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Nitrogen Deficiency in Arecanut : Causes and Management

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The soil is the top layer of the earth's surface, comprised of minerals and filled with air and water. Soil provides shelter to many animals that live on or in and is the base of plant systems. Plants' growth and development depend on minerals and water in the soil. Without soil, there would be no vegetation and no food for the living organism on the earth. About 95% of our food nutrients come from soils, which have a natural capacity to provide nutrients to support crop growth. However, not all soils have the same ability to provide nutrients. Currently, we are facing a contrasting scenario of nutrient imbalances. In some regions, soils are naturally unfertile with little or no agricultural capability; soil degradation affects soil health in many places, and crop growth is ultimately affected in both situations. On the other hand, there are soils in which excessive additions of nutrients through improper management have led to soil, air, and water pollution and seri ous terrestrial and aquatic biodiversity effects. These highly contrasting nutrient imbalance scenarios both contribute to food insecurity and are not environmentally or economically sustainable.

Major states growing Arecanut crops are Karnataka, Kerala, Assam, Tamil Nadu, Meghalaya & West Bengal. Karnataka has occupied first place among arecanut growing states in India. As per the statistics provided by the government, arecanut is grown in many districts of Karnataka. In Karnataka arecanut is grown as a cash crop. Arecanut cultivation is a traditional form of agriculture in the Malanad and coastal parts of Karnataka. The arecanut cultivation is concentrated in Dakshina Kannada, Uttara Kannada, Udupi, Shimoga and Chikmagalur districts of Karnataka which receive heavy rainfall. In recent years arecanut is also grown in plain land districts like Chitradurga, Davanagere, Tumkur and small patches in Hassan, Mandya, Mysore and Kodagu districts due to the

irrigation projects and canal water availability. Among these districts 45% of arecanut production is contributed by coastal belt regions, 40% from the plain land area and the remaining 15% from other districts.

Soil and Climate

Arecanut can be grown on a wide range of soils. However, this crop thrives best in well-drained soils with good organic matter. Arecanut cultivation was predominant in gravelly laterite soils of the red clay type of Southern Kerala and Coastal Karnataka. Laterite, red loam and alluvial soils are most suitable for cultivation. The plain region or maidan part of Karnataka is cultivated in fertile clay loam soils. In areas where tank irrigation is practised, the soils may have an admixture of tank silt. Similar results were also reported by Srinivasan et al. (2021) for coconut plantations. Soils with pH from 5.2 to 7.0 is suitable for arecanut cultivation. To avoid sun scorching, adequate protection from exposure to the South-Western sun should be needed. Quick-growing shade-providing trees should be planted on the southern and western sides well before planting arecanut seedlings. This is a moisture-sensitive crop and should be grown with adequate irrigation. This crop requires a well-distributed annual rainfall of 750 mm to 4500 mm. This crop can be grown at altitudes up to 1000 meters above mean sea level (MSL). The ideal temperature range of 10°C to 40°C is best for its growth and yield.

Plants require more nitrogen (N) than any other nutrient, but only a small portion of the nitrogen in the soil is available to plants; 98% of the nitrogen in the soil is in organic forms. Plants cannot take up most forms of organic nitrogen except for some small organic molecules. The largest flux of N in soils occurs through the continuous recycling of N in the plant-soil system: soil mineral N is taken up by the plant. It is fixed into biomass, and eventually, N returns in the form of plant debris to the soil. Soil biota facilitates the decomposition of added debris, mineralizes a fraction of N and thus renders it available to the crop. Simultaneously, the remaining N is so integrated into the soil organic matter pool that it ultimately becomes the soil's largest stock of stable N.

Nitrogen Deficiency in Arecanut

Plants are stunted and generally yellow with lower leaves being most affected. Older leaves are a golden yellow colour.

As the deficiency progresses, younger leaves will also become discoloured. When the entire crown except for the spear leaf is affected, leaves will become progressively lighter in colour and

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may be nearly white. Growth virtually stops when N deficiency is severe, but the palms may linger in this state for a considerable length of time. In older palms in the landscape or field, canopy size becomes greatly reduced, very light green, and the trunk will taper (pencil-pointing).

Management

Nitrogen inputs and outputs vary considerably amongst farmers and soils, with variations mainly attributable to levels of crop development and water resources. The nutrient imbalance could have a large impact on arecanut production and soil quality degradation. Both the N imbalance and the N losses can be improved greatly without compromising crop yields. Annual application of 100 g N (220 g urea), 40 g P_2O_5 (200 g rock phosphate) and 140 g K_2O (235 g muriate of potash) in addition to 12 kg each of green leaf and compost per palm per year is recommended.The application of balanced N fertilizer along with organic manure N is the potential for improving N deficiency and crop productivity (Velthof et al., 2009). Foliar application of 2% urea thrice at fortnightly intervals or soil application of 1-2 kg urea/tree also helps to recover from nitrogen deficiency.

Conclusions

There is a need to address the Nitrogen deficiency to improve the productivity of arecanut grown in different parts of Karnataka. Adopting cost-effective nutrient management through organic manures is the best solution to overcome this deficiency. The arecanut waste can be composted and used as manure. In low fertile soils adding tank silt will also enhance the nutrient status of the soil. A proper nitrogen management strategy will help to restore sustainable arecanut productivity. The major arecanut zones of Karnataka states can be identified for site-specific integrated nutrient management interventions. These interventions must consider soil nutrient status, age of the crops and water availability. The prevailing management strategies should also be refined based on these criteria.

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