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Evaluation of Micronutrient Status of Soils and Their Relation with Some Chemical Properties of Soils of Northern Tahsils (Jintur, Selu and Pathri) Of Parbhani District

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Abstract: *The present investigation was carried out for evaluation of the status of DTPA-Fe, Cu, Mn and Zn in relation with chemical properties in soils of Jintur, Selu and Pathri tahsils of Parbhani district. Total 225 surface soil samples (75 from each tahsil) were collected. These soil samples were analysed for soil properties and fertility status of soil. The results revealed that the study area soils are neutral to alkaline in soil reaction, safe in electrical conductivity, low to high in organic carbon content and non-calcareous to calcareous in nature. Considering soil nutrient index values these soils are deficient in DTPA- Zn while Sufficient in DTPA-Fe, Cu and Mn. Further, DTPA-Mn was found significantly correlated with electrical conductivity.*

Keywords: *Zn, Fe, Mn, Cu, Nutrient Index.*

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I. Introduction

The micronutrient are essential for the proper biochemical transformations within the plant body, so as to yield the desired end products, Zn is essential for protein and auxin production, cu is a constituent of cytochrome oxidase, Fe helps in photosynthesis while Mn is essential for photosynthesis, carbon assimilation and nitrogen metabolism. Soil fertility is one of the important factors controlling yield of the crops soil characterization in relation to evaluation of fertility status of the soil of an area or region is an important aspects in context of sustainable agricultural production because of imbalanced and inadequate fertilizer use couples with low efficiency of other inputs, the response (production) efficiency of chemical fertilizer nutrients has declined tremendously under intensive agriculture in recent years (Yadav and Meena, 2009). Keeping these in view and also lack of information on micronutrients status to identify the emerging micronutrient deficiency or toxicity in the soils, therefore a comprehensive study was undertaken for Evaluation of Micronutrient Status of Soils and their Relation with some chemical properties of soils of Northern Tahsils (Jintur, Selu and Pathri) of Parbhani District.

II. Material And Methods

The study area (Parbhani district) is located between 18º 45’ to 20º 10’ N latitude and 76º 13’ to 77º 26’ E longitude having 409 meter height over the mean sea level. Parbhani district is the northern part of Marathwada region of Maharashtra state. The geographical area of the district is 6541 sq.km. Annual rainfall is 794 mm. The district is covered by basaltic lava flow. Some layers of lava flow are hard and compact, while others are soft, principally basic volcanic rocks of basaltic and dolomite composition are involved as soil parent material. Parbhani district comprises of nine tahsils out of these northern tahsils i.e. Jintur, Selu and Pathri tahsils considered for the study. Total 225 surface soil samples were collected from northern tahsils of Parbhani district (Jintur, Selu and Pathri) for this 15 villages were selected from each tahsil and five representative surface soil samples from each villages were collected during the year 2011-2012. The soil pH, EC, Organic Carbon and CaCO were estimated by the standard procedures as described by Jackson (1973). The micronutrients in these soil samples were extracted with DTPA solution (Lindsey and Norvell, 1978) with the help of Atomic Absorption Spectrophotometer. The soil nutrient index was calculated according to the procedure given by Ramamoorthy and Bajaj (1969) .

III. Result And Disscussion

The results of study presented in Table (1a, b, c) indicated that all the soil samples from Jintur, Selu and Pathri tahsil were neutral to alkaline in soil reaction within safe limit of electrical conductivity. The pH of soil varied from 6.66 to 7.91 with a mean value of 7.41 in Jintur soils, 6.75 to 8.60 with an average value of 7.63 in Selu soils and 6.70 to 8.18 with a mean value of 7.65 in Pathri. This may be because of formation these soils from basaltic parent material rich in basic cations as reported by Mali and Raut (2001). Similar results were reported by Ram et al. (1999). EC of soil varied from 0.05 to 1.35 dsm^{-1} with average value of 0.29 dsm^{-1},

