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The Effects of Soil Compaction on the Growth of Oil Palm (*Elaeis guineensis* Jacq.) Seedlings

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Abstract

Mechanisation in oil palm plantation can lead to soil compaction along tracks with bulk densities increasing above 1.7 $g\,cm^{-3}$ at some places, which could lead to negative impact on root development and growth of oil palm. A 7-month pot experiment to evaluate the effect of soil compaction on root development and growth of oil palm seedlings was studied in Nigeria. It was laid out in a completely randomised design (CRD) with six replications. Compaction levels were achieved at soil bulk densities of 1.5, 1.7, 1.9 and a control soil C with no compaction. Growth parameters of plant height (PH), frond width (FW), collar girth (CG) frond length (FL), number of fronds (NF) were measured 3, 5 and 7 months after planting (MAP). At 7 MAP, plant root and biomass attributes such as primary root dry weight (PRDW), primary root length (PRL), and shoot dry weight (SDW) were determined. At 3MAP, PH, CG, FL, and NF were significantly higher for the control while treatments of $1.5\,g\,cm^{-3}$ and $1.7\,g\,cm^{-3}$ gave the highest FW. 5MAP, results for control and $1.5\,g\,cm^{-3}$ treatments were significantly higher for PH, FW, CG, than those of 1.7 and $1.9\,g\,cm^{-3}$. Control had highest value for FL, and at par with 1.5, $1.7\,g\,cm^{-3}$ treatments, but was significantly different from $1.9\,g\,cm^{-3}$. At 7MAP, control had highest PH, FW, and NF. However, soils with $1.5\,g\,cm^{-3}$ had highest CG, and FL values. For root biomass and length were also highest for the control. Treatments of $1.5\,g\,cm^{-3}$ gave the highest SDW, but were not significantly different from control. Values for all measured parameters were lowest in $1.9\,g\,cm^{-3}$ treatments. It showed that pots under zero compaction were most effective in improving growth of roots and shoots of oil palm seedlings. Results also indicated that bulk densities of 1.7 and $1.9\,g\,cm^{-3}$ had negative effects on oil palm seedling growth.

Keywords: Growth, oil palm, seedling, soil compaction

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