Studies of physicochemical parameters of different soil samples of Visnagar Taluka, Mehsana district

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Abstract:

In the present study, an attempt has been made to investigate the soil fertility status of Mehsana district. Five representative locations were selected for the study and 20 samples from each location and direction of area were collected. Analysis of soil was carried out for the studies of various parameters like pH, Electrical conductivity, phosphorous, copper, iron, calcium, magnesium, sulphur, organic carbon, available potash, manganese and zinc. Low, medium & high range of all parameter also calculated from analysis data. This information will be helpful to the farmers to solve the problems related to soil nutrients amount of which fertilizers to be added to soil to increase the yield of crops.

Keywords: Fertility, pH, Electrical conductivity, Soil, Nutrients, Fertilizers.

Introduction:

Soil testing is often performed by commercial labs that offer a variety of tests, targeting groups of compounds and minerals. The advantages associated with local lab are that they are familiar with the chemistry of the soil in the area where the sample was taken. This enables technicians to recommend the tests that are most likely to reveal useful information.

Different plants have different soil pH and nutrient requirements. Testing is inexpensive when compared to investments in yours plants, amendments, time and efforts. The Fertilizer guidelines provide with the soil test results are based on environmentally-friendly soil fertility management's practices. A soil test will assess the present's levels of major plant nutrients, soil pH, micronutrients and provide an estimate of total soil [1-4]. Recommendation will include the amounts of limestone and fertilizer, if necessary, to meet the requirements of the specific plant or crop being grown.

Agricultural nutrients such as potassium (K), magnesium (Mg), and Calcium (Ca) are very important for plants growths and development. The analysis of these nutrients elements is thus helpful in assessing the fertility of the soil and improving soil quality prior to planting or during crop growth [5-6].

The pH of soil is vital for how well it holds minerals. When the soil it too acidic, minerals will be leached out by rainwater before the plants have a chance to use them. Highly Alkaline soils are often associated with mineral deficiencies due to low solubility of minerals under alkaline condition. Neutral or Slightly alkaline soils are ideal for growing particular pH requirements. Many research groups have studied on soil fertility of various soil samples [7-12].

Plant Nutrients

Although plants absorb a large number of elements, all of them are not essential for the growth of plant. The elements which are required by plant for their normal growth, development, metabolism and to complete their life cycle are called the essential ones. Some of these are required in large amounts and some in traces. Nutrients are classified as Primary (Macro), Secondary and micro, and are further classified as follow:

Major nutrients required for plant growth

Class 1: Carbon, hydrogen and oxygen (C, H, O).

Class 2: Nitrogen, potassium and phosphorus.

Secondary Nutrients: Magnesium, Calcium and sulphur

Micro nutrients: Iron, boron, zinc, molybdenum, manganese, copper and chlorine.

Soil testing can be divided into four steps (1) sampling (2) analysis (3) interpretation and (4) recommendations. One of the most important aspects of soil testing is that of obtaining a representative sample of the area.

CHEMICAL & EQUIPMENTS

Potassium chloride, Buffer tablate, Sulphuric acid, Potassium dichromate, Sodium bicarbonate, activated charcoal (phosphorous free), Ammonium molybdate, Stannous chloride, Ammonium acetate, Calcium chloride, Glacial acetic acid, Barium chloride, Gum acacia, Sodium diethyl dithiocarbomate, Sodium hydroxide, Muroxide, Ethylene di amine tetraacetate, Ammonia buffer, Diethylenetriamine pentaacetic acid, Eriochrome black-T, were procured from s.d. fine chem Ltd. All chemicals are of analytical grade reagent.

pH was measured on pH meter (systronics Model No-335), Conductivity was measured on conductivity meter (systronics Model No-304), Optical density was measured on colorimeter (systronics Model No-202), Analytical balance (Wensar Model No-PGB200) was used to weigh samples and reagents, Flame photometer (systronics Model No-128) was used for analysis of Potash, Micro Nutrients was analyzed on Double beam atomic absorption spectrophotometer (Elico Model No-SL 194).

METHOD OF ANALYSIS:-

(1) Sulphur

Method for making standard graph for Sulphur

Weighted out 5.434 g potassium sulphate and make up 1 Ltr by using distilled water (this solution contains 1000 ppm of sulphur). 25 ml this solution was taken and make up 1 Ltr with distilled water (this is working standard solution of sulphur). Taken 0.0 (Blank), 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, and 10 ml working solution in 25 ml volumetric flask. In every flask 1.0 g barium chloride and 1 ml gum acacia solution were added, and make up 25 ml by using distilled water. Then optical density of blank solution was set to zero using blue filter.