from 0.12 to 1.02 dsm^{-1} with a mean value of 0.27 dSm^{-1} and 0.09 to 1.56 dsm^{-1} with a mean value of 0.29 dsm^{-1} respectively in Jintur, Selu and Pathri tahsils. The organic carbon content was varied from 2.2 to 10.5 g kg^{-1} with an average value of 6.0 g kg^{-1} in Jintur soils, 0.7 to 13.9 g kg^{-1} with an average value of 4.6 g kg^{-1} in Selu and 2.7 to 9.7 g kg^{-1} with an average value of 6.6 g kg^{-1} in Pathri. It indicates that these soils were low to high in organic carbon content. The high content of organic carbon might be due to addition of organic matter through either artificially or naturally and its subsequent decomposition. These results were in confirmatory with results reported by Waikar et al. (2004).The free $CaCO_3$ content was varied from 5.0 to 160 g kg^{-1} with a mean value of 65.6 g kg^{-1} in Jintur, 5.0 to 170 g kg^{-1} with a mean value of 53.3 g kg^{-1}in Selu and 10.0 to 145.0 g kg^{-1} with a mean value of 75.0 g kg^{-1} in Pathri. These soils are indicating non-calcareous to highly calcareous nature. DTPA-Fe was found 36 percent deficient in soils of Jintur (2.59 to 20.80 with an average value of 5.95 mg kg^{-1}), 4 per cent deficient in soils of Selu (2.32 to 12.97 with an average value of 7.38 mg kg^{-1}) and 8 per cent deficient in soils of Pathri (2.90 to 12.57 with an average value of 7.33 kg ha^{-1}). This high Fe content in soil may be due to presence of minerals like Feldspar, Magnetite, Hematite and Limonite which together constitute bulk of trap rock in these soils (Vijaya kumar et al. 2013). In case of DTPA-Cu content, it was ranged from 0.75 to 6.54 mg kg^{-1} with an average value of 2.55 mg kg^{-1} in soils of Jintur tahsil, 0.55 to 3.02 mg kg^{-1} with a mean value of 1.55 mg kg^{-1} in soils of Selu tahsil and 0.11 to 3.98 mg kg^{-1} with a mean value of 1.40 mg kg^{-1} in soils of Pathri tahsil indicating its sufficiency in these soils. The higher amount of DTPA-Cu in surface layer might be due to higher biological activities and chelating effect (Kadao et al. 2002; Jibhakate et al. 2009). DTPA-Mn content was found to be ranged from 5.26 to 20.62 mg kg^{-1} with an average value of 13.07 mg kg^{-1} in the soils of Jintur, 2.32 to 12.97 mg kg^{-1} with an average value of 7.38 mg kg^{-1} in soils of Selu and 3.74 to 28.14 mg kg^{-1} with an average value of 12.16 mg kg^{-1} in the soils of Pathri indicating that available Mn was 100 percent sufficient in all the tahsil. The relative high content of Mn in these soils could be due to the soils derived from basaltic parent material which contained higher ferromagnessiume minerals. Similar results were reported by Hundal et al. (2006). The DTPA-Zn content in the soils varied from 0.07 to 1.29 mg kg^{-1} with a mean value of 0.43 mg kg^{-1}, 0.11 to 3.16 mg kg^{-1} with an average value of 0.41 mg kg^{-1} and 0.04 to 1.72 mg kg^{-1} with a maen value of 12.16 mg kg^{-1}, respectively indicating Zn deficient soil in 97 percent in Jintur, 99 percent in Selu and 97 percent in Pathri tahsil. This low content of DTPA-Zn in these soils might be due to fact that under alkaline conditions, the zinc cations are changed largely to their oxides or hydroxides and thereby lower the availability of zinc. The similar results were also reported by Meena et al. (2006)

Soil Nutrient Index Value: As per the NIV developed by the Ramamoorthy and Bajaj (1969) the nutrient index value for (Table 2) soils of Jintur, Selu and Pathri tahsils of Parbhani district represents fertility status for micronutrients Zinc and Iron noticed 97 % and 36 % deficient in soil whereas against Manganese and Copper observed 100 % sufficient in soils of Jintur tahsils of Parbhani district, micronutrients only Zinc and Iron noticed 99 % and 4 % deficient in soil whereas against Manganese and Copper observed 100 % sufficient in soils of Selu tahsils of Parbhani district, whereas micronutrients only Zinc noticed 97 % deficient in soil whereas against Iron, Manganese and Copper observed 92 %, 100% and 99 % respectively, sufficient in soils of Pathri tahsils of Parbhani district.

