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PROCESSING OF AGRICULTURAL PRODUCTS (1 jdl)

Shkelqim Karaj, Joachim Muller, Determination of physical, mechanical and chemical properties of seeds and kernels of Jatropha curcas L.,
Industrial Crops and Products, Volume 32, Issue 2, September 2010, Pages 129-138, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2010.04.001.
(http://www.sciencedirect.com/science/article/pii/S0926669010000804)

Abstract:

This study was conducted to investigate physical, mechanical and chemical properties of Jatropha curcas seed and kernels. The considered parameters were terminal velocity, unit mass, bulk/solid density, volume, porosity, surface area, specific surface area, coefficient of friction, static/dynamic angle of repose, rupture force, deformation at rupture point, deformation ratio at rupture point, hardness, energy used for rupture, moisture content, oil content, higher heating value, protein content and ash content. Seed mass frequency was indentified and four fractions of seeds were distinct by terminal velocity. It was observed that all physical characteristics such as unit mass, dimensions (x, y, z), arithmetic diameter, geometrical diameter and volume within seeds and kernels are significantly different between fractions at $p <= 0.01$. Coefficient of static friction of seeds was higher on rubber surface and lowest on stainless steel, namely 0.45 and 0.22. The coefficient of static friction was higher on all surfaces for kernels than for seeds. It was noticed that angle of repose of kernels was higher than for seeds. The rupture force of seeds and kernels increased with unit mass for horizontal (x), transversal (y) and vertical (z) direction. Vertical position showed highest values of rupture force for both, seeds and kernels. Lowest rupture force was recorded in transversal direction for seeds and in horizontal direction for kernels. Similar results were obtained for hardness. The oil content of kernels was higher than that of seeds for all fractions, the heaviest fraction of seeds and kernels show the highest values of oil content, namely 36% and 56%. Moisture content of seeds was higher than that of kernels and moisture content of kernels was decreasing with the increase of unit mass, namely from 7.55% to 4.11% moisture content (w.b). The higher heating value of kernels was higher than the higher heating value of seeds. The heaviest fraction of seeds and kernels showed the highest heating value, namely 26.23 MJ/kg for seeds and 30.20 MJ/kg for kernels.

Keywords: J. curcas; Physic nut; Purging nut; Terminal velocity; Physical properties; Mechanical properties; Chemical properties