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Cyanide content and distribution in cassava plants, in association with physiological age

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Introduction

Cassava is a key staple food crop in tropical parts of the world. However, the presence of cyanogenic glucosides limits its consumption, in particular in leaves. Root parenchyma is mainly consumed by humans, and the root cortex is used for animal feed. Leaves are mostly considered as a byproduct, however their high protein, vitamin and mineral content have potential nutritional benefits. This study evaluates the concentration of HCN at different physiological ages and distribution in different parts of the plant for 50 genotypes, in order to clarify the risk posed by cyanogens.

Materials and methods

Cassava genotypes from the Cassava diversity Collection at the International Center of Tropical Agriculture (CIAT) were planted and harvested in Palmira, Colombia. Cyanide content in root parenchyma, peels and leaves of 50 landraces was analyzed at 11 months (Essers et al., 1993 with modifications). In addition, the effect of physiological age (3, 6 and 11 months) on cyanide content in cassava leaves was assessed, using 11 genotypes with contrasting cyanide contents. The genotypes were selected for their representativeness of the genus Manihot in Latin America and Asia.

Results and conclusion

The Mesoamerica Caribbean, Amazon and Humid Atlantic forest groups were associated with higher cyanide in the leaves (average 1092 ppm, 886 ppm and 754 ppm DB, repectively) (Table 1); while South American rainforest, Humid Atlantic forest and Mesoamerica Caribbean groups were associated with higher cyanide in peels (average 1137 ppm, 885 ppm and 893 ppm DB, repectively). The Andean group was associated with low to moderate cyanide contents in all parts of the plant. In young cassava leaves (figure 1) cyanide content was high (3791 ppm DB), and decreased markedly with time until harvest (1100 and 450 ppm DB at 6 and 11 months, respectively). These findings on cyanide content in a large number of genotypes and its relation with physiological age are important to identify genotypes with attractive attributes for increased utilization of cassava leaves.

Table 1. Average cyanide content (HCN in ppm, DB) in various parts of cassava plants (leaves, peels and parenchyma) in seven genetic diversity groups of Latin America (50 genotypes).

Diversity Group	Parenchyma	Peel	Leaves
Amazon	639 [a]	683 [ab]	886 [ab]
Andean	185 [b]	483 [b]	335 [d]
Dry Atlantic Forest	192 [b]	551 [b]	736 [abcd]
Humid Atlantic Forest	628 [a]	885 [ab]	754 [abc]
MesoAmerica Caribbean	239 [b]	893 [ab]	1092 [a]
Savanna	195 [b]	788 [ab]	511 [bcd]
South American Rain Forest	202 [b]	1137 [a]	472 [cd]
Average	305	804	655
S. Dev.	240	492	416
Sources of variation (probability > F) from ANOVA			
Diversity Group	<0.0001	0.1399	0.0112

Months	Average
3	3791 [a]
6	1100 [b]
11	450 [c]

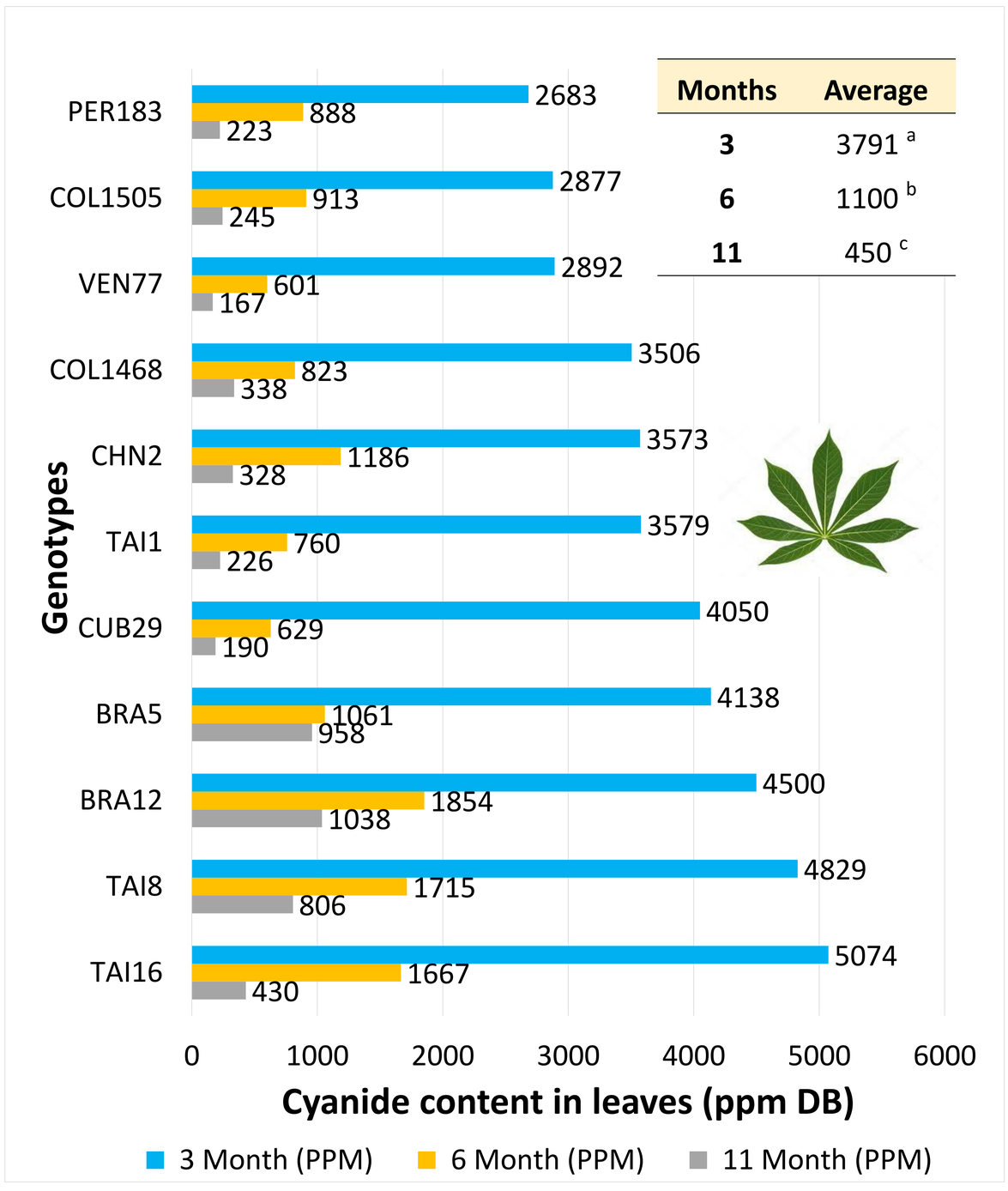

Figure 1. Cyanide content of cassava leaves at 3, 6 and 11 months physiological age.

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