Table 1a. Physico-chemical characteristics and nutrient status of Jintur tahsil of Parbhani District

Sr. No	Name of village	pH	EC (dSm^{-1})	OC (g kg^{-1})	$CaCO_3$ (g kg^{-1})	Fe (mg kg^{-1})	Mn (mg kg^{-1})	Zn (mg kg^{-1})	Cu (mg kg^{-1})
Jintur tahsil									
1.	Ambarwadi	6.72-7.53 (6.95)	0.10-0.23 (0.15)	3.7-7.5 (5.6)	5.0-98.0 (38.6)	2.72-5.39 (3.64)	10.75-18.36 (14.69)	0.13-1.29 (0.49)	1.0-4.22 (2.91)
2.	Bamani	6.66-7.31 (6.88)	0.11-0.31 (0.16)	2.4-8.5 (5.7)	10-100 (68.6)	3.76-8.10 (5.61)	10.30-18.58 (14.33)	0.48-0.95 (0.71)	2.0-5.95 (4.39)
3.	Bhosi	6.89-7.67 (7.30)	0.11-0.27 (0.18)	2.2-8.1 (4.9)	48-138 (86.6)	2.59-4.48 (3.19)	11.45-18.23 (14.17)	0.16-0.24 (0.20)	1.08-1.58 (1.27)
4.	Chandaj	7.05-7.71 (7.48)	0.15-0.65 (0.29)	4.8-9.3 (7.0)	54-120 (83.0)	5.21-8.14 (6.62)	9.75-13.84 (11.35)	0.15-0.44 (0.32)	0.91-4.73 (2.72)
5.	Dahegaon	7.04-7.70 (7.45)	0.14-0.23 (0.17)	2.5-9.0 (6.1)	20.0-102.0 (78.4)	2.68-8.71 (5.38)	7.05-20.62 (12.34)	0.10-0.94 (0.35)	1.53-5.15 (2.72)
6.	Karanji	6.67-7.64 (7.11)	0.07-0.35 (0.25)	4.6-8.2 (6.8)	36.0-89.0 (60.6)	2.88-20.80 (7.38)	12.69-19.09 (15.13)	0.40-0.89 (0.57)	2.40-4.55 (3.30)
7.	Kausadi	6.98-7.76 (7.57)	0.41-1.31 (0.73)	5.2-7.5 (6.4)	71.0-100.0 (87.6)	2.72-7.32 (5.16)	10.71-17.03 (13.54)	0.18-1.24 (0.45)	0.83-2.45 (1.59)
8.	Korwadi	7.19-7.76 (7.46)	0.09-0.27 (0.17)	3.7-9.7 (5.9)	18.0-69.0 (47.0)	2.64-4.87 (3.64)	6.11-14.08 (10.39)	0.23-0.73 (0.51)	0.83-4.48 (2.75)
9.	Kumbhari	7.45-7.63 (7.55)	0.19-0.38 (0.30)	3.3-6.6 (5.3)	10.0-80.0 (45.2)	5.43-10.42 (8.22)	5.26-16.93 (11.29)	0.16-0.29 (0.19)	0.75-2.09 (1.48)
10.	Mankeswar	6.90-7.70 (7.46)	0.11-0.32 (0.19)	2.2-8.2 (5.2)	50.0-92.0 (72.6)	2.72-9.87 (6.76)	7.05-15.23 (10.67)	0.07-0.74 (0.35)	1.18-3.12 (2.21)
11.	Marwadi	7.47-7.91 (7.76)	0.13-1.11 (0.45)	5.2-8.7 (6.5)	10.0-70.0 (38.0)	3.80-8.68 (6.77)	9.42-17.84 (13.12)	0.34-0.94 (0.58)	2.36-3.48 (2.97)
12.	Mathala	6.99-7.85 (7.50)	0.10-0.99 (0.34)	5.8-10.5 (7.5)	32.0-80.0 (50.0)	3.41-8.42 (6.10)	10.64-15.67 (13.30)	0.22-0.83 (0.40)	1.03-2.05 (1.47)
13.	Pangari	7.25-7.86 (7.63)	0.05-0.28 (0.17)	4.5-7.9 (6.0)	30.0-105.0 (57.0)	2.73-8.64 (5.56)	5.98-12.06 (9.20)	0.17-1.02 (0.58)	1.63-6.54 (3.84)
14.	Sankrala	7.41-7.68 (7.54)	0.07-0.46 (0.24)	3.3-9.0 (6.5)	40.0-160.0 (91.6)	5.60-9.74 (7.68)	11.70-18.87 (16.13)	0.17-0.49 (0.37)	1.38-2.23 (1.85)
15.	Varana	7.29-7.67 (7.56)	0.18-1.35 (0.53)	3.7-7.4 (5.4)	40.0-104.0 (80.0)	5.71-9.84 (7.65)	12.74-19.36 (16.35)	0.18-0.69 (0.47)	1.54-4.57 (2.88)
	Total	6.66-7.91 (7.41)	0.05-1.35 (0.29)	2.2-10.5 (60.0)	50-160 (65.6)	2.59-20.80 (5.95)	5.26-20.62 (13.07)	0.07-1.29 (0.43)	0.75-6.54 (2.55)

