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ROOT AUGER FOR PEAT AREA

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Malaysia has about 2.3 million hectares of peat land (Halim *et al.*, 1990). Peat is a heterogeneous mixture of more or less decomposed plant (humus) material that has accumulated in a water-saturated environment and in the absence of oxygen. Its structure ranges from more or less decomposed plant remains to a fine amorphic, colloidal mass.

The Malaysian peat is made up of homogenous woody tree residues and other plants that thrive on the forest floor of swamps. The peat medium is a structureless material that has a very low bulk density, low in nutrients and low in pH level (Joseph *et al.*, 1974). The bulk density of an organic soil is the weight of a given volume of soil usually expressed on a dry weight basis in grammes per cubic centimetre. Values range from 0.05 g cm^{-3} in very fibric, undecomposed materials to less than 0.5 g cm^{-3} in well decomposed materials.

Most organic soils shrink when dried but swell up upon watering, unless they are dried beyond a threshold value when irreversible drying occurs. Shrinkage calculated as a percentage of the original volume ranges from 90% for aquatic peats to 40% for fibric peats.

Irreversible drying occurs after periods of intensive drying and is typical of many peat soils. Surface layers of organic materials in many reclaimed and drained peat swamps exhibit this behaviour. After exposure to the sun, the materials become loose and are very difficult to hydrate. This may cause severe drought stress in shallow rooting crops.

Subsidence or the lowering of the surface of reclaimed peat is undoubtedly the greatest problem when attempting to sustain agricultural activities. It is caused by changes in conditions brought about by drainage. Waterlogged and anaerobic peat in the natural swamp becomes aerobic when drained. The aerobic conditions lead to biological oxidation or mineralization of the organic deposits. Peat subsidence has several serious consequences. Drainage must be regularly adapted to new levels and conditions, otherwise inundation and flooding will recur.

The growing of perennial crops, particularly plantation crops on tropical peats, has been studied in Malaysia for some time (Kanapathy, 1978; Tie and Kueh, 1979). One of the most difficult problems to counteract is the poor root anchorage provided by the soft peat, especially for perennial crops such as oil palm (*Elaeis guineensis*) which become top-heavy when mature. Peat subsidence, a consequence of intensive drainage, uproots the shallow-rooting trees causing them to lean progressively and eventually topple (Dolmat *et al.*, 1982). Root study is important for understanding the oil palm performance under limited growth medium such as peat. However, root sampling in peat area is difficult since the material is sometime loose and friable. The high water table that ranges from 60 to 90 cm from the surface can also cause problem during sampling. Obtaining intact root samples are often difficult when using an ordinary root auger, since a large

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portion of the sample can be left behind as the auger is extracted out of the ground. An improved root auger was specifically designed to overcome this problem. A study was carried out to test the capability of the new improved root auger for sampling oil palm roots in peat.

MATERIALS AND METHODS

The root auger was fabricated from mild steel and is made up of the handle, a spring lever, sample bucket, trap door and a serrated root cutting edge (*Figure 1*). Two 1 m long steel tubes connect the handle to the sample bucket. The trap door on the sample bucket can be closed by pulling the spring level on the handle.

During the sampling operation, the handle is used to turn the auger along its long axis while forcing the auger into the ground until a suitable depth is reached (*Figure 2*). This allows the serrated edge on the bottom of the bucket to cut the roots. The hinge door on the bucket is operated by pulling on the spring lever when extracting the auger from the ground. This enables the hinge door to trap the peat core sample in the bucket and prevent it from falling out. The peat core sample is then extracted out from the bucket and the roots samples collected.

Sampling test was carried out at the MPOB Research Station in Teluk Intan, Perak. Peat core samples were taken from five distances from the base of a mature 18-year-old palm. Each hole was sampled in 15 cm increments up to 90 cm deep. Roots were oven dried and used for dry weight determination. Comparison was made with root data obtained using a conventional root auger.

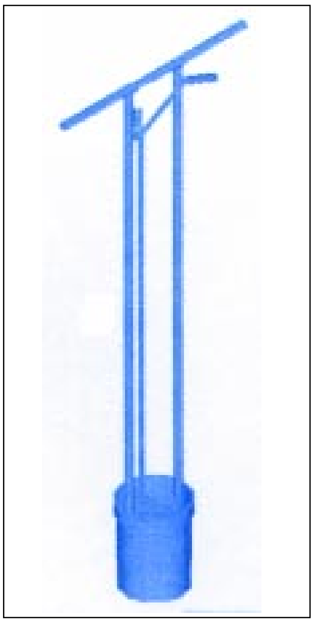

Figure 1. Peat auger design.

Figure 2. Using the peat.

RESULTS AND DISCUSSION

The total root dry weight sampled with the peat auger was greater than the standard root auger as shown in *Figure 3*. This can be attributed to

