



Continuous issue-4 | January - March 2015

Analysis of Chemical Parameters of Soil Samples of Chuda Taluka Dist. Surendranagar, Gujarat

Abstract

*Study of soil samples of various villages of **Chuda Taluka** of **Surendranagar district** based on some chemical parameters like Conductivity (EC), pH, Phosphorous(P), Potash(K) and Organic Carbon(%). The chemical parameters have been found more different by many reasons, since one of them is repeated cultivation by farmers, which have no complete knowledge about soil fertility correlate with soil nutrients level and which are the appropriate fertilizers, hence it is found to study the analysis of soil. Soil samples collected by trained sample collector from the different villages of **Chuda Taluka** of **Surendranagar district** and analysed by us under Government of Gujarat "Soil Health Card Project".*

Keywords: Nutrients, Parameters, Fertility, Chuda

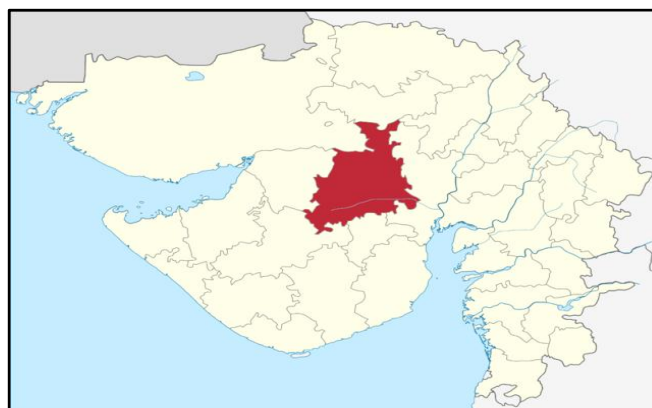
1.0 Introduction

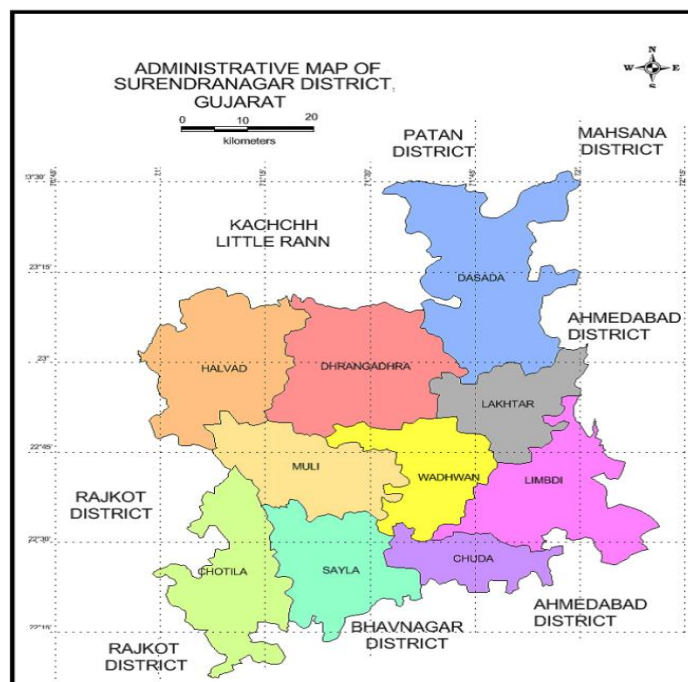
Soil is the abundant basic material of the earth formation in universe, which has provided the necessary nutrients to grow the plants, since the lack of nutrients, the soil gets less productive. According to Joffe(1949) soil is the composition of different minerals and organic materials. Generally plants grow by absorbing required nutrients through its roots depending on the soil quality. Soil quality is depending on availability of nutrients. The purpose of this study of soil samples that an attempt to find out nutrients level after repeated cultivation and irrelevant excessive uses of chemical fertilizers.

