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Analysis and study of potash presence in soil of some villages of Dabhoi taluka of Vadodara district, Gujarat

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Abstract: *This physico-chemical study done for soil. The study parameters like PH, conductivity total carbon present, Nitrogen, Phosphorus (P_2O_5) and present Potassium (K_2O). The objective of this study is to know nutrient's quality and quantity of soil of some villages of Dabhoi taluka of Vadodara district, Gujarat. From the results of this study we know that the soil of Dabhoi taluka have low, medium & high potassium content. Than calculate the fertility index for potassium for that soil and found 4.1 to 10.2. This result and its conclusion will help farmers to decided, which nutrients to be added through various fertilizers and how can increase the yield of crops.*

Key words: *Potash, fertility index, Dabhoi taluka, Gujarat*

Introduction:

Soil is the very important natural resource for human, animals, other living organism and plants. Soil provide essential nutrient to plant[1]. Soil contains various minerals, organic components, water and air[2]. Testing of soil based on nutrient management has emerged as a key issue efforts to increase agriculture productivity & production since optimal use of nutrients based on Soil analysis can improve crop productivity and minimize wastage of these nutrients. Lack of primary, secondary and micronutrients have been observed in intensive cultivated areas [3,4]. Some of States of India including Andhra Pradesh, Gujarat, Haryana, Karnataka and Uttar Pradesh have made remarkable progress in soil testing programme. This study useful for expansion of soil testing facilities, popularization of the programme in campaign mode, development of soil fertility index and use of information technology in delivering soil nutrient status and appropriate recommendation to farmers. This compendium is an effort to put together existing status of soil testing facilities state wise and highlight main issues in soil testing programme Compendium on soil health [5].

In this work studied soil samples of 10 different villages of Dabhoi taluka. The physicochemical properties like moisture content, specific gravity, PH value of soil and estimations of Mg^{2+}, Na^{+}, K^{+} and Cl^{-}, HCO_3^{-}, PO_4^{3-}, No_3^{-} of soil were analyzed. The fertility of the soil depends on the concentration of N,P,K organic and inorganic matters and water. All nutrients have their own role for growth of plant. Nitrogen is required for growth of plant & nucleic acid. Potassium (K) is required for flowering purpose and required for building of protein and it is also important for photosynthesis, fruit quality and for avoid of diseases. Potassium is also useful in plants cell division, carbohydrate formation, various enzyme action and resistance to certain plant disease, over 60 enzymes are known to require potassium for activation. Phosphate is necessary for roots growth of plants. Calcium is required for cell wall of plant [6-11].

Fertilizer addition is recommended on the basis of analysis results of soil. Now a day an STR (Soil Test Recommendation) basis in which contents of major nutrients (N, P, K) are determined following standard methods before sowing. Their values suggest quality of soil in terms of its nutrients contents i.e. high, medium, or low nutrients. These nutrients

content are than deduced from required amount of nutrients for following crop and this much amount of nutrients is now recommended for addition to soil [12] Quality characteristics of soil such as PH, electrical conductivity (EC), Calcium (Ca2+), Magnesium (Mg^{2+}), Bicarbonate (HCO_3^-), Chloride (Cl^-), total organic carbon, available Nitrogen, available phosphorus(P_2O_5) and available Potassium (K_2O) were determined as per standard methods.

Present study is an attempt to find out the nutrient's quantity in soil of several villages of Dabhoi taluka, Gujarat. This results will help farmers to decide the amount of fertilizers to be added to soil to increase crop yield. The objective of this paper was to evaluate the status of potassium in selected soil samples using the traditional Flame photometric method of K analysis (NH_4OAc, -K). And to analyze the trend in fertility status of soils of Dabhoi taluka of Gujarat State.

Experimental:

There are villages selected for study from Dabhoi Taluka. A representative soil sample were collected following standard quadric procedure and taken in polythene bags. In laboratory these samples were analyzed for different chemical parameters following standard methods [13]. The reagents used in this analysis is of AR grade and water is double distilled water. All obtain results were compared with standard values[14] to find out low, medium or high nutrient's content essential for STR (Soil Test Recommendation).

Soil is shaken with neutral normal ammonium acetate.

During the extraction ammonium ions replace potassium ions absorbed on the soil colloids.

$$\text{Colloid } K^+ + CH_3COONH_4 \longrightarrow$$

$$\text{Colloid } NH_4^+ + CH_3COOK$$

Being the almost similar ionic radii, K^+ is more effectively replaced by NH_4^+. The extract is then filtered and potassium is determined with flame photometer.

The procedure for Potassium measurement:

- Take 5 gm soil in 150 ml conical flask or plastic bottle.
- Add 50 ml of 1 N ammonium acetate solution and shake for 30 minutes on a shaker.
- Filter the content through a Whatman No.1 filter paper.
- Feed the filtrate to the flame photometer and note the reading.
- Take blank reading also.

The available K_2O value can be calculated from this photometric reading by multiplying a standard factor. Based on the soil test values for different nutrients, soil samples are generally classified into three categories, low, medium and high. Using these fertility classes firtility index was calculated.

Result and discussion:

Table 1 represent the range of Low, Medium and High potassium content as per standard of soil analysis, it is the permissible standard according to Anand Agriculture University.

This values are used to determine the category of soil whether the soil sample have Low, Medium or High content of Potassium.

