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An analysis of alkali soil in some villages of Northern Gujarat area and its treatment by gypsum

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ABSTRACT

Soil pollution is one of the current environment problems of the world wide. Today the contamination of soil by repeated use or excess of same fertilizer, inadequate drainage system in agriculture field, sparing excessive insecticides and herbicide and most the man-made cause is the application of soft water in irrigation (surface or ground water) containing relatively high proportion of sodium bicarbonates and less calcium and magnesium are main reason to soil pollution. We take some soil sample of northern Gujarat region and check alkalinity by Physico-chemical test by pH meter scale and treat with suitable remedies gypsum to maintain soil alkalinity.

Keywords: alkali soil, alkalinity, pH meter, soft water irrigation, gypsum

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INTRODUCTION

Alkaline soils are difficult to take into agricultural production[1]. Due to the low infiltration capacity, rain water stagnates on the soil easily and, in dry periods, cultivation is hardly possible without copes irrigated water[2-5]. Agriculture is limited to crops tolerant to surface water logging and the productivity is low[6]. Soil alkalinity is associated with the presence of sodium carbonate or washing soda (Na_2CO_3) in the soil, either as a result of natural weathering of the soil particles or brought in by irrigation water. The sodium carbonate, when dissolved in water, dissociates into $2Na^+$ and CO_3^{2-} [7]. The sodium carbonate can react with water to produce carbon dioxide (CO_2), escaping as a gas or absorbed by Algae, and sodium hydroxide (Na^+OH^-), which is alkaline and gives high pH values. A slightly acidic soil condition is often favourable for crop but alkaline soil is not favourable for crop. So, reclamation with pH measure and treatment with suitable remedies is necessary for such type of soil. Alternatively, gypsum (calcium sulphate, $CaSO_4.\ 2H_2O$) can also be applied as a source of Ca^{++} ions to replace the sodium at the exchange complex[8]. Related to this pH determination, calculation of gypsum requirement of alkaline soils[9].

MATERIALS AND METHODS

In experimental section there are three sections which are;
Soil Texture:
Soil texture refers to the relative proportion of different size of the mixture like sand, slit and clay. In alkaline soil sample generally the soil texture are as follow;

Clay: 60% clay + 25% slit + 15% sand

This soil texture proportion measure by international pipette method using Stocke's low[10].

$v = 2r2\ (\rho s - \rho l)g/9n$

Where:
v = velocity of particle falling in a liquid, cm/sec
r = radius of particles, cm
ρs = density of the solid particles, ~2.65 g/cm^3
ρ1 = density of the liquid, g/cm^3
g = acceleration due to gravity, 980 cm/sec^2
n = viscosity of the liquid, poises.

Soil Colour:
The colour of soil is determined by matching soil sample with international Munsell colour chart. All soil sample match nearly with Munsell colour chart under dry and moist condition.

Physico-Chemical Method:
All sample of soil checked by different laboratory methods. Mainly we use pH electrometric method to check alkaline nature of the soil.

Apparatus : - pH meter
- Beaker
- Spatula

Reagent: - Distilled water
- Slandered buffer solution of pH -7.0, & 9.0

Procedure:
We take 100-200 gm of air dried soil sample in beaker and add distilled water till soil sample attains the saturation stage. The pH meter is to be sat for the temperature and calibrate with two buffer solution in alkaline. The electrode is moved a little to ensure removal of water film around it and pH regarding is again taken when it is constant than recorded the pH value in two decimal units.

RESULT AND DISCUSSION

In result and discussion, tabular data shows reclamation of alkaline soil with gypsum by schoonover's EDTA titration method to Calculate amount of gypsum tons per hector in 30 cm depth respectively[11].

Result Table :

Sample	Soil Texture In %	Nature of soil	Colour	pH	Requirement of gypsum Tons/acre
1	85% Clay	Alkaline	Black	8.9	4.7
2	80% Clay	Alkaline	Black	8.7	4.4
3	80% Clay	Alkaline	Black	8.6	4.1
4	80% Clay	Alkaline	Black	8.4	3.8
5	70% Clay	Alkaline	Black	8.2	3.5
6	70% Clay	Alkaline	Gray	8.1	3.2
7	70% clay	Alkaline	Gray	7.9	2.9
8	65% clay	Alkaline	Gray	7.7	2.5
9	60% clay	Alkaline	Gray	7.6	1.9
10	> 60% clay	Alkaline	Gray	7.4	1.2

CONCLUSION

The majority of agriculture spices prefer approximately neutral pH values. The soil with excessive alkaline cause reduced soil productivity. In this soil analysis experimental work we conclude that All soil samples were alkaline on the bases of pH value which shown in tabular form. The help of some slandered international calculating method, we conclude that alkaline soil need gypsum to maintain its pH for crop growing.

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