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Effect of calcium, potassium and phosphorous solubility with organic farming practices in black soil: A farmer study

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Abstract

The soil organic carbon plays a important role for nutrients solubility and control level of pH in soil. Total 32 farmers were selected of Biore Group of Kasarawad Tehsil of Khargone district (M.P.) for this study. The soil pH, EC, Soil organic, Available P, K and Ca were determined by using standard methods. In this study we found that the pH value (mean=7.43) of soil samples were normal. In the case of organic carbon we evaluated that all sample contain high or normal range. The solubility of phosphorus, calcium and potassium in all samples were high or normal. In this study we reevaluate that the solubility of calcium, potassium and phosphorous were depend upon the soil pH and organic carbon. So in future this study will made a beneficial for former. Former can decreased the cast of cultivation, got more production and improved soil health. The research helps decrease the consumption rate of fertilizer and motivate to farmers for organic farming.

Keywords: Organic Farming, Fertilizer, Farmer, Black Soil

Introduction

Soil carbon includes both inorganic carbon as carbonate minerals and as soil organic matter (Jobbágy, 2000) [5]. Soil organic carbon is present as soil organic matter. Soil organic carbon is divided between living soil biota and dead biotic material derived from biomass. Soil organic carbon tends to be concentrated in the upper layer of land. Topsoil ranges from 0.5% to 3.0% organic C for most upland soils. Black Cotton Soil (Vertisols) typically from highly basic rocks, such as basalt, in climates that are seasonally humid or subject to erratic droughts and floods. Phosphorus, Potassium and Calcium are secondary nutrients that are critical to crop development and there is no large atmospheric source that can be made biologically available (Ezawa *et al.*, 2002) [1]. It is needed in large amounts by all plants for the formation of cell walls and cell membranes, and it plays a vital role in soil structure also. The farmers are used fertilizers (DAP, SSP, DSP, TSP and MOP etc) containing P, K and Ca for more crop production. The solubility of fertilizer is depending upon the concentration of organic carbon and also the level of soil pH (Gyaneshwar *et al.*, 2002 and Hao *et al.*, 2002) [2, 3]. In this Study we will find the effect of application of organic carbon on the solubility of P, K and Ca in soil. So in future this study will made a beneficial for former. Former can decreased the cast of cultivation and improved soil health. The research help decrease the consumption rate of fertilizer.

Material and Methods

Soil Sample Collection

Total 32 farmers were selected of Biore Group (A group of organic farmers, which cultivate organic cotton and other crop) of Kasarawad Tehsil of Khargone district, located at 22.13°N 75.6°E. (Madhya Pradesh) for study (Fig-1). The surface soil samples (0-20 cm depth) were collected from deferent farmer field which cultivate organic farming for analysis. Samples were completely air-dried and passed through 2 mm sieve and stored in properly labelled plastic bags for experiment.

Soil Sample Analysis

The soil pH and electrical conductivity were determined in 1:2.5, soil: water suspension (Jackson, 1973) [4]. Soil organic carbon was determined by the back titration method

(Walkley and Black, 1934) [10]. Available phosphorus content of soil was determined with ammoniummolybdate spectrophotometric method (Olsen, *et al.*, 1954) [7]. The water soluble K and Ca the amount of which is determined by using a flame photometer by emission spectroscopy (Reeuwijk, 2002) [8].

P, in all samples were normal or high (Fig.-3). In this study we found that three sample (Sample No. 6, 7, 9) containing low P, because there Electrical conductivity were also low. The available calcium and potassium level in all samples were high or normal. The solubility of calcium potassium and phosphorous is depend upon the soil pH. The nutrients statuses were increased with application of organic manure (Kang *et al.*, 2005) [6].

