

A Comparative Study of Various Physical and Chemical Parameters of the Soils of Kutch District

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ABSTRACT: Cultivation of crops and yield of crop is highly dependent on the soil where they are grown. Soil contains carbon, nitrogen along with certain other essential requirements. Crops yield is highly dependent on physical and chemical properties of soil as well as on surrounding environment. pH, organic carbon, electric conductance, concentration of micro and macro elements in the soil are responsible for crop yield. Low value of higher concentration of such elements may result into low production. Hence it is very essential to determine the quality of soil before using it for agriculture purpose. Here in this study, concentration of all these parameters are analyzed for a large samples size of Kutch district the Gujarat state, India.

KEYWORDS: Soil parameters, Kutch, micro and macro elements, soil quality.

I. INTRODUCTION

Soil is thought to be the major nutrient provider for crop production. Carbon, hydrogen and nitrogen are major components required for the growth of any plant. Apart from these, plant also requires certain microelements like potassium, sulfur, boron, magnesium, zinc, chlorine and trace elements for their growth. C, H, O and N are backbone of plant as well as also form biomolecule. Micro and trace element are also vital for growth as they may act as cofactor for activation of certain enzymatic activities, inhibitor to prevent adverse effect on plant, they also directly or indirectly involved in growth and regular activity of plants. For any plant, it becomes primary necessity to have these elements available in the soil in sufficient quantity. If one or more elements are present in lesser concentration than it can be easily provided in form of synthetic chemicals as such as chemical fertilizers, but higher concentration of any of these components may have adverse effect on plant. [1], [2] Therefore it becomes very essential to analyze the quality of soil before using for agriculture purpose. This analysis will help in finding out the optimum requirement of chemical fertilizer which is essential for maximum crop yield. Not only this, if higher concentration of such elements are found in the soil than adequate steps should be taken care for optimum production of crop. [3], so it is planned to study the variation of various parameters of the samples collected from the Kutch district. Parameters like pH, electric conductance, organic carbon, P, K, Zn, Fe, S, Mn, Cu, Mg and Ca are analyzed by standard method and results are compared with standard range.

II. MATERIAL AND METHODS

Geographic Location of the Area

Geographical location of the study area is presented in fig. 1. Kutch is the largest district of India. It covers approximately 45,652 sq km area. It has more than 960 villages with population of more than 21 lakhs. Its geographical coordinates are 23.9150° North, 70.3670° East.

Samples Collection

Total 15,561 samples were collected from 160 villages for 3 talukas of the Kutch district. Samples were collected as per guidelines issued by Government of India for the analysis of soil[4].

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Methods of determination of various parameters

For the various analysis of the samples guidelines issued by the Government of India was followed strictly and all the experiment were carried out at least three times[4]. Results were tabulated and statistical analysis was done to check the level of significance using SPSS 16.0.



Fig 1. Geographic Location of Kutch District

III. RESULTS AND DISCUSSION

All the obtained data were noted in a tubular and used for the analysis. Here, in the following table (Table 1) only district wise and taluka wise data were shown with Mean±SD value. Data were also analyzed village wise but it is not shown here.

Table 1. Mean and SD value of each parameter for kutch district and different talukas

Parameter	Kutch District	Bhuj taluka	Mundra taluka	Mandavi taluka
Total Samples	15561	7132	3667	4762
pH	7.54±0.61	7.57±0.82	7.51±0.26	7.52±0.37
EC (dS/cm)	0.42±0.18	0.45±0.17	0.46±0.26	0.35±0.17
OC (%)	0.57±0.19	0.57±0.18	0.67±0.19	0.49±0.19
P (Kg/Ha)	38.17±17.83	36.50±17.65	35.10±13.21	43.02±20.12
K (Kg/Ha)	322.18±207.02	303.22±161.75	281.10±91.40	382.22±298.34
Fe (ppm)	2.81±1.09	2.81±1.094	2.81±1.095	2.81±1.095
Cu (ppm)	0.39±0.14	0.39±0.14	0.39±0.14	0.38±0.14
Mn (ppm)	4.80±2.80	4.82±2.83	4.80±2.87	4.78±2.68
Zn (ppm)	4.75±2.54	4.74±2.53	4.78±2.56	4.75±2.53
Ca (Meq/100gm)	11.68±2.59	11.69±2.59	11.69±2.59	11.68±2.60
Mg (Meq/100gm)	5.27±1.49	5.24±1.49	5.27±1.49	5.25±1.49
S (ppm)	35.90±6.32	35.90±6.32	35.88±6.31	35.90±6.33

From overall analysis of the entire collected 15561 sample, it was found that the entire kutch region has neutral pH, which is the prime requirement for any crop. [5], [6] Not only pH but certain other elements were also found to be present in adequate concentration. These include organic carbon, phosphorus, copper, calcium and magnesium.