Table No-1: Reading for Standard Graph of Sulphur

Sr. No.	Working standard sulphur solution in ml	ppm	O.D.
1	0	0	0
2	1	1	11
3	2	2	22
4	3	3	32
5	4	4	40
6	5	5	55
7	6	6	67
8	7	7	84
9	8	8	106
	10	10	129
	Total ppm	46	Total: 546

Calculation:-

1 Reading = Total ppm of Sulphar/Total reading

1 Reading = 46/546
=0.08

Sulphar ppm or mg/kg

Sulphar ppm or mg/kg = sample reading X graph Factor X 50 X 25 /20 X 10

Sample Reading X 0.084871 X 50 X 25/200

Sulphar ppm = Sample Reading X 0.530443 or mg/kg

Process:

10 g air dried soil sample was taken in 150 ml conical flask. 50 ml 0.15% calcium chloride extracting solution was added and shaken on mechanical shaker for 30 min. Filtered it on whatman filter No. 42. 20 ml filtrate was taken in 25 ml volumetric flask. 2 ml glacial acetic acid, 1 g crystal of barium chloride and 1 ml gum acacia solution were added. Make up the volume to 25 ml, then first set zero optical density using blank solution (as above method without taking soil sample).Measured optical densities (O.D) of above prepared sample by using blue filter.

(2) Micronutrients (Cu, Fe, Mn, Zn) analysis by AAS

Preparation of D.T.P.A extracting solution

1.967 g D.T.P.A. and 13.3 ml triethanol amine were taken in 500 ml flask. 400 ml distilled water was added. 1.47 g calcium chloride dihydrate was taken in 1ltr flask and dissolved in 400 ml distilled water. To this solution, previously prepared D.T.P.A. & T.E.A. solution was added and pH was adjusted to 7.3 by using add 1M HCl. Make up 1 ltr with distilled water.

Analysis method for micronutrients (Cu, Fe, Mn, Zn)

Weighted 20 g dried soil sample in a plastic bottle, then added 40 ml of D.P.T.A. solution. Shake on mechanical shaker for 2 hrs. Filtered it on whatman filter No. 40 in funnel cum test tube. Prepared standard curve for element by using different working ppm solution as per standard method of analysis and condition suggested by Elico brochure and then run the sample and note the ppm of elements. Obtained ppm reading multiped with factor 2.0.

(3) Carbon

Method for making standard graph for Organic carbon.

Weighed out 1.25 g sucrose and taken it into 250 ml of volumetric flask and dissolved in 1 N of potassium dichromate solution, and makes up 250 ml volume by using 1 N potassium dichromate. 7 glass beakers of 50 ml were taken and numbered from 1 to 7. 0 ml, 1 ml, 2 ml, 3 ml, 4 ml, 5 ml and 6 ml solution was taken into above beakers from prepared solution of potassium dichromate. Taken 10 ml 1 N potassium dichromate solution and 20 ml conc. sulphuric acid in test-tube and placed for 30 minutes. Allowed to cool and added 20 ml distilled water. Prepared following different standard carbon ppm solution and measured optical density (O.D.) by using red filter.

Table No-2: Reading for Standard Graph of Carbon

Sr. No.	ml of sucrose solution diluted in potassium dichromate	Amount of sucrose	O.D.
1	0 (blank)	----------	0
2	1	0.005 g	29
3	2	0.010 g	65
4	3	0.015 g	95
5	4	0.020 g	127
6	5	0.025 g	156
7	6	0.030 g	181
	Total	0.105 g	653

Calculation:-

1 Reading

1 Reading = Total Amount of Sucrose / Total Reading
= 0.000160796
= 0.000161043 g Sucrose

1 Reading Carbon value:
0.00006837
0.00006764 gram organic carbon

1 Reading Graph Factor Value = 0.000067638 X 100
= 0.0067638

Process:

Taken 1.0 g soil sample in 100 ml beaker. 10 ml 1 N Potassium dichromate solution and 20 ml conc. Sulfuric acid were added to the sample and cooled the solution for 30 minutes. 20 ml distilled water was slowly added and allowed for 12 hrs for oxidation. Then first set zero optical density using blank solution (as above method without taking soil sample). Measured optical density (O.D.) of soil sample by using red filter and note down the reading.

(4) Calcium

5 g air dried soil sample was taken in 150 ml conical flask and 25 ml of neutral normal ammonium acetate was added. Shaken it on mechanical shaker for 5 min, and filtered through Whatman filter paper No.1. 10 ml filtrate solution was taken in conical flask, and 2-3 crystals of sodium diethyl dithiocarbamate were added. Then 5 ml 16% sodium hydroxide and 40-50 mg of the murexide indicator were added. Titrate it with 0.01N EDTA solution till the color gradually changes from orange red to reddish violet (purple), note the titrated EDTA solution.

(5) Potassium

Method for graph factor of Potassium
Prepared following stock solution and from it make various potash ppm solutions and run in flame photometer and note down potash ppm the reading.