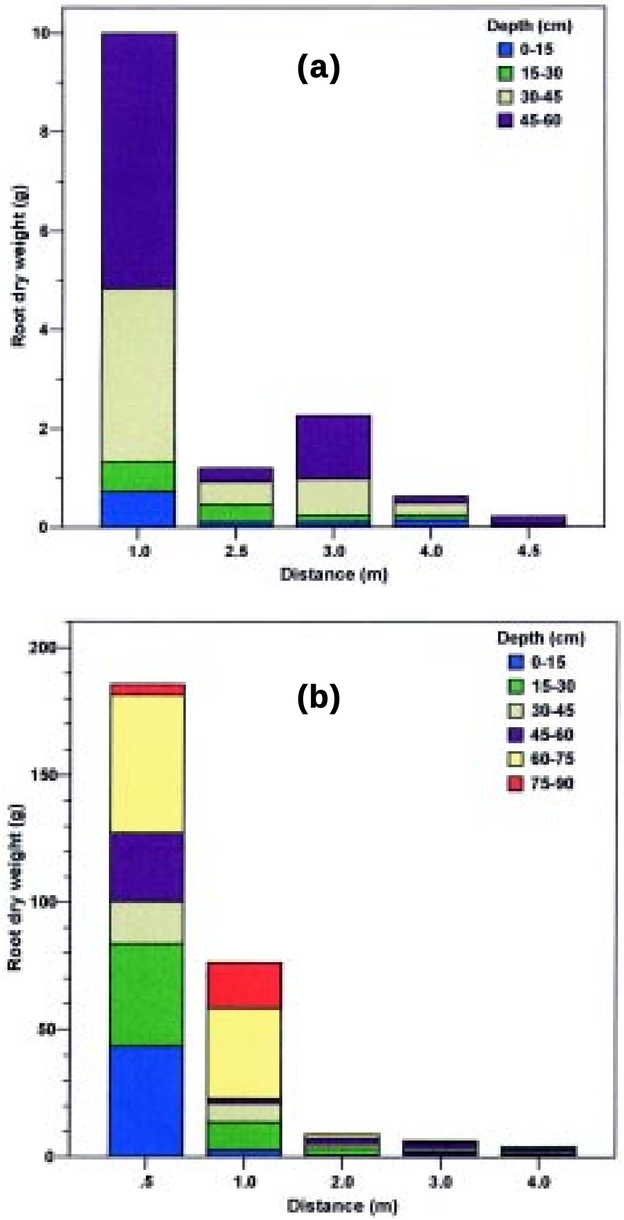

Figure 3. Total root dry weights at each sampled depth and distance from the trunk using (a) standard root auger and (b) peat root auger, taken from the same palm age at the MPOB Research Station in Teluk Intan, Perak.

the peat auger having a bigger sampling volume (15 cm diameter by 17 cm height) and greater sampling depth (0 to 90 cm). The special feature of the peat auger also prevents root samples from being left in the ground when the auger was extracted out.

Comparisons using the root dry weight per volume shows that the peat auger had higher values than the standard root auger at distances less than 1 m from the trunk (*Figure 4*). The serrated cutting edge improves the cutting of roots that are numerous near the trunk.

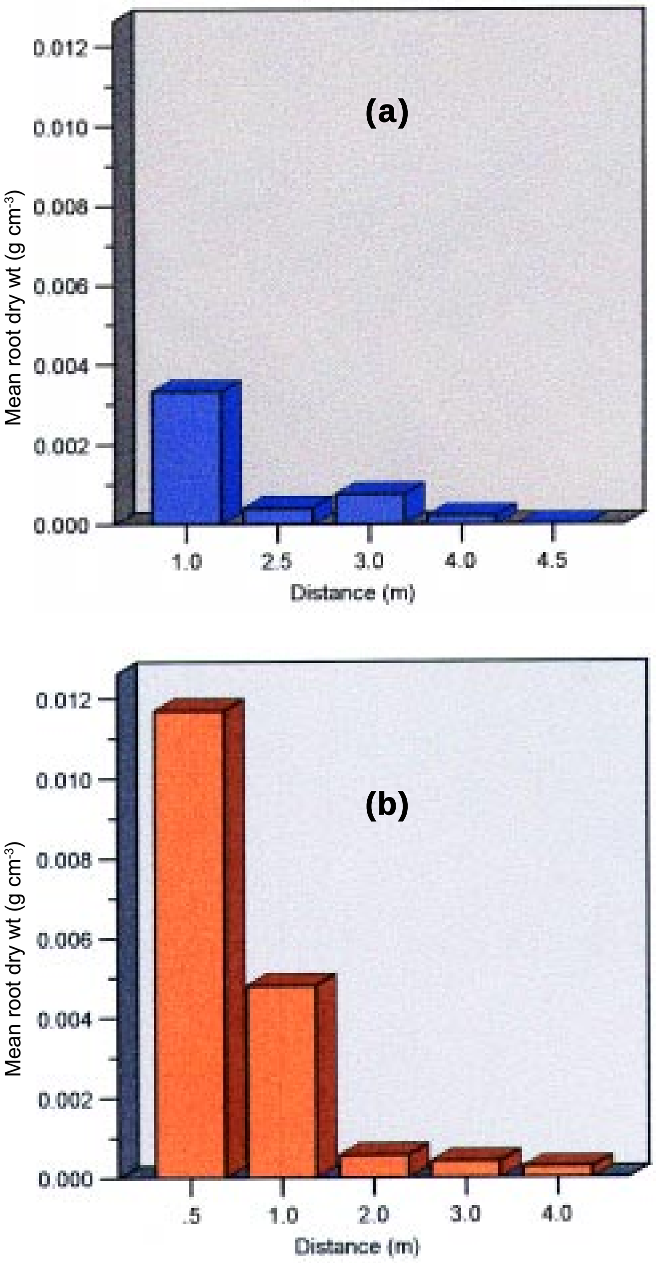

Figure 4. Total root dry weights per volume from several distances from the trunk using (a) standard root auger and (b) peat root auger, taken from the same palm age at the MPOB Research Station in Teluk Intan, Perak.

CONCLUSION

The peat auger design improves the sampling of oil palm roots under the unique conditions encountered in peat areas. Intact root samples were obtained when the peat auger was extracted from the ground. The serrated cutting edge helps to cut the numerous roots present near the base of the oil palm trunk.

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