

SOME NOTES ON THE COCONUT ROOT SYSTEM

The root system provides anchorage to the coconut palm and provides means of absorbing nutrients and water from the soil. Also, important growth regulators are synthesized within roots. Considering the size of an adult palm and the weight of the fully laden crown, it is obvious that it requires firm anchorage to the soil, which is provided by roots which are well spread. The size and spread of the root system are influenced by the soil type and soil physical conditions.

The other important function of the root system is to absorb water and nutrients to meet the demand developed within the crown. The root and shoot growth is inter-dependent, and one cannot succeed when the other is failing. The amount of water and nutrients available to the palm depends on the volume of soil with which roots are in contact.

The root system of palms which are monocotyledonous, is different from that of dicotyledonous trees like mango or jak. The coconut palm has numerous fibrous adventitious roots produced from the bole of the tree. The total number of roots in a 25-year old palm could vary from 2000 - 4000. These roots are projected in all directions in the soil for anchorage and to absorb water and nutrients. The direction of root growth is often influenced by soil moisture availability, soil physical properties and gravity.

The first formed roots tend to grow vertically downwards into the soil. Others grow obliquely or horizontally. Their greatest concentration is in the top meter of the soil and within a radius of about 2 meters from the base of the palm. The average length of a root ranges from 5 m to 6 m, but some may extend laterally, especially in moist sandy soils, up to even 10 m to 25 m. Roots do not grow into dry soil or into stagnant water. Long immersion in poorly aerated water kills them. They can tolerate salinity up to about that of sea water.

Generally, roots of the coconut palm are uniform in size and shape. Each root has at the extremity a growing point covered by a thimble-shaped root-cap. Just behind this is a whitish thin walled region 2 mm to 5 mm in length. The thickness of the outer or epidermis of the roots varies depending on the age of the roots. The colour indicates the functional capacity of roots. Dark brown to reddish roots have lost the absorption capacity and they provide anchorage to the palm.

Coconut roots do not have root hairs. Absorption of water and nutrients take place in the cream coloured region just behind the root cap. It would therefore be noted that the total absorption area of the coconut root system is very small compared to the total volume of the roots. Coconut palms grown in sandy soil have well distributed and deep root system whereas palms grown in lateritic/gravelly soil with a hard pan have surface spreading root system with less vertical roots and confined to a limited space in the soil.

A kind of fibrous tissues is observed on the surface of the horizontally spreading roots. They are called pneumatophores and are designed to absorb air from the atmosphere as roots need air for respiration. It is reported that the roots of a coconut palm up to a depth of about 25 cm and to a distance of 200 cm away from the bole are active in absorbing nutrients. Fertilizer application therefore has to be concentrated within this area called the (manure circle), for efficient absorption. The ability of palms to withstand drought depends on the development of a deep, profusely branched root system that is capable of absorbing water from the large volume of soil. If husk/coir dust pits are established in between the palms roots grow towards them to absorb water retained in husks coir dust.

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When the soil dries up for a prolonged period, the outer cells in the absorbing region of the roots develop thickened walls through which water will not enter. Roots so affected remain more or less in a resting condition. The recovery after a severe drought is a slow process. Normal root absorption does not commence with the first rains. First the growing points of the roots have to be reactivated from their enforced rest. This is followed by root elongation and the formation of a new absorbing region.

Absorption of water into the roots takes place by a process called "diffusion". The cells in roots have a solution more concentrated than water in the soil. Therefore, water molecules move through the membranes into the cells by diffusion. Since the solute concentration is higher in saline water, most plants cannot absorb

water from such a source. However, in coconuts the solute concentration is rather high enabling them to tolerate sea water. When the soil is waterlogged, the roots start rotting due to microbial activity and poor aeration. Roots may die prematurely due to water logging, pest attack, mechanical injury or become brittle when old.

Continuous renewal of roots is very important as roots cease to absorb water when they become thick, impervious wall in the absorbing region. Therefore, roots depend on shoots for carbohydrates, growth regulators and amino acids while the shoots depend on roots for water, minerals and growth regulators. When the balance between them is disturbed, palms gradually decline.

COCONUT DAY - 1990



For the first time, the Coconut Research Institute conducted a COCONUT DAY on 25 November, 1990. A large number of growers participated in this event, and they had an opportunity to visit the laboratories and field experiments.

The photograph shows the participants in the field.