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# ESTIMATION OF LEAF AREA IN BANANA VAR. NENDRAN (MUSA AAB GROUP) USING LINEAR PARAMETERS

Measurement of leaf area even in detached leaves of banana poses great problem due to the enormous size of leaves. Hence it would be of great value if the area could be estimated from some linear measurements of leaves which in combination with some constants would give an estimate of leaf area with a reasonable degree of accuracy. Besides being simple, this method has the advantage that the measurements could be undertaken even in non-detached leaves. Many scientists had made use of linear measurements to estimate leaf area in several species of plants. Spencer (1962) in cassava, Arora and Chanana (1975) in grapes, Rao (1975) in bajra, Sreekumar *et al.* (1978) in green gram, Nair *et al.* (1978) in pineapple and Nair *et al.* (1979) in soybean used this technique. In banana also similar studies were conducted by Murray (1960) who suggested that the product of length and breadth multiplied by the factor 0.8 would give an estimate of leaf area with a reasonable degree of accuracy. But in 'Nendran', the most popular banana variety of Kerala, this factor was not found to give similar results and hence the study.

A sample of 35 leaves of different sizes belonging to plants of different age groups were randomly collected from the crop grown at the Banana Research Station, Kannara. Area of each leaf ($cm^2$) was obtained graphically. Length of leaf lamina (cm) along the midrib (L) and breadth (cm) at half the length (B) were measured for each leaf. The correlations with area were then worked out separately for L, B and L x B values. The six different models tried were $A=aL+C$, $A=aL$ $A=aB+C$, $A=aL+bB+C$, $A=aL \times B+C$ and $A=aL \times B$, whereas A-area of leaf, L=length of lamina along midrib, B=breadth at half the length and a, b, c=constants to be estimated from the observations. These were estimated by the method of least squares. The coefficient of determination for each model was then calculated and comparison made. From these the best fitting and most convenient model was selected.

The different models and the coefficient of determination ($R^2$) for each model is given in Table 1.

Table 1

Different models and their coefficient of determination ($R^2$)

| Sl.No. | Models | $R^2$ (%) |
|---|---|---|
| 1 | A= 75.71 L—3691.05 | 99.28 |
| 2 | A= 47.31 L | 85.31 |
| 3 | A=311.13 B+10233.07 | 93.68 |
| 4 | A= 40.38 L+85.03 B—2776.85 | 99.35 |
| 5 | A= 0.851 L x B—200.71 | 99.78 |
| 6 | A= 0.825 L x B | 99.68 |

