Comparative Analysis of Various Factors of Irrigated and Non–Irrigated Soils of Various Villages of Bhesan District of Junagadh

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ABSTRACT: Soil is one of the most vital sources for cultivation of all types of the crops on the land. The crops selection for cultivation 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 play significant role in selection of crop. Irrigation also plays an important role. So a comparative study was carried out between various properties of irrigated and non-irrigated agriculture land of bhesan village, Junagadh district in the state of Gujarat, India. From the study it was found that both type of land have sufficient concentration of all the micro and macro elements. However these concentrations were found little higher in irrigated soil as compare to non-irrigated.

KEYWORDS: irrigated, non-irrigated, Bhesan, physical and chemical properties of soil

I. INTRODUCTION

Soil is thought to be the major nutrient provider for crop production. The major components required for the growth of any crop includes macroelements like carbon, hydrogen and nitrogen, microelements like potassium, sulfur, boron, magnesium, zinc, chlorine and certain trace elements. Macroelements play key role in over all development and biomolecule formation where as micro and trace element serves various purposes like, 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. It is very essential to have all these elements in the soil for good growth of plants. If they are not available in the soil then they can be provided in form of synthetic chemicals as fertilizers[1]. However excess of certain elements have also shown adverse effect on plant[2]. Presence of adequate water in form of moisture also plays significant role in overall growth and development of plant. It is thought that water increases the rate of transportation of these elements[3]. So a study was planned to study the variation of various parameters which are thought to be crucial for the growth of plants between irrigated and non-irritated soil of various villages of Bhesan village of Junagadh district in the state of Gujarat, India. Parameters like pH, electric conductance, organic carbon, P, K, Zn, Fe, S, Mn, Cu, Mg and Ca was considered for present study.

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II. MATERIAL AND METHODS

Geographic Location of the Area

Geographical location of the study area is presented in fig. 1. Its geographical coordinates are 21° 33' 0" North, 70° 42' 0" East. Bhesan is a district located near Junagadh city.

Fig 1. Geographic Location of Bhesan Village

Samples Collection

Samples were collected as per guidelines issued by Government of India for the analysis of soil[4]. Total 2877 samples from irrigated soil and 518 samples from non-irrigated soil were collected for the analysis and immediately processed.

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.

III. EXPERIMENTAL RESULTS AND DISCUSSION

In this study, the focus was only on the major factors which may affect the growth of plant. Apart from these, there are many other parameters which also affect the growth. Table 1 shows analysis results of various soil samples collected from various village of the Bhesan district. The villages were broadly classified as irrigated and non irrigated villages. Total twelve villages were belonging to irrigated and three villages were belonging to non-irrigated villages. Average values of various analyses performed for collected samples along with the 2-tailed significance value. (Table 2) These parameters plays significant role in the development of plant. Mean value of all the analyses along with the standard deviation were shown on the table.

Based on the resultant data it is noted that both soil are slightly alkaline pH, which is one of most favoring factor the plant growth[5], [6]. Alkaline nature of soil inhibit the flow of certain metals and other components to the plants making growth rate slower. Electric conductance of both kinds of soils is found below 0.5 dS/cm, this reflects soils are free of salts. Irrigated and non-irrigated soils both contain higher concentration of carbon. This is again a growth

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Table 1.Aanalysis results of various soil samples collected from various village of the Bhesan district