2.0 Materials and Methods

2.1 Study Area:

Surendranagar district has a geographical area of about 10,489 sq. km and falls in the Survey of India Degree sheets 41N and 41M, between North latitudes 22° 8' and 23° 3' and East longitudes 70° 58' and 72° 12' shown in figure no.1. The district has 651 villages and 11





towns (populations greater than 1,00,000) spread over 10 talukas, namely Wadhwan, Limbdi, Dasada, Dhrangadhra, Chuda, Muli, Halvad, Chotila, Sayla and Lakhtar. Surendranagar district is the average hilly areas, Piedmont slopes, and alluvial plains (main land) largest dry district as near to Kutchh small desert in Gujarat in India. It covers 531 sq.m. forest area and 7624 cultivable area which have major three types of soil 1) Medium black soils 2) Red sandy soils and 3) Salty soils among them Chuda taluka lies between latitudes $22^{\circ}19'N$ and longitudes $71^{\circ}35'E$ with an altitude of 63m above the mean sea level.

2.2 Method

Soil samples were collected by scientific method, 0 to 20 cm depth below the surface. The sample were dried and sieved through 2 mesh sieve store in polythene bags and labelled for analysis. As per "Soil Testing Manual-Gujarat, all samples were analysed Phosphorous (P), Potash (K), Organic Carbon (%), Electrical Conductivity (EC), pH.

pH values were determined using digital pH meter. In this method 10 g soil sample was mixed with 20 ml distilled water in 1: 2 ratio. The suspension was stirred with glass rod with some intermittently about 30 minutes and left for one hour. The combine electrode was dipped into suspension and pH was recorded. pH value as a measure of the hydrogen ion concentration of the soil water system and determine the acidity and alkalinity of the soil. It is a useful property of soil as it determines the level of nutrients, microbial activity and physical condition of soil.

