

A SURVEY OF SOIL FERTILITY STATUS OF CASHEW NUT GARDENS OF SOUTH GOA, INDIA.

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ABSTRACT: Characterization of surface soil for fertility was studied by taking ten representative samples of traditional cashew nut gardens in south Goa. Study revealed that soils are acidic (slight to moderate) in nature with non saline low cation exchange capacity. The available nitrogen content varied from 108 (low) to 945kg/ha (high). The data on available phosphorus (P_2O_5) indicate low 16.13 to high 18.82 kg/ha indicating low nutrient indices. Potassium status was from 44.8 to 291.2 kg/ha. The exchangeable cation is in the ratio of 1:3 with high fertility rating.

Key words: Cashew nut, fertility status, nutrients, exchangeable cations.

INTRODUCTION

Cashew (*Anacardium occidentale* L) which was introduced in Goa by the Portuguese in the sixteenth century, mainly to control soil erosion and to use in a forestation programmes has now become an important cash crop of Goa. It is grown in an area of 47094ha which becomes to 30% of the total cultivated area has more land under cashew nut than any other state. Although there has been significant increase in the area under cashew nut since liberation (13,513 ha in 1961) as there has been no significant increase in the productivity. The agro climatic situation in South Goa offers good scope to raise successful cashew nut plantation in varied soils ranging from coastal sandy to sandy loam and laterite in the hill slopes up to elevation of about 700 meter. Although cashew can adapt itself to wide range of soil conditions, it suffers in the soils with prolonged water logging. Extreme low temperature and frost are also not conducive to raise plantations. There is a scope to extend cashew nut cultivation in the wastelands identified by the land survey department of the state. These factors play a dominant role in determining the soil fertility and productivity constraints. The status of 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 South Goa that would focus on adopting appropriate cultural and nutritional management practices to keep the cashew nut plants healthy and productive.

Study area.

Goa encompasses an area of 3,702 km² (1,430 sq mile). It lies between the latitudes 14°53'54" N and 15°40'00" N and longitudes 73°40'33" E and 74°20'13" E. Most of Goa is a part of the coastal country known as the Konkan, which is an escarpment rising up to the Western Ghats range of mountains, which separate it from the Deccan Plateau. The highest point is the Sonsogor, with an altitude of 1,167 meters (3,827 feet). Goa has a coastline of 101 km (63 miles).



Goa's main rivers are the Mandovi, the Zuari, the Terekhol, Chapora River and the Betul. The Mormugao harbour on the mouth of the river Zuari is one of the best natural harbors in South Asia. The Zuari and the Mandovi are the lifelines of Goa, with their tributaries draining 69% of its geographic area. Goa has more than forty estuarine, eight marine and about ninety riverine islands. The total navigable length of Goa's rivers is 253 km (157 miles). Goa has more than three hundred ancient tanks built during the rule of the Kadamba dynasty and over a hundred medicinal springs.

Most of Goa's soil cover is made up of laterites which are rich in ferric [aluminium](#) oxides and reddish in colour. Further inland and along the river banks, the soil is mostly alluvial and loamy. The soil is rich in minerals and humus, thus conducive to plantation. Some of the oldest rocks in the Indian subcontinent are found in Goa between Molem and Anmod on Goa's border with Karnataka. The rocks are classified as Trondjemeitic Gneiss estimated to be 3,600 million years old, dated by the Rubidium isotope dating method. A specimen of the rock is exhibited in the Goa University.

Goa, being in the [tropical zone](#) and near the Arabian Sea, has a warm and humid climate for most of the year. The month of May is the hottest, seeing day temperatures of over 35°C (95°F) coupled with high humidity. The monsoon rains arrive by early June and provide a much needed respite from the heat. Most of Goa's annual rainfall is received through the monsoons which last till late September.

Goa has a short cool season between mid-December and February. These months are marked by cool nights of around 20 °C (68 °F) and warm days of around 29°C (84°F) with moderate amounts of humidity. Further inland, due to altitudinal gradation, the nights are a few degrees cooler. During March 2008 Goa was lashed with heavy rain and strong winds. This was the first time in 29 years that Goa had seen rain during March.

The state is divided into two districts: North Goa and South Goa. Panaji is the headquarters of the north Goa district and Margao of the south district. Each district is governed by a district collector, an administrator appointed by the Indian government.

