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COCONUT RESEARCH INSTITUTE

Leaflet No. 43

MAGNESIUM DEFICIENCY IN COCONUT PALMS

INTRODUCTION

Magnesium has long been considered an element essential for plant growth on account of its role in chlorophyll formation, and indirectly, in photosynthesis. But only within about the last thirty years was it recognised as of any significance in practical fertilizer usage. The composition of fertilizer mixtures has generally been confined to nitrogenous, phosphatic and potassic fertilizers on the assumption that these mixtures contained sufficient magnesium and other elements essential for plant growth as impurities. But with the increasing tendency towards the production and use of highly refined chemical fertilizers, the need for including magnesium in fertilizer programmes has become apparent.

The manuring of coconut palms has hitherto been restricted to the application of nitrogen, phosphoric acid and potash. **Within the last decade an intense yellowing of mature leaves has been observed in coconut palms grown on regularly manured but heavily leached lateritic soils of the high rainfall areas in the Western and Southern Provinces. This has been found to be due to magnesium deficiency.** Soils consisting of lateritic gravels or light sands are more prone to be deficient in magnesium. Magnesium deficiency is known to be accentuated by the presence of excess acidity, and the continued use of ammonium, potassium and calcium salts.

The highly leached acid lateritic soils and light sandy soils receiving regular doses of N. P. K. fertilizer mixtures containing refined chemical fertilizers such as ammonium sulphate, muriate of potash and saphos phosphate therefore present optimum conditions for the development of magnesium deficiency symptoms in coconut palms grown on them. Furthermore, in soils which have been subject to a long period of mono-culture and continuous cropping (coconut cultivation extending to a hundred years or more in some areas) such deficiencies must arise sooner or later unless adequate steps are taken by way of correct fertilizer application to replenish nutrient losses. It has been calculated that next to potash and nitrogen, magnesium ranks highest in the amounts of various plant nutrients removed per acre of coconut per annum.

Incidence of magnesium deficiency in coconut palms has now been observed in most major coconut growing districts in Ceylon. It is widespread in the acid lateritic soils of the Southern and Western provinces, and in the cinnamon-sand soil types of the Chilaw-Negombo area. It has also been found to occur on gravelly and sandy loam soils in the Chilaw, Kurunegala and Matale districts.

2. VISUAL DEFICIENCY SYMPTOMS.

Characteristic visual symptoms of magnesium deficiency in coconut palms are the yellowing of matured fronds with a green marginal effect on either side of petioles and midribs which retain their normal colour. The green margin on either side of the petiole is due to the basal end of leaflets remaining green. Generally, the yellowing commences at the lower end of leaflets in mature fronds, and gradually spreads to the upper parts. As the yellowing advances there is a tendency for the leaflets to wither prematurely, beginning at the tips and edges. Sometimes the yellowing is accompanied by a brown pin-head type of mottling. **Nut production is also considerably reduced.**

The visual symptoms described above are quite distinct from those associated with coconut scale—where generally yellowing of leaflets occurs in patches close to the petiole. They are also different from those associated with water logging or general neglect—where foliar colorations are more towards a yellowish orange, and no green marginal effects are observed.

However, their identification requires some experience, and it is best to eliminate the possibilities of coconut scale, water-logging or general neglect being the cause of foliar yellowing before rushing into concluding that it is due to magnesium deficiency. When in doubt, planters are advised to communicate with us and send us some samples of fresh leaflets enclosed in a polythene bag. Initially, visual deficiency symptoms may be seen only in isolated palms within a block, and the yellowing may disappear temporarly with the rains. With time, however, the deficiency symptoms will set in permanently in the entire field. It is advisable that the remedial measures described below be taken before the deficiency becomes acute since recovery is rather slow.

3. EXPERIMENTAL RESULTS

Field and laboratory studies have been carried out on palms showing intense deficiency spmptoms described above at Mattegoda Estate, Polgasowita and Walgama Estate, Pannipitiya. Diagnosis of magnesium deficiency by observation of the visual symptoms has been confirmed by leaf and soil analytical techniques developed in our laboratories.

FOLIAR SPRAYING of affected palms with 1-2 per cent solutions of magnesium sulphate brought about complete recovery in a few months—three months, in the case of young palms (about eight years old) and five months for adult palms. The sprayings were done fortnightly with a power sprayer. Each palm was sprayed with about three gallons of solution so as to wet the foliage completely. The results were most encouraging, since it was feared that owing to the waxy nature of the coconut leaflet, the chances of foliar absorption of nutrients would be small. The response to foliar spraying was very much quicker than that achieved by soil applications of magnesium where even after three years complete recovery in leaf colour was not obtained. How-ever, the foliar spraying technique can only be considered to be of diagnostic value in its application to the coconut palm. It is not practicable to carry out routine large scale foliar spraying of adult palm.