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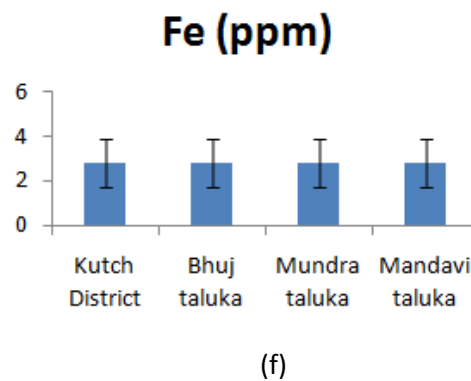
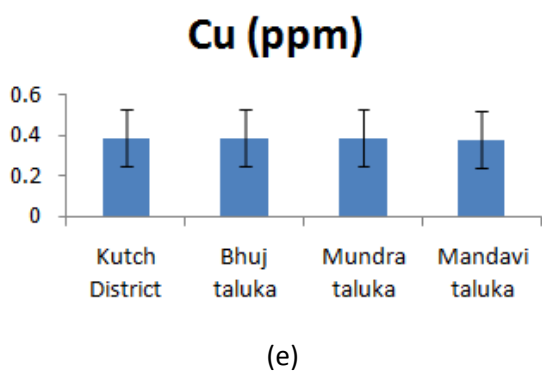
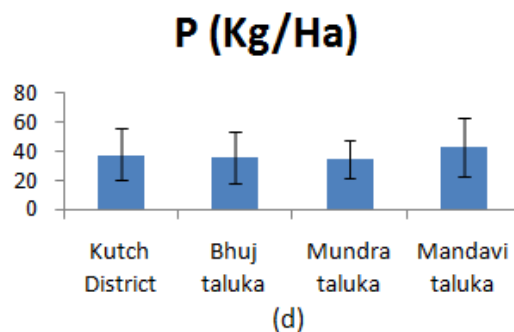
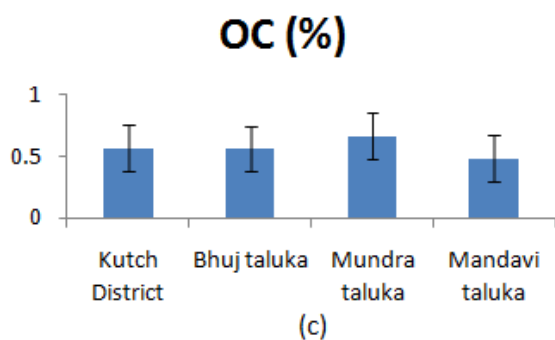
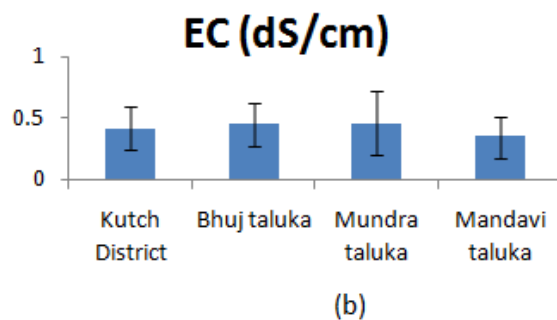
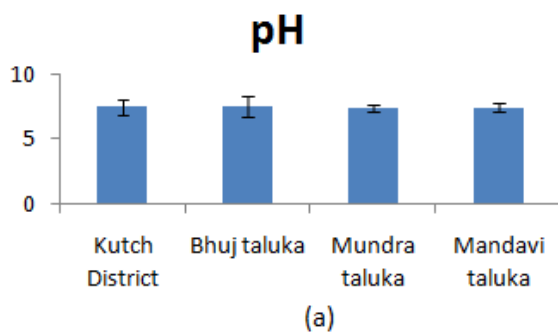
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Whereas elements like potassium, zinc and sulfur were found extremely high in this region. The level of electric conductance, ferrous and manganese were found very low in all the samples. Among the three different talukas no major changes were observed in the concentration of various elements except potassium. Mandavi has maximum potassium of 382.22 kg/ha, followed by bhuj which has 303.22 kg/ha and last mundra which has 281.10 kg/ha. This variation is because utilization of synthetic fertilizer for better yield.

Comparison of various parameters between different taluka

Comparative study of pH, EC, OC, P, K, Fe, Cu, Mn, Zn, Ca, Mg and S of various talukas of Kutch district is presented in following figures. In each figure starting from a to k, Mean \pm SD value for any one parameter was shown for kutch district and three major talukas.



