

Short Communication

Alternate Methods for Leaf Area Measurement of Sunflower

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Leaf area determination is important as it gives an expression of growth of leaves which are the source of photosynthates. Measurement of leaf area in crops like sunflower with wide variations in number, size and shape is very difficult especially in large samples. Several methods for estimating leaf area in various crops have been suggested by earlier workers (Rhoads and Bloodsworth, 1964; Jonson, 1967). But these methods are time consuming and laborious. Thus, the need is felt for simple and rapid method, involving less costly equipments, for determining leaf area in sunflower crop. Since leaf area has shown a fairly good relationship with some easily measured characters like length and breadth, and dry weight, etc., in certain field crops (Joshi and Yadav, 1982; Seshadri and Shanmugham, 1983; Joshi, 1991). The present study was made to find out the relationship of leaf area with the easily measured characters in sunflower crop.

Investigations were carried out during summer of 1992-93 at Experimental Farm, CCS Haryana Agricultural University, Hisar. Twelve plants each of hybrid and composite varieties of

sunflower were selected randomly and leaves were used for the estimation of leaf area at two growth stages, viz., full bloom (flowering) and seed setting stage. The actual leaf area was measured by automatic leaf area meter (LI-COR LI-3100), in addition to length, breadth and dry weight were also recorded for respective leaves to work out leaf area of sampled plants. Correlation and regression studies between leaf area and dry weight, and leaf area and product of length and breadth were made at above crop growth stages.

The correlation coefficient between leaf area and other characters, viz., leaf dry matter, length x breadth were found highly significant (Table 1). The values of correlation coefficient at flowering stage ranged between 0.926 to 0.978 for these characters. The strongest correlation ($r = 0.978$) was observed between leaf area and dry weight at flowering stage, closely followed by seed setting stage (0.965). The coefficient value between area and length x breadth was 0.926 at flowering and 0.892 at seed setting stage. The flowering stage seems to give better indication of leaf area of plant than later stage. High value of correlation

Table 1. Correlation and regression between leaf area (Y) and other leaf characters (X)

Character (X)	State	Correlation of X and Y (r)	Regression equation
Dry weight	Flowering	0.978	$Y = 243.6 + 110.4 X$
	Seed setting	0.965	$Y = 289.6 + 124.6 X$
Length x Breadth	Flowering	0.926	$Y = 290.5 + 0.915 X$
	Seed setting	0.892	$Y = 211.2 + 0.962 X$

Table 2. Leaf measurements and leaf area estimated using regression equations for 12 sunflower samples

Dry wt. (g)	L X B* (cm ²)	Leaf area (cm ²)		
		Actual	Estimated I*	Estimated II*
Flowering stage				
37.9	4592.2	4316.3	4423.4	4492.4
107.8	12487.5	11843.6	12148.3	11716.6
77.1	9208.7	8821.4	8760.4	8716.5
65.8	7947.4	7493.5	7511.4	7562.4
71.4	8502.1	8216.4	8129.8	8069.9
80.3	9607.9	8911.9	9113.3	9081.8
54.0	6525.9	6014.7	6210.6	6261.7
108.4	12927.7	12015.3	12211.7	12119.3
62.4	8020.9	7098.8	7137.6	7269.6
84.9	10253.8	9566.7	9611.3	9672.7
144.8	17515.2	16020.1	16234.4	16316.9
35.1	4252.3	3918.4	4122.8	4181.4
Seed Setting Stage				
53.1	6938.0	6872.9	6910.3	6816.2
55.8	7330.3	7116.3	7241.4	7189.6
46.4	6185.9	5982.5	6067.3	6100.2
25.0	3433.7	3363.1	3401.5	3480.1
88.3	11659.7	11124.3	11294.8	11311.1
89.3	11668.7	11201.6	11416.6	11319.8
47.6	6220.9	6063.9	6216.4	6133.5
97.3	12820.8	12008.3	12416.6	12349.8
162.8	21469.0	20169.9	20569.8	20649.7
72.1	9535.9	9086.3	9277.4	9289.0
64.9	8510.9	8224.4	8379.2	8316.6
116.5	15305.2	14129.3	14801.4	14781.7

* L x B = Length x Breadth

1 = Using regression equation with dry weight

11 = Using regression equation with L x B

coefficient (0.978) between leaf area and dry weight showed that estimation of leaf area from dry weight may be reasonably accurate.

The actual measurement and estimates of leaf area using leaf parameters were found close to each other, except, in a few cases (Table 2). Analysis of residuals indicated that correlation was significant at both the stages. But when the z-test was applied, the estimates were significant at flowering stage only, which indicated that flowering stage is more appropriate for area estimation. These findings are in conformity with results of Reddy and Prabhakar (1988). Thus, it can be inferred that it is possible to estimate leaf area in sunflower with the help of dry weight and length x breadth characters of leaves.

References

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