Parameter	Rafadiya	Barvada	Sardarpur	Damrala	Mandva	Mendarda	Chuda	Dolva	Gorviyali	Sankrola	H.khakhra	H.Khajuri	Morvada	Chuda	Dolva
Total Sample	349	415	383	260	145	270	655	280	30	30	30	30	413	25	80
Type of Irritation	Irrigated												Non-irrigated		
pH	7.15 ±0.14	7.29 ±0.19	7.18 ±0.14	7.21 ±0.15	7.24 ±0.17	7.27 ±0.17	7.24 ±19	7.31 ±0.28	7.21 ±0.18	7.11 ±0.15	7.19 ±0.25	7.22 ±0.19	7.16 ±0.13	7.32 ±0.21	7.16 ±0.19
EC	0.334 ±0.088	0.332 ±0.099	0.339 ±0.129	0.379 ±0.165	0.397 ±0.189	0.392 ±0.178	0.258 ±0.096	0.298 ±0.079	0.276 ±0.069	0.297 ±0.084	0.325 ±0.113	0.330 ±0.105	0.287 ±0.060	0.276 ±0.064	0.235 ±0.059
OC	1.191 ±0.258	1.197 ±0.270	1.325 ±0.257	1.317 ±0.359	1.130 ±0.235	1.175 ±0.185	1.248 ±0.237	1.103 ±0.207	1.163 ±0.254	1.295 ±0.260	1.030 ±0.174	1.056 ±0.131	1.218 ±0.250	1.149 ±0.221	1.165 ±0.251
P	49.810 ±19.103	59.000 ±180.284	59.094 ±18.966	57.080 ±22.110	55.751 ±20.451	56.355 ±17.562	54.713 ±17.992	50.617 ±16.694	55.666 ±15.605	63.533 ±18.849	60.366 ±19.216	58.366 ±16.672	52.992 ±18.934	49.800 ±13.228	54.362 ±17.322
K	455.36 ±93.48	465.55 ±96.15	472.72 ±98.91	499.09 ±119.85	493.73 ±106.35	415.30 ±82.86	432.55 ±83.25	415.35 ±85.23	404.20 ±92.23	380.50 ±71.99	392.63 ±78.07	382.37 ±82.80	452.63 ±84.28	431.84 ±100.35	432.35 ±79.33
Zn	1.799 ±8.71	0.478 ±0.351	0.739 ±1.509	0.200 ±0.448	0.500 ±0.295	0.492 ±0.218	1.466 ±4.908	17.467 ±2.236	1.903 ±2.887	1.389 ±2.060	1.048 ±1.048	1.498 ±1.685	0.761 ±1.114	0.550 ±0.218	12.727 ±7.795
Fe	2.314 ±4.744	15.151 ±6.702	6.930 ±4.848	11.130 ±6.836	18.293 ±6.354	16.151 ±6.234	15.984 ±9.319	27.380 ±25.608	5.134 ±2.115	5.056 ±2.217	5.321 ±3.572	4.489 ±3.569	9.463 ±7.246	22.710 ±5.363	28.224 ±13.604
S	55.524 ±27.118	45.180 ±15.460	57.041 ±21.885	35.186 ±13.116	19.474 ±6.081	24.659 ±5.834	27.764 ±7.106	46.138 ±18.209	27.460 ±13.922	26.000 ±7.882	24.980 ±8.378	49.267 ±13.978	49.183 ±9.593	27.388 ±3.675	33.973 ±7.461
Mn	5.561 ±5.710	18.098 ±13.799	5.473 ±6.318	6.881 ±5.383	13.516 ±9.508	10.786 ±6.931	11.962 ±9.883	7.947 ±16.412	16.832 ±12.788	14.336 ±1.372	10.863 ±9.777	0.348 ±0.651	11.267 ±11.039	29.152 ±5.705	19.245 ±5.267
Cu	1.103 ±0.624	1.015 ±0.647	0.965 ±0.591	1.291 ±0.720	1.971 ±0.722	1.752 ±0.644	1.977 ±1.253	5.349 ±5.140	1.650 ±0.384	1.295 ±0.709	1.589 ±0.744	1.172 ±0.479	1.240 ±0.767	2.440 ±0.730	4.234 ±1.916
Mg	8.255 ±3.906	6.125 ±1.462	8.373 ±2.614	16.350 ±11.964	25.860 ±8.732	32.863 ±6.302	8.142 ±3.256	9.877 ±3.904	7.243 ±1.738	6.976 ±1.551	6.183 ±1.790	7.043 ±1.547	6.677 ±1.592	8.352 ±1.596	7.472 ±1.904
Ca	43.049 ±8.493	36.100 ±4.591	31.068 ±19.077	16.502 ±12.417	40.323 ±19.276	43.123 ±20.447	56.134 ±80.205	33.807 ±29.861	29.490 ±2.998	33.136 ±6.683	33.576 ±3.129	28.746 ±39.293	34.650 ±4.293	28.168 ±3.943	34.760 ±5.873

