

## **Some engineering properties of Palmyra palm tree (*Borassus aethiopum*) germinating shoot**

### **ABSTRACT**

This study was carried out to determine some engineering properties of germinating shoot of Palmyra Palm tree (*Borassus aethiopum*) relevant to the design of an agricultural harvesting machine. Seed volume, sphericity, weight, surface area, aspect ratio and compressive strength were determined at three different moisture contents of 41.72%, 26.11% and 18.39% (wb) respectively. Standard methods and instruments were used to conduct the experiments. The results of the physical properties revealed that the major, intermediate and minor diameters, surface area and weight increased with the increase in moisture content. The maximum mean values of the major, intermediate and minor diameters were 280.00 mm, 33.00 mm and 25.90 mm respectively while the minimum mean values were 209.67 mm, 16.67 mm and 15.21 mm at the three moisture contents respectively. The mean coefficient of variation for the major, intermediate and minor diameters were 10.57%, 32.84% and 10.59% respectively. The statistical analysis carried out on the physical properties shows that the F value (38.77) is greater than the F-critical value and also the P-value  $1.74 \times 10^{-32}$  is less than the significance level ( $\alpha = 0.05$ ) which means there is a significant difference between the physical properties of germinating shoot within the range of moisture contents. The mechanical properties of the Palmyra palm germinating shoot revealed a mean force at break as 1247.10 N, 650.00 N and 707.10 N for longitudinal, natural and transverse loading positions respectively. The stress at break has mean values of 1247.10 N/mm<sup>2</sup>, 650.00 N/mm<sup>2</sup> and 707.10 N/mm<sup>2</sup> for longitudinal natural and transverse loading positions respectively. The energy at break has mean values of 2.16 Nm, 2.42 Nm and 1.80 Nm, for longitudinal natural and transverse loading positions respectively. The mean values of the energy at yield for longitudinal, natural and transverse loading positions were 1.56 Nm, 1.03 Nm and 1.44 Nm respectively. The stress at yield has mean values of 1158.50 N/mm<sup>2</sup>, 627.67 N/mm<sup>2</sup> and 734.25 N/mm<sup>2</sup> for longitudinal, natural and transverse loading positions respectively. While the mean values for the Young's modulus at longitudinal, natural and transverse loading positions were 15326.00 N/mm<sup>2</sup>, 5768.80 N/mm<sup>2</sup>, and 5010.90 N/mm<sup>2</sup> respectively.

**Keyword:** Engineering properties; Germinating shoot of Palmyra palm; Libido; Muruchi