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EFFICIENCY AND RELIABILITY COMPARASION OF LEAF AREA METER IN CONTRAST TO PLANIMETER

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The comparative study for efficiency and reliability of Leaf Area Meter and Planimeter was performed with special reference to the precision in measurements and the time rate of observation The correlation coefficients, regression equations, Variance of regressed estimates, standard deviation of error in measurements and the t-Values (paired) revealed that Leaf Area Meter measures with more precision and accuracy than planimeter. The time rate of observation also showed that Leaf Area Meter measures about 8 to 10 times faster than planimeter.

INTRODUCTION

Predictions based upon exact measurements only can give reliable results. In various branches of agriculture and biosciences, the predictions and estimates about the yield, production, intensity of disease, effectiveness of insecticides and drugs are made on the basis of leaf area data (Watson, 1952, Tissen, 1962). Till now, planimeter is considered a standard method and is extensively used in leaf area measurements. But the measurements by planimeter are cumbersome, slow and prone to human errors. Beside we cannot measure the area of all types of leaves with planimeter. Leaf Area Meter (New instrument provides quick and precise leaf area measurements. This study is conducted to check the efficiency and reliability of Leaf Area Meter as compared to planimeter.

MATERIALS AND METHODS

In order to check the efficiency and reliability of both the instuments, 150 specimens of standard sizes were used. For makig the specimens of standardard size, geometrical figures such as squares, rectangles and triangles were made on the paper with the help of a foot rule. Area of such specimens were calculated by mathematical formulae and it was supposed to be the standard area. All the figures were alloted serial numbers and were cut exactly along the boun-

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dary lines to serve as standard specimens. Area of the same specimens were than measured with Leaf Area Meter and planimeter. For statistical analysis, the measurements by standard method, Leaf Area Meter and planimeter were represented by variable x, y and z respectively and mainly the students t-statistics for paired observations was followed.

RESULTS & DISCUSSION

Comparative statistics of Leaf Area Meter and planimeter are given in the table 1.

Table-1. *Comparative Statistics of "Leaf Area Meter" and "Planimeter Methods.*

	Leaf Area Meter	Plantimeter
Correlation coefficient of area measurements	r_{xy} = .996	r_{xz} = .982
Coefficient of determition of area measurements.	r^2_{xy} = .992	r^2_{xz} = .964
Regression equation of y/z of x.	y = 1.007 x − .32	z = 1.112 x − 2.75
Variance of Regressed estimate of y/z.	$\%S^2_{y.x}$ = .85	$S^2_{z.x}$ = 50.70
Variance of regression coefficient	S^2_b = $(5.12)\ 10^{-6}$	S^2_a = $(2.89)\ 10^{-4}$
Standard deviation of error in measurements.	S.D = 1.157	S.D = 7.91
T-Values (paired).	t_c = .07023NS	t_c = 3.43*
Mean time for one observation (Sec.)	T_y = 10.25	T_y = 86.4
Correlation coefficient of area specimen and time of observation	r_{xT_y} = .09	r_{xT_z} = .08

There is almost complete correlation (.996) between the exact area and the area measured by Leaf Area Meter whereas in case of planimeter, the carrelation coefficient (.982) is not so close to one.

The coefficients of determination reveal that error in measurement in case of planimeter is 3.6% whereas in case of Leaf Area Meter, it is only 0.8%. Salisbury (1957) attributed that planimeter measured with not less than 5% error. However this study reveals that plainmeter measures the area with an error of about ± 4 %.

The comparative study of regression lines also reveals that the error in measurements by Leaf Area Meter remains almost negligible throughout the whole range of area, whereas in case of planimeter, the error increases above and below 25 cm^2.

Variance of regression estimates and confidence belts of regression estimate and also the Varience of regression coefficient reveal that Leaf Area Meter is more efficient aeliable instrument than planimeter, because smaller the value of variance of estimate, greater the efficiency of the instrument.

Precision of an instrument is also measured by standard deviation of error in measurements (Frederic *et al*, 1969). The smaller valve of standard deviation in errors for Leaf Area Meter (1.157) makes it more efficient and reliable than planimeter (7.91).

The t-Values (Paired) also show that Leaf Area Meter (.0702NS) is more efficient than planimeter (3.43*).

The mean time for one observation by Leaf Area Meter is 10.23 second whereas in case of planimeter it is 85.4 sec.

There is approximately zero dependence between the area of the specimen and the time for one observation by Leaf Area Meter. But in case of planimeter, the time of observation depends upon the area of the specimen. For collective measurements of Leaf Area, Leaf Area Meter is still more efficient as it can measure the area of a number of leaves at a time.

Leaf Area Meter measures the area of compound, diseased and perforated leaves with the same accuracy and at the same rate. We cannot measure the area of such leaves with planimeter. Leaf Area Meter is more efficient and reliable leaf area measuring instrument than planimeter and especially useful for statistical area measurements.

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