SOIL FERTILITY STATUS AND FERTILIZER REQUIREMENTS OF SUGARCANE FIELD IN BIJAPUR DISTRICT

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ABSTRACT: Characterization of surface soil (0-20cm) for fertility status was studied by taking 28 representative samples from Bijapur district. Study revealed that soils are sandy loam to clay loam in texture. The available nitrogen content varied from 295,5 to 405 kg/acre. The data available indicates low phosphorus (120 to 477kg/acre). Potassium status was medium (109.96kg) to high of (471 kg/acre) with high index value and high fertility rating. In India, current fertilizer recommendations are very old and developed based on agroclimatic zones, current agro-climate zone and suitability of current fertilizer recommendations. Sugarcane in Bijapur district was studied as a test crop. The results indicate that, agroclimatic zone vary widely in soil and in their potentials, behavior and response to the management. It was also observed that fertilizer application efficiency varied which contributed to errors of both excess and insufficient application. All these suggest that soil based fertilizer recommendations should be preferred to achieve precision in farming and to minimize crop production, maintain soil health and minimize fertilizer misapplication.
Key words: fertilizers, sugarcane, soil fertility

INTRODUCTION

Sugar cane is one of the most profitable commercial crop grown in Bijapur district to an extent of 33,800ha. Bijapur district ranks second in the cultivation of sugarcane and further as many as 586 jaggery processing units are located in the district. The district essentially consists of five talukas namely Bijapur, Basavana Bagewadi, Indi, Sindagi,and Muddebihal. Due to the Krishna river projects sufficient water is available for irrigation. The productivity of sugarcane is affected by many factors, one of them is soil nutrients, the imbalance of which constraints the productivity. The status of the soil fertility determines the level of crop productivity. In the present study an effort is made to determine the physico-chemical properties and their fertility status of the Bijapur district that would focus on adapting appropriate cultivation and nutritional management practices to keep the plants healthy and productive.

Amongst the factors of production inputs fertilizer have played key role in increasing production of food grains and other commercial crops in India since 1960. To get minimum benefits and reduce nutrient loses from fertilizer they must be applied in right quantity, sources and combination at the right time using the right method.

The current agronomics package of practices are recommended uniformly for the zone irrespective of the soil variety that occurs within a zone. Fertilizer recommendations are made from the experiments conducted in one soil type may not hold good for another type of soil because of their basic variation in texture, reactions and mineralogy. The response to fertilizers greatly influenced by the soil type and special soil variability that has reflected from complex geological and pedagogical processes.

Spatial variation of soil practices decrease the efficiency of the fertilizers applied uniformly at the field scale (Bhatt AV,1991; Carr P.M,1991; Jackson M.L;1973 et al). At the same time there is an increasing pressure to reduce the application of the fertilizers in commercial agriculture and minimize non-point sources of pollution of both surface and ground waters. Therefore application of variable rather than uniform rates of fertilizer has been proposed to avoid the application of excess of fertilizers where it will not be properly utilized by the crops (Larsen W.E;1991; Miller M.P (1988). There was a selective crop response to nutrients in different soils and the responsiveness varied with soil development and modality of the soil.

Consideration of infield variation of the soil fertility and crop conditions and matching the agricultural inputs like seeds, fertilizers irrigation, insecticides, pesticide etc, to optimize the input or minimizing the crop yield from the given quantum of input is referred to as 'precision farming and precision agriculture'. The term precision farming means carefully tailoring the management practices for the soil and crop suiting to the different conditions found in each field.

Precision farming is desirable if agricultural productivity has to be increased. though widely adapted in developed countries, precision farming is yet to take firm ground in India. Primarily due to its unique position of land holdings, poor infrastructure, lack of farmers inclination to take risk. Socio economic and demographic conditions. Present fertilizer recommendations could be refined based on soil to increase the cost of production and environmental pollution (Tiwari et al1972.Sehgal et al 1996, and Jacson M.L et al 1973).

The soil site suitability evaluation is based on the FAO frame work for land evaluation was made here. Soil site stability for irrigation and some of the major crops were evaluated based on the criteria suggested. Therefore the present paper highlights the soil variations in Bijapur district for fertilizer recommendations and emphasizes the necessity of soil based fertilizer recommendations as a first step towards precision farming.

MATERIALS AND METHODS

An irrigated area of approximately 38.9000 ha in Bijapur district was selected for the study. (Figure.-1)

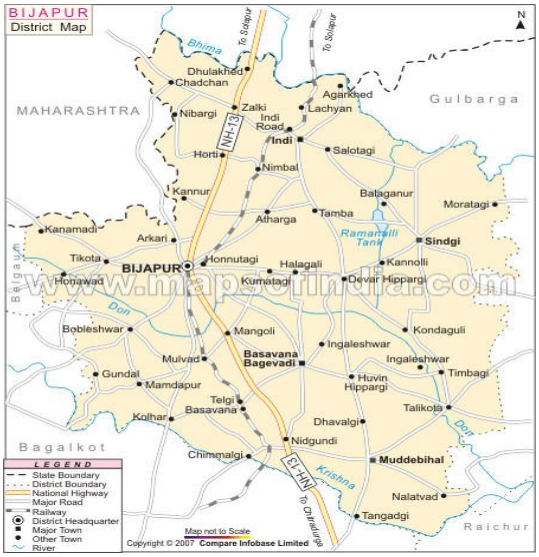

Figure-1: Study locations at Bijapur District

The area under study is irrigated and intensively cultivated with commercial crops such as sugarcane, maize, wheat, turmeric and vegetables grown alternatively. The climate of the area is characterized by mean annual rainfall of about mm most of which is received during June to September. Surface (0-15cm) soil samples were drawn at random from the different physico-graphic units of the area. The random sampling was done because of difficulty in grid sampling in an area predominantly planted the sugarcane. Soil samples were first air dried in shade then powdered gently with wooden mallets and sieved through 2mm sieves then stored in clean polythene containers for further analysis. The samples were analysed for pH, Electrical conductance (EC), Organocarbon (OC), N,P and K.

