LEAF AREA DETERMINATION IN MEDICINAL YAM

RAPID, accurate and non-destructive estimates of leaf area are needed to study the relationship between leaf area and other morphological characters. Several methods have been devised to determine leaf area of various crops (Asif[1], Garg and Mandahar[2], Rao[3], Vivekanandan *et al*[4]) the most common method being the development of mathematical regression formula using easily measured leaf parameters. The present study is an attempt in this direction.

Ten leaves each from seven randomly selected plants (70 leaves) from two species of medicinal yam, viz., *Dioscorea composita* and *Dioscorea floribunda* grown at the Experimental Station, Indian Institute of Horticultural Research, Hessaraghatta, Bangalore during 1977 were taken at flowering for leaf area determination. Leaf area was determined by adopting various techniques such as plotting the leaves on graph paper and counting the squares (actual leaf area), calculating from length and breadth of leaves, drymatter : area basis, conventional method of planimetry and by using a constant factor. The constant factor was obtained from another set of 70 leaves by dividing their actual area by the sum of the products of their length and breadth.

Regression equations were fitted to find out the relationship between the actual area and leaf length, breadth, dry weight and length and breadth. The constants were estimated by the method of least square analysis. Correlations were worked out between the actual leaf area and the area determined by various techniques and are presented in Table I along with R^2 values.

TABLE I

Correlation of area estimated by different methods with actual leaf area

Method of estimation	Formula	Correlation coefficient (r)	(R^2) %
Dioscorea composita:			
1. L and B without factor	$A = L \times B$	0·7047*	49·66
2. L and B with factor	$A = L \times B \times 0{\cdot}705$	0·9680*	93·70
3. Area on drymatter basis	$A = 13{\cdot}7574 + 108{\cdot}3955\,X$	0·8612*	74·17
4. Regression with L	$A = -83{\cdot}5342 + 13{\cdot}0923\,L$	0·9134*	83·43
5. Regression with B	$A = -76{\cdot}8239 + 17{\cdot}2309\,B$	0·9656*	93·24
6. Regression with L and B	$A = -85{\cdot}5136 + 4{\cdot}1862\,L + 12{\cdot}6708\,B$	0·9759*	95·23
7. Planimetry	$A = -0{\cdot}6067 + 1{\cdot}0031\,X$	0·9966*	99·32
Dioscorea floribunda :			
1. L and B without factor	$A = L \times B$	0·6199*	38·43
2. L and B with factor	$A = L \times B \times 0{\cdot}620$	0·9841*	96·85
3. Area on drymatter basis	$A = 17{\cdot}5256 + 111{\cdot}8708\,X$	0·9630*	92·74
4. Regression with L	$A = -15{\cdot}7505 + 7{\cdot}8890\,L$	0·7976*	63·62
5. Regression with B	$A = 11{\cdot}7837 + 9{\cdot}5896\,B$	0·9323*	86·92
6. Regression with L and B	$A = -14{\cdot}8572 + 3{\cdot}1974\,L + 7{\cdot}3960\,B$	0·9634*	92·82
7. Planimetry	$A = -0{\cdot}6073 + 1{\cdot}0040\,X$	0·9939*	98·78

A = Actual area (sq. cm); B = Breadth of leaf (cm); L = Length of leaf (cm); X = Individual value of eaf; * = Singificant at 1%.

It is evident from Table I that the leaf area calculated by the conventional method of planimetry was the best as judged from R^2 values in both the species, *D. composita* (R^2=99·32%) and *D. floribunda* (R^2 = 93·78%) However, this method is quite laborious and time consuming, besides being unsuited for the estimation of area of the intact leaves. Leaf area computed as the product of length and breadth is not at all accurate in both the species. Leaf area based on dry matter is quite accurate in the case of *D floribunda* as R^2 is 92·71% although it is not a good indicator of leaf area in *D composita*

(74·17%). Therefore, when large samples have to be handled, this method can be adopted in *D floribunda*. Regression equations with either only leaf length or leaf breadth do not give very good estimate of leaf area except in the case of *D composita* where regression with leaf breadth gives fairly good estimate of leaf area (R^2=93·24%). Multiple regression equation using both leaf length and leaf breadth gives very valid estimate of leaf area in both the species. It may be observed that the leaf area estimated with a constant of 0·705 and 0·620 in *D composita* and *D floribunda* gives R^2 value of 93·70 and 96·85% respectively. The leaf area estimated with this method is as accurate as the area estimated from the multiple regression equation with leaf length and leaf breadth, and it is very close to the actual area, besides being very simple for computation. This method could be adopted conveniently for both the species of medicinal yam due to the main advantage of its simplicity in operation in comparison to planimetry, even though the regression with leaf length and leaf bradth is more precise than this method in *D composita*. At the same time, it is almost as accurate as that of planimetry. Thus, leaf area in *D composita* and *D floribunda* species of medicinal yam could be determined by simply multiplying the product of leaf length and leaf breadth with a constant factor of 0·705 and 0·620, respectively. This method can easily be applied in both destructive and undestructive methods of growth analysis.

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AN YET UNDEFINED HOST OF *ISOPARORCHIS HYPSELOBAGRI* BILLET, 1898

Isoparorchis hypselobagri Billet, 1898 belonging to the family *Isoparorchidae* generally infects the air bladder of a siluroid fish *Wallago attu*. A number of references[1-6] are also available reporting the occurrence of the juvenile forms specially metacercaria in some non siluroid fish. Recently Mahajan *et al*[7] have made a new host record *Channa punctatus* Bloch, a non siluroid fish, which in addition to the juvenile forms, also lodged the adults measuring 14–20 mm in length and 8–12 mm in breadth.

The present investigation reports the occasional occurrence of *I. hypselobagri* in a completely new host, the common Indian frog *Rana tigrina* infecting the liver but in an encysted condition. These were collected, on five occasions, 2–3 at a time. The parasites measured 16–25 mm in length and 9–14 mm in breadth. The gonads are fully developed but the uterus consisted of less number of eggs as compared to their normal host inhabiting counterparts. They resembled the type species in almost all their anatomical characters. With the report of *I. hypselobagri* infection from *R. tigrina*, its host range which was restricted to the fishes can be extended to the amphibians also.

In fish hosts adults occur only in the air bladder and only the juvenile forms occur in other organs like spleen, liver, muscles, ovary etc. In contrast to this, the adults in the amphibian hosts occur in the liver. Hence, it is presumed that next to the air bladder they prefer the liver as the site of infection. As there is a difference in the microenvironment of the parasite, probably to overcome this difference they live in an encysted condition. However the presence of the adults in the liver makes it clear that they need not be obligatory aerobes, as it appears from their oxygen rich environment in the air bladder; but they are facultative aerobes agreeing with other digenetic trematodes; capable of carrying the metabolic activities anaerobically.

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