Title Design of machine to size java apple fruit with minimal damage

Author Krawee Treeamnuk**,** Siwalak Pathaveerat**,** Anupun Terdwongworakul and Chanida Bupata

Citation Biosystems Engineering, Volume 107, Issue 2, October 2010, Pages 140-148

Keywords java apple; sizing machine

Abstract

Java apple fruit features attractive skin, sweet and crispy flesh, and a high susceptibility to mechanical damage. The java apple produced in Thailand has gained popularity in local and foreign markets, is available almost all year round and is sold at good prices. Fruit export drives postharvest mechanisation, of which fundamentally important machines such as a mechanical sizer for java apple are still not available. This research was aimed at designing, constructing, testing, and evaluating an efficient sizing machine for java apple. Design concepts featured a) a sizing parameters which were determined by the diameter of the fruit and b) a sizing mechanism which causes minimum damage. The sizing machine comprised a feeding unit and a diverging belt sizing unit that are powered by two 187 W 220 V 50 Hz electric motors, gear reducer and pulleys. Performance tests indicated that velocity and inclination angle of the sizing belt; feeding belt velocity and the fruit orientation significantly affects the sizing performance at $p < 0.05$. The optimum conditions for continuous mechanical sizing depended on the variety. The optimum sizing performance was characterised by a contamination or error ratio of 10.8–16.5%, and a throughput capacity of 149.7–195.1 kg h^{-1} with no significantly noticeable damage to the sized fruits. Manual sizing of the exported java apple featured an error ratio of 27.9%, a damage percentage of 13.3%, and a capacity of 107.2 kg h^{-1}. Therefore, the java apple sizing machine can be operated without adding more mechanical damages to the sized fruit.