

Studies on soil nutrient status of acid lime orchards in Western Vidarbha

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ABSTRACT

A survey of 70 acid lime orchards were made to evaluate the soil nutrient status of acid lime orchards in western Vidarbha region of Maharashtra state. Acid lime orchards were classified in high yielding and low yielding group for evaluation of soil nutrient content. Soil samples were collected, processed as per the standard procedure and analyzed for their nutritional content. The average nitrogen content in soil was 398.57 kg ha⁻¹ and 270.12 kg ha⁻¹, phosphorus 43.47 and 35.98 kg ha⁻¹, potassium 328.30 and 227.92 kg ha⁻¹, calcium 23.50 and 21.58 cmol(p⁺)kg⁻¹, magnesium 12.94 and 10.43 cmol(p⁺)kg⁻¹, sulphur 17.32 and 15.77 kg ha⁻¹, iron 8.49ppm and 7.86ppm, manganese 20.79ppm and 19.26ppm, zinc 1.19ppm and 0.87ppm, copper 9.78ppm and 7.31ppm in high and low yielding orchard respectively. The average range of different nutrients content in different orchard soil viz. nitrogen 266.56-611.52 and 141.12-454.72 kg ha⁻¹, phosphorus 17.47-64.06 and 19.71-53.76 kg ha⁻¹, potassium 118.92-662.18 and 114.40-465.13 kg ha⁻¹, calcium 16.38-32.65 and 16.16-29.08 cmol(p⁺)kg⁻¹, magnesium 4.64-19.20 and 5.68-13.62 cmol(p⁺)kg⁻¹, sulphur 12.43-19.66 and 11.31-19.99 kg ha⁻¹, iron 5.00-12.73ppm and 3.53-11.65ppm, manganese 11.25-37.73ppm and 9.25-27.13ppm, zinc 0.62-2.23ppm and 0.55-1.29ppm, copper 4.68-17.93ppm and 4.65-9.85ppm in high and low yielding orchard respectively.

Key words : Soil nutrients, Orchards, Vidarbha.

INTRODUCTION

Acid lime (*Citrus aurantifolia* Swingle) is locally known as *Kagzi lime* or *Nimboo*. Acid lime plant requires judicious supply of plant nutrients for proper growth and yield of high quality fruits. Improper and inadequate nutrition is one of the major cause of citrus decline in India. Studies on the decline of Mandarin in Kerala showed that poor nutrient status of soil and negligence in manuring are the causal factors (Iyer and Iyengar, 1956, Ramakrishna, 1954) in Chennai. Deterioration and unthrifty growth of citrus trees was reported due to lack of adequate nutrients in Punjab (Nijjar and Singh, 1966 and Singh and Bakhshi, 1958). Determination of nutritional need of acid lime orchard and then application of nutrients as per their requirement is an essential step and operation for proper growth and optimum yield of high quality fruits. However, to ensure high economic productivity and to sustain the available soil nutrient status of desirable levels correct dose of manures and fertilizers must be applied by using reliable diagnostic tools.

Considering the importance of plant nutrition in determining production and quality of acid lime and lack of information regarding the optimum range of nutrients in soil, particularly for maintaining the yield potential of quality fruits of acid lime in Western Vidarbha region, the present investigation was undertaken to evaluate the soil nutrient status for optimum production of acid lime and to decide the requirement of nutrient for acid lime.

MATERIALS AND METHODS

Soil samples of acid lime from the selected 70 orchards were collected and processed as per the standard procedure and analyzed for their nutritional contents. The circular band 30 to 40 cm wide under beneath the perimeter of that tree from which leaf sample were to be collected for the soil sampling. The surface soil (0-30cm) samples were taken from the said circular band 30 to 40cm away from stem and were kept separately. The collected soil samples were kept separately according to orchard high or low yielding sub population. These samples were air dried in shade, ground gently by wooden pestle and mortar sieved through 2mm sieve for determination of available nutrients and through 0.2mm sieve for organic carbon and free calcium carbonate estimation. Thus processed samples of 2 mm and 0.2mm size were duly labeled and stored in clean polyethylene bags for further analysis.

The processed samples were analyzed for different soil characteristics, macro and micro-nutrients viz. Soil pH(pH meter), Electrical conductivity (dSm⁻¹) (conductivity meter), Calcium carbonate (%) (rapid titration method), Organic carbon (%) (Walkley and Black

method), nitrogen (Kjeldahl method), phosphorus (Vanadomolybdate yellow colour method), potassium (Flame photometry method), calcium and magnesium (EDTA method), sulphur (Turbidimetry method), zinc, iron, manganese and copper (Atomic Absorption Spectrophotometer).

RESULTS AND DISCUSSION

Characteristics of soil

The data presented in Table 1 and 2 indicated that soil are moderate alkaline to alkaline in reaction with the pH value ranging from 7.54-8.91 with mean pH value (8.25) in high yielding orchards during 2002-03 and 7.87-8.63 with mean pH value in (8.08) during 2003-04 which is slightly decreasing in order. The average range of pH value for two year was 7.75 - 8.77 with mean pH value of 8.16, which was moderate to alkaline in nature in high yielding orchards. Similar trends were observed in low yielding orchards during both the years of investigation. Kanwar and Randhawa (1960), Dhingra and Kanwar (1963) and Kanwar *et al.*, (1965) reported that the pH of soils should not be more than 8.5 for the successful growth of citrus. Dhawan *et al.* (1957) reported similarity in their findings that the safe limit of pH was 7.0 to 8.5 for citrus. In the present investigation, the results have conformity with the findings of Patil and Malewar (1998) who reported that the soils of acid lime in Western Vidarbha are moderately alkaline in reaction (pH 7.9 to 8.3)

The soil electrical conductivity is a measure of soluble salt concentration in soil. Higher amount of salt in soils (higher EC) restrict the nutrient uptake and thus affect plant growth. EC of Acid lime orchards soil ranging from 0.05-0.27 dSm⁻¹ with mean EC value (0.13 dSm⁻¹) in high yielding orchards during 2002-03 and 0.09-0.25 dSm⁻¹ with mean value (0.15 dSm⁻¹) during 2003-04 which is slightly increasing in order. The average range of EC for two year was 0.07-0.17 dSm⁻¹ with mean EC value (0.15 dSm⁻¹) in high yielding orchards (Table 1). As regard the low yielding orchard, EC was ranging from 0.04-0.24 dSm⁻¹ with mean EC value (0.17 dSm⁻¹) during 2002-03 and 0.10-0.25 dSm⁻¹ with mean value (0.18 dSm⁻¹) during 2003-04, which was slightly increasing in order. The average range of EC for two year was 0.09-0.24 dSm⁻¹ with mean (0.17 dSm⁻¹) in low yielding orchards (Table 2). Cooper and Peyando (1959) reported decrease in growth of young and old lime trees when treated with salts. Joolka and Singh (1979) reported inhibitory effects of salts on the growth of citrus roots and sweet orange. Patil (1979) suggested that EC should not exceed (3 dSm⁻¹) for orange fruit crop. The shoot growth, number of leaves and the leaf area of Nagpur mandarin were adversely affected as salinity levels increased in the soil (Khanna and Kumar, 1990). However, EC of acid lime orchards under study was within safe limits (<0.25 dSm⁻¹).

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