A Simple Method to Determine the Surface Area of Areca Fruits (*Areca catechu* Linn.)

The fruit rot or *Mahali* of arecanut (*Areca catechu* L.), the most destructive disease is controlled by spraying of 1% Bordeaux mixture twice during the monsoon season. In order to estimate the quantity of copper retained on the surface of the nut between the first spray and the next, the surface area must be known. In the present study, an attempt was made to evolve a simple non-destructive method to calculate the surface area.

In the first instance 50 nuts were collected, each nut was weighed and the volume also was found out by water displacement. The actual surface area was determined by peeling the pericarp of the fruit, flattening it on a graph paper and then measuring the area covered by it. The regression equation of the form $y=a+bx$ was fitted separately both for weight of fruits and for volume of fruits, wherein y=surface area and x=weight/volume of the fruit.

This preliminary study indicated that it is more reliable to use weight of fruits as the independent variable for calculating the surface area. Therefore, areca fruits at three different stages of development (Bhat, Krishnamurthi and Rao, 1962), *viz.*, less than 20 g (50 fruits), between 20 and 40 g (83 fruits) and above 40g (38 fruits) were collected. Weight and actual surface area of each fruit were recorded. The regression equation of the form $y=a+bx$ was fitted separately for each of these three groups.

The preliminary study to choose the appropriate independent variable for determining surface area revealed that weight of a fruit is more reliable than its volume for calculating its surface area. Table I gives the regression equations along with its r^2 values for weight and volume as independent variables. Since the r^2 value obtained was quite high in case of weight of fruit as the independent variable, it is preferable to use the weight of fruits for calculating the surface area.

Subsequently, the study was undertaken for the three distinct phases of fruit development, taking into consideration only the weight of fruits. The regression equations obtained for each of the three weight-groups are given in Table II.

The identical nature of these regression lines was tested using 'T' statistic (Chakravorthy, Laha and Roy, 1967) and it was found that these lines were not identical ($T = 13.98 > F_{4, 165; 0.05}$). Since the values of a and b did not differ much for groups 2 and 3, the identical nature of these groups was further tested using the same 'T' statistic and it was found that these two lines are identical ($T = 0.99 < F_{2, 117; 0.05}$), and hence a common regression equation $y = 15.94 + 0.86\,x$ is suggested.

Table I. *Regression equations and r^2 values (n = 50)*

Independent variable (x)	Regression equations for estimating surface area (y)	r^2
Weight of fruits	y = 15.21 + 0.87x	0.8968**
Volume of fruits	y = 23.65 + 0.69x	0.5535

Table II. *Regression equations and r^2 values*

Weight groups	n	Regression equations	r^2
1 (up to 20 g)	50	y = 12.27 + 0.86x	0.7156**
2 (between 20 and 40 g)	83	y = 14.66 + 0.90x	0.8649**
3 (above 40 g)	38	y = 14.79 + 0.88x	0.7396**

n = No. of observations made
** Significant at 1% level

In this analysis, the common regression equation for groups 2 and 3 and the regression equation for group 1 have the same value of b, suggesting thereby that these lines are parallel and the rate of increase in surface area per unit weight is constant.

This equation is, thus a reliable and quick method to find out the surface area based on weight of areca fruits.

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REFERENCES

BHAT, K. S., KRISHNAMURTHI, S. and RAO, V. N. M. 1962. Studies in the development of fruit in the arecanut. *South Indian Horticulture*. 10: 1-17.

CHAKRAVORTHY, I. M., LAHA, R. G. and ROY, J. 1967. *Handbook of Methods of Applied Statistics*. Vol. 1. John Wiley & Sons, New York. pp. 365-368.

Estimation of Leaf Area in Cinnamon (*Cinnamomum verum* Presl)

The measurement of leaf area is of importance in the analysis of plant growth. In recent years, a number of accurate and rapid methods are available for leaf area estimation (Marshall, 1968; Kumar et al., 1977; Rao, Khan and Chadha, 1978; Mohankumar and Prabhakaran, 1980).

Results of a study undertaken at the UNDP/FAO Research Project of the Department of Minor Export Crops,