Research Note

CHEMICAL COMPOSITION OF PLANTAIN LEAVES OF DIFFERENT RANKS AND OF THEIR SECTIONS[1]

Foliar analysis has become a valuable guide in determining the fertilizer requirements of a crop. It is being used commercially for sugarcane, pineapple, coffee, and citrus. Little information is available on the use of foliar analysis as a guide for fertilizing plantains (*Musa* AAB group), an important food crop in Puerto Rico. Knowledge of the variation of nutrient elements within the leaf and among different leaves is necessary for accurate sampling in foliar analysis. This paper deals with the variation in chemical composition (N, P, K, Ca, and Mg) within the leaf and for leaf rank (number) for plantains.

A fertilizer experiment with plantains on a Corozal clay, an Ultisol, pH 5.2, at the Corozal Substation, located in the humid mountain region of Puerto Rico was used as the source material for this work. The plants received 202 kg/ha N, 112 P_2O_5, and 403 K_2O divided into three equal applications at 1, 4, and 10 months after planting. Leaf samples were taken at 4, 6, and 9 months after planting from nine plants for leaf section and leaf rank studies. The first fully opened leaf, counting from the top, was designated as leaf No. 1. Leaf No. 3 was used for the sampling for the leaf section study.

The variation in nutrient composition for the various leaf sections is given in table 1. The blade had a higher N, P, Ca, and Mg content than the midrib which, in turn, was higher in K. A similar relationship has been observed for sugarcane leaf blade and sheath.[2]

Variation in chemical composition along the long axis of the leaf was also evident. N and Ca contents increased from the base to the tip of the leaf in both blade and midrib, with the reverse being true for K. Blade P was highest at the base, but changed little toward the tip. Midrib P content was higher at the tip than at the base. There was no definite trend for changes in Mg content moving from base to tip. The variations in N, P, K, and Mg for the plantain leaf in this study were similar to those in bananas.[3]

In very few instances is the entire plantain leaf used for chemical analysis. To save space and time in drying and grinding, only a portion

[1] Manuscript submitted to editorial Board, June 24, 1976.

[2] Samuels, G., Influence of using various sugarcane leaves and parts of the sugarcane leaf on chemical composition, J. Agr. Univ. P.R. 51(1): 22-8, 1967.

[3] Twybord, I. T., and Coulter, J. K., Foliar diagnosis in banana fertilizer trials, Plant Analysis and Fertilizer Problems 4: 357-70, 1964.

of the leaf is used. The data obtained indicate that the plantain leaf does not have a uniform chemical composition along its long axis. Therefore, to insure consistency in leaf sampling, it is necessary that the sample be taken from the same portion of the leaf each time. Visual estimates of the leaf center are not reliable for consistent and uniform sampling when a portion of the leaf is used. To find the center of the long axis, the leaf is folded in half. The section taken from the leaf is measured each time to insure uniformity.

The influence of leaf rank or number on the chemical composition of the plantain leaf is shown in table 2. N and Ca content increased in blade and midrib, moving from the second to the fifth leaf. K content decreased in the blade, but increased in the midrib from leaf No. 2 to 5.

TABLE 1.—*Distribution of nutrient elements in the plantain leaf*[1]

Element	Distribution of element in leaf on a % dry weight basis							
	0–15[2]	15–30	30–45	45–60	60–75	75–90	90–105	105–120
				Blade				
N	4.27	4.47	4.67	4.82	5.07	4.96	4.82	4.81
P	.32	.28	.27	.26	.25	.27	.26	.27
K	7.06	6.71	6.36	6.09	5.93	5.79	5.70	5.49
Ca	.64	.72	.81	.77	.89	.89	.84	.66
Mg	.28	.33	.28	.29	.24	.27	.28	.33
				Midrib				
N	1.33	1.35	1.39	1.53	1.66	1.75	1.95	2.03
P	.12	.12	.12	.11	.13	.15	.15	.16
K	12.96	13.9	12.23	12.33	11.79	11.68	11.66	–
Ca	.55	.68	.67	.72	.80	.81	.86	–
Mg	.18	.14	.13	.14	.15	.15	.16	–

[1] Average of two samplings at 4 and 6 months of age for leaf No. 3.
[2] Portion of leaf in cm from base to tip.

TABLE 2.—*Influence of leaf rank or number on distribution of nutrients in the platain leaf*[1]

Leaf[2] number	Leaf nutrient content on a % dry weight basis				
	N	P	K	Ca	Mg
		Blade			
2	4.33	0.27	5.72	0.39	0.31
3	4.57	.28	5.13	.58	.31
4	4.66	.27	5.00	.75	.31
5	4.76	.27	4.88	.84	.30
		Midrib			
2	1.25	0.12	9.34	0.35	0.29
3	1.31	.12	9.90	.49	.31
4	1.32	.13	9.93	.58	.32
5	1.42	.12	10.40	.84	.34

[1] Average of three samplings at 4, 6, and 9 months of age.
[2] Counting the first fully-opened leaf at the top as No. 1.

There was no appreciable change in leaf P for blade or midrib in the various leaf numbers. For Mg, there was an increase in content in the midrib, moving from second to fifth leaf, but no change was apparent for blade Mg. Murray,[4] working with banana leaves in sand culture, found a similar relationship.

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[4] Murray, D. B., The effect of major nutrients on growth and leaf analysis of the banana, Tropical Agr. 37: 97–106, 1960.