Table No-3: Reading for Standard Graph of Potassium

Flask No	Stock solution	Concentration of Pottash in 100 ml Volumetric Solution (ppm)	Reading of Flame Photometer
1	0.0ml (Blank)	----------	0
2	1.0ml	10ppm	35
3	1.5ml	15ppm	49.5
4	2.0ml	20ppm	53.5
5	2.5ml	25ppm	68.5
6	3.0ml	30ppm	75
7	4.0ml	40ppm	97
	Total	140ppm	378.5

Calculation

1 Reading = Total Solution of ppm / Total Reading
=140 / 378.5
= 0.370

1 Gram Soil = R X 0.370 X 5 Microgram K / Gram Soil (0.370 Graph Factor)
R= Flame Photometer Reading of sample

K
Kg/Hectare = R X 0.370 X 5 X 2.24 (2.24 = Factor in **K** Hectare)

K_2O

Kg/Hectare = R X 0.370 X 5 X 2.24 X 1.20 (1.20 = Factor in **K_2O** Hectare)
= R X 4.972

Process:

5 g soil sample was taken in 100 ml conical flask. 25 ml 1 M neutral ammonium acetate solution was added. Shaken it for 5 minutes on shaking machine and filtered the solution on whatman filter paper. Flame photometer was calibrated by using 10, 20, 30, 40, 50, 60, 70, 80 and 90 ppm standard potassium solution. After calibration run above filtrate for analysis and note down the reading.

(6) pH

10 g soil & 20 ml distilled water were taken in 50 ml beaker & stirred for 30 min. In 50 ml beaker taken 10 g soil and added 20 ml distilled water and stir for 30 min. Adjusted the temperature of pH meter at 25 ^{0}C. Calibrated the pH meter using 4, 7.0, 9.2 pH buffer solution. Washed the electrode with distilled water and clean by filter paper. Immerses electrode in above suspense solution and note the reading.

(7) Electrical Conductivity (E.C.)

10 g soil and 20 ml distilled water were taken in 50 ml beaker. It was stirred for 30 minutes. The temperature of E.C. meter was adjusted at 25 ^{0}C then conductance was adjusted to 1.412 mS/cm by using 0.01 N KCl solution. Washed the electrode with distilled water and cleaned with filter paper. Immerses electrode in above suspense solution and note the reading.

(8) Phosphorus

Method for making standard graph for phosphorus.

0.439 g previously dried potassium dihydrogen orthophosphate was dissolved in 500 ml distilled water and 25 ml 7.0 N Sulphuric acid solution was added and then makes up 1 Ltr by using distilled water. 10 ml above solution was taken and makes up 500 ml by using distilled water (1 ml this resulting solution is equivalent to 2 ppm of phosphorus). By using this solution, various standard phosphorus ppm solutions were prepared and measured and their optical densities (O.D) were measured by using red filter.

Table No-4: Standard Graph of Phosphorous

Flask No.	2 ppm Working Solution of Phosphorous	8.5 pH Solution of Sodium Bicarbonate	1.5 Percentage Solution of Ammonium Molybdate-HCl	Working Solution of Steanus Chloride	O.D.
1	0 Blank	5 ml	5 ml	1 ml	0
2	1 ml = 2 ppm	5 ml	5 ml	1 ml	20
3	2 ml = 4 ppm	5 ml	5 ml	1 ml	37
4	3 ml = 6 ppm	5 ml	5 ml	1 ml	55
5	4 ml = 8 ppm	5 ml	5 ml	1 ml	83
6	5 ml = 10 ppm	5 ml	5 ml	1 ml	102
7	10 ml = 20 ppm	5 ml	5 ml	1 ml	198
	Total = 50 ppm				495

Calculation

1 Reading

= Total Solution of ppm / Total Reading
=50 / 495
= 0.101
0.1010 Microgram P (Graph Factor)

1 Gram Soil = R X 0.1010 X 4 Microgram P/ Gram Soil
R =Colorimeter Reading of Sample 0. 1010= Graph Factor
P Kg/ Hectare = R X 0.1010 X 4 x 2.24 (2.24 = Factor in 'P' Hectare)
P_2O_5 Kg/ Hectare = R X 0.1010 X 4 X 2.24 X 2.29 (2.29 = Factor in 'P_2O_5 ' Hectare)
P_2O_5 Kg/ Hectare = R X 2.0723584

Process:

2 g soil sample and 40 ml 0.5 M sodium bicarbonate (8.5 pH) solution were taken in 100 ml beaker. To this, 1 g phosphate free activated charcoal was added and shaken on shaker for 30 minutes. The solution was filtered and pipette out 5 ml. 5ml 1.5% ammonium molybdate-hydrochloric acid solution was added to this solution. Allow to stand for 30 minutes, then 1ml 0.016 M stannous chloride solution was added & make up 25 ml using distilled water. Blank solution was prepared according to the above process without taking the soil sample.

Red filter was used and zero optical density was set by using above blank solution, then put the above sample solution and note the optical density.