Table 1b. Physico-chemical characteristics and nutrient status of Selu tahsil of Parbhani District

Sr. No.	Name of village	pH	EC (dSm-1)	OC (g kg^{-1})	CaCO3 (g kg-1)	Fe (mg kg^{-1})	Mn (mg kg^{-1})	Zn (mg kg^{-1})	Cu (mg kg^{-1})
				Selu tahsil					
1.	Borgaon	7.37-7.97 (7.71)	0.13-0.32 (0.18)	4.2-6.7 (5.4)	37.0-70.0 (48.2)	4.84-7.04 (6.08)	7.84-15.45 (12.10)	0.27-1.08 (0.72)	0.80-1.72 (1.15)
2.	Dasala	7.28-7.71 (7.51)	0.14-0.31 (0.22)	2.7-6.0 (4.3)	41.0-71.0 (56.0)	4.29-7.44 (5.67)	8.45-17.30 (12.51)	0.17-0.47 (0.33)	0.65-1.38 (1.08)
3.	Gohegaon	7.38-7.66 (7.56)	0.12-0.22 (0.16)	2.8-7.3 (4.9)	43.0-96.0 (60.0)	4.97-8.12 (6.34)	5.37-12.10 (8.75)	0.25-0.76 (0.43)	0.97-1.66 (1.30)
4.	Hadgaon	7.06-7.62 (7.44)	0.15-0.27 (0.18)	3.7-9.6 (6.9)	40.0-66.0 (55.0)	5.17-9.18 (7.61)	5.84-13.37 (8.53)	0.27-0.47 (0.38)	1.94-3.02 (2.34)
5.	Kajali rohina	7.59-8.16 (7.90)	0.19-0.33 (0.26)	1.5-4.0 (2.3)	25.0-80.0 (58.4)	4.68-9.40 (7.82)	5.96-10.40 (8.35)	0.22-0.39 (0.31)	1.56-2.37 (2.01)
6.	Kanhad	7.35-7.74 (7.64)	0.16-0.33 (0.21)	1.5-5.5 (3.5)	28.0-40.0 (32.8)	5.08-12.53 (9.02)	7.34-11.29 (9.87)	0.11-0.31 (0.23)	1.07-2.35 (1.68)
7.	Kharadgaon	7.32-7.80 (7.53)	0.19-0.53 (0.35)	2.2-13.9 (7.3)	30.0-70.0 (51.2)	4.80-12.97 (8.75)	4.68-11.30 (7.51)	0.11-3.16 (0.89)	0.55-2.13 (1.48)
8.	Kundi	6.75-8.30 (7.68)	0.14-0.52 (0.25)	1.8-3.4 (2.5)	15.0-83.0 (53.6)	6.39-10.41 (7.74)	6.88-19.21 (10.75)	0.16-0.27 (0.22)	0.81-1.48 (1.13)
9.	Mhalsapur	7.52-7.68 (7.60)	0.13-0.28 (0.19)	2.2-6.6 (3.5)	30.0-52.0 (43.4)	5.80-9.74 (8.08)	7.64-12.31 (9.94)	0.17-0.39 (0.29)	0.58-1.40 (1.17)
10.	Radhe dhamangaon	7.01-7.78 (7.53)	0.16-0.23 (0.20)	0.9-8.5 (3.5)	31.0-80.0 (52.2)	6.52-13.01 (9.57)	8.35-9.21 (8.81)	0.20-0.65 (0.42)	1.06-1.50 (1.29)
11.	Raja	6.78-8.01 (7.64)	0.20-0.55 (0.31)	2.2-7.5 (4.8)	58.0-81.0 (70.4)	5.04-9.86 (7.44)	12.20-18.46 (16.26)	0.37-0.83 (0.48)	1.41-2.21 (1.79)
12.	Rajwadi	7.69-8.60 (8.04)	0.19-1.02 (0.42)	3.3-8.2 (5.2)	55.0-70.0 (60.6)	7.56-13.10 (9.58)	10.74-13.66 (12.06)	0.24-0.74 (0.38)	1.55-2.32 (2.0)
13.	Rawalgaon	7.34-7.76 (7.54)	0.16-0.86 (0.32)	0.7-7.5 (3.5)	50.0-61.0 (54.8)	6.82-13.3 (10.39)	5.46-8.21 (6.33)	0.19-0.52 (0.31)	0.83-2.23 (1.45)
14.	Sonna	7.12-7.76 (7.46)	0.28-0.56 (0.41)	4.8-9.7 (7.2)	20.0-170.0 (66.4)	3.33-8.78 (5.56)	8.94-18.08 (12.16)	0.40-0.68 (0.51)	1.41-2.43 (1.92)
15.	Tandulwadi	7.59-7.89 (7.71)	0.15-1.01 (0.41)	1.5-7.5 (4.9)	5.0-64.0 (37.4)	9.20-12.81 (11.30)	8.76-14.02 (11.24)	0.18-0.41 (0.28)	0.89-1.97 (1.52)
	Total	6.75-8.60 (7.63)	0.12-1.02 (0.27)	0.7-13.9 (4.6)	5.0-170 (53.3)	2.32-12.97 (7.38)	4.68-19.21 (10.34)	0.11-3.16 (0.41)	0.55-3.02 (1.55)

