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A RAPID METHOD FOR THE ESTIMATION OF LEAF AREA IN FIELD BEAN

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The present investigation aimed to establish a relationship between leaf length x leaf breadth and leaf area in field bean CV. Co. 1. The regression equation fitted against leaf area and the product between terminal leaf length and breadth was Y = 3 09 + 1.63 (X) (r = 0.9647**), where Y = leaf area (trifoliate leaf) per leaf. X = Length X Breadth of the terminal leaf let of the trifoliate leaf (L x B). The leaf area was also predicted by using the formula A = 1,685 (L x B). A significant correletion (r = 0.9630**) was also obtained with actual and predicted leaf area by using the above constants. It was found that the predicted leaf area by regression equation was more accurate than by using A = 1 685 (L x B) method. This study will be helpful to estimate the leaf area *in situ* without destroying canopy.

The measurement of leaf area is an essential part of growth, analytical and plant physiological studies. Several methods for the estimation of leaf area have been described (Hatfield *et. al.* 1976). Among these, non destructive method is simple, inexpensive accurate (Yeboah *et. al* 1983). Attempts have been made to estimate the leaf area by non-destructive analysis in groundnut (Padalia and Patel, 1980); Sunflower (Rowsen *et al*, 1980); Soybean (Wiersma and Bailey, 1975), Lucerne (Shahane and Mungikar, 1984) ; Pigeonpea (Hughes *et. al.*, 1979) maize Elahorkie, 1985) ; Sorghum (Arkel, 1978) and also in Cassava (Villages *et al.*, 1981; Lockard *et al.*, 1985). The use of regression equation for the relationship between leaf length and leaf area was reported to be more accurate (Asomaning and Lockard, 1963, Epstein and Robinsen, 1965; Went, 1967). However, such method of measuring leaf area in field bean is lacking. So the primary objective of this study is to formulate methods in this crop to measure the leaf area by non-destructive analysis.

MATERIALS AND METHODS

The experiment was conducted under field conditions in Tamil Nadu Agricultural University, Coimbatore with field bean CV. CO. 1. Ninety six leaves of different size were removed randomly from different position of the plant at 50 per cent flowering phase. They were grouped to twenty four types based on the leaf size and the mean values were taken into account for leaf area computation. The terminal leaflet of each trifoliate leaf was measured for its maximum length (L) and Breadth (B) Their actual leaf area was also measured in LI-COR conveyer belt automatic leaf area meter LI 3100. Their individual leaf area was also predicted by both $Y = a + bx$ and $A = K$ (LxB) method. Where Y and A are leaf area of a trifoliate leaf; a, b and K are constants. X the product of L and B (L x B). The data were subjected to statistical analysis and correlation coefficient were worked out (Snedecor and Cochran, 1967).

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Table 1. Relationship between leaf length and breadth with leaf area

S. No.	Length (L)	Breadth (B)	X (L x B)	K factor	Actual leaf area (cm^2 $leaf^{-1}$)	Calculated leaf area $Y = a + bx$ (cm^{-2} $leaf^{-1}$)	Calculated leaf area $A = k(l \times w)$ (cm^{-2} $leaf^{-1}$)
1.	7 6	7.5	57.0	1.72	98 15	96.00	96.05
2.	12.0	9 8	117.6	1.55	182.60	194.76	198.12
3.	12 0	9.2	110.4	1.61	177.40	183 04	186.02
4.	13.0	11.9	154.7	1.48	230 00	255.25	260.67
5.	15.5	13.4	207.7	1.71	355.21	341.64	349.97
6.	11 8	11.0	129 8	1.72	224.28	214.66	218.71
7.	12.0	11.0	132.0	1.68	222.66	218.25	222.42
8.	11.8	10.0	118 0	1.44	170.12	195.43	198.43
9.	12.2	11.0	134.2	1 65	222.19	221.84	226.13
10.	10.5	8 9	93.5	1.66	155.96	155.49	157.55
11.	15 0	13 5	202.5	1.78	360.41	331.17	341.21
12.	14.5	12.0	174.0	1.28	223 43	286.71	293 19
13.	10.0	10.5	105 0	1.68	177.14	174 24	176.93
14.	10 0	8.9	89.0	1.81	161.56	148.16	149.97
15.	9.5	8.0	76.0	1.68	128.18	126.97	128.06
16.	9.5	8.9	84.6	1.66	141.22	140.98	142 55
17.	12 0	9.0	108.0	1.54	166.28	179 13	181.98
18.	8.0	8.0	64.0	1 78	114 00	107.41	107 84
19.	7.5	7.5	59.3	1.65	97.59	99.75	99 92
20.	11.0	11.2	123.2	1.87	230.40	203.91	207 59
21.	6.5	7.0	45.5	2 04	92.83	77.26	76.66
22.	7.5	6.8	51.0	1.88	96.97	86.22	85.97
23.	7.5	8 5	63.6	1.98	126 38	106.75	107.17
24.	11.5	11.0	126.50	1.60	202.79	209 29	213 15
Mean	10.73	10.20	109.47	1.685	181.53	181.43	184.44

RESULTS AND DISCUSSION

Data on linear measurements and leaf area were presented (Table 1). There were wide variation in the length, breadth, K factor, actual and predicted leaf area. The mean leaf area constant (K) was found to be 1.685. There was not much difference between actual (181.53 cm^{-2} $leaf^{-1}$) and predicted leaf area 184.44 cm^{-2} $leaf^{-1}$). A significant and positive correlation ($r = 0.9630^{**}$) was also obtained between actual and predicted leaf area.

The regression equation fitted against actual leaf area was $Y = 309 + (X)1.63$ The correlation between Y and X was found to be possitive and significant ($r = 0.9646^{**}$). Correlation was obtained between actual and predicted leaf area. Very little diffetence could

be noticed between actual (181.53 cm^{-1} $leaf^{-1}$) and predicted leaf area (181.43 cm^{-1}. $leaf^{-1}$.) It was very clear that the predicted leaf area by regression equation was more close to the actual leaf area than the predicted leaf area by constant (K) factor. The use of regression equation for measuring leaf area by non-destructive method has also been reported (Went, 1967; Yeboah *et al.*, 1983).

From this study, it could be concluded that the leaf area estimation by regression equation was more reliable than by using constant factor (K). The higher correlation between actual and predicted leaf area obtained in regression equation was also an added information to confirm regression equation was more accurate and precise. This study may be helpful to estimate the leaf area *in situ* without destroying the canopy. In addition, it will also save a lot of time and labour.

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