

NUTRIENT DEFICIENCY DISORDERS AND THEIR MANAGEMENT IN ARECANUT

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Arecanut grows well in the Western Ghats Hills and Plains and in the North Eastern Hills regions. Arecanut cultivation is predominant in gravelly laterite soils of red clay type of Southern Kerala and Coastal Karnataka. In plain region or maidan parts of Karnataka, it is cultivated in clay loam soils. Laterite, red loam and alluvial soils are suitable for arecanut cultivation. The areas, where tank irrigation is a common practice, the soils may have admixture of tank silt. Arecanut as a plantation crop is cultivated at a spacing of 2.7 m x 2.7 m with recommended fertilizer dose of 100:40:140 g NPK/ palm/ year and 20 litres of water/ tree/ year through drip irrigation, which is generally followed in laterite soils. In addition, application of 12 kg each of green leaf and compost per palm is also recommended. In heavy soils, general recommendation of nutrients is 50 g N, 40 g P₂O₅ and 140 g K₂O along with green manures. Vermicompost is rich in N, P, Ca, Mg and micronutrients, about 4 kg of vermicompost per palm per year meets the N and P nutrient demand of arecanut (Bhat and Sujatha, 2004). When arecanut is grown in non-traditional zones without proper nutrient management and package of practices, deficiencies or disorders will occur.

Application of only organics or chemical fertilizers may lead to imbalance in nutrition of

arecanut. Thus, nutrient management strategies need to be planned for arecanut taking in to account the soil fertility status. Disorders could be due to nutrient deficiency or toxicity. Nutrient deficiency disorders are caused as a result of inadequate level of nutrient supply from the soil due to improper, inadequate and imbalanced application of fertilizers or nutrient sources. The deficiency disorders in plants are expressed as characteristic symptoms. As symptoms in plants arise due to several factors like pests, diseases, nutrient deficiency, toxicity *etc.*, it becomes important to identify the exact reason. Nevertheless, the actual disorder can be ascertained only with proper soil testing results that are obtained from soil testing laboratories. It is advisable to consider nutrient deficiency/ toxicity before the development of visual symptoms with the help of plant and soil analysis.

Nitrogen and potassium deficiencies are the most common major nutrient deficiencies found in areca gardens. Among the micronutrient disorders the most widespread are zinc and boron deficiencies. After identification of the actual deficient nutrient only, the management should be undertaken in the field. The fertilizers need to be applied based on the soil test data, to correct the deficiency.

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A. Nutrient deficiency symptoms, diagnosis and remediation in arecanut

1. Primary nutrients

1.1. Nitrogen (N): Nitrogen is one of the essential macronutrients that play a key role in plant nutrition. This is very important helping in the formation of chlorophyll, proteins and many other molecules essential for plant growth. The nutrient is directly involved in photosynthesis. Nitrogen being mobile in the plant system deficiency symptoms first appears in the older leaves. The major symptom of nitrogen deficiency is general yellowing (Fig.1). In the initial stages the lower leaves turn golden yellow in colour. The leaves later dry up turning into light brown in colour. A general restriction on plant growth is noticed with N deficiency. Foliar application of urea, thrice, at fortnightly intervals or soil application of 1-2 kg urea/ palm (NIPHM). Application of nitrogenous fertilizers based on soil test data would help in correcting N deficiency.



Fig.1. Arecanut leaf expressing N deficiency

1.2. Phosphorus (P): Phosphorus, essential macro nutrient, is involved in photosynthesis, respiration, energy storage and transfer, cell division, and enlargement. Phosphorus promotes early root formation and growth. Symptoms of P deficiency appear on lower leaves as yellow discoloration between veins and development of purplish colour on leaf sheath. Vegetative growth is lesser than that of normal palms in case of P deficiency. Recommended dose of 40 g P_2O_5 / palm/ year should be applied as split doses during pre and post monsoon seasons.

1.3. Potassium (K): Potassium is required in relatively large amounts in palms and it facilitates several major functions. This nutrient is involved in photosynthesis, enzyme activation and osmoregulation. Osmoregulation affects the pressure within a plant cell: potassium controls the opening and closing of stomata. If potassium levels in soils are low, plant leaves develop symptoms of water stress. Palms may also become more susceptible to disease if important elements, including potassium, nitrogen, boron, and magnesium, are out of balance in soils. Potassium deficiency symptoms occur on older/ lower leaves first. However, new and emerging leaves may also show symptoms as the deficiency becomes more severe. Symptoms include light coloured or brown necrotic speckling of the leaves and scorching of the leaf tips or margins (Fig.2). There will be reduced canopy size and trunk diameter in advanced stages of K deficiency. On soils tested to be deficient in K, the regular use of a potassic fertilizer could help in preventing or alleviating mild symptoms.



