Journal of Plantation Crops 11 (1): 47-49 June, 1983

000431

A RAPID METHOD FOR ESTIMATION OF LEAF AREA OF ONE YEAR OLD SEEDLINGS OF TALL VARIETY OF COCONUT PALMS*

K. V. SATHEESAN, G. NARASIMHAYYA** A. RAMADASAN
Central Plantation Crops Research Institute, Kasaragod 670 124, Kerala, India.

ABSTRACT

The area of individual leaf (P) of any position in one year old West Coast Tall (WCT) coconut seedlings can be estimated using a single linear function, P = 27.39 + 0.6 X in sq.cm. where 'X' is the product of length and width of lamina, with a reliability of 91 per cent. The total functional leaf area (Y) can be estimated using the function Log (Y) = -0.434 + 1.042 Log (N) + 1.060 ($\bar{X}$) with a reliability of 99 per cent and where N is the number of leaves, X is the mean product of length and width of all leaves, or using the function Log (Y) = 0.819—0.41 Log (N) + 0.915 Log (X_3) where X_3 is the product of length and width of the third leaf and N the number of leaves, with a reliability of 97 per cent.

INTRODUCTION

Methodology in the rapid non-destructive estimation of leaf area has been the subject of studies in several crop plants (Ashbey and Das, 1963; Epstein and Robinson, 1965; Hoffman, 1971; Sepaskhah, 1977; Schneiter, 1978). Marar and Pappachan (1964) were the first to suggest a regression equation for estimation of leaf area of one year old West Coast Tall (WCT) coconut seedlings, based on the length and width of lamina. Faole (1968) computed leaf area of young coconut palm from the dry weight of lamina. The estimated leaf area based on the equation of Marar and Pappachan (1964) was too wide from the actual leaf area and hence this method cannot be adopted for a realistic estimate. Hence a fresh study was undertaken to evolve a reliable methodology to estimate leaf area in coconut.

MATERIALS AND METHODS

Twenty, one-year-old WCT seedlings selected randomly from the nursery of the CPCRI Farm were used for the study. After recording the length and width of lamina, the total area was determined using LI - Cor - Electronic leaf area meter, Model 3000. The linear regressions for estimation of individual leaf area and the correlation coefficients of the total functional leaf area (Y) with number of leaves (N) and length and width of leaves of different

* *Contribution No. 171 of CPCRI, Kasaragod.*

** *Present address: Directorate of Oil Seeds Research, Rajendra Nagar, Hyderabad 500 030, Andhra Pradesh.*

positions were then worked out. The reliability of the equation was then tested in a batch of 10 WCT seedlings raised in a different location.

RESULTS AND DISCUSSION

The linear regressions in respect of individual leaves after testing the same (Roy, Chakravarthy and Laha, 1959) for their coincidence, are presented in Table I where P_1 to P_7 represent individual leaf area in respective positions begining from the youngest fully unfolded leaf designated as leaf No. 1, P=individual leaf area of any position, X_1 to X_7=product of length and width of leaves of respective positions. It may thus be seen that the equation $P=27.39+0.61\ X$ in cm^2 can be used for estimating area of individual leaves of any position, with a reliability of 91 per cent.

The suitability of the product of length and width of leaves of different positions in the estimation of total functional leaf area (TFLA) of seedlings was then investigated. The correlation coefficients of Y (TFLA) with (N) the number of leaves, and (X) of leaves of different positions were worked out. Based on N, X_2, X_3, X_4, and X_1, the multiple regressions on (Y) was then worked out. The results are presented in Table II. These regression functions were tested (Roy et al., 1959) for their coincidences.

Table I. *Regressions of leaf measurements on individual leaf area*

Equation number	Position of leaf	Regressions	R^2	No. of observations
1.	1	$P_1 = 71.7975 + 0.6281\ x_1$	92.341	20
2.	2	$P_2 = 60.6433 + 0.6214\ x_2$	86.092	20
3.	3	$P_3 = 1.2971 + 0.6047\ x_3$	96.604	20
4.	4	$P_4 = 36.3495 + 0.6226\ x_4$	96.575	20
5.	5	$P_5 = 1.8257 + 0.5841\ x_5$	90.408	19
6.	6	$P_6 = 12.7482 + 0.5771\ x_6$	95.086	16
7.	7	$P_7 = 25.7338 + 0.4568\ x_7$	91.714	7
8. Combined		$P = 27.3862 + 0.6139\ x$	91.605	122

It may be observed that equation 2 with N and X, is as good as the exact measurements, with a reliability of 99 per cent. This needs the measurement of $(\bar{X})$, besides counting the number of leaves (N). However, in equation 4 deleting $(\bar{X})$, requiring measurement of X_3 only, besides recording (N), a reliability as high as 97 per cent was obtained.

ACKNOWLEDGEMENT

The authors are thankful to Dr. N. M. Nayar, former Director, CPCRI for his critical comments and guidance.

Table II. *Regressions of total leaf area on average (length and width) and number of leaves*

Equation numbers	Variables considered	Regressions	R_2
1.	N, X_2, X_3, X_4, $\overline{X}$	Log (Y) = —0.304 + 0.999 Log (N) —0.015 Log (X_4) —0.027 Log (X_3) +0.064 Log (X_4(+ 1.011 Log (X)	99.387%
2.	N & $\overline{X}$	Log (Y) = —0.434 + 1.042 Log (N) + 1.060 Log ($\overline{X}$)	99.341%
3.	N X_2, X_3, X_4	Log (Y) = 0.693 + 0.003 Log (N) + 0.257 Log (X_2) + 0.630 Log (X_3) + 0.49 Log (X_4)	97.59%
4.	N & X_3	Log (Y) = 0.819—0.041 Log (N) + 0.915 Log (X_3)	97.059%
5.	X_3	Log (Y) = +0.973 + 0.907 Log (X_3)	97.046%

Where N = number of leaves, X = product of length and width and $\overline{X}$ = average product of length and width of all leaves

REFERENCES

ASHBEY, D. A. and DAS, D. B. 1963. A method of determining leaf area in cotton. *Agron. J.* 55: 584–585.

EPSTEIN, E. and ROBINSON, R. R. 1965. A rapid method for determining leaf area of potato plants. *Agron. J.* 57: 515–516.

FAOLE, M. A. 1968. The growth of young coconut palm (*Cocos nucifera* L.) 1. The role of the seed and of photosynthesis in seedlings growth upto 17 months of age. *Ast. J. agri. Res.* 19: 781–789.

HOFFMAN, G. H. 1971. Estimation of leaf area from length measurements for hybrid granex onion. *Agron. J.* 63: 948–949.

MARAR, M. M. K. and PAPPACHAN, G. 1964. A note on the estimation of leaf area in coconut seedlings. *Indian Cocon. J.* 17: 137–141.

ROY, J., CHAKRAVARTHY, I. and LAHA, R. 1959. *Hand book for practical work in statistics.* pp. 327–330. ISI, Calcutta.

SEPASKHAH, A. R. 1977. Estimation of individual and total leaf area of safflower. *Agron. J.* 69: 783–785.

SCHNEITER, A. A. 1978. Non-destructive leaf area estimation in sunflower. *Agron. J.* 70: 141–142.