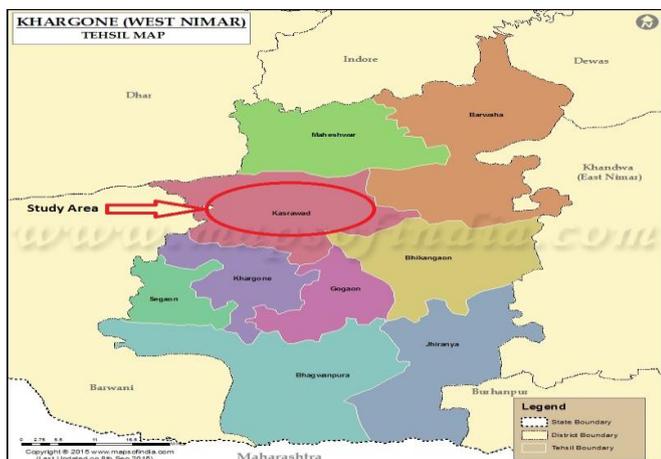


Fig 1: Study Area

Result and Discussion

The result showed in table-1 the pH value (mean=7.43, tab.-2) of soil samples were normal (Tab.-1). The factor of normal pH of soil was application of organic matter (Stockdale and Brookes, 2006) [9]. In the case of organic carbon we evaluated that all sample contain high or Normal range but only two (18 and 30) containing low Organic carbon (Fig.-2). The available

Table 1: Physicochemical analysis of Soil

S. No	pH	EC (ms ⁻¹)	S. No	pH	EC (ms ⁻¹)
1	7.25	0.36	17	7.40	0.46
2	7.36	0.59	18	7.34	0.54
3	7.50	0.72	19	7.32	0.41
4	7.23	0.46	20	7.46	0.38
5	7.50	0.96	21	7.51	0.79
6	7.39	0.41	22	7.45	0.46
7	7.52	0.32	23	7.54	0.54
8	7.32	0.41	24	7.53	0.4
9	7.39	0.39	25	7.66	0.85
10	7.40	0.73	26	7.62	0.59
11	7.31	0.29	27	7.65	0.63
12	7.27	0.43	28	7.57	0.36
13	7.14	0.35	29	7.56	0.61
14	7.25	0.94	30	7.48	0.33
15	7.42	0.85	31	7.42	0.63
16	7.39	0.34	32	7.65	0.47

