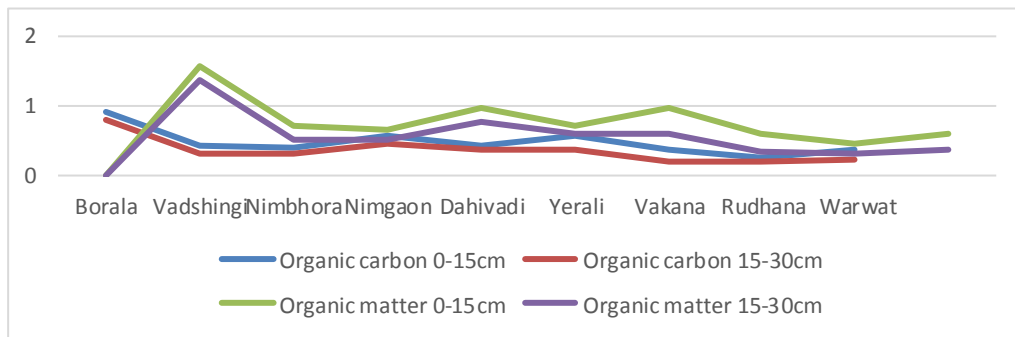
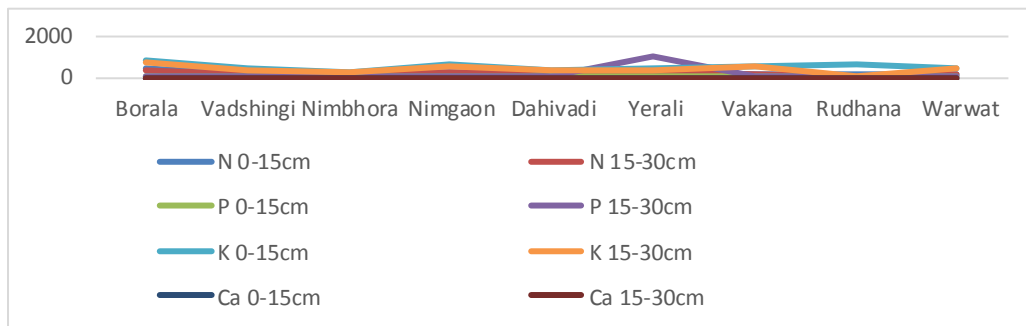
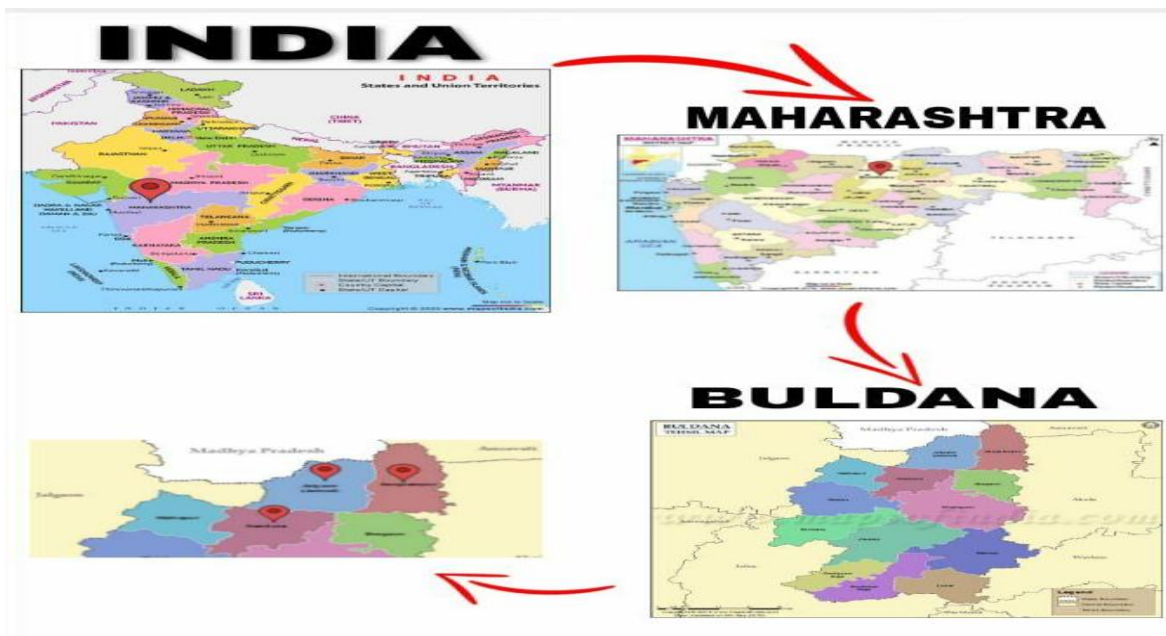


Fig.3 Response of available nitrogen, phosphorus, potassium and calcium (kg ha^{-1}) in farmer's field at 0-15 and 15-30 cm depth



Source: bharatmaps.gov.in



As presented in table 6 and fig. 3, the highest soil available K 493.6 < 493.8 lowest 295.6 were recorded in villages Vakana, Warwat and minimum Nimbhora respectively, at 0-15 cm depth and at 15-30 cm maximum available nitrogen 442.1 < 0.45 lowest 0.18 were recorded Borala, Nimgaon and lowest Rudhana, due to depth and sites and available K was found to be significant. the high contain of organic matter increase the level of K, Similar results were reported by Upadhyay *et al.*, (2014). and the highest soil available calcium 0.45 < 0.42 lowest 0.35 were recorded in villages Nimbhora, Dahivadi and minimum Vadshingi respectively, at 0-15 cm depth and at 15-30 cm maximum available calcium 0.42 < 0.41 lowest 0.32 were recorded Nimbhora, Dahivadi and lowest Vadshingi, due to depth and sites available calcium was found to be significant, calcium buildup is caused by excessive use of inorganic fertilizer or the use of composts and manures high in phosphorus. High soil calcium levels also can threaten streams, rivers, lakes and oceans. similar results were reported by Bhise *et al.*, (2019).

It was concluded that soil parameters were studied during the course of investigation responded good soil health the best villages was Borala followed by Nimgaon, block Buldana of Maharashtra. It was found the pH slight acidic to neutral, EC, Nitrogen, Organic carbon, Potassium and Phosphorus in adequate range having good amount of Ca-Mg. The available nutrients are based on farmers applied sources such as fertilizers, organics manures, crop residues, biofertilizers, *etc.* in their field for respective crops. The findings of the results are based for Buldana Block of Maharashtra were suitable for cultivation of such as cotton, maize, redgram, gram and soyabean *etc.*, and soil having good fertility status and productivity.

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