Experimental values of quality characteristics especially for available Potassium of soil of the Dabhoi Taluka with their fertility index are presented in the Table 2. This table represent the number of samples lies in Low, Medium and High Potassium content. The same table represent the calculated values of fertility index for available Potassium of the soil for all these 10 villages. Data presented in Table 2 shows that soils of very few villages contain lower available potash, few villages have medium range of available Potassium and most of villages contain high range of available potassium. Wide range of infect average all the samples lies in high range indicates good quality

of soil suggest sufficient amount of presence of available Potassium and hence no need of nutrient supplements to this soil. Most of the farmer's are using compost and chemical fertilizers, urea and phosphatic fertilizers only, since last 25 to 30 years which contains concentrated amount of nitrogen and organic carbon, potassium and phosphorus. On the basis of these results farmers are advised to use integrated nutrient management practice to maintain optimum concentration of all the essential nutrients for plants. Farmers are also advised to add bio fertilizers containing organic carbon and nitrogen solubilising bacteria. The graphical representation clearly confirms the recent status of all 10 villages for the presence of available Potassium in their soil.

Figure 1, represents the village wise category for Number of sample lies in Low, Medium and High Potassium. This clears that how many samples were collected from the village and what is the status of Potassium level in that sample whether it has Low, Medium or High nitrogen content. Using these fertility classes nutrient / fertility index was calculated as per the following equation.

Fertility index = (NL*1+NM*2+NH*3)/100

Where NL, NM and NH are number of sample falling in low, medium and high classes of Potassium. Figure 2 shows the fertility index for available Potassium is finally used for recommendation of fertilizers and crop selection.

Table 1: Range of Low, Medium and High category of Available Potassium in the form of K_2O

Category of soil in respect presence of available potash	Total available Potassium
Low	<140 kg K_2O /Ha
Medium	140-280 kg K_2O/Ha
High	>280kg K_2O/Ha

Figure 2: Fertility index for Potassium content

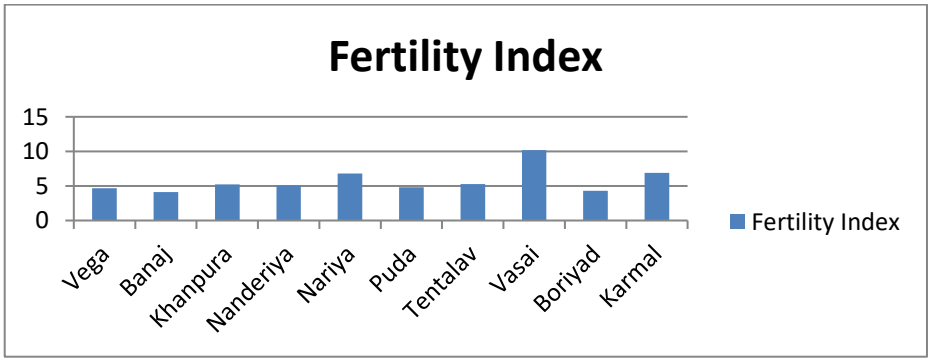

Figure 1: Numbers of samples lies in Low, Medium and High available potassium content range

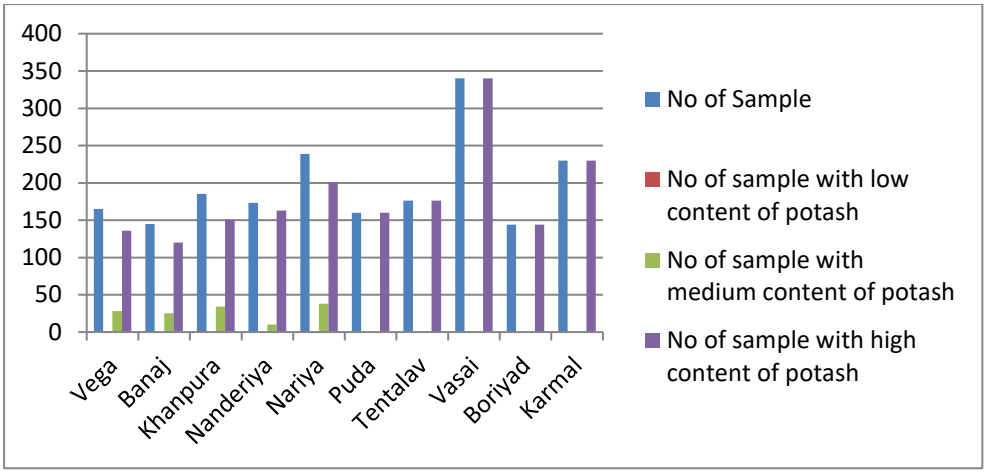

Table 2 : Study of Presence of Potassium Content in the soil of Dabhoi taluka District : Vadodara,

Sr. No.	Village of Dabhoi Taluka	No of Sample	No of sample **with low content** of potash	No of sample **with medium content** of potash	No of sample **with high content** of potash	Fertility Index
1	Vega	165	1	28	136	4.65
2	Banaj	145	0	25	120	4.1
3	Khanpura	185	0	34	151	5.21
4	Nanderiya	173	0	10	163	5.09
5	Nariya	239	0	38	201	6.79
6	Puda	160	0	0	160	4.8
7	Tentalav	176	0	0	176	5.28
8	Vasai	340	0	0	340	10.2
9	Boriyad	144	0	0	144	4.32
10	Karmal	230	0	0	230	6.9

Conclusion: From above study can be concluded that there are high content of available potassium found in most of samples. Only few samples have medium content of available potassium.

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