ROLE OF CHLORINE IN COCONUT NUTRITION

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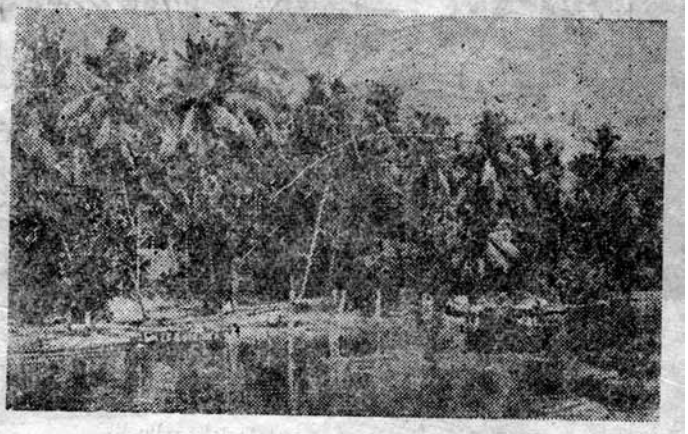
The sources from which plants derive their food have been the subject of much speculation from very ancient times and attracted the attention of many thoughtful men in the field of agriculture. Various theories were advanced to explain the 'principle' of vegetation, but the brilliant work of Justus von Liebig in 1840 is considered to be the real turning point in the field of agricultural chemistry and plant nutrition. He propounded his brilliant hypothesis that 'plants feed upon simple mineral and gaseous substances which they build into complex products' and thus the importance of mineral substances in the nutrition of plants was fully realised.

The multifarious and often complex kinds of substances such as sugars, starch, cellulose, proteins, tannins, lignins, amino acids, etc., which constitute the cellular structure of plants are synthesised from simpler substances like carbon dioxide, water and mineral nutrients present in the plant environment.

It is generally agreed upon at the present time that at least sixteen elements viz., carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, chlorine, iron, manganese, copper, zinc, boron and molybdenum are invariably indispensable for the normal growth and productivity of plants. They are known as the 'essential elements'. Out of the sixteen elements listed above, some are required in relatively large amounts and are known as major nutrients and others in relatively small quantities known as micro nutrients. The latter seven elements are generally considered as micronutrient elements.

Chlorine is an element whose essentiality for higher plants was established by T. C. Broyer and his coworkers only in 1954. Most of the chlorine in soils is present in the form of simple soluble salts such as potassium chloride and it is absorbed by plants in the form of chloride ion. The chlorine content of soils usually ranges from 10 to 1000 ppm (0.001 to 0.1 per cent). Measurable quantities of this element, chiefly in the form of sodium chloride, are added to soil each year through rain water. Salt sprays along



Chlorine deficiency is unheard of in coastal and backwater areas

the ocean beaches evaporate, leaving sodium chloride dust, which moves into the atmosphere and is dissolved and carried down by snow and rain. However, cloud formations of continental regions are less rich in chlorine than those of oceanic region. The amount of chlorine added to the soil in this way varies considerably depending mainly on the distance from the sea and is reported to range from 15.0 to 40.0 kg. per hectare per year (Eriksson, 1952). Further, chlorine is added to soil as an incidental component of commercial fertilizers like potassium chloride (Muriate of potash).

Chlorides are highly soluble and are not retained in any appreciable quantity in the soil organic matter or clay particles unlike nitrogen and phosphorus and, as a result, are subject to heavy leaching and removal from the soil, particularly in areas of high rain fall like the humid tropics where coconuts are largely grown. Thus the availability of chlorine in such soils is limited to recent additions. Nevertheless the natural balance remains positive in most situations and cases of chlorine deficiency are not common in cultivated crops. However, responses in the field to small additions of chloride were reported in cotton, tobacco, tomatoes, barley, corn and sugar beet.

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Applying salt to seedlings is an old practice

Recent investigations carried out by Ollagnier and Ochs (1971) and Uexkull (1972) have established the need of chlorine for coconut and oil palm beyond question. Further they have emphasised the high requirement of chlorine and suggested to rank chlorine as an essential major nutrient element for coconut and oil palm. They have observed chlorine deficiencies in regions far from the seas where the natural supply of chlorine will be less. It has been pointed out that the high responses on the growth of young coconut palms and the yield of bearing palms to additional supplies of potassium chloride are well correlated with the increasing levels of chlorine in the tissues and not the potassium levels. Chlorine deficiency is reported to have less influence on the number of nuts produced than on the size of the nut which is in agreement with the observation that generally nut size is larger along the coastal areas and tends to decrease with increasing distance from the sea. Yellowing or orange mottlings of the older leaves and drying up of outer edges and tips of leaflets are suspected to be chlorine deficiency symptoms in coconut. These symptoms are similar to those of potash deficiency reported in coconut.

It is interesting to observe that coconuts are often producing better along sea coasts compared to inland areas. It is reported that in Malaya best coconut palms are found in places irrigated with slightly brackish water. In Ceylon monthly applications of common salt (sodium chloride) at the rate of 454g per seedling for 15 months on a rocky laterite soil had shown clear improvement in vigour, size and foliage colour compared to untreated seedlings. The application of common salt in coconut gardens has been a very old and popular practice among coconut growers. It is very widely applied to the soil as well as into the crown of the palm, often admixed with wood ash. In the light of the recent observations by Ollagnier

Applying common salt in the crown—another time honoured practice

and Ochs (1971) and Uexkull (1972) it is quite possible that the effect of sodium chloride is due mainly to chlorine.

In plantations somewhat distant from the sea shore, it is possible that the availability of chlorine may not be sufficient to maintain chlorine levels in the leaves high enough for good production. Potassium chloride (muriate of potash) is, therefore, an ideal fertilizer for coconuts, as it supplies the high requirement of the plant for potassium and at the same time it supplies chlorine which is regarded as an essential and important nutrient element for coconut.

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