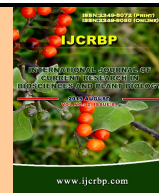




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Original Research Article

Determination of Soil Quality of Junagadh District, Gujarat, India

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Abstract	Keywords
Quality of soil plays vital role in cultivation of crops. The quality of soil can be determined by analyzing various chemical and physical parameters. These are those parameters which affects the growth of plant directly or indirectly. Physical parameter includes pH and EC, whereas concentration of various macro, micro and trace element are considered in chemical parameters. Normal ranges of all these parameters are already determined based on which quality of soil can be predicted. In the current study, Junagadh district of Gujarat, India is selected. Samples are collected from various Talukas of the district and compared to determine the soil quality.	Chemical parameters Junagadh Physical parameters Soil analysis

Introduction

Crops are highly dependent on soil for their nutrient and other elements required for the growth and development. All the three kinds of element i.e. macro, micro and trace elements are present in the soil which can be easily utilized by plants for their growth and metabolism. Macro elements like C, H, O and N play an important role in formation of structure and backbone of plant. Apart from these, they are also of major constituents in certain essential biomolecules (Kinyangi, 2007; Shomar, 2012).

Micro and trace element mainly acts as cofactors for activation of certain enzymatic activities, inhibitor to prevent adverse effect on plant. They also directly or indirectly are involved in growth and regular activity of plants. For any plant it very essential to have these elements available in the soil in sufficient concentrations, lower of higher concentration of any of these elements may have adverse effect on plant.

Therefore it is very essential to analyze the quality of soil before using for agriculture purpose. This will help in determination of soil quality. Not only this, it will also give above the idea about the addition volume of various crops improvers mainly fertilizers. Extensive addition of such compound leads to lose soil fertility (Patel et al., 2014). An experiment has been planned to study the variation of various parameters of the samples collected from the Junagadh district. Parameters like pH, electric conductance, organic carbon, P, K, Zn, Fe, S, Mn, Cu, Mg and Ca are analyzed by standard method and by comparing the results with standard range.

Materials and methods

Geographic location of the area

The geographical location of the study area is presented in Fig. 1. Junagadh is a part of Saurashtra region of Gujarat state, India. It covers approximately 59 square

km area. It has the population of more than 5.17 lakhs. The geographical coordinates of Junagadh district are 21.52°N and 70.47°E.

Samples collection

A total of 12,362 samples were collected from 80 villages of six Talukas of Junagadh district, Gujarat State. The samples were collected as per the guidelines issued by Government of India for the analysis of soil (Department of Agriculture and Co-operation, 2011).

Methods of determination of various parameters

For the analysis of physico-chemical parameters of the samples, guidelines issued by the Government of India were followed strictly and all the experiments were carried out at least three times (Department of Agriculture and Co-operation, 2011).

Results were tabulated and statistical analysis was done to check the level of significance using SPSS version 16.0.

Fig. 1: Geographic location of Junagadh District.



Results and discussion

Table 1 and the Figs. 1 to 5 show the average values of different parameters of the soil samples collected from various Talukas of Junagadh district, Gujarat. Based on the overall results, it was found that the entire Junagadh region has net neutral soil. Maximum pH is found in Junagadh city was around 7.69 and lowest in Bhesan taluka. However in rest of talukas no significant difference was observed (Fernández and Hoeft, 1990). In case of EC, again Junagadh taluka has shown highest EC of 076, followed by Keshod. Least EC was found in the Bhesan district. Maliya has shown presence of maximum organic matter in the

soil whereas others have comparatively lesser concentration. Concentration of P is found higher in Bhesan which is around 55.16 and least is found in Junagadh. Junagadh, Keshod, Visavadar and Bhesan have shown very high concentration of K as compare to the rest of the two talukas. However overall concentration of K is very high as compare to acceptable range which should be 140-280 Kg/ha (Patel et al., 2014). Highest concentration of Fe found in the soils collected from Keshod, followed by Bhesan and other talukas. A large variation in the Fe concentration was seen from sample to sample even though collected from same taluka. Cu and Zn were almost found similar in all the collected samples.

