

DETERMINATION OF SELECTED ENGINEERING PROPERTIES OF COWPEA (*VIGNA UNGUICULATA*) RELATED TO DESIGN OF PROCESSING MACHINES

O. Chukwu¹ and M. O. Sunmonu²

¹Department of Soils, Water and Agricultural Engineering, Sultan Qaboos University, P. O. Box 34, Postal Code 123, Al-Khod, Muscat, Oman.

²Department of Agricultural & Biosystems Engineering, University of Ilorin, PMB 1515, Ilorin, Nigeria.

ABSTRACT

In this study, some selected engineering properties of two improved varieties of cowpea (Sampea 7 and Txv 3236) grown in Nigeria were determined. The properties of Sampea 7 are: Length (9.48 ± 1.46 mm), width (6.75 ± 0.66 mm), thickness (5.35 ± 0.73 mm), roundness (2.38 ± 0.28), sphericity (3.64 ± 0.46), mass (48.0 ± 10.0 g), volume (1.04 ± 0.26 mm³), density (1.00 ± 0.28 kg m³), surface area (10.74 ± 1.78 cm²), angle of internal friction ($11.05 \pm 2.07^\circ$), angle of repose ($20.50 \pm 2.38^\circ$) and moisture content ($7.01 \pm 0.05\%$ db). The compressive strength, tensile strength, abrasive strength, shear strength and torsion strength of Sampea 7 are 66.25 ± 16.12 N, 65.53 ± 15.51 N, 64.55 ± 14.55 N, 65.20 ± 15.50 N and 65.00 ± 16.10 N, respectively while its hardness is 7.98 ± 0.03 kg. The properties of Txv 3236 are: Length (7.76 ± 0.56 mm), width (5.25 ± 0.14 mm), thickness (4.11 ± 0.42 mm), roundness (1.42 ± 0.14), sphericity (5.12 ± 1.00), mass (32.0 ± 8.0 g), volume (0.70 ± 0.10 mm³), density (0.48 ± 0.20 kg m³), surface area (8.80 ± 1.02 cm²), angle of internal friction ($9.23 \pm 1.58^\circ$), angle of repose ($21.05 \pm 1.26^\circ$) and moisture content ($6.7 \pm 0.22\%$ db). The compressive strength, tensile strength, abrasive strength, shear strength and torsion strength for Txv 3236 are 93.65 ± 13.62 N, 93.55 ± 13.71 N, 92.56 ± 13.70 N, 93.50 ± 13.60 N and 92.75 ± 13.65 N, respectively while its hardness is 11.96 ± 3.57 kg. Statistical tests on the properties showed that dimensions, compressive strength, tensile strength, hardness, abrasive strength, shear strength and torsion strength of the two cowpea varieties are highly significant at 5% level; roundness, sphericity, volume, surface area and angle of internal friction are significant at 5% level; while mass, density, angle of repose and moisture content are not significant at 5% level.

Keywords: cowpea, biomaterials, engineering properties, mechanical properties, physical properties.