The soil pH and EC were measured in 1:2.5 soil water suspension using Elico pH meter and direct reading digital conductivity meter respectively. OC was analysed by Walky and Blacky et al method (1934). Available phosphorous by Olsen et al (1954) method and available potassium by Jackson et al (1967) were analysed. The available nitrogen was estimated from organic content of the soil.

The values of available nutrients (N,P,K) after rating them were low, medium, and high as shown in the table-1.

RESULTS AND DISCUSSION

Physicochemical properties: The soil of the study are alkaline except sample no. 5. The soil pH varied from 5.2 to 8.8. The total soluble salt content of the soils was expressed as electrical conductivity (EC) which varied from 0.08 to 2.38mS/cm. The organic carbon content of the soil was in the range of 0.29 to 1.24%. In most of the samples organic carbon content was higher. The high organic carbon content status in the soil can be attributed to good vegetable growth and the consequent addition of the organic matter to the soil in this area. The available nitrogen content varied from 292.5 to 405kg/acre. The available phosphorous was in the range of 0.35 to 29.25kg/acre. The data indicate that majority of the soil samples from Bijapur district are low in available phosphorous content while the sample no. 4,5,6 and 8 are high in available phosphorous content. The high phosphorous content is attributed to the regular application of the phosphatic fertilizers and the immobile nature of the phosphate ions in soil which must have resulted in accumulation of phosphorous in soil(Shukla.S.S etal 1995). In soil where available phosphorous content is high there are much chances of zinc deficiency and it is extremely important to use requisite amount of phosphatic fertilizers(Pati.P.L.et al1990).

As in the wheat and sugarcane cropping system higher doses of nutrient are added, it has been observed that in the area there has been increasing available phosphorous due to its built up over a period of time. The available potassium content of these soil are generally high and ranged from 106 to 471kg/acre. The higher content of the available potassium is attributed to the prevalence of elite potassium rich mineral in these soils (Kanwar, 1959;Varma et al 2005 and patel L.B 2000). Moreover, as the ground waters of the particular sugarcane area have considerable amount of dissolved potassium irrigation with such waters also results in higher amount of available potassium in these soils.

Recommended urea dose varied from 60 to 230 kg/acre, DAP dose ranged from 39 to 155kg/arcre and MOP dose ranged from 30 to 106 kg/acre respectively.

Table-1 Analytical data of Sugar cane Soil Fertility of Bijapur district.

S.No	pH	Electrical conductivity mmhos/cm	Organic carbon%	N Kg/acre	P Kg/acre	K Kg/acre	Urea Kg	DAP Kg	MOP Kg
	Found						Fertilizer recommended		
1	8.6	1.70	1.24	398	0.35	155	100	39	76
2	8.5	0.28	0.90	405	4.25	106	70	97.5	106
3	8.6	1.70	1.24	558	0.35	155	100	39	76
4	7.7	0.0	0.93	292	29.2.	471	185	155	35
5	7.6	0.38	0.72	292	20.4	409	70	155	70
6	7.3	0.97	0.37	405	28.6	139	70	155	70
7	7.8	1.08	0.56	360	27.3	394	185	155	35
8	7.3	0.65	0.29	405	26.3	192	185	155	35
9	5.2	0.83	0.67	420	3.0	120	60	155	35
10	8.4	0.97	0.48	301	5.0	120	70	155	70
11	8.8	0.22	0.43	269	4.0	120	70	155	70
12	7.9	1.17	0.31	194	3.0	120	220	155	70
13	8.2	0.55	0.47	470	6.0	120	225	155	70
14	8.1	0.46	0.35	603	3.0	120	225	155	30
15	8.3	1.78	0.38	269	6.0	120	220	155	30
16	8.1	0.48	0.43	344	5.0	120	230	155	30
17	8.6	0.68	0.55	332	4.0	120	195	155	35
18	8.2	2.38	0.53	383	5.0	120	185	155	35
19	8.5	0.21	0.61	345	8.0	120	185	155	35
20	8.2	0.37	0.55	438	3.0	120	185	155	35
21	8.2	0.35	0.70	395	7.0	120	185	155	35
22	8.0	0.89	0.63	457	5.0	120	185	155	35
23	8.5	0.20	0.73	407	3.0	120	185	155	35
24	8.7	0.11	0.65	420	3.0	120	185	155	35
25	8.4	0.23	0.67	407	3.0	120	185	155	35
26	8.8	0.19	0.65	420	8.0	120	185	155	35
27	8.0	0.58	0.67	326	4.0	120	185	155	35
28	8.5	0.14	0.52	380	8.0	120	185	155	35

Conclusions:

The present paper reveals that there is wide variation in soil fertility status of the soils developed on various land forms in Bijapur district, but large number of soils are low in available nitrogen, low to higher in available phosphorous and medium to high in available potassium contents. The different nutrients have to be restored through chemical fertilizers and/ or organic manure to maintain soil health for the efficient and sustainable sugarcane production in these soils, a farming system that is both soil enriching and restoring needs to be developed.

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