Table 1c. Physico-chemical characteristics and nutrient status of Pathri tahsil of Parbhani District

Sr. No.	Name of village	pH	EC (dSm^{-1})	OC (g kg^{-1})	$CaCO_3$ (g kg^{-1})	Fe (mg kg^{-1})	Mn (mg kg^{-1})	Zn (mg kg^{-1})	Cu (mg kg^{-1})
				Pathri tahsil					
1.	Babhalgaon	7.70-7.93 (7.77)	0.12-0.44 (0.27)	3.3-8.2 (6.6)	35.0-145.0 (115.0)	4.32-8.45 (6.53)	6.11-16.72 (12.84)	0.10-0.44 (0.29)	0.78-1.07 (0.92)
2.	Borgaon	7.13-7.70 (7.50)	0.16-0.60 (0.36)	4.9-8.5 (6.4)	51.0-106.0 (69.6)	4.90-10.8 (8.20)	8.27-15.78 (11.74)	0.23-0.59 (0.37)	0.83-3.59 (1.75)
3.	Devgaon	7.28-7.61 (7.46)	0.13-0.28 (0.22)	3.6-9.2 (5.7)	25.0-85.0 (50.4)	4.57-10.42 (7.07)	3.74-11.06 (8.12)	0.17-0.37 (0.26)	0.77-1.30 (0.97)
4.	Devnandur	7.45-7.71 (7.56)	0.22-0.64 (0.46)	7.2-9.7 (8.6)	10.0-110.0 (69.8)	3.66-11.8 (7.56)	6.40-12.99 (9.04)	0.04-0.58 (0.27)	0.61-1.90 (1.39)
5.	Dhalegaon	7.48-8.04 (7.78)	0.18-1.05 (0.43)	3.9-9.4 (6.8)	39.0-75.0 (62.4)	5.12-9.60 (7.40)	7.05-15.47 (11.57)	0.04-0.79 (0.47)	1.04-1.81 (1.41)
6.	Gunj	7.31-7.93 (7.62)	0.09-0.38 (0.23)	2.7-7.0 (5.3)	35.0-85.0 (68.0)	2.90-8.45 (5.50)	5.04-10.16 (8.13)	0.20-0.42 (0.31)	0.99-2.06 (1.64)
7.	Jaitapurwadi	7.45-7.97 (7.72)	0.19-0.66 (0.34)	3.8-7.6 (6.2)	56.0-94.0 (77.0)	5.71-8.68 (7.31)	6.11-25.82 (14.95)	0.12-0.27 (0.20)	0.80-1.78 (1.12)
8.	Loni	7.72-7.99 (7.84)	0.10-0.29- (0.21)	6.3-9.7 (7.7)	65.0-100.0 (80.8)	6.30-12.57 (8.45)	5.60-17.4 (9.65)	0.04-0.45 (0.33)	0.84-1.66 (1.17)
9.	Maliwada	6.70-7.77 (7.47)	0.61-1.56 (0.88)	4.5-8.5 (6.4)	13.0-95.0 (71.2)	5.01-9.74 (7.57)	8.30-20.10 (15.51)	0.24-0.81 (0.48)	0.73-3.98 (2.27)
10.	Masala khurd	7.36-8.12 (7.67)	0.17-0.49 (0.27)	3.7-9.2 (7.1)	45.0-120.0 (83.0)	3.72-7.81 (6.18)	9.16-24.30 (17.49)	0.19-1.24 (0.50)	0.89-1.79 (1.24)
11.	Rampuri	7.57-8.18 (7.80)	0.15-0.91 (0.40)	3.4-7.5 (5.8)	40.0-135.0 (91.4)	3.82-9.36 (6.63)	9.27-17.22 (12.65)	0.17-0.55 (0.32)	1.06-2.07 (1.41)
12.	Sarol khurd	7.43-8.10 (7.65)	0.12-0.38 (0.23)	3.5-9.6 (6.0)	50.0-94.0 (73.4)	4.96-12.40 (9.56)	8.36-20.62 (12.31)	0.19-0.39 (0.26)	0.56-2.52 (1.52)
13.	Takalgavhan	7.51-7.79 (7.61)	0.22-0.70 (0.39)	4.0-9.7 (7.0)	35.0-95.0 (76.0)	4.50-9.18 (7.07)	9.20-17.18 (12.96)	0.04-1.72 (0.56)	0.11-2.01 (1.32)
14.	Tura	7.44-7.77 (7.63)	0.17-0.57 (0.41)	3.7-9.0 (6.6)	32.0-99.0 (64.0)	5.48-9.23 (7.71)	9.36-16.54 (12.43)	0.14-0.37 (0.23)	0.71-1.77 (1.26)
15.	Wadi	7.63-7.83 (7.72)	0.20-0.49 (0.30)	5.2-9.7 (7.6)	46.0-94.0 (74.2)	5.48-9.80 (7.46)	8.64-28.14 (14.01)	0.14-1.10 (0.42)	0.78-2.92 (1.61)
	Total	6.70-8.18 (7.65)	0.09-1.56 (0.36)	2.7-9.7 (6.6)	10-145 (75.0)	2.90-12.57 (7.33)	3.74-28.14 (12.16)	0.04-1.72 (0.35)	0.11-3.98 (1.40)