(9) Magnesium

5 g air dried soil sample was taken in conical flask. To this, 25 ml of neutral ammonium acetate solution was added. The solution was shaken on mechanical shaker and filtered through Whatman (No.1) filter paper. 5 ml solution was pipetted out in conical flask. To this solution, 2-3 crystal sodium diethyl dithiocarbamate, 5 ml of ammonium chloride-ammonium hydroxide buffer solution and 3-4 drops of Eriochrome black-T indicator were added. Titrated it slowly against 0.01 M EDTA solution. At the end point color changed from wine red to blue.

Result and Discussion

Soil sampling

Soil sampling was done during the dry season. Soil sampling was done at five randomly located points within each farm. The soils were sampled at two depths, 0 to 15 cm, 15 to 35 cm, using mini-soil pits dug at each sampling point. The soil samples were air dried in the laboratory and sieved through a 2 mm sieve for different types of laboratory analyses.

The Results of soil samples & its LMH data shown in table no: 7(A), 7(B), 8(A), 8(B), 9(A), 9(B), 10(A), 10(B), 11(A), and 11(B).

Table No-5: Critical Limits of Nutrients:-

Sr. No.	Parameters	Unit	Critical Limits		
			Low	Medium	High
1	pH	------	<6.5	6.5-8.2	>8.2
2	Electric Conductance	------	<1	1-3	>3
3	Organic carbon	%	<0.51	0.51-0.75	>0.75
4	Phosphorous	Kg/Hectare	<26	26-60	>60
5	Potash	Kg/Hectare	<151	151-300	>300
6	Zinc	ppm	<0.5	0.5-1.0	>1.0
7	Ferrous	ppm	<5	5-10	>10
8	Sulphur	ppm	<10	10-20	>20
9	Manganese	ppm	<5	5-10	>10
10	Copper	ppm	<0.2	0.2-0.4	>0.4
11	Magnesium	ppm	<1.0	1.0-2.0	>2.0
12	Calcium	ppm	<1.5	1.5-3.0	>3.0

Calculation of soil fertility Index:

$$= \frac{(\%\ \text{of Low} \times 1) + (\%\ \text{of Medium} \times 2) + (\%\ \text{of High} \times 3)}{100}$$

Table No-6: Calculation of Low, Medium, High rating of soil fertility Index:

Sr. No.	Range	Rating
1	Less than 1.67	Low
2	1.67 to 2.33	Medium
3	Greater than 2.33	High

Table No-7(A): Analysis of soil sample

Samples site: Village: Bakarpur, Taluka: Visnagar, District: Mehsana, Gujarat, India.

Sample No.	pH	EC	Org. Carbon (%)	Phosphorous (Kg/ Hectare)	Pottash (Kg/ Hectare)	Zn ppm	Fe ppm	Sulphur ppm	Mn ppm	Cu ppm	Mg (Me*/100 g soil)	Ca (Me*/100 g soil)
1	8.13	0.23	0.63	62.17	362.76	1	4.16	28.11	10.64	0.46	1.2	11.3
2	8.20	0.34	0.66	53.88	377.49	0.98	4.1	13.26	7.84	0.48	2.15	9.85
3	8.27	0.33	0.64	29.01	277.09	0.76	4.02	9.55	5.86	0.28	2.15	9.75
4	8.19	0.34	0.66	33.16	427.01	0.7	4.1	13.26	7.38	0.44	1.25	12.75
5	8.13	0.27	0.53	41.45	473.86	0.58	3.94	50.92	6.84	0.34	1.3	12.9
6	8.04	0.41	0.74	43.52	311.89	0.82	4.1	15.91	8.1	0.34	2.85	9.15
7	8.30	0.22	0.66	39.37	289.14	0.86	3.88	15.91	6.04	0.36	2	10.8
8	7.81	0.47	0.68	47.66	352.05	0.56	3.88	13.79	6.7	0.22	1.9	11.1
9	7.99	0.33	0.62	45.59	358.74	0.58	4.1	27.58	7.84	0.32	1.9	11.7
10	7.91	0.27	0.68	24.87	362.76	0.58	3.94	23.34	6.7	0.26	2.5	10.5
11	7.98	0.31	0.56	26.94	374.81	0.84	4.1	24.93	8.7	0.34	0.5	12.5
12	8.18	0.50	0.76	26.94	306.54	0.92	3.88	25.99	6.8	0.26	0.9	11.1
13	8.20	0.24	0.63	24.87	277.09	0.7	3.88	19.63	6.7	0.28	1.75	14.15
14	8.08	0.30	0.65	24.87	448.43	0.68	3.8	27.05	8.52	0.32	1.1	12.4
15	7.88	0.67	0.64	49.74	325.28	0.42	3.58	6.37	11.44	0.26	0.85	13.45
16	8.17	0.38	0.78	60.10	309.22	0.54	4.16	10.08	7.8	0.24	1.85	9.85
17	7.90	0.36	0.57	26.94	465.83	0.76	4.16	10.08	8.66	0.34	2.3	9.7
18	8.14	0.35	0.82	55.95	349.37	0.42	4.1	12.20	6.88	0.26	1.8	9.3
19	8.01	0.27	0.61	41.45	358.74	0.56	3.8	6.37	8.24	0.28	3.2	8.5
20	7.77	0.49	0.63	24.87	306.54	0.88	3.88	9.02	9.28	0.32	0.5	12

***= Miliequivalent**

Table No-7(B): Soil Fertility Index & Soil Test Rating

Samples site: Village: Bakarpur, Taluka: Visnagar, District: Mehsana, Gujarat, India.