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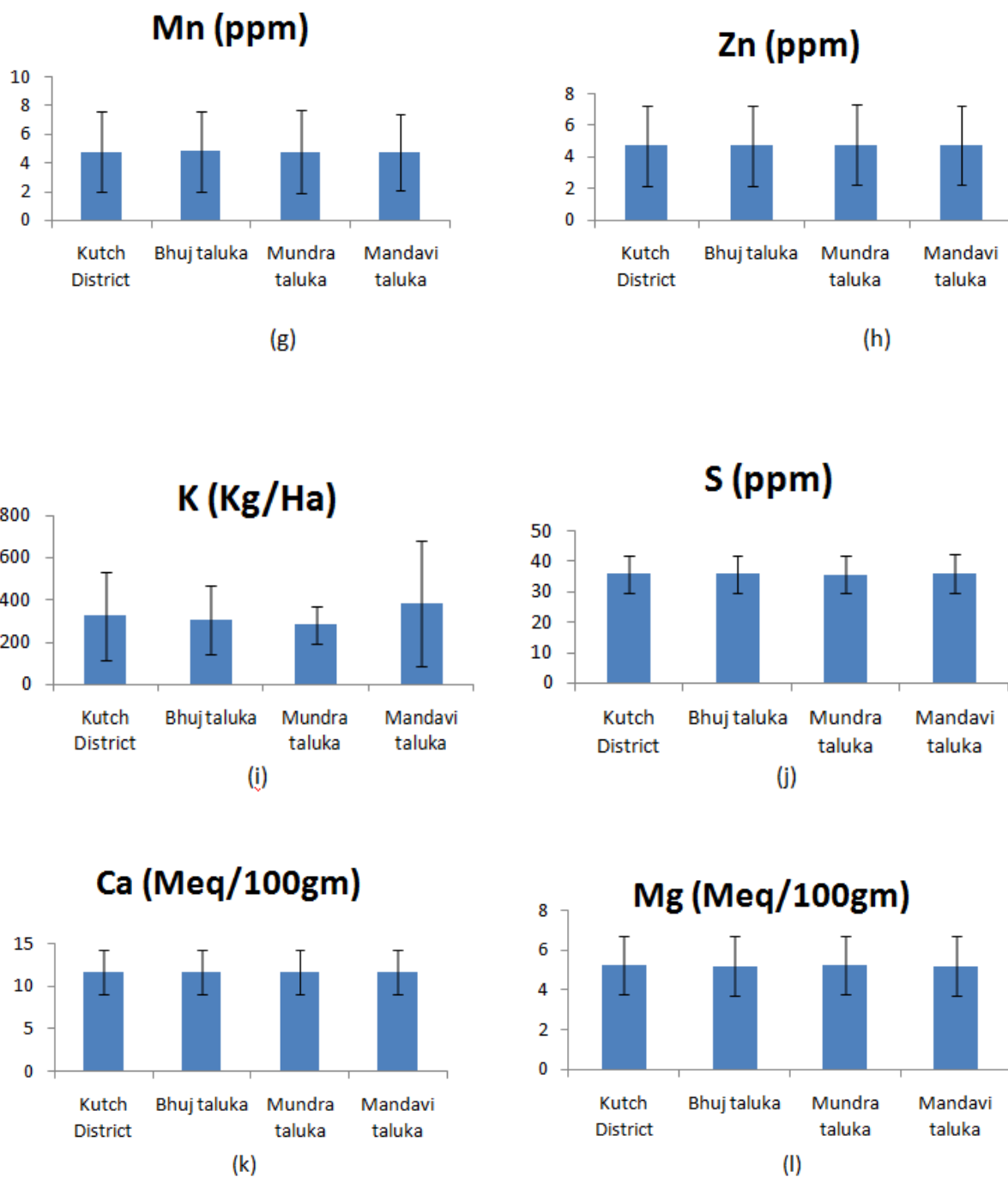


Fig 2. Comparative study of different parameters of Kutch district and its three talukas (a - k)

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From the comparative analysis among different talukas has shown that samples collected from Mundra have more variation in EC as compare to bhuj and mandavi. Similarly samples of mandavi have shown large variation in K concentration. All the other factors were almost similar for all the talukas.

Correlation matrix

	pH	EC	OC	P	K	Fe	Cu	Mn	Zn	Ca	Mg	S
pH	1											
EC	0.043	1										
OC	0.052	0.193	1									
P	-0.021	-0.102	-0.086	1								
K	0.018	-0.05	-0.077	0.102	1							
Fe	0.005	-0.005	-0.014	0.013	-0.011	1						
Cu	0.001	-0.019	-0.003	0.008	0	-0.003	1					
Mn	-0.009	-0.006	-0.01	0.013	-0.005	-0.002	-0.02	1				
Zn	0	-0.002	0	-0.002	0.006	-0.005	-0.008	0.051	1			
Ca	0.003	-0.004	0.004	-0.012	-0.003	0.009	0.008	0.002	0.055	1		
Mg	-0.009	0.004	0.006	-0.008	0.017	0.017	-0.006	-0.014	0.029	0.067	1	
S	-0.002	-0.004	-0.002	0.008	0	0.009	0.004	-0.061	-0.028	0.074	0.047	1

When principal component analysis was done for determination of correlation matrix, positive correlation were found between pH and OC, EC and OC, Mn and Zn, Ca and Mg+, P and K and also between Ca and S. Whereas major negative correlation was found between EC and P, OC and P and OC and K. However, all the other parameters did not shown any significant correlation.

IV. CONCLUSION

From the overall study it was concluded that the soil of kutch from where the samples have been collected has all the necessary factors required for the growth of plants except a few metals.

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