Fig.2. Symptoms of potassium deficiency

2. Secondary Nutrients

Calcium, magnesium, and sulphur are the secondary nutrients. These nutrients are needed in lesser quantities than that of the primary nutrients

2.1. Calcium (Ca): Calcium is an essential nutrient which is utilized for continuous cell division and formation. This is also involved in nitrogen metabolism, reduces plant respiration, aids in translocation of photosynthesis from leaves to fruiting organs and stimulates microbial activity. Calcium, immobile in plants, the deficiency symptoms appear on the younger leaves and leaf tips. Calcium deficiency is characterized by the abnormal growth of young leaves and growing points. Foliage exhibits a mosaic type chlorosis (Fig.3). Severe deficiency leads to the death of the bud or growing point. Application of dolomite @ 2-5 kg/ tree/ year can correct the calcium deficiency.



Fig.3. Ca deficiency

2.2. Magnesium (Mg): Magnesium is the key element of chlorophyll production. It improves utilization and mobility of phosphorus and also acts as an activator and component of many plant enzymes. It facilitates increased iron utilization in plants. Magnesium is a mobile element; hence the deficiency symptoms first appear on older leaves. The older leaves exhibit interveinal chlorosis leaving the midrib and veins green in colour (Fig.4). The chlorosis starts at the leaf tip progressing downwards and inwards along the margins and between the veins. Leaf margins curve upwards in the later stages.



Fig.4. Magnesium deficiency

3. Micro nutrients

The micronutrients include iron, manganese, zinc, copper, boron and molybdenum. These plant nutrients are required for plants in very small quantities but they are equally important to plant development and profitable crop production as the major nutrients.

3.1. Zinc (Zn): Crown choking can be identified at initial stages with appearance of dark green colour of leaves and reduction in size of old leaves. Soil application of zinc sulphate @ 10 g per palm is ideal if disorder symptoms are in initial stages. In case of severe reduction in leaf size and crown choking, spraying of 0.5 % zinc sulphate (5 g per litre of water) mainly on fresh foliage can be done so that new leaves will emerge normally.



Fig.5.Crown choking

3.2. Boron (B): Boron deficiency symptoms include mottled chlorosis starting at the tip of older leaves and interveinal chlorotic streaks which merge to produce necrotic lesions. The flowers and fruits will be smaller in size. At an advanced stage, there will be death of growing point. Nut splitting is also seen when boron is deficient in palms. Boron can be toxic even in

small amounts, so generally fertilizers for palms should contain only very small amounts of boron. Spraying of Borax @2g/l in the initial stages of disorder is found effective in correcting the deficiency.

B. Optimum concentration and range of nutrients

The optimum ranges of nutrients given in Table 1. are arrived at, based on the research conducted in arecanut. If the soil test values fall below this range, application of nutrients is recommended. These findings indicate the scope for judicious use of inorganic fertilizers. The higher optimum range for soil test K and micronutrients for laterite soils suggests the need for split application of K fertilizers (Bhat *et al.*, 2012). If soil test values of phosphorus and potassium are below 30 kg P₂O₅ and 300 kg K₂O per ha in arecanut basins, P and K are reaching deficit level and yields might reduce if nutrients are not applied sufficiently at this stage.

Table 1. The optimum range of nutrients in laterite soils for arecanut

| Nutrients | FAO | Optimum level |
|-----------|----------|---------------|
| P | 8-15 | 15 |
| K | 100-150 | 192 |
| Ca | 801-1600 | 925 |
| Mg | 101-200 | 179 |
| Zn | 0.5-1.0 | 5.5 |
| Cu | 0.2-0.5 | 26 |
| Fe | 2.1-4.0 | 37 |
| Mn | 1.0-2.0 | 88 |
| B | 0.5-1.0 | 1.37 |

Bhat *et al.*, 2012

- ➔ The degree of symptom expression and correction largely depends upon the method, time and frequency of nutrient application.
- ➔ Diagnosis and remediation can only be suggested by detailed soil and plant tissue analysis and other field parameters.
- ➔ Above listed are the most common disorders that are seen in major areca growing tracts of India. Certain field specific disorders may rise in plantations that may show similarities with above said symptoms

and hence management measures should be taken only after following standard soil testing.

References

- Bhat, R. and Sujatha, S. 2004. Crop management. In: *Arecanut* (Eds: Balasimha, D. and V.Rajagopal), CPCRI, Kasaragod. pp. 76-102.
- Bhat, R., Sujatha, S. and Jose, C.T. 2012. Assessing soil fertility of a laterite soil in relation to yield of arecanut in humid tropics of India. *Geoderma*.p 91-97.
- www.niphm.gov.in NIPHM-AESA based IPM package- Arecanut