Sample No.	pH	EC	Org. Carbon (%)	Phosphorous (Kg/ Hectare)	Pottash (Kg/ Hectare)	Zn ppm	Fe ppm	Sulphur ppm	Mn ppm	Cu ppm	Mg (Me*/100 g soil)	Ca (Me*/100 g soil)
L	0	20	0	4	0	2	20	4	0	0	4	0
M	18	0	17	14	3	18	0	9	18	17	10	0
H	2	0	3	2	17	0	0	7	2	3	6	20
%L	0	100	0	20	0	10	100	20	0	0	20	0
%M	90	0	85	70	15	90	0	45	90	85	50	0

%H	10	0	15	10	85	0	0	35	10	15	30	100
S.F.I.*	2.10	1.00	2.15	1.90	2.85	1.90	1.00	2.15	2.10	2.15	2.10	3.00
LMH** of SFI	M	L	M	M	H	M	L	M	M	M	M	H

*= Soil Fertility Index, **= Low, Medium, and High oil Fertility Index

CONCLUSION:- It is concluded from above analysis that E.C. & Fe are in low amount for ferrous ammonium sulphate should be added for better plant and growth & productivity. The other parameters are in sufficient. pH is in medium limit, so it can be neutralized by using acidic fertilizer.

Table No-8(A): Analysis of soil sample

Samples site: Village: Kamana, Taluka: Visnagar, District: Mehsana, Gujarat, India.

Sample No.	pH	EC	Org. Carbon (%)	Phosphorous (Kg/ Hectare)	Pottash (Kg/ Hectare)	Zn ppm	Fe ppm	Sulphur ppm	Mn ppm	Cu ppm	Mg (Me*/100 g soil)	Ca (Me*/100 g soil)
1	8.37	0.69	0.65	43.52	335.99	0.4	4.14	47.21	7.62	0.9	1.75	10.65
2	8.30	0.66	0.92	31.09	306.54	0.36	4.34	55.17	8.86	0.9	4.35	8.55
3	8.72	0.19	0.97	64.24	240.95	0.34	4.52	19.63	9.86	0.68	4.35	10.05
4	8.76	0.21	0.93	68.39	318.59	0.34	4.6	23.87	9.94	0.8	3.7	9.1
5	8.36	0.41	0.60	93.26	279.77	0.4	4.14	27.05	11.52	0.76	4.2	9.9
6	8.47	0.41	0.93	62.17	370.79	0.3	4.14	22.28	7.04	0.8	3.35	8.15
7	8.30	0.49	0.94	84.97	330.63	0.36	4.26	27.05	7.86	0.9	2.65	8.55
8	8.45	0.28	0.79	89.11	290.48	0.26	4.2	31.83	8.02	0.76	3.55	9.65
9	8.33	0.41	0.93	93.26	374.81	0.3	4.2	27.05	7.96	0.72	4.35	10.15
10	8.50	0.45	1.31	82.89	309.22	0.26	3.82	24.40	5.7	0.6	3.75	7.05
11	8.30	0.54	1.10	91.18	259.69	0.36	4.86	27.05	8.02	0.9	4.15	7.65
12	8.35	0.39	0.93	84.97	350.71	0.34	4.26	23.34	8.22	0.7	6.35	7.85
13	8.78	0.87	0.78	68.39	246.30	0.3	4.52	31.83	6.72	0.78	4.55	9.05
14	8.74	0.18	0.79	29.01	199.45	0.34	3.94	38.72	8.54	0.8	4.05	8.05
15	8.38	0.37	0.83	22.80	432.37	0.38	4.2	36.07	13.42	0.92	2.75	9.75
16	8.62	0.34	0.74	51.81	263.70	0.42	4.4	40.84	6.48	0.72	4.8	8.2
17	8.55	0.30	0.79	29.01	234.26	0.26	4.46	18.04	6.34	0.7	3.7	9
18	8.30	0.53	0.73	84.97	291.81	0.3	4.26	14.32	7.24	0.82	2.6	6.2
19	8.40	0.48	0.66	89.11	413.63	0.36	4.2	17.50	10.26	0.92	4.35	10.65
20	8.57	0.20	0.72	49.74	212.84	0.24	4.6	20.16	14	0.82	3.45	11.75

***= Miliequivalent**

Table No-8(B): Soil Fertility Index & Soil Test Rating

Samples site: Village: Kamana, Taluka: Visnagar, District: Mehsana, Gujarat, India.