The districts are further divided into eleven talukas – Talukas of North Goa are Bardez, Bicholim, Pernem, Ponda, Satari and Tiswadi, the talukas of South Goa are Canacona, Mormugao, Quepem, Salcete and Sanguem. Headquarters of the respective talukas are Mapusa, Bicholim, Pernem, Ponda, Valpoi, Panjim, Chaudi, Vasco, Quepem, Margao and Sanguem.

MATERIALS AND METHODS

To evaluate the soil fertility status of South Goa a systematic survey was carried out. Surface (0-15cm depth) soil samples were collected from 10 sites following the standard procedures of soil sample collection. The soil samples were analysed for various attributes. The soil pH and electrical conductivity were determined in 1:2.5 soil water suspension using Elico pH meter respectively. Electrical conductivity, organic carbon, water holding capacity, specific gravity were analysed according to standard methods¹. The available nitrogen was determined by the method described by Subbaih and Asija², where as available phosphorus³, potassium and calcium by Jackson method⁴. Analytical data showing the physicochemical properties are shown in Table.1.

Table.1: Analytical data of Soil fertility status of south Goa, India

S.No	Location	pH	EC mmhos/cm	°C %	Water holding capacity ml/10g	Sp.G	N Kg/ha	P Kg/ha	K Kg/ha	Ca Kg/ha	Mg Kg/ha
1	Curtorim	7.0	0.10	2.04	2	1.15	918	18.82	168	0.0449	0.58
2	Canacona	7.0	0.14	0.24	5	1.03	108	18.80	156	0.0998	0.27
3	Davorlim	7.1	0.07	0.29	4	1.05	135	16.13	44.8	0.0449	0.34
4	Velm	6.0	0.04	2.04	4	1.28	452	18.80	224	0.219	0.24
5	Loutolim	7.0	0.09	0.32	8	1.26	144	18.82	235	0.0748	0.94
6	Navelim	6.0	0.10	0.28	5	1.40	126	18.80	168	0.159	0.91
7	Gogol	7.0	0.06	2.10	4	1.46	945	16.13	190	0.158	0.46
8	Borda	7.2	0.08	1.03	5	1.18	463	16.15	291.2	0.104	0.25
9	Talaulim	7.2	0.07	0.44	1	1.58	198	16.14	89.6	0.204	0.28
10	Gogol	7.0	0.03	2.08	8	1.42	936	18.82	201.6	0.174	0.21

RESULTS AND DISCUSSIONS

The pH of the soil ranged from 6.0 to 7.2 the soils were acidic and non-saline due to acidic parent material. High rain fall in this area induces leaching of soluble salts⁵. The EC values of South Goa command area studied were in normal range i.e 0.03 to 0.14dSm⁻¹ (lowest).Dasog and Hadimani reported EC ranging from 0.39 to 0.53 dSm⁻¹ at surface in BLBC soils⁶.

The organic carbon content of the soils were in the study area ranged from 0.24 to 2.10% and fall under low, medium category. Dudal has reported that organic carbon in Indian soils range sub humid soils⁷. The organic matter build up in soils is related to natural vegetation, cropping history and temperature. Water holding capacity varied from 1ml to 8ml/10 g.

The specific gravity of the samples ranged from 1.03 to 1.58. The available nitrogen content varied from 108 (low) to 945kg/ha. Shukla et al⁸ also observed wide variations of nitrogen in their studies. The data on available phosphorus indicate low range from 16.13 to 18.82 kg/ha, since the soils are rich in hydrated as well as amorphous oxides of Fe and Al, the potent source of 'P' immobilization, P content was very low in these soils^{5,9,10}. Near neutral pH have a significant role in enhancing the P availability. Available P increases with pH and decreases with organic carbon. The data pertaining to available potassium content under cashew nut soils ranged from 44.8 to 291.2kg/ha. Ranganathan and satyanarayana observed low content of potassium in coastal soils due low pH¹¹. The calcium content ranged from 0.0449 to 0.219meq/100g and magnesium from 0.21 to 0.94 meq/100g respectively, which indicates low exchangeable cations. These were determined as a matter of routine to include all the secondary nutrients and to examine the ratio of these to other nutrients. It is stated that Mg deficiency can occur in soils with high exchangeable Ca/Mg exceeding 10:1 ratio¹². The ratio observed in the soils studied were well under 1:3 ratio.

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