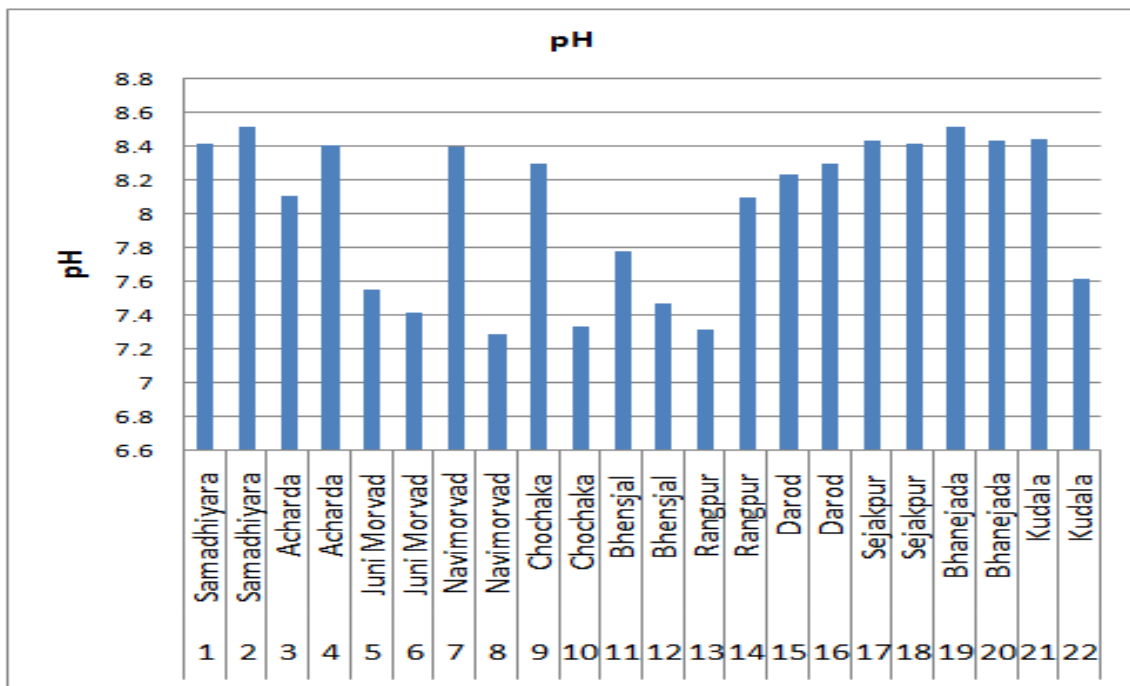
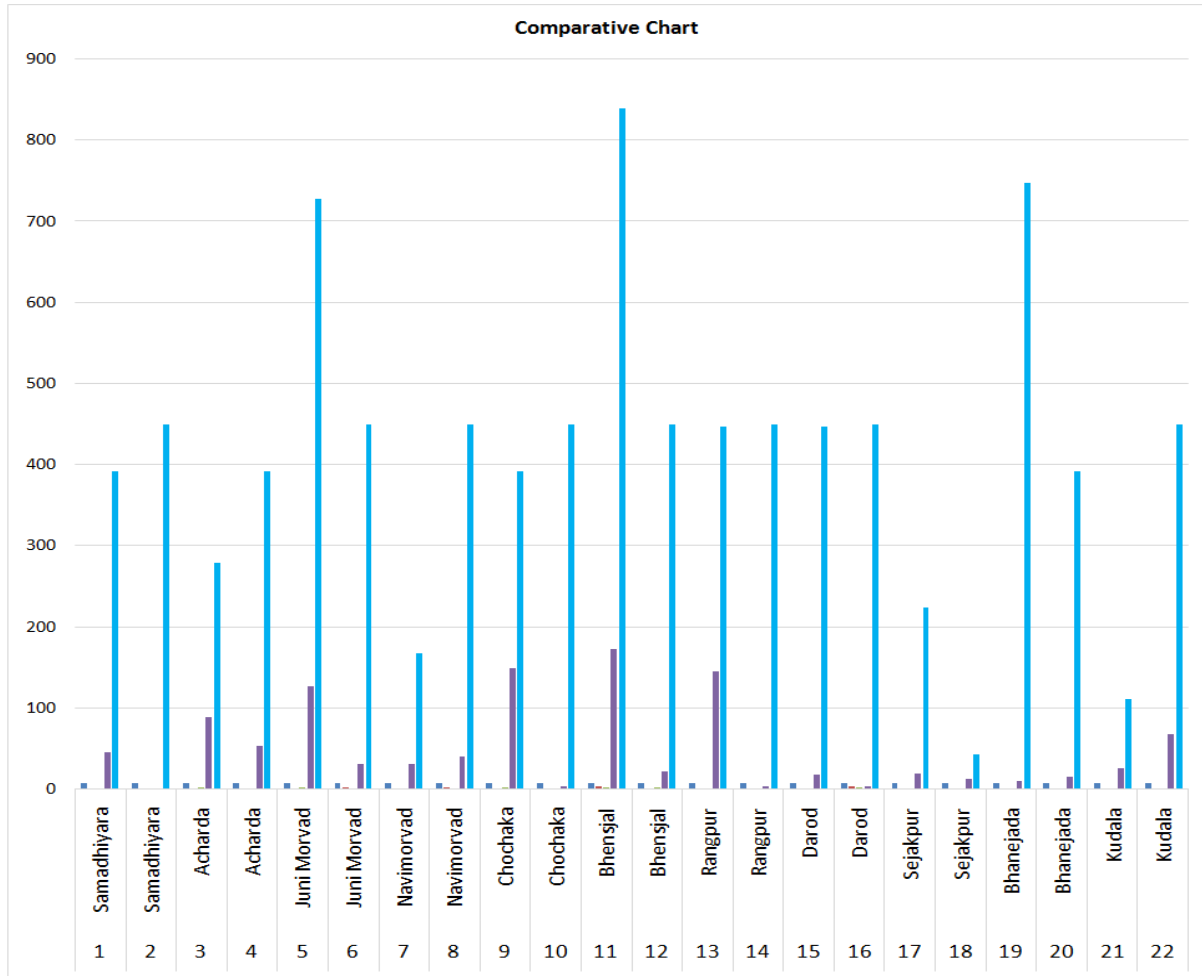
Electrical conductivity (EC) explicit the ion contents of solution which determine the electro current carrying capacity thus giving a clear idea of the soluble salts present in the soil. The electrical conductivity of a soil samples was determined on an EC digital electrical Conductivity Bridge for which 10g soil was added in 20ml distilled water. The suspension was stirred intermittently for half an hour and kept it for complete dissolution of soluble salts at least 30 minutes. The soil was allowed to settle down and then conductivity cell was inserted in solution to take the reading to record the EC values.

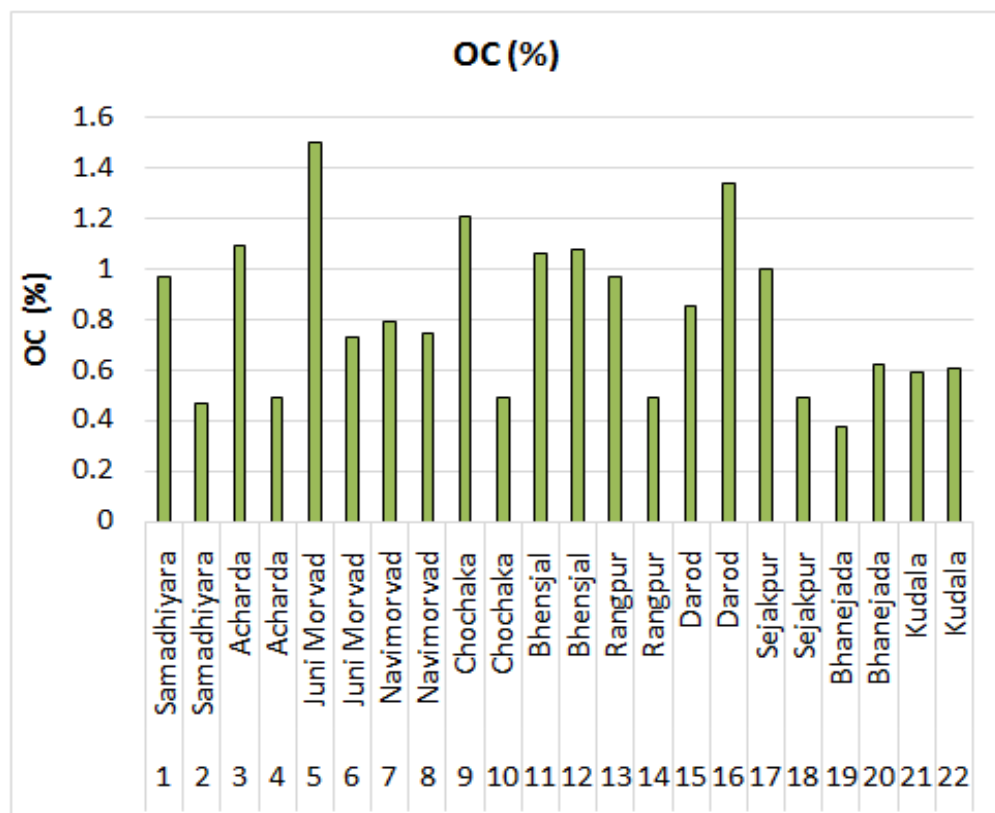
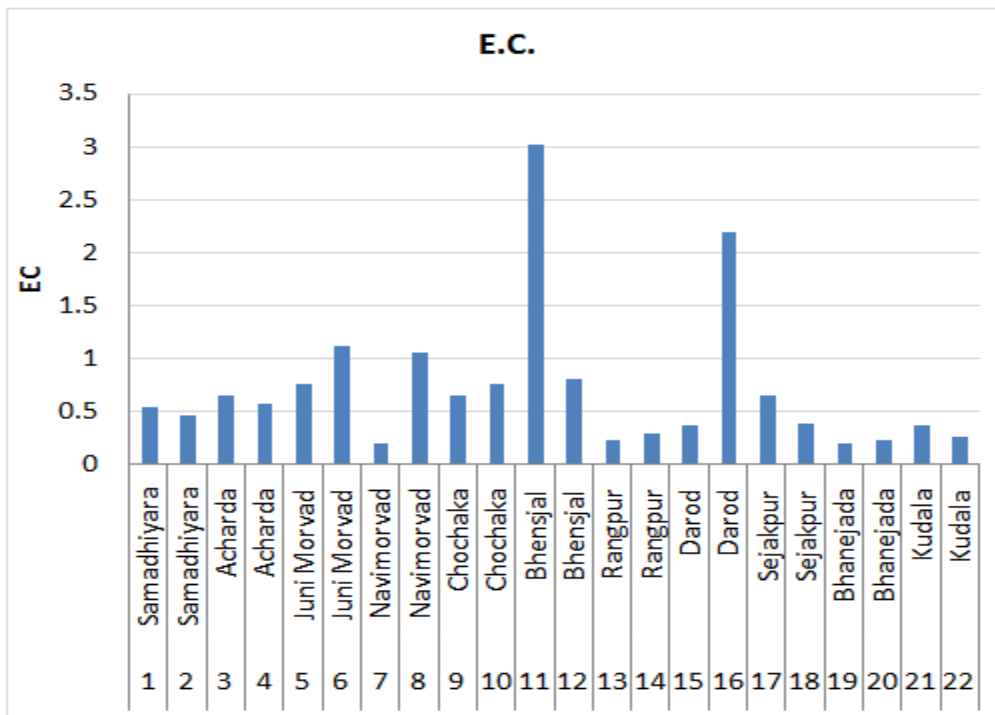
Organic matter is useful in supplying nutrients and water to the plants and also provides good physical conditions to the plants. The quantity of organic carbon in the soil was estimated by using modified Walkey- black method (Walkey and black, 1934) as described by Jackson (1967). 1g finely ground dry soil sample was passed through 0.5mm sieve without loss and was taken into 250ml conical flask. To this 10ml of 1N potassium dichromate and 20ml con. H_2SO_4 were added and the contents were shaken for a minute and allowed to set aside for exactly for 30 minutes and then 20ml distilled water then put these sets whole night. On second day take reading in photoelectric coloury meter with setting 660 mm red filter.

In soils obtainable phosphorus is found as orthophosphate in several forms and combinations but only a small part of it might be available to plants. Obtainable phosphorus was determined by Olsen's method (Olsen *et al*, 1954) modified by Watanbe (1965). The reagent for Olsen's P was 0.5 M $NaHCO_3$ (pH 8.5) prepared by dissolving 42g $NaHCO_3$ in distilled water. The pH was adjusted at 8.5 with 20% NaOH solution. 2 g of air dried soil was weighed into 150ml Erlenmeyer flask, 50ml of 0.5 M $NaHCO_3$ Solution has pH 8.5 known as Olsen's reagent and one gram of phosphate free activated charcoal were added. The flasks were shaken for 30 minutes and contents were filtered immediately by filter paper preferably Whatman No. 41. Then 5ml of the filtrate was taken through pipette into 25ml of volumetric flask and was neutralized with H_2SO_4 using p-nitro phenol as indicator and the volume was made up by adding distilled water. After addition of 1 ml solution of stannous chloride blue colour developed and intensity of blue colour was read in photoelectric colorimeter within 10 minutes at a wavelength of 730nm. A blank was run without soil. Potassium in soil water has been estimated by flame by preparing the standard solutions of potassium (ppm) and feeding the diluted extract in flame photometer for recording the reading for standard and sample with K filter.

Table: 1: Showing the variation in different parameter of soil samples from Chuda Taluka

| Sample No. | Village | pH | E.C. | OC (%) | P | K |
|------------|-------------|------|------|--------|-------|-----|
| 1 | Samadhiyara | 8.42 | 0.55 | 0.97 | 46.4 | 392 |
| 2 | Samadhiyara | 8.52 | 0.46 | 0.47 | 4.51 | 450 |
| 3 | Acharda | 8.11 | 0.66 | 1.09 | 89.1 | 280 |
| 4 | Acharda | 8.41 | 0.57 | 0.49 | 54.12 | 392 |
| 5 | JuniMorvad | 7.55 | 0.76 | 1.5 | 126.8 | 728 |
| 6 | JuniMorvad | 7.42 | 1.12 | 0.73 | 31.57 | 450 |
| 7 | Navimorvad | 8.4 | 0.21 | 0.79 | 31.4 | 168 |
| 8 | Navimorvad | 7.29 | 1.06 | 0.75 | 40.59 | 450 |
| 9 | Chochaka | 8.3 | 0.66 | 1.21 | 149.6 | 392 |
| 10 | Chochaka | 7.34 | 0.76 | 0.49 | 4.51 | 450 |
| 11 | Bhensjal | 7.78 | 3.02 | 1.06 | 172.9 | 840 |
| 12 | Bhensjal | 7.47 | 0.81 | 1.08 | 22.55 | 450 |
| 13 | Rangpur | 7.32 | 0.23 | 0.97 | 145 | 448 |
| 14 | Rangpur | 8.1 | 0.29 | 0.49 | 4.51 | 450 |
| 15 | Darod | 8.24 | 0.38 | 0.85 | 19 | 448 |
| 16 | Darod | 8.3 | 2.2 | 1.34 | 4.51 | 450 |
| 17 | Sejakpur | 8.44 | 0.66 | 1 | 19.7 | 224 |
| 18 | Sejakpur | 8.42 | 0.39 | 0.49 | 13.53 | 437 |
| 19 | Bhanejada | 8.52 | 0.2 | 0.38 | 10 | 748 |
| 20 | Bhanejada | 8.44 | 0.24 | 0.62 | 16.3 | 392 |
| 21 | Kudala | 8.45 | 0.37 | 0.59 | 26.7 | 112 |
| 22 | Kudala | 7.62 | 0.27 | 0.61 | 67.65 | 450 |





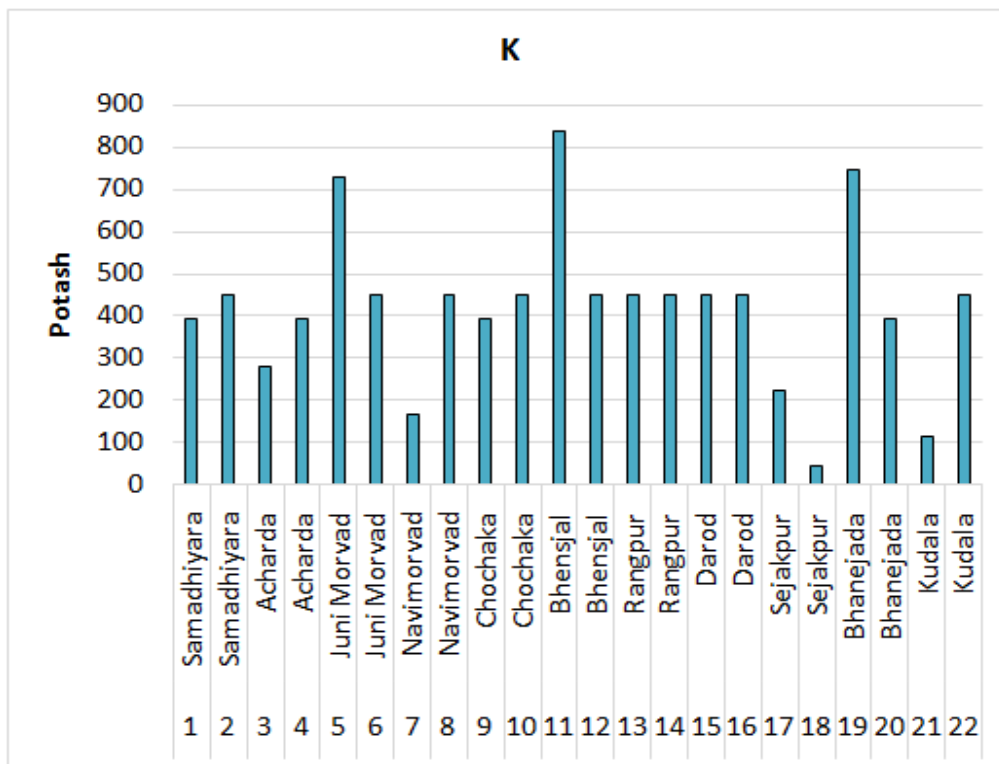
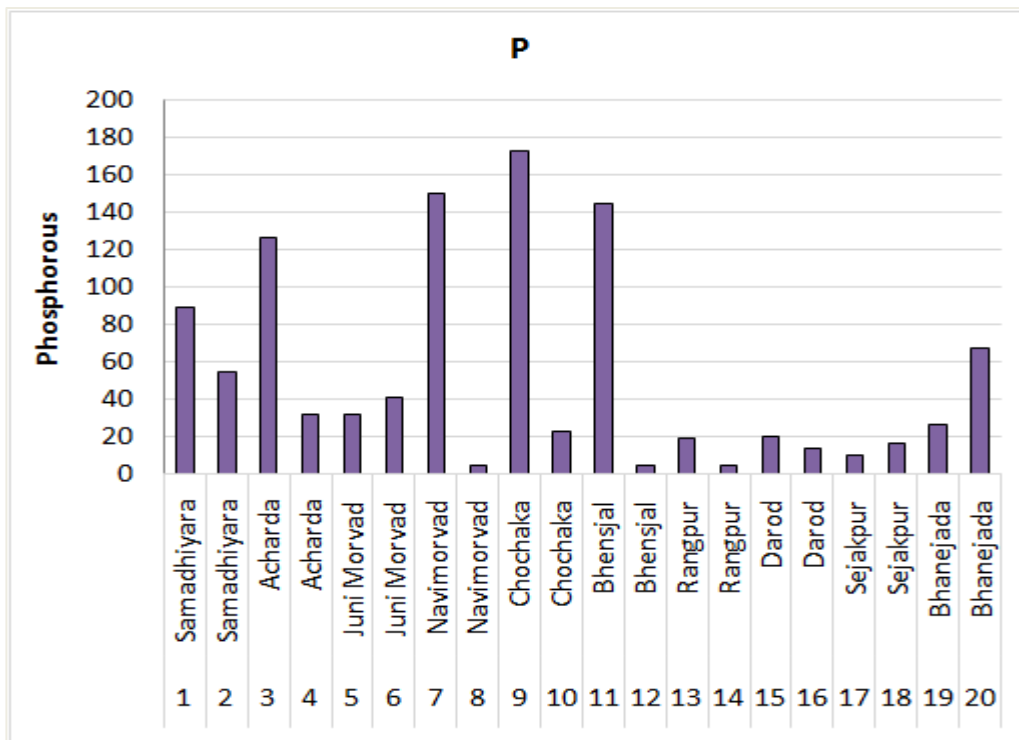


Figure: Variations of parameters like pH, EC, C-Org, P and K in soil sampl

Table 2: Interpretation of soil properties (Reference MM-SOIL Govt.Of India-2011)

| Parameters | Interpretation | |
|-------------|----------------|---------------------|
| pH | < 4.6 | Extremely acidic |
| | 4.6 – 5.5 | Strongly acidic |
| | 5.6 – 6.5 | Moderately acidic |
| | 6.6 – 6.9 | Slightly acidic |
| | 7 | Neutral |
| | 7.1 – 8.5 | Moderately alkaline |
| | > 8.5 | Strongly alkaline |
| EC dS/cm | 0 – 2 | Salt Free |
| | 4 – 8 | Slightly Saline |
| | 8 – 15 | Moderately Saline |
| | > 15 | Highly Saline |
| OC (%) | < 0.5 | Low |
| | 0.5 – 0.75 | Medium |
| | > 0.75 | High |
| P Kg/ha | < 10.0 | Low |
| | 10 – 24.6 | Medium |
| | > 24.6 | High |
| K Kg/ha | < 108 | Low |
| | 108 – 280 | Medium |
| | > 280 | High |

3.0 Result and Discussion

After analysis of all samples over here the data shows in (Table 1) that the values for pH range from 7.32 to 8.52 (Fig.) hence the data proves soils are moderately alkaline and in this situation the solubility of minerals decreases, makes nutrient deficiencies in the soils.

Electrical Conductivity value ranges from 0.20 dS/cm to 3.02 dS/cm (Table 1), however sample No. 11 shows excess content of soluble salts which may due to excess use of fertilizer like P and K. Electrical conductivity is used to estimate the concentration of soluble salt in soil and is commonly used as measure salinity too.

The value of EC below 0.4dS/cm is considered salt free or non-saline. The soils sample no.11 under analysis was found slightly saline except most of samples (Fig.).

The organic carbon (%) ranges from 0.38 to 1.5 % (Fig.).The organic soil matter includes all the dead plant materials and live or dead animals.

Soils have variety of organic compounds in different degrees of decomposition. For plants growth and metabolism, Phosphorus is one of the main nutrients. Phosphorous containing fertilizers supplied to the soil as is rapidly converted into unavailable form. Microorganisms have the biggest role in conversion of soluble Phosphate to insoluble phosphate. Phosphorous in the present soils vary from 10 Kg/hectare to 172.9 Kg/hectare (Fig.) the highest value in sample No. 11 may be due to use of excessive phosphorous fertilizers.

Application of phosphorus (P) is necessary for maintaining a balance between the other plant nutrients and ensuring the normal growth of the crop.

When soil is in dry condition potassium fixation occurs and the potassium is bonded between layers of clay, under certain conditions, dependent on the soil texture, intensity of drying, and initial amount of exchangeable potassium. From the analysed samples potassium ranges from 112 Kg/hectare to 840 Kg/hectare (Fig.) indicating sufficient K in most of the sample except sample No 7 and 21.

4.0 Conclusions

1.The physico-chemical analysis of the soil samples from Samadhiyara, Navimorvad, Kudala, Junimorvad, Chochaka, Bhensjal, Rangpur, Darod, Sejakpur and Bhanejada of Chuda taluka have diverse terrain conditions and varied but limited endowments of nature. The main crops are cotton, oil seeds and food grains.

2.Most of the farmers are using expensive and excessive chemical fertilizers and the too much dose of such fertilizers in few soils has rendered high values of P and K. The retention of K could also be due the clay minerals formed by chemical weathering of basalts which is the parent material for the soil.

3.Use of acidic fertilizers and organic manure are the solution, which can raise the crop yield.

5.0 Acknowledgement

The author is thankful to **Dr. H. M. Babariya**, Deputy Director of Agriculture Soil Test Laboratory, Department of Agriculture, Gandhinagar, Gujarat, India for providing soil samples for the purpose of this study.

We are highly thankful to **Dr. A.S.Rathore**, Principal of Gujarat Arts and Science College, Ahmedabad for encourage us during this research work.

We are also thankful to head of Chemistry Department, all the Teaching and non-teaching staff helping us for this entire research work.

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