

## **Packaging Development to Support Export Supply Chain of Mangosteen Fruit**

Sutrisno<sup>1\*</sup>, Sugiyono<sup>1</sup> and Ismi Makhmudah Edris<sup>2</sup>

<sup>1</sup>*Department of Mechanical and Bio-System Engineering, Faculty of Agricultural  
Engineering and Technology, Bogor Agricultural University,  
Kampus IPB Darmaga, PO.Box 220, Bogor, Indonesia 16002*

<sup>2</sup>*Food and Agricultural Machinery Engineering, Graduate Program, Bogor Agricultural  
University, Bogor, Indonesia 16002*

*\*Corresponding author. E-mail: kensutrisno@yahoo.com*

### **Abstract**

The changes of the quality of mangosteen fruits for export market occur during the distribution handling from production center to the shipment port and then to the destination market countries. This research was carried out to develop optimum packaging design of mangosteen fruit for export market using corrugated carton material which enable to be stacked in maximum load. The result showed that compressive strength of C-flute packaging type with inner package was 474.5 kgf, while the BC-flute packaging type was 663.2 kgf. The maximum stacking was determined based on the capacity, compressive strength of packaging and safety/environment factor in ASTM D4269 standards. The designated packaging of C-flute and BC-flute type could be maximally stacked up to 29 units and 35 units of packaged fruits, respectively. Compressive strength decreased higher under storage at 13°C (RH approximately at 90-95%) than 8°C with 60-75% RH i.e. 40.04-41.64% and 6.75-30.31%, respectively. Mechanical damage symptom occurred in C-flute type with 2x2 and 2x3 inner model during transportation was broken calyx at 1.39 and 1.67%, respectively. Packaging model under different capacity did not significantly influence firmness and TSS but significantly influence weight loss.

Keywords: mangosteen, packaging design, compressive strength, mechanical damage

### **Introduction**

Mangosteen, The Queen of Fruit, has become one of the most popular tropical fruit in the world because of its exotic shape, taste and color. The largest import markets of mangosteen from Indonesia are China (44.4%), Hongkong (35.47%), Singapore (8.54%), expand to Middle Eastern (6.14%) and Europe (0.39%). For Indonesia, mangosteen has become the main export fruit commodity. Meanwhile, it is reported that a big shrinkage occurred in exported fruit of which only 35%-40% was accepted by importing countries (Sutrisno *et al.*, 2009).

Packaging is conducted to maintain the safety of a product during transportation and to protect it from pollution and quality

degradation as well as to make it easy in handling. The advantages of using appropriate packaging are efficiency in handling, ease in storage and distribution as well as reducing transportation and marketing cost (Hardenberg, 1986).

Box which is made of corrugated carton is a type of packaging which mostly used for transportation of goods including fruits, vegetables and other industrial goods. Corrugated carton box is very functional because of its practical for retail sale, needs little stock room and is made from material which is environmentally friendly. This type of carton box can also be designed for application which have various strengths and forms needed. However, the compressive strength of packaging box depends on