

Research Note

ESTIMATION OF LEAF AREA IN THREE TANIER (XANTHOSOMA SPP.) CULTIVARS GROWN IN PUERTO RICO¹

Leaves represent the main photosynthetically active surface of the plant, and the development of a leaf area is central to plant growth. Studies on crop growth and development often require estimation of leaf area throughout the growth cycle of crop plants by nondestructive methods. The need for such estimation became evident in our tanier crop growth simulation studies designed to generate a crop data base for the development of the SUBSTOR-AROID model².

Chapman³ developed a simple and accurate nondestructive technique to estimate leaf area in tanier. The method consists of measuring the distance between the leaf apex (A') and the point of conjunction between petiole and lamina (A) as well as the distance between A and the tip of one of the basal lobes of the leaf (B or B', fig. 1). The product of (AA') (AB)²/1000 is then substituted for the independent variable (x) in a simple linear regression equation. Unfortunately, the regression equations developed by Chapman are cultivar specific and could not be used in our studies. In addition, the independent variable (x) used in this study is dimensionally incorrect since it corresponds to a unit of volume rather than area. Therefore, in our studies the independent

variable was redefined as the product of (AA') × (AB'). Regression equations were then developed to estimate leaf area of three commercial tanier cultivars commonly grown in Puerto Rico.

Measurements of AA' and AB' were recorded for leaves of cultivars Blanca del País (*X. caracu*), Morada, and Kelly (*X. violaceum*). A total of 430, 407, and 423 leaves of each cultivar, respectively, was picked at different dates and stages of development. Immediately after recording the measurements, leaf area was measured with a LI-3100 area meter (LI-COR, Inc.)⁴.

Best-fit curves were determined with the General Linear Model (GLM) procedure of the Statistical Analysis System (SAS). Only coefficients significant at $p \leq 0.05$ were retained in the models.

Leaf area was linearly related to the independent variable in all three cultivars used (table 1). The obtained coefficients of determination (r^2) show that the regression equations closely fit the observed data (table 1). Consequently, the total sum of squares in the models are mainly attributed to the independent variable. The combined analysis of variance (data not shown) showed a significant difference among cultivar leaf area means and slopes. Therefore,

¹Manuscript submitted to Editorial Board 10 January 1991.

²International Benchmark Sites Network for Agrotechnology Transfer, 1988. Experimental design and data collection protection for IBSNAT: Minimum data set for systems analysis and simulation. Technical Report 1. Dept. of Agronomy and Soil Science, University of Hawaii, Honolulu.

³Chapman, T., 1964. A note on the measurement of leaf area of the tannia (*Xanthosoma sagittifolium*). Trop. Agric. Trin., 41 (4): 351-52.

⁴Trade names in this publication are used only to provide specific information. Mention of a trade name does not constitute a warranty of equipment of materials by the Agricultural Experiment Station of the University of Puerto Rico, nor is this mention a statement of preference over other equipment or materials.

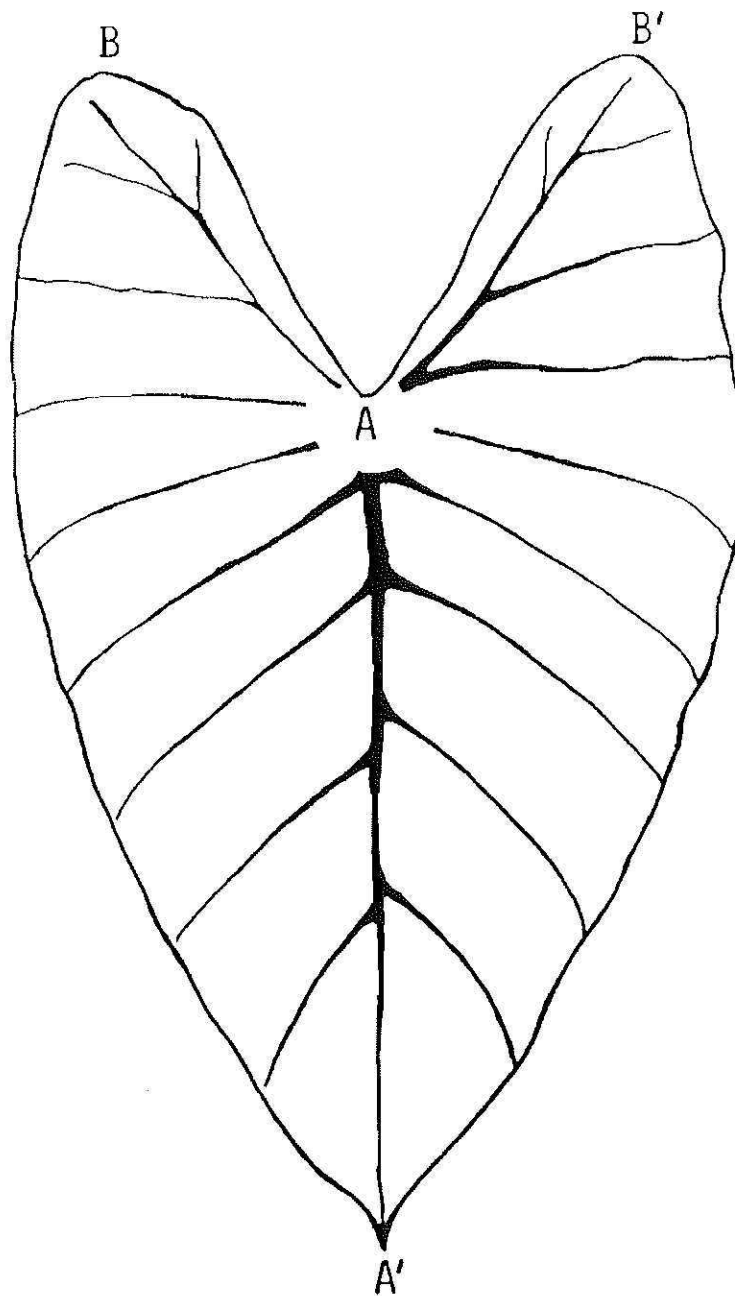


Fig. 1.—Linear measurements taken on tanier leaf.

it was not possible to obtain a single regression equation that would have accommodated the three cultivars.

The regression equations developed in this study by obtaining linear measurements of AA' and AB' provide the means of

TABLE 1.—Regression equations, coefficients of variation, and coefficients of determination for leaf area in three commercial tanier cultivars

Cultivars	Regression equation	Coefficient of variation	Coefficient of determination
Blanca	$Y = 0.646 + 1.678(x)^1$	7.82	0.988
Morada	$Y = 7.547 + 1.625(x)$	6.88	0.993
Kelly	$Y = 19.78 + 1.572(x)$	8.33	0.988

¹The independent variable (x) is defined as the product of (AA') X (AB').

calculating leaf area in agronomical and physiological field studies with taniers through nondestructive techniques.

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