Table 1: Statically analysis of data

Parameters	Mean	Max	Min	SD
pH	7.43	7.66	7.14	0.13
EC	0.53	0.96	0.29	0.19

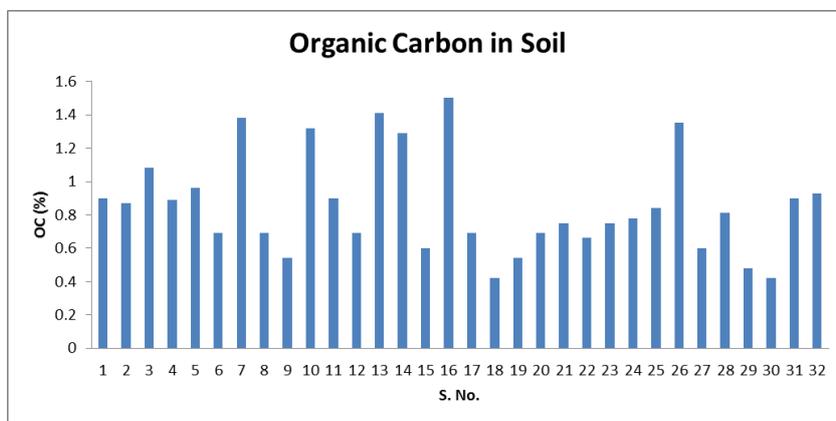


Fig 2: Organic Carbon in Soil

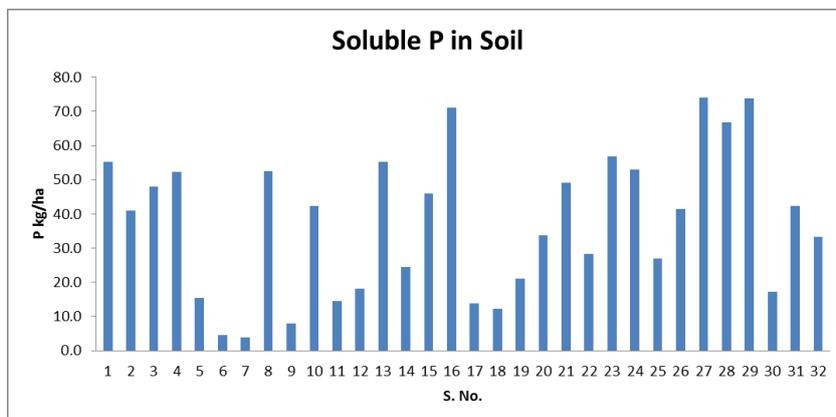


Fig 3: Soluble P in Soil

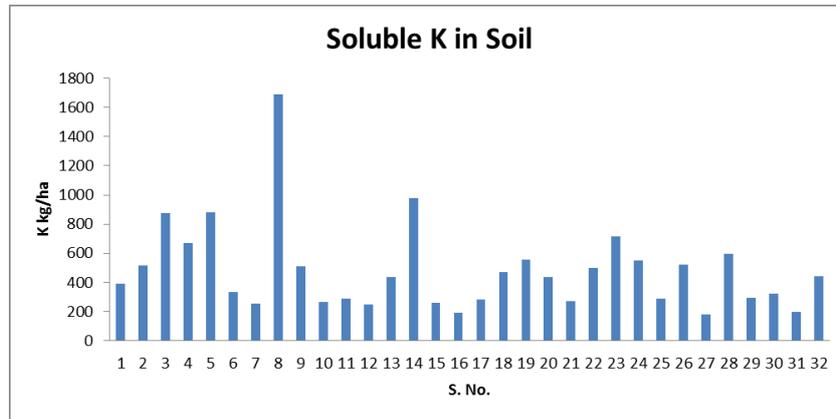


Fig 4: Soluble K in Soil

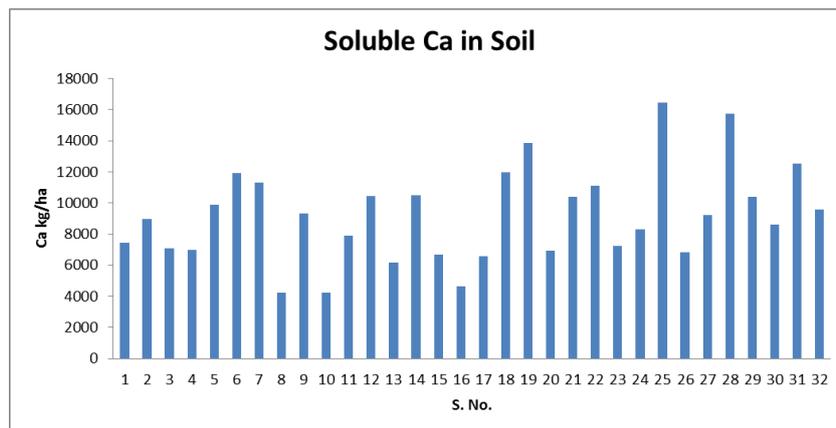


Fig 5: Soluble Ca in Soil

Conclusion

Black cotton soil is highly calcareous soil. Phosphorous, Potassium and calcium are second most important nutrients for plant production. It is a responsible for root development, stalk and stem strength, flower and seed formation, crop maturity and production crop quality and other many important roles for plant. From above all study we were found the organic carbon is the most important factor for maintained soil fertility and improved soil water holding capacity with nutrient. In this study we reevaluate that the solubility of calcium, potassium and phosphorous were depend upon the soil pH and organic carbon. So in future this study will made a beneficial for former. Former can decreased the cast of cultivation, got more production and improved soil health. The research helps decrease the consumption rate of fertilizer and motivate to farmers for organic farming.

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