FIELD TRIALS on soil applications of magnesium (both as magnesium sulphate and dolomitic limestone) along with the usual N. P. K. fertilizer mixture were commenced in 1957. Affected palms receiving magnesium gave a yield of about 50 nuts per palm per annum in the period 1960-62, in contrast to a yield of 35 nuts from palms not receiving any magnesium. Healthy green palms on the same plantation receiving only N. P. K. fertilizers gave a yield of 70 nuts per palm per annum for the period 1960-62. The field trials have also indicated that soluble magnesium sulphate acts quicker than the insoluble dolomite in bringing about improvements in leaf colour. Further, it was observed that affected palms receiving N. P. K. fertilizers only were in a worse condition than palms receiving no fertilizers at all.

4. MAGNESIUM FERTILIZERS

The following magnesium fertilizers are currently available in the local market and can be obtained under the coconut fertilizer subsidy scheme:—

(i) Ground dolomitic limestone (dolomite), 20% MgO (Magnesium oxide) at Rs. 65/- per ton.

(ii) Kieserite (Magnesium sulphate), 24% MgO (Magnesium oxide) at Rs. 380/- per ton.

(iii) Commercial Epsomsalts (Magnesium sulphate) 16% MgO (Magnesium oxide) at Rs. 380/- per ton.

Dolomitic limestone contains both magnesium and calcium in a sparingly soluble form. The magnesium in dolomite is not readily available to plants, so that it is unsuitable for use as a magnesium fertilizer where quick effects are required. But on account of its low cost and local availability, it is recommended as the most economical fertilizer for the long term magnesium enrichment of soils and prevention of gradual development of magnesium deficiency. Since dolomite has an alkaline reaction, its use should be restricted to acid soils (PH below 6.5). The majority of coconut soils have an acid reaction, but should there be any doubts on this point, planters are advised to consult us.

Dolomite should not be mixed with fertilizer mixtures containing sulphate of ammonia as nitrogen will be lost. Dolomite contains a large proportion of calcium. It might be feared that this would give rise to other complications. However under the acid soil conditions for which dolomite applications are recommended, such a possibility is extremely remote.

Kieserite is a form of magnesium sulphate with a high content of water soluble magnesium which is easily available to plants. It is therefore recommended for application where symptoms of magnesium deficiency have already set in and quick remedial action is called for. It is also suitable for application as a long term preventive measure in neutral and alkaline soils where dolomite cannot be used.

The only reason that we do not recommend kieserite generally as a long term preventive measure is that it is considerably more expensive than dolomite.

Commercial Epsom Solts is also a form of magnesium sulphate, but completely soluble in water. It can be used instead of kieserite. Although both are equally priced, kieserite has a higher content of magnesium and is therefore more economical.

5. REMEDIAL MEASURES

As a long term preventive measure against magnesium deficiency, ground dolomitic limestone should be applied on all coconut land in the high rainfall areas of the Southern and Western provinces at the rate of 5 lbs. per adult palm and 3 lbs. per young palm once in three years.

On the lateritic gravels of the north-Western and central provinces, on the cinnamon-sand soils of the Chilaw-Negombo district and on light loams and sandy loams, dolomite should be applied at the rate of 3 lbs. per palm, both adult and young once in three years as a safety measure against possible development of magnesium deficiency.

Where symptoms of magnesium deficiency have appeared, the following measures should also be taken **in addition** to the long term preventive measures described above—(a) apply

Kieserite at the rate of 2½ lbs. / palm. (b) six months later, apply a further dosage of 2½ lbs. Kieserite, (c) one year after the initial application of Kieserite, treat each palm with 3 lbs. Kieserite, and thereafter continue the Kieserite, application at 3 lbs. per palm per annum until the yellow palms have been restored to a healthy green colour.

Young palms showing deficiency symptoms should be treated with Kieserite at the reduced dosage of 1 lb. per palm applied half yearly until recovery.

In the case of palms showing acute deficiency symptoms, and where regular annual N. P. K. manuring has been done, the N. P. K. manuring should be suspended for one year during the first year of application of Kieserite.

As already mentioned, dolomite should not be mixed with N. P. K. fertilizers containing sulphate of ammonia. But it can be applied at the same time as the N. P. K. mixture proided that the fertilizers are dug over well into the soil immediatley after application. Kieserite may be incorporated in the usual N. P. K. fertilizer mixture.

The recommendations made in leaflet No. 36 regarding time and method of application hold good for magnesium fertilizers as well.

It should be noted that the response to soil applications of magnesium is slow, and once deficiency symptoms have set in, a period of 2 to 3 years may lapse before any beneficial effects are observed.