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TECHNIQUES FOR SAMPLING OIL PALM ROOTS. I. MOTORISED ROOT SAMPLER

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Root study is an important aspect of research for understanding how plants interact with the environment. However, sampling of roots is an arduous task. A technique using a motorised hammer and a STIBOKA soil column cylinder was found to greatly enhance the sampling of oil palm roots in mineral soil. It enables a team of three workers to rapidly sample roots from a palm in a day.

INTRODUCTION

Plant researchers generally concentrate on the activities of shoots and neglect the roots, partly because they are out of sight and more difficult to study than shoots. However, vigorous root systems are as essential as vigorous shoots for plants to be healthy. The growth of roots and shoots is completely inter-dependent, and one cannot succeed if the other fails. Roots not only absorb water and minerals, but they also have other important functions such as anchorage, conversion of inorganic nitrogen into organic compounds, and synthesis of growth regulators such as cytokinins and gibberellins. In turn, roots are dependent on shoots for carbohydrates, growth regulators and organic substances. Therefore, the successful growth of plants depends on maintenance of a balance in growth and function between roots and shoots.

At present, destructive sampling is still used for studying carbon partitioning and root biomass distribution. However, this method only gives an estimate of the total quantity of roots. It does not allow root activities to be classified according to their size or function. Furthermore, in the field it is not possible to ascertain from which palm a root comes from.

In a previous oil palm root study, root samples were extracted from the soil using a root auger which minimized damage to the plant (Chan, 1976). Holes were augered every one metre along each of three axes radiating from the palm at equal 120° angles apart.

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Using a manual root auger limits the amount of sampling than can be done. This paper describes a technique for rapid sampling of oil palm roots in mineral soils.

MATERIALS AND METHODS

The system consisted of a petrol driven wrecking hammer (Pjonjar; Sweden), a STIBOKA soil column cylinder (Eijkelkamp, Netherlands) and a lifting jack. The soil column cylinder is made up of two halves that can be easily separated. Before use, the surface of the soil column cylinder was lightly coated with petroleum jelly or vaseline to reduce friction between the soil and cylinder wall. Then the STIBOKA cylinder was positioned vertically over the sampling point and driven one metre into the ground with the use of the motorised hammer *(Figures 1* and *2).*

To pull the cylinder out, a length of 2.5mm diameter steel chain was tied to the cylinder and attached to the lifting jack *(Figures 3* and *4).* After retrieving the cylinder from the soil, it was laid on the ground and the soil core retrieved *(Figure 5).* The soil core can then be cut into suitable sections of 10cm or 20cm lengths and the roots recovered.

RESULTS AND DISCUSSION

The motorised hammer drove the soil column cylinder to the depth of one metre in less than five minutes. It took even less time to withdraw the cylinder using the lifting jack. This is much faster than using a hand auger that can take more than half an hour to complete one hole.

Some of the advantages of using the STIBOKA soil column cylinder auger are the

Figures 1 and 2. Using the motorised hammer to drive the STIBOKA soil column cylinder into the soil.

Figures 3 and 4. Pulling the soil column cylinder out with the lifting jack. A length of 2.5cm diameter steel chain was tied to the cylinder and attached to the lifting lever of the jack.

Figure 5. The soil column cylinder opened into two halves to reveal its soil sample intact.

large diameter and length of the sample (10cm diameter by 100cm length), easy penetration and easy removal of the cylinder from the soil, and a loose and relatively uncompressed soil sample. The operation was also unaffected by stones or soil aggregates that often impede the entry of hand augers.

Using the motorised system, the number of holes that can be sampled a day was considerably increased. On average, a team of three workers can complete the sampling of one palm in a day. This technique enhances the work efficiency of root sampling.

This technique does not overcome one of the major drawbacks of root sampling – the inability to differentiate between roots from different palms. However, it can be used to estimate root growth in soil.

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