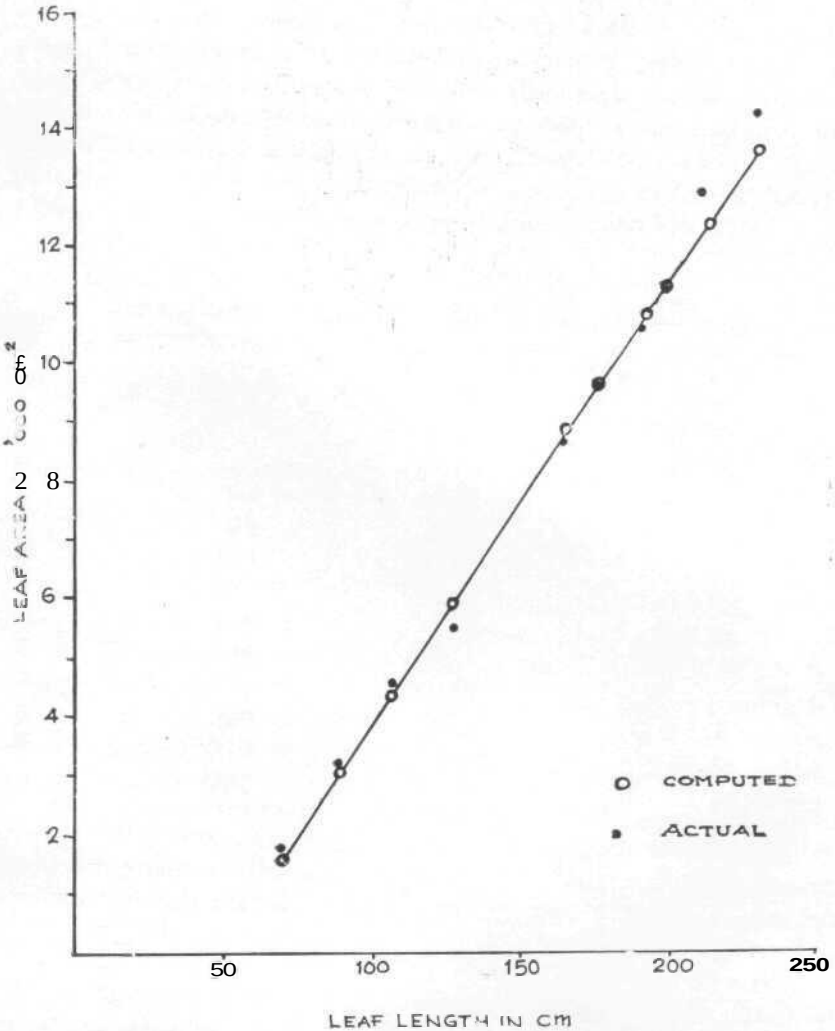


Fig. 1 Comparison of actual and computed leaf area for different leaf lengths

Of the six models tried using linear measurements, four models (Models 1, 4, 5 and 6) were found to have very high $R^2$, that is, more than 99% of the variation in leaf area was explained by each of these models. Hence any of these models can quite satisfactorily be used to predict the leaf area. Among the four models, model $A = aL + C$ has the advantage that it needs the measurement of length only. Considering the labour involved in measuring the breadth at half the length, especially in a standing crop, this model seems to be the best for practical purpose. The actual and estimated leaf area were compared for some representative samples, the result of which is given in Table 2 and Fig. 1.

Table 2

Comparison of actual area and the area computed using length only

| Sl. No. | Length (cm) | Leaf area ($cm^2$) | | Deviation (%) over actual area |
|---|---|---|---|---|
| | | Actual | Computed ($A=aL+C$) | |
| 1 | 70 | 1808 | 1608.65 | 11.03 |
| 2 | 90 | 3281 | 3122.85 | 4.82 |
| 3 | 108 | 4557 | 4485.63 | 1.57 |
| 4 | 128 | 5580 | 5999.83 | 7.52 |
| 5 | 166 | 8746 | 8876.81 | 1.50 |
| 6 | 178 | 9764 | 9785.33 | 0.22 |
| 7 | 192 | 10660 | 10845.27 | 1.74 |
| 8 | 200 | 11424 | 11450.95 | 0.24 |
| 9 | 213 | 13008 | 12435.18 | 4.40 |
| 10 | 230 | 14376 | 13722.28 | 4.55 |

It is quite clear that the actual and estimated values of leaf area are in good agreement and the deviations are quite insignificant. For practical purpose the model $A = 76 \times \text{length} - 3700$ could be employed with great accuracy.

സംഗ്രഹം

ഇലയുടെ വിസ്തീർണ്ണം ഗണിച്ചെടുക്കാനുള്ള ഒരു എളുപ്പവഴി കണ്ടുപിടിക്കുന്നതിനായി നേന്ത്രൻ ഇനം വാഴയിലകളുടെ നീളം, വീതി എന്നിവയിൽ ആറ് വ്യത്യസ്ത സാംഖ്യകീയ മാതൃകകൾ പരീക്ഷിച്ചു. നോക്കിയതിൽ നാല് മാതൃകകളും വളരെ ഫലപ്രദമായി കാണുകയുണ്ടായി. ഇവയിൽ $A = aL - C$ എന്ന മാതൃകയിൽ നീളം മാത്രം കണക്കിലെടുത്താൽ മതി എന്ന പ്രത്യേക സൗകര്യമുള്ളതിനാൽ പ്രായോഗിക തലത്തിൽ വളരെ ഉപയുക്തവുമാണ്.

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