Table 1. Values of different parameters of for the soil samples collected from various Talukas.

Talukas (N)		pH	EC	OC	P	K	Fe	Cu	Mn	Zn	Ca	Mg	S
Junagadh (2192)	Mean	7.69	0.76	0.98	37.27	439.90	7.21	2.51	5.98	1.27	29.09	6.93	44.32
	SD	0.23	0.34	0.29	16.48	204.98	6.82	1.46	2.56	0.71	6.40	2.55	28.12
Bhesan (3395)	Mean	7.23	0.32	1.22	55.16	449.31	13.29	1.81	10.74	2.57	39.84	11.19	40.43
	SD	0.19	0.13	0.26	18.87	96.11	12.16	2.08	6.04	1.88	6.354	9.09	19.47
Visavadar (3106)	Mean	7.25	0.44	1.23	40.83	409.73	9.67	1.50	6.34	0.93	31.53	8.16	32.90
	SD	0.20	0.29	0.29	19.94	179.18	6.79	0.88	1.89	0.58	7.92	3.21	14.22
Maliya (1806)	Mean	7.57	0.51	1.49	44.66	272.20	9.76	2.24	4.59	0.69	36.30	8.41	33.82
	SD	0.28	0.29	0.49	31.10	249.40	6.96	1.19	2.98	0.22	6.03	2.53	13.29
Mendarda (1654)	Mean	7.57	0.45	1.08	37.84	305.16	8.55	2.05	5.39	1.31	29.20	7.52	62.45
	SD	0.24	0.22	0.38	21.00	288.05	7.73	1.35	3.38	0.93	5.31	2.94	31.46
Keshod (209)	Mean	7.64	0.73	1.05	39.69	427.38	14.76	2.04	14.32	0.90	37.23	8.44	30.38
	SD	0.25	0.28	0.29	15.76	197.43	8.14	1.15	6.58	0.76	6.44	3.05	9.98
Total (12362)	Mean	7.42	0.48	1.20	44.27	392.16	10.18	1.96	7.24	1.46	33.86	8.73	41.04
	SD	0.29	0.30	0.37	22.37	208.32	9.04	1.54	3.46	0.90	3.40	5.59	23.33

Values of Cu and Zn have indicated that both these elements are present in higher concentration in the entire region (Jia et al., 2010; Valladares et al., 2009). Similarly Ca and S contents were also found to be higher in entire Junagadh district. Keshod and Bhesan have shown higher concentration of Mn and Mendarda has shown lowest concentration. Ca and Mg are found highest in Bhesan as compare to other talukas. Overall observation indicates that Bhesan has comparatively higher concentration of micro and trace elements in the soil. The higher concentration of K is because of uncontrolled used of synthetic fertilizers for more production of crops (Tittonell et al., 2008). Higher concentrations of other elements are because of the rocky area of the entire Junagadh district.

Fig. 2: Comparative analysis of pH, Fe, Mn and Mg in various talukas of Junagadh district.

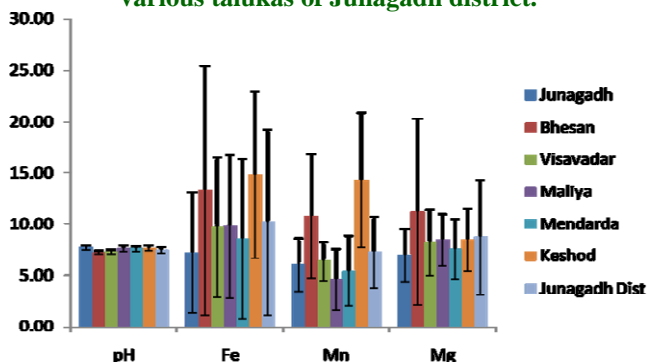


Fig. 3: Comparative analysis of EC, OC, Cu and Zn in various talukas of Junagadh district.

