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STANDARDISATION OF LEAF SAMPLING TECHNIQUE IN COCOA SEEDLING

Cocoa is a fast growing crop. The nursery life of cocoa is four to six months. Such a crop which has a short nursery life and a comparatively short juvenile period (1.5 to 2 years) has to be nourished properly in the nursery. There is, thus, scope for standardising tissue analysis technique for this crop, as a guide to nutrient deficiency diagnosis. Though soil tests would throw light on the available nutrient status of the soil, foliar diagnosis has often proved better in as much as it represents the amount of nutrient absorbed by the plant.

Cocoa seedlings grown in pots to determine their requirement of NPK were utilised for the studies. The treatments consisted of factorial combinations of nitrogen (75, 100 and 125 kg N/ha), phosphorus (30, 40 and 50 kg P_2O_5/ha) and potassium (105, 140 and 175 kg K_2O/ha). An absolute control with no fertiliser was also included in the experiment for comparison. Thus, there were 28 treatments. The experiment was laid out in completely randomised design with two replications. For the standardisation of the leaf smampling technique, leaves were collected from three plants per treatment per replication at 180 and 210 days of growth. The leaves were numbered downwards starting from the first fully opened one. The leaf ranks 1, 2, 3, 4 and 5 were collected from the three plants at three and four months of growth and pooled separately. The leaves were dried at 70-75°C and powdered, prior to chemical analysis. The nitrogen, phosphorus and potassium contents were determined using the standard procedures described by Jackson (1958).

The data on nitrogen, phosphorus and potassium content of leave in relation to its position are furnished in Table 1. The nitrogen content varied depending on the position of the leaf on the plant. Young leaves contained more nitrogen than the older ones. But the phosphorus content was not influenced by the position of the leaves on the plant. Unlike phosphorus, the younger leaves accumulated more potassium than the older ones. For all the three nutrients, leaf position x treatment interaction was not significant. The NPK content of the different leaves was subjected to correlation analysis with the uptake of corresponding nutrients. The results indicated that nitrogen content of the leaves at any position was not related to the uptake of nitrogen by the cocoa seedlings. The phosphorus content of the lower leaves (the fourth and the fifth leaves) correlated significantly with the phosphorus uptake. The correlation coefficients for fourth and fifth leaves were respectively • 0.389* and 0.376* at third month of growth and 0.531** and 0.478* at fourth month growth. The relationships between the phosphorus content of the fourth leaf at the third and fourth months of growth, and the phosphorus uptake by the plant could be expressed by the equations $y = 0.069x + 0.01$ and $y = 0.11x + 0.007$, respectivlely. The corresponding equations for the fifth leaf were $y = 0.078x + 0.008$ and $y = 0.1x + 0.009$.

The relationship between the potassium content of the fifth leaf and the uptake of potassium, was studied and the correlation coefficient was only 0.364. Significant correlation was obtained ($r = 0.526^*$) when two points were

Table 1. NPK content (%) of the leaves in relation to their positions

Leaf rank*	Stage of growth					
	3rd month			4th month		
	N	P	K	N	P	K
1**	3.01	0.253	1.65	3.05	0.241	1.65
2	3.03	0.253	1.58	3.03	0.235	1.59
3	3.00	0.267	1.63	2.97	0.238	1.56
4	2.92	0.256	1.52	2.92	0.228	1.48
5	2.93	0.251	1.45	2.90	0.234	1.50
CD (0.05)	0.09	-	0.11	0.04	-	0.07

* From the apex downwards

** Fully opened one

removed and the data reanalysed. From these considerations, it is apparent that the leaf numbered fifth from the apex is more suitable for sampling than the leaf numbered fourth. Eventhough the fourth leaf gave slightly higher correlation coefficients at the third and the fourth months between leaf phosphorus levels and total phosphorus uptake as compared to the fifth leaf, correlations between potassium levels in the fourth leaf and potassium uptake were not significant. Therefore, the leaf ranked fifth from the apex is suggested as the standard leaf for leaf analysis in cocoa seedlings.

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