Sample No.	pH	EC	Org. Carbon (%)	Phosphorous (Kg/ Hectare)	Pottash (Kg/ Hectare)	Zn ppm	Fe ppm	Sulphur ppm	Mn ppm	Cu ppm	Mg (Me*/100 g soil)	Ca (Me*/100 g soil)
L	0	20	0	0	0	20	0	0	0	0	0	0
M	0	0	6	0	0	0	0	0	16	0	1	0
H	20	0	14	20	20	0	20	20	4	20	19	20
%L	0	100	0	0	0	100	0	0	0	0	0	0
%M	0	0	30	0	0	0	0	0	80	0	5	0
%H	100	0	70	100	100	0	100	100	20	100	95	100
S.F.I.*	3.00	1.00	2.70	3.00	3.00	1.00	3.00	3.00	2.20	3.00	2.95	3.00
LMH** of SFI	H	L	H	H	H	L	H	H	M	H	H	H

*= Soil Fertility Index, **= Low, Medium, and High Soil Fertility Index

CONCLUSION:- It is concluded from above analysis that E.C. & Zn are in low amount, Zinc sulphate should be added for better plant and growth & productivity. The other parameters are in sufficient. pH is in high limit, so it can be neutralized by using acidic fertilizer.

Table No-9(A): Analysis of soil sample

Samples site: Village: Basana, Taluka: Visnagar, District: Mehsana, Gujarat, India.

Sample No.	pH	EC	Org. Carbon (%)	Phosphorous (Kg/ Hectare)	Pottash (Kg/Hectare)	Zn ppm	Fe ppm	Sulphur ppm	Mn ppm	Cu ppm	Mg (Me*/100 g soil)	Ca (Me*/100 g soil)
1	8.33	1.04	0.62	78.75	254.33	0.86	5.86	47.74	7.62	0.78	2.6	13.2
2	7.98	1.17	0.66	62.17	331.97	1.14	4.96	51.98	16.02	0.78	4	8.5
3	8.11	1.03	0.79	41.45	345.36	1.1	5.24	34.48	16.88	0.82	4.4	8.5
4	8.01	1.22	0.61	43.52	323.94	3.38	5.04	29.17	16.26	0.76	3.95	8.65
5	8.57	0.69	0.65	47.66	266.38	0.74	5.38	40.84	9.7	0.68	4.1	8.9
6	8.75	0.57	0.63	47.66	220.87	0.78	5.38	31.83	9.76	0.72	3.65	7.35
7	8.48	0.95	0.82	58.03	301.19	0.88	5.66	41.37	6.74	0.78	5.5	12.5
8	8.67	0.60	0.62	55.95	207.48	0.84	5.42	36.07	10.46	0.66	1.5	8.5
9	8.40	0.93	0.64	51.81	190.08	0.42	7.44	37.66	7.76	0.56	2.2	7.1
10	8.13	0.67	0.49	58.03	377.49	2	5.8	50.39	9.58	0.76	2.25	8.15
11	8.48	0.83	0.66	24.87	219.53	0.32	7.64	40.31	7.24	0.44	1.1	9.9
12	8.22	0.70	0.47	33.16	366.78	0.48	6.3	32.89	11.04	0.52	2.35	8.65
13	8.13	0.67	0.53	26.94	299.85	0.38	6.3	26.52	9.56	0.56	3.1	8.7
14	8.47	0.92	0.61	26.94	354.73	0.84	6.2	50.92	7.52	0.5	3.05	8.15
15	8.21	0.70	0.62	39.37	354.73	0.38	6.04	42.97	8.86	0.76	0.8	9.6
16	8.60	0.72	0.50	45.59	216.85	0.72	5.52	38.19	10.44	0.36	5	8
17	8.48	0.98	0.60	78.75	286.46	0.8	6.04	45.09	6.92	0.46	5.6	11.4
18	8.42	0.92	0.57	58.03	247.64	0.3	7.4	38.72	6.4	0.38	3.7	5.8
19	8.51	0.80	0.52	45.59	223.55	0.72	5.52	32.89	9.52	0.42	3.05	9.15
20	8.24	0.81	0.73	51.81	370.79	0.46	6	44.56	9.62	0.5	1.7	8.3

***= Miliequivalent**

Table No-9(B): Soil Fertility Index & Soil Test Rating

Samples site: Village: Basana, Taluka: Visnagar, District: Mehsana, Gujarat, India.