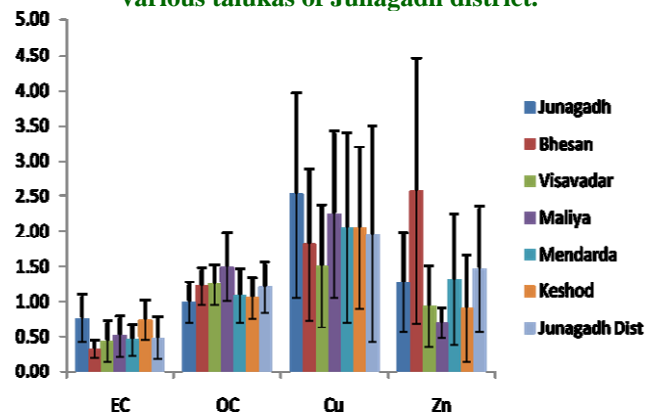


Fig. 4: Comparative analysis of K in various Talukas of Junagadh district.

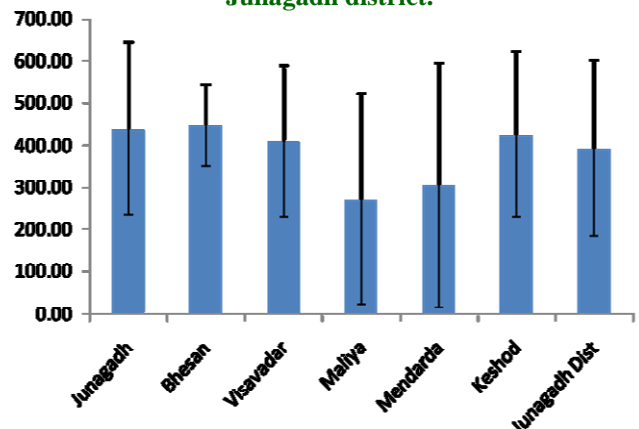
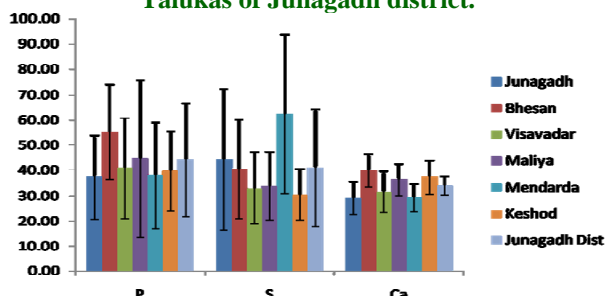


Fig. 5: Comparative analysis of P, S and Ca in various Talukas of Junagadh district.



Principal Component Analysis

PCA is done to determine the correlation between the important components of the analysis. Results of PCA analysis is shown in Table 2.

No significant correlation was found except between EC and pH, and Cu and Fe. Rest of all the components showed no direct correlation with the other components.

Table 2. Principal Component Analysis of soil physico-chemical parameters.

Parameters	pH	EC	OC	P	K	Fe	Cu	Mn	Zn	Ca	Mg	S
pH	1.00											
EC	0.28	1.00										
OC	-0.09	-0.06	1.00									
P	-0.15	-0.12	0.01	1.00								
K	-0.17	-0.02	-0.08	0.09	1.00							
Fe	-0.12	-0.13	-0.02	0.12	0.08	1.00						
Cu	0.17	0.06	-0.04	-0.03	-0.02	0.31	1.00					
Mn	0.00	0.02	-0.02	0.01	0.01	0.12	0.00	1.00				
Zn	0.08	0.01	-0.04	-0.05	-0.01	-0.01	0.11	0.01	1.00			
Ca	-0.04	-0.03	0.01	0.03	-0.01	0.07	0.02	0.00	-0.02	1.00		
Mg	-0.12	-0.08	0.02	0.09	0.04	0.17	0.04	0.05	-0.06	0.06	1.00	
S	0.12	-0.01	-0.10	-0.04	0.02	0.00	0.05	-0.04	0.03	-0.02	-0.09	1.00

Conclusion

Based on the overall study it is found that the soil of Junagadh are very rocky and contain several elements in higher concentration, though most of the parameters are in favour of crop cultivation.

Acknowledgement

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