

Changes in leaf lamina shape and size during banana shoot development



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Introduction

Bananas and plantains are grown as perennial crops, producing consecutive generations from suckers, which develop on the main plant. Sucker development consists of distinct physiological stages: peeper (small sucker appearing just above the ground and bearing scale leaves only), sword sucker (large sucker with lanceolate type leaves) and maiden sucker (large non-fruiting sucker with foliage leaves). Peepers, sword suckers and maiden suckers represent a distinct physiological stage in sucker growth with distinct morphological features, the most important being the leaf lamina size. The aim of this study was to assess changes in leaf lamina shape during the growth of lateral shoots and to determine how fast suckers from different genotypes develop broad leaves to manufacture their own food through photosynthesis, and thus reducing their dependency on the parent for nutrients. This can be achieved by determining how fast the sucker leaf length: width ratio halves (*i.e.* the RL50 value).

Materials and Methods

Assessments of the size of leaf lamina of peeper, sword sucker, maiden sucker and water sucker leaves of *Musa* spp. were carried out on 'Gros Michel' (dessert - *Musa* AAA group) and 'Gonja' plants (plantain - *Musa* AAB group) at the ISAR research station at Rubona in Rwanda and at the IITA *Musa* germplasm collection at Onne in Nigeria (on the plantains 'Agbagba' and 'Mimi Abue', and the dessert banana 'Kparanta' [*Musa* AAB group; Pome subgroup]). In addition, the speed of change in leaf length:width ratio during progressive leaf emissions were assessed on 16 *Musa* genotypes at the NARO banana farm at Kawanda in Uganda. Leaf lamina length and leaf lamina width were measured for each assessed leaf. For all these studies, the leaf length was taken as the length from the leaf petiole to the tip of the leaf while the lamina width was taken at the widest part of the lamina.

Results and Discussions

Leaves of water suckers of all genotypes had a significantly wider leaf lamina compared to leaves of sword suckers with the same leaf length. Leaf width of peepers and sword suckers did not exceed 20 cm in most cases. There was a gradual change from sword or lanceolate type leaves to a broader leaf lamina type similar to water sucker leaf shapes (Photo 1 and Figure 1). This progressive leaf lamina broadening of the youngest leaves is an indication of the increased independence of the suckers from the mother plant. Water suckers are loosely or not attached to the mother plant and hardly rely on the mother plant for nutrition. They therefore develop broad leaves even when they have the height of large peepers or small sword suckers. Leaves of water suckers are similar in shape to those of maiden suckers (Figure 1). Maiden suckers are therefore less dependent on the mother plant suggesting that lateral shoots become less dependent on the mother plants as they increase in size and develop broader leaves. The results from Uganda also indicate that the leaf length:width ratio decreases with an increase in height of the leaf petioles' insertion point on the pseudostem. All genotypes obtained an RL50 before leaf seven except for 'Pisang lilin', 'Bogoya' and 'Fougamou' suggesting that sucker independence from the mother plant may be delayed in these three genotypes (Table 1).



Photo 1. Leaves taken from a maiden sucker of the dessert banana 'Gros Michel': gradual change from the older sword or lanceolate type leaves to the newly formed broader lamina leaf type.

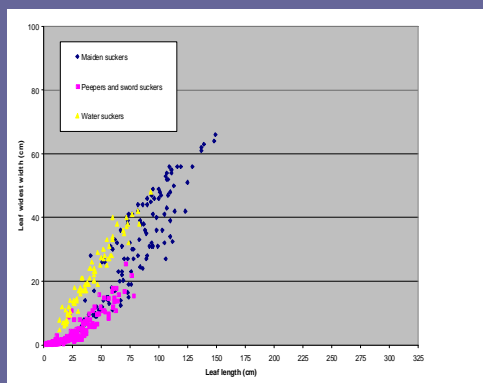


Figure 1. Relationship between leaf lamina length and leaf lamina widest width for peepers, sword suckers, maiden suckers and water suckers of the plantain 'Gonja'.

Table 1: Leaf length:width (L:W) ratio for leaves 1 and 20, and the RL25, RL50 and RL75 for 16 genotypes assessed at Kawanda, Uganda. (the figures in brackets are the leaf numbers).

Cultivar	L:W ratio at leaf 1	RL25	RL50	RL75	L:W ratio at leaf 20
Calcutta 4	8.30	(2) 6.23	(5) 4.00	(10) 2.08	3.23
Pisang lilin	10.00	(10) 7.50	(12) 4.09	(X)* 2.50	3.79
<i>Musa balbisiana</i>	10.00	(2) 7.50	(3) 5.00	(6) 2.50	2.68
Enzirabahima	18.75	(5) 14.06	(6) 9.33	(7) 4.69	2.58
Nfuuka	25.00	(3) 18.75	(5) 9.33	(6) 6.25	2.74
Muracho	6.00	(3) 4.50	(5) 2.67	(X) 1.50	3.23
Gonja	7.00	(1) 5.25	(7) 3.17	(X) 1.75	2.11
Prata	16.00	(3) 12.00	(5) 4.57	(10) 4.00	2.56
Robusta	15.00	(1) 11.25	(4) 7.00	(6) 3.75	2.57
Bogoya	8.00	(8) 6.00	(10) 3.50	(X) 2.00	2.83
KM5	18.00	(2) 13.50	(3) 4.73	(7) 4.50	3.17
Fougamou	4.00	(4) 3.00	(10) 2.00	(X) 1.00	2.34
Saba	5.00	(2) 3.75	(4) 2.50	(X) 1.25	2.79
FHIA1	26.00	(2) 19.50	(4) 8.67	(11) 6.50	2.44
FHIA17	20.00	(2) 15.00	(3) 10.00	(11) 5.00	2.17
FHIA3	18.75	(2) 14.06	(3) 9.38	(7) 4.69	2.79

*: The RL75 was not reached within the first 20 leaves

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