Sample No.	pH	EC	Org. Carbon (%)	Phosphorous (Kg/ Hectare)	Pottash (Kg/ Hectare)	Zn ppm	Fe ppm	Sulphur ppm	Mn ppm	Cu ppm	Mg (Me*/100 g soil)	Ca (Me*/100 g soil)
L	0	16	3	0	0	20	0	0	0	0	1	0
M	5	4	15	0	0	0	0	0	14	2	3	0
H	15	0	2	20	20	0	20	20	6	18	16	20
%L	0	80	15	0	0	100	0	0	0	0	5	0
%M	25	20	75	0	0	0	0	0	70	10	15	0
%H	75	0	10	100	100	0	100	100	30	90	80	100
S.F.I.*	2.75	1.20	1.95	3.00	3.00	1.00	3.00	3.00	2.30	2.90	2.75	3.00
LMH** of SFI	H	L	M	H	H	L	H	H	M	H	H	H

*= Soil Fertility Index, **= Low, Medium, and High Soil Fertility Index

CONCLUSION:- It is concluded from above analysis that E.C. & Zn are in low amount, Zinc sulphate should be added for better plant and growth & productivity. The other parameters are in sufficient. pH is in high limit, so it can be neutralized by using acidic fertilizer.

Table No-10(A): Analysis of soil sample

Samples site: Village: Pudgam, Taluka: Visnagar, District: Mehsana, Gujarat, India.

Sample No.	pH	EC	Org. Carbon (%)	Phosphorous (Kg/ Hectare)	Pottash (Kg/Hectare)	Zn ppm	Fe ppm	Sulphur ppm	Mn ppm	Cu ppm	Mg (Me*/100 g soil)	Ca (Me*/100 g soil)
1	8.38	0.50	0.34	64.24	176.70	0.21	2.5	12.20	6.2	1.32	3.35	8.15
2	8.28	0.54	0.39	72.53	148.58	0.18	2.42	13.26	7.57	1.3	2.95	7.55
3	8.27	0.76	0.76	82.89	188.74	0.53	2.34	18.57	10.03	1.12	4.2	10.1
4	8.53	0.34	0.46	84.97	165.99	0.27	2.4	20.16	6.97	1.02	5.45	8.65
5	8.36	0.30	0.33	70.46	152.60	0.27	2.34	23.87	6.05	1.34	4.75	7.55
6	8.18	0.85	0.74	84.97	198.11	0.52	2.34	19.10	7.35	1.12	3.95	6.55
7	8.20	0.36	0.63	82.89	240.95	0.43	2.42	13.26	4.11	1.46	6.35	8.25
8	8.28	0.68	0.88	68.39	244.96	0.52	2.23	12.73	9.94	1.1	2.95	6.15
9	8.72	0.24	0.39	64.24	136.54	0.2	2.42	18.57	4.01	1.2	5.05	6.55
10	8.51	0.51	0.43	82.89	165.99	0.19	2.25	18.04	6.05	1.08	4.8	6.4
11	8.32	0.60	0.37	66.32	184.73	0.17	2.34	13.26	6.4	1.22	3.05	5.85
12	8.29	0.49	0.39	89.11	174.02	0.17	2.95	15.38	5.88	1.12	4	6.2
13	8.77	0.23	0.34	68.39	178.03	0.14	2.59	13.26	5.55	0.98	4.585	8.015
14	8.45	0.35	0.36	84.97	210.16	0.27	2.5	11.67	9.79	1.24	3.15	5.65
15	8.63	0.47	0.39	89.11	172.68	0.24	2.38	13.26	6.89	1.02	4.85	7.35
16	8.75	0.19	0.34	72.53	192.76	0.15	2.48	12.20	6.02	1.26	2.75	9.35
17	8.32	0.13	0.81	43.52	203.47	0.45	2.25	23.87	10.07	1.24	3.45	6.55
18	8.20	0.90	0.89	47.66	287.80	0.48	2.55	23.34	10.15	1.22	4.3	7.8
19	8.22	0.95	0.91	91.18	330.63	0.34	2.65	17.50	10	1.1	4.1	8.8
20	8.22	0.92	0.87	51.81	311.89	0.36	2.65	23.87	8.79	1.02	2.95	7.55

***= Miliequivalent**

Table No-10(B): Soil Fertility Index & Soil Test Rating

Samples site: Village: Pudgam, Taluka: Visnagar, District: Mehsana , Gujarat, India.

Sample No.	pH	EC	Org.Carbon (%)	Phosphorous (Kg/ Hectare)	Pottash(Kg/ Hectare)	Zn ppm	Fe ppm	Sulphur ppm	Mn ppm	Cu ppm	Mg (Me*/100 g soil)	Ca (Me*/100 g soil)
L	0	20	12	0	2	17	20	0	2	0	0	0
M	3	0	2	3	16	3	0	15	15	0	0	0
H	17	0	6	17	2	0	0	5	3	20	20	20
%L	0	100	60	0	10	85	100	0	10	0	0	0
%M	15	0	10	15	80	15	0	75	75	0	0	0
%H	85	0	30	85	10	0	0	25	15	100	100	100
S.F.I.*	2.85	1.00	1.70	2.85	2.00	1.15	1.00	2.25	2.05	3.00	3.00	3.00
LMH** of SFI	H	L	M	H	M	L	L	M	M	H	H	H

*= Soil Fertility Index, **= Low, Medium, and High Soil Fertility Index

CONCLUSION:- It is concluded from above analysis that E.C., Zn and Fe are in low amount, Ferrous ammonium sulphate & Zinc sulphate should be added for better plant and growth & productivity. The other parameters are in sufficient. pH is in high limit, so it can be neutralized by using acidic fertilizer.

