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## Correlation studies between chemical properties of moderately saline alkaline soils and available plant nutrient

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### Abstract

The study was conducted on soil and water quality management strategies under special reference to GIS and Remote sensing in minor of Mula right bank canal command area was conducted during the year 2018-2020 at Department of Soil Science and Agricultural chemistry, with an objective to assess the level of degradation in minor of Mula right bank canal area. The geo-referenced 152 soil samples were collected from Mula right bank canal minor No.2 by using Global Positioning System (GPS). Correlation studies to study the relationship between two dependent variables. The relationship between chemical properties of soil and available plant nutrient in soil was carried out by using SAS system statistical software for windows, version 6.12. (1989-1996 by SAS institute. Inc., U.S.A.). The correlation coefficient (r) of pH is showed negatively significant correlation with available N, and Mn with the 'r' values of -0.17\* and -0.30\*\* respectively. The EC was showed negatively significant correlation with available K and available Cu with the 'r' values of -0.16\* and -0.16\* respectively. The available Mn and Zn has shown positive significant correlation with EC which is evident from 'r' value of 0.33\*\* and 0.17\* respectively and CaCO<sub>3</sub> shows negative and significant correlation with available Mn with the 'r' values of -0.28.

**Keywords:** Correlation, relationship, moderately saline alkaline, chemical properties, available plant nutrient, 'r' value

### Introduction

The relationship between chemical properties of moderately saline alkaline soils and available plant nutrient showed in the Mula canal command area. The correlation of available nitrogen, phosphorus potassium, zinc, iron, copper and manganese with soil pH, EC, calcium carbonate and organic carbon are studied and the correlation coefficients between soil chemical properties and available nutrients was carried out and "r" value was reported. For understanding the reasons of deficiency of available nutrients in soils, correlation of chemical properties with available macro and micronutrients was needed. Hence, present investigation was undertaken to study the status of macro, micronutrients and their relationship with important soil chemical properties in moderately saline alkaline soils of Mula canal command area of Rahuri tehsil of Ahmednagar district of Maharashtra.

### Methodology

The surface soil samples were collected by GPS based sampling methodology on grid basis in the area of minor of Mula right bank canal. Samples were collected in summer season during May, 2018. The 152 soils samples from nearby fields collected from the Minor No. 2 Mula right bank canal command. Each soil sample was collected in a clean plastic bag and analyzed for different parameters. Soil samples were collected from 0-30 cm depth at each location and prepared and analyzed for the analysis according to the standard procedures defined time to time. The chemical properties and available plant nutrient of 152 soil samples was carried out and correlation between this property was carried by using SAS system statistical software for windows, version 6.12. (1989-1996 by SAS institute. Inc., U.S.A.)

### Result and discussion

The pH of the soils of study area has negative and non-significant correlation with available P and Zn, however it has positive non-significant correlation with available K, Fe and available Cu. It showed negatively significant correlation with available N, and Mn with the 'r' values of -0.17\* and -0.30\*\* respectively. This may be due to high rate of denitrification at lower values available nitrogen in soil, at higher pH, calcium precipitates with P as Ca-phosphate and reduce P availability (Tisdale *et al.* 1997) <sup>[14]</sup>.

The similar results were noted by Jadhav *et al.* (1978) [3] in some citrus growing soils of Marathwada and found no significant relationship between available zinc and iron with soil pH. Sharma *et al.* (2003) [11] analyzed the soils from Nagpur District in semi-arid region of Rajasthan and observed that the available Fe, Mn, Zn and Cu were negatively correlated with soil pH.

The EC of the study area showed negatively but non-significant correlation with available N and available Fe. But positively non-significant correlation with available P. It showed negatively significant correlation with available K and available Cu with the 'r' values of -0.16\* and -0.16\* respectively. This relationship might be due to potassium and copper acts as cation in soil solution and present of excess exchangeable sodium availability of potassium is low. The available Mn and Zn has shown positive significant correlation with EC which is evident from 'r' value of 0.33\*\* and 0.17\* respectively. Sakal *et al.* (1988) [10] reported the distribution of Fe, Mn, Zn and Cu in old alluvial soils and showed that the negative correlation between EC and available Zn in soil. Chavan *et al.* (1980) [1] studied Zn, Mn, B and Mo distribution in soil profiles of Maharashtra and revealed that electrical conductivity was positively associated with Zn and Mn in soils.

Organic carbon showed negatively non-significant correlation with available N, P and Mn, where as it has positively non-significant correlation with available K, Fe, Zn and Cu and exchangeable Ca, Mg. This relationship may be due to the presence of more than 50% of P in organic forms and after the decomposition of organic matter as humus is formed which forms complex with Al and Fe. Minakshi *et al.* (2005) [5] studied the spatial distribution of micronutrients in soils of Patiala District and reported that organic carbon is positively correlated with Zn, Cu, Fe, Mn. Indulkar *et al.* (2007) [2] stated that the available N showed positively significant correlation with organic carbon. Organic carbon showed positive and non-significant correlation with available P, S, Mo, Fe, Mn, Zn and Cu.

The CaCO<sub>3</sub> was negatively and non-significantly correlated with available N, K and available Zn, while it is positively and non-significantly correlated with available P, Fe and Cu. It shows negative and significant correlation showed with available Mn with the 'r' values of -0.28. This relationship might due thus adsorption/ fixation to N and P with calcium carbonate present in soil (Tisdale *et al.* 1997) [14]. Nipunge *et al.* (1996) [6] studied some Inceptisols soil series of Maharashtra and recorded that the DTPA extractable Fe and Mn had negative relationship with CaCO<sub>3</sub>.

**Table 1:** Correlation studies between soil chemical properties and plant available nutrient of Mula Right Bank Canal command area Minor No.-2 (Moderately saline alkaline soil)

Particulars	Soil chemical properties (n=152)			
	pH	EC	Organic carbon	CaCO <sub>3</sub>
N	-0.17*	-0.02	-0.02	-0.07
P	-0.02	0.01	-0.04	0.11
K	0.14	-0.16*	0.11	-0.03
Fe	0.07	-0.03	0.02	0.06
Mn	-0.30**	0.33**	-0.08	-0.28**
Zn	-0.02	0.17*	0.06	-0.08
Cu	0.14	-0.16*	0.09	0.13

\* Significant at 5% level: 0.159

\*\*Significant at 1% level: 0.208

## Conclusion

The relationship between chemical properties of soil and available plant nutrient in moderately saline-alkaline soil most affected due to the present of excess amount of soluble salt. Available N and Mn decreased, with increasing pH. Available K and Cu decreased, whereas Mn and Zn increased with increasing EC. Available Mn decreased with increasing value of CaCO<sub>3</sub> content in soil.

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