

B-118 Assessment of oxygen availability in soils of different drainage classes and its effect on coconut root growth

L P Vidhana Arachchi, L L W Somasiri
Coconut Research Institute, Lumuwila

The coconut plantations in Sri Lanka covers about 416,000 ha. The coconut productivity within this extent is highly variable due to the soil conditions of which soil drainage is an important character. Availability of oxygen in soil varies with different drainage conditions, which is one of the limitations to coconut root proliferation. The knowledge on the threshold level of the oxygen availability for coconut roots in different soils is useful for reclamation of such lands and upgrading the coconut production. The present study was carried out to study the variation of oxygen concentration of soils in different drainage classes at different depth and its effect on coconut root growth and proliferation.

Oxygen measurements were made in well drained (no water logging observed upto a depth of 90 cm), imperfectly drained (water logging is observed less than one month period upto 30 cm depth and 1-6 months at 30-60 cm depth) and poorly drained (water logging is observed 3-6 months period at 30 cm depth and more than 6 months at 30-60 cm depth) soils upto a depth of 120 cm at 20 cm intervals with an oxygen meter.

Results showed that moisture content of soils of different drainage classes varied from 1% to 53% (on dry basis) during the experimental period and moisture content higher than 12% (on dry basis) tends to reduce oxygen concentration of soils. In well drained and moderately well drained soils, the oxygen concentration ranged from 20 to 17% upto a depth of 120 cm, within which 80 to 90% of the total coconut root mass was found. The coconut root growth and the function of respiratory organs were found to be very low when the oxygen concentration dropped to 15% which can be considered as the threshold level. In poorly drained soils, oxygen concentration was less than 15% beyond 60 cm depth. The oxygen level further dropped to 5% beyond 80 cm depth in poorly drained soil where no roots were observed. In such soils, all the root mass was found to be confined to 0-06 cm depth, leading to the formation of a root mat. The growth and nut yield of the coconut palm was found to be severely affected when oxygen availability became limited at the 60 cm depth, whereas the yield of the palm was very high when soils were well drained or imperfectly drained.