Table 2. Deficiency of Micronutrients of Jintur, Selu and Pathri tahsils of Parbhani district

SN.	Available Nutrients	Jintur		Selu		Pathri	
		Deficient %	Sufficient %	Deficient %	Sufficient %	Deficient %	Sufficient %
1	**Iron**	36	64	4	96	8	92
2	**Manganese**	-	100	-	100	-	100
3	**Zinc**	97	3	99	1	97	3
4	**Copper**	-	100	-	100	1	99

Correlations: A positively relationship of available Fe with organic carbon (r = 0.063). The results were in close agreement with findings of Murthy and Murthy (2005) and the negative correlation of available Fe with soil pH and $CaCO_3$ indicated that there is precipitation of available iron in to insoluble products which supports the classical phenomenon of lime induced iron deficient. The available Mn showed a significant and positive correlationship with electrical conductivity (r = 0.159*) and organic carbon (r = 0.028) (Table 3). The significant and positive relation of available Mn with electrical conductivity and organic carbon was also reported by Yadav and Meena (2009). A negative correlation of available Zn with soil pH (r = -0.036). The negative correlation with pH may be attributed to their precipitation as hydroxides and carbonates consequently making them immobile and unavailable to the plants. Similar results were obtained by Shinde (2007) while it is observed positive with electrical conductivity (r = 0.078), organic carbon (r = 0.080) and negative relationship with $CaCO_3$ (r = -0.03). This could be attributed to the presence of organic matter that release the Zn from the parent material and increase their solubility. The similar results were also reported by Sharma et al. (2003).

Table 3. Correlation between the physico-chemical properties and available nutrients in soils of of Jintur, Selu and Pathri tahsils of Parbhani district

Available Nutrients	Physico-chemical properties			
	pH	EC	O.C	$CaCO_3$
Fe	-0.119	0.050	0.063	-0.067
Mn	-0.104	0.159*	0.028	0.037
Zn	-0.036	0.078	0.080	-0.03
Cu	-0.065	-0.004	-0.027	-0.107

*Significant at 5% level, **Significant at 1% level

IV. Conclusions

The soils of northern tahsils (Jintur, Selu and Pathri) of Parbhani district are neutral to alkaline in soil reaction, safe in electrical conductivity, low to high in organic carbon content and non-calcareous to calcareous in nature. According to the concept of soil nutrient index soils are deficient in DTPA- Zn while Sufficient in DTPA-Fe, Cu and Mn content.

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