promoting factor, whereas potassium and phosphate, were found in very high concentration. The main reason behind it is uncontrolled application of chemical fertilizers containing N, P and K. Excess quantity of these elements tends

to stay in the soil in idle form for longer period of time and leading to adverse effect on soil fertility at times[7]. When results for microelements like ferrous, sulfur, manganese, zinc, copper, magnesium and sulfur are compared, again they have showed higher values. It is also attributed to uncontrolled use of chemical fertilizers[8]. When the results are compared with the standard value of soil as per Government of India, Sulfur and calcium are found almost 3 times higher than the normal recommended range. Copper is around 5 times higher than the normal accepted value. Zinc and Manganese are almost found in double the concentration than the recommended. Overall results of the study have shown that irrigated soils tend to retain more macro and micro elements. This is however beneficial for the plant growth but excess of them may affect the plant growth. When obtained data were analyzed using SPSS for independent t test and one-way ANOVA, most of the data are found absolutely significant where p-value is found less than 0.001 except organic carbon, zinc, ferrous and copper, they have higher p-values.

Table 2. Analysis of various parameters of irrigated and non-irrigated soils

Parameter	Irrigated	Non-Irrigated	Sig.(2-tailed)
Total Samples	2877	518	-
pH	7.23±0.19	7.17±0.15	0.000
EC (dS/cm)	0.324±0.130	0.3041±0.0905	0.001
OC (%)	1.219±0.263	1.206±0.249	0.318
P (Kg/Ha)	55.540±18.92	53.0502±18.45	0.006
K (Kg/Ha)	449.46±98.04	448.48±84.60	0.831
Zn (ppm)	2.570±9.376	2.599±5.389	0.945
Fe (ppm)	13.340±12.35	13.000±1.11.04	0.552
S (ppm)	39.464±20.44	45.782±11.38	0.000
Mn (ppm)	10.268±10.96	13.362±11.12	0.000
Cu (ppm)	1.819±2.169	1.760±1.496	0.552
Mg (Meq/100gm)	11.966±9.649	6.880±1.698	0.000
Ca (Meq/100gm)	39.509±42.59	34.354±4.756	0.000

Another comparative study of two major crops' is also done. These two crops are groundnut and cotton. Since longer period of time both the crops are been cultivated in respective fields. It is an assumption that these crops may also have affected the nutrient quality of soil. So analysis is done for the same. Results of obtained data are presented in table 3. Almost all the parameters have similar value except Zn, Mn and Ca.

Table 3. Analysis of various parameters of the groundnut fields and cotton fields

Parameter	Groundnut	Cotton	Sig. (2 tailed)
Total Sample	1771	1624	-
pH	7.19±0.19	7.25±0.18	0.000
EC	0.321±0.111	0.320±0.138	0.684
OC	1.202±0.255	1.232±0.266	0.001
P	54.033±18.937	56.389±18.735	0.000
K	449.72±94.94	448.86±97.38	0.795
Zn	4.168±11.696	0.8359±3.171	0.000
Fe	11.611±14.782	15.125±8.043	0.000
S	47.351±21.563	32.879±13.282	0.000
Mn	8.866±10.838	12.784±10.902	0.000
Cu	2.011±2.689	1.591±1.036	0.000
Mg	9.491±6.264	13.043±11.114	0.000
Ca	35.634±17.092	42.090±53.744	0.000

In entire district, 1771 fields are growing groundnut while 1624 fields are growing cotton as their major crops. Comparison of various analyses has revealed that there is no significant difference between pH, EC, OC, P concentration, K concentration of both the fields. But a major difference is observed between zinc concentration, manganese concentration, copper concentration, calcium concentration. Overall results indicate that cotton growing fields' have more concentration of microelements. Statistical analysis is showing that most of the data are significant except EC and potassium concentration.

IV. CONCLUSION

From the overall study it is concluded that both irrigated and non-irrigated soils of the Bhesan village have sufficient but excess quantity of element. This will definitely promote the plant growth. Second another important observation is irrigated soil contain comparatively higher concentration of microelements.

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