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Correlation and principal component analysis of physical properties of tender coconut (*Cocos nucifera* L.) in relation to the development of trimming machine

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Abstract

The physical properties such as tender coconut size, weight, husk thickness, and husk moisture tender content play a vital role in the development of an efficient and ergonomic trimming machine. The important physical properties of tender coconuts of cultivars namely Kulasekaran Green Dwarf (KGD), Andaman Giant Tall (AGT), Ganga Bondam (GB), Malayan Orange Dwarf (MOD), and Chowghat Orange Dwarf (COD) were determined. The important properties including weight, diameter, height, husk thickness, husk moisture content, shell diameter, shell height, and shell thickness were high for nuts of AGT and low for COD nuts. The average bulk density, true density, and porosity of AGT were 332.47 $kg \cdot m^{-3}$, 1,196.67 $kg \cdot m^{-3}$, and 72.21%, respectively. The husk weight and volume of water of AGT were 87.77% and 12.39% high, respectively, compared with COD. In the correlation study, the coconut weight correlated positively (r = 0.791) with the diameter and vertical distance between the shell and the fruit base (r = 0.813). The principal component analysis suggested that the cultivars GB, KGD, and MOD have similar physical properties to COD and AGT. Thus, the present investigation documents crucial basic information to design an efficient and superior tender coconut trimming machine.

Practical Applications

Transportation of intact tender coconut is difficult, and thus a manually trimmed tender coconut shape of a cylindrical side with a conical top has gained more importance among the domestic and international consumers owing to its fresh and natural taste and attractive shape. The high transportation cost of tender coconut, shortage of manpower to trim the tender coconut, and the high production cost to make the shape of the cylindrical side with a conical top have created an urgent need for the development of trimming machines. The physical properties of tender coconut and its correlation studies are very important for the designing and development of a trimming machine.

