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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, Matale, Sri Lanka for leaf area determination in *Cinnamomum verum* (Presl) by various methods are reported in this paper.

Based on the leaf morphology and growth habit, 25 *C. verum* plants were selected and accession numbers were given. Fifty mature leaves were randomly collected from the primary as well as secondary branches of each accession and numbered. Length (L) was measured from the apex of the leaf to the base of the leaf up to the point of insertion. Breadth (B) was measured at the widest point of the leaf. After tracing the outline on a paper, leaf area was measured by the planimeter.

The product of length and breadth was also obtained for each accession. The K_1 values of the 25 accessions were derived from the mean values of length (\bar{L}), breadth (\bar{B}) and area (\bar{A}) by using the following equation $(\bar{L}) \times (\bar{B}) K_1 = \bar{A}$. The same procedure was also employed for the log values of the above linear measurements by using $\log (\bar{L} \times \bar{B}) K_2 = \log \bar{A}$.

Regression equation and correlation coefficients were also worked out for the independent variables such as length (\bar{L}), length squared, (\bar{L}^2) breadth (\bar{B}) breadth squared (\bar{B}^2), the sum of length and breadth (L+B), the product of length and breadth (L×B) and the log transformed data of the product of length and breadth $\log (L \times B)$ with the dependent variable area.

The reliability of predicting the leaf area by using the "K" values and linear parameters was tested using ten Walpita (W) selections viz., 9, 11, 12, 16, 17, 18, 25, 29, 32 and 36. A representative sample of 50 mature leaves were harvested from each of these selections. Measurements of the leaf length and the maximum breadth were made. The leaf area was computed using "K" values obtained from both actual data and log transformed data. Leaf area was also determined by planimeter method and electronic area meter (model L. I 3000) method. The values obtained under these four methods were tested using the "t" test.

The leaf length ranged from 8.27 to 15.14 cm with an overall mean of 11.74 ± 1.62 cm, breadth ranged from 3.27 to 6.45 cm with an overall mean of 5.21 ± 0.74 cm, area ranged from 19.1 to 56.44 cm² with an overall mean of 39.01 ± 9.12 cm². The K_1 values of the 25 accessions ranged from 0.5431 to 0.7642 with an overall mean of 0.6367, while the mean K_2 values for log transformed data ranged from 0.85396 to 0.92952 with an overall mean of 0.889.

The analysis of variance for regression of $\bar{L} \times \bar{B}$ vs. planimeter area (\bar{A}) and $\log(\bar{L} \times \bar{B})$ vs. $\log \bar{A}$ of the 25 accessions indicated that both values were significant at 1% level. But the deviation from regression was less in the case of log transformed data of $L \times B$ than the product of $L \times B$.

The regression analysis of leaf area and various parameters such as length, breadth, squared length, squared breadth, the sum of squared length and squared breadth, the sum of length and breadth, the product of length and breadth and log of the product of length and breadth are given in Table I. The correlation coefficient of all these parameters with the leaf area were highly significant at 0.1% level.

The highly significant correlation of linear dimensions of leaf area in the

present study was in agreement with those reported in various crop plants elsewhere (Rao et al., 1978; Hughes and Proctor, 1981; Makhija and Chitkara, 1977).

A comparative study of leaf area measurement by planimeter, electronic area meter, $L \times B \times 0.6367$, and the log method [$\log(L \times B) \times 0.889$] for 10 Walpita selections indicated that the overall means of the above four methods do not show any significant difference at 5% level.

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Table I. Relationship between planimetered leaf area and its components

Components of leaf area (independent variable)	Correlation coefficient (r)	Regression equation
Maximum leaf length	0.9030***	$Y = 19.346 + 4.95X$
Maximum leaf breadth	0.8586***	$Y = 14.435 + 10.18X$
Product of maximum leaf length and breadth	0.9382***	$Y = 6.301 + 0.522X$
Maximum leaf length squared (L^2)	0.8945***	$Y = 9.606 + 0.2095X$
Maximum leaf breadth squared (b^2)	0.8573***	$Y = 10.6256 + 1.010X$
The sum of length and breadth ($L + B$)	0.9266***	$Y = 23.867 + 3.6974X$
Product of length and breadth squared	0.853 ***	$Y = 23.47 + .0463X$
The sum of length and breadth squared	0.9231***	$Y = 8.016 + 0.1829X$
Log transformed data of the product of maximum length and breadth	0.9623***	$Y = 0.105 + .8275X$

*** Significant at 0.1% level

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REFERENCES

- HUGHES, B. R. and PROCTOR, J. T. A. 1981. Estimation of leaflet, leaf and total leaf area of *Panax quinquefolius* L. using linear measurements. *J. Amer. Soc. Hort. Sci.* 106: 167-170.
- KUMAR, R., SRIVASTAVA, R. P., SINGH, A. K. and BANA, D. S. 1977. Use of linear measurement in the estimation of leaf area of some apricot, peach, plum, pear and guava varieties. *Ind. J. Hort.* 34: 229-236.
- MAKHIJA, M. and CHITKARA, S. D. 1977. A simple method for estimation of leaf area in different cultivars of guava. *Haryana J. Hort. Sci.* 6: 125-127.
- MARSHALL, J. K. 1968. Methods of leaf area measurements of large and small leaf samples. *Photosynthetica.* 2: 41-47.
- MOHANKUMAR, B. and PRABHAKARAN, P. V. 1980. Determination of leaf area in pepper (*Piper nigrum* L.) using linear measurement. *Indian Cocoa, Arecanut and Spices Journal.* 4 (1): 1-2.
- RAO, G. S. P., KHAN, B. H. and CHADHA, K. L. 1978. Comparison of methods of estimating leaf surface area through leaf characteristics in some cultivars of *Mangifera indica*. *Scientia. Hort.* 8: 341-348.