Genome structure and chromosome segregation in triploid interspecific plantain bananas (AAB) and breeding accessions (AAAB).

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Abstract:

Many banana cultivars are triploid interspecific hybrids between *M. acuminata* (Genome A, 2n=22) and *M. balbisiana* (Genome B, 2n=22). They included the important group of Plantain cooking bananas classified as AAB that account for almost 20% of the bananas produced worldwide. Previous molecular analysis suggested that this group is genetically homogeneous but diversified phenotypically through somatic variations.

To progress on the understanding of chromosome composition and segregation of the breeding material used to improve plantain bananas, we performed several analysis based on Genotyping By Sequencing (GBS) technologies.

We analyzed the A/B chromosomes composition of a few plantain cultivars and discovered chromosome segments with AAA composition and one entire chromosome with ABB composition instead of the supposed general 'AAB' composition.

We compared the global chromosome structure of A and B genomes through the construction a high density *M. balbisiana* genetic map and its comparison with the *M. acuminata* reference sequence assembly. We identified a large reciprocal translocation between a region of 0.6Mb at the beginning of chromosome 1 and a 8 Mb region at the end of chromosome 3. We also identified a large inversion of 9Mb within chromosome 5.

We analyzed the A/B chromosomes segregation in a progeny from an 'AAAB' tetraploid breeding accession derived from a plantain