Table No-11(A): Analysis of soil sample

Samples site: Village: Ganeshpura, Taluka: Visnagar, District: Mehsana, Gujarat, India.

Sample No.	pH	EC	Org. Carbon (%)	Phosphorous (Kg/ Hectare)	Pottash (Kg/Hectare)	Zn ppm	Fe ppm	Sulphur ppm	Mn ppm	Cu ppm	Mg (Me*/100 g soil)	Ca (Me*/100 g soil)
1	9.16	0.59	0.91	51.81	219.53	0.42	3.2	22.28	5.58	0.3	2.7	5.5
2	8.60	1.00	0.66	68.39	243.63	0.18	3.2	265.75	5.14	0.56	4.8	5
3	8.71	1.60	0.89	84.97	151.26	0.36	3.38	62.59	15.26	0.36	2.75	6.75
4	9.25	0.37	0.91	72.53	190.08	0.3	4.32	35.01	9.2	0.56	3.55	7.35
5	9.22	0.44	0.72	20.72	248.98	1.34	3.38	29.17	6.96	0.48	3.55	5.25
6	9.36	1.10	0.74	24.87	271.74	0.42	3.2	99.19	8.18	0.48	3.05	7.25
7	9.55	0.49	0.56	29.01	295.83	0.24	3.56	34.48	5.28	0.44	2	6.1
8	8.88	1.11	0.91	43.52	224.88	1.26	3.32	167.09	6.34	0.7	2.35	6.55
9	8.85	1.00	0.77	31.09	178.03	0.32	3.5	128.90	6.48	0.7	2.45	8.65
10	8.94	1.13	0.76	29.01	211.50	0.26	3.14	255.14	3.56	0.44	2.85	6.65
11	8.38	1.00	0.91	72.53	218.19	3.48	3.32	98.13	10.96	0.58	3.45	12.05
12	8.23	1.25	0.91	64.24	263.70	0.3	3.6	326.22	2.58	0.36	2.95	10.15
13	8.48	1.00	0.93	47.66	269.06	2.1	3.82	100.25	7.14	0.64	3.65	8.55
14	9.46	0.74	0.91	43.52	191.42	0.26	4.38	161.25	4.8	0.7	0.6	9.6
15	9.00	0.88	0.93	49.74	322.60	0.24	3.56	91.24	8.46	0.64	1.4	8.7
16	9.14	1.74	0.91	43.52	204.81	0.58	3.96	271.59	7.04	0.54	0.85	7.65
17	9.15	0.73	0.84	70.46	248.98	0.4	3.42	31.83	5.28	0.58	1.8	9.3
18	8.89	0.84	0.64	64.24	149.92	0.2	3.64	51.45	2.04	0.48	0.45	8.85
19	9.90	0.49	0.90	29.01	194.10	1.68	3.82	325.16	9.76	0.7	0.45	9.95
20	8.50	1.00	0.84	47.66	238.27	0.32	4.2	202.10	21.56	0.84	3.9	9.7

***= Miliequivalent**

Table No-11(B): Soil Fertility Index & Soil Test Rating

Samples site: Village: Ganeshpura, Taluka: Visnagar, District: Mehsana, Gujarat, India.

Sample No.	pH	EC	Org. Carbon (%)	Phosphorous (Kg/ Hectare)	Pottash (Kg/ Hectare)	Zn ppm	Fe ppm	Sulphur ppm	Mn ppm	Cu ppm	Mg (Me*/100 g soil)	Ca (Me*/100 g soil)
L	0	9	0	2	1	14	20	0	4	0	4	0
M	0	11	5	11	18	1	0	0	13	3	3	0
H	20	0	15	7	1	5	0	20	3	17	13	20
%L	0	45	0	10	5	70	100	0	20	0	20	0
%M	0	55	25	55	90	5	0	0	65	15	15	0
%H	100	0	75	35	5	25	0	100	15	85	65	100
S.F.I.*	3.00	1.55	2.75	2.25	2.00	1.55	1.00	3.00	1.95	2.85	2.45	3.00
LMH** of SFI	H	L	H	M	M	L	L	H	M	H	H	H

*= Soil Fertility Index, **= Low, Medium, and High Soil Fertility Index

CONCLUSION:- It is concluded from above analysis that E.C., Zn and Fe are in low amount , ferrous ammonium sulphate & Zinc sulphate should be added for better plant and growth & productivity. The other parameters are in sufficient. pH is in high limit, so it can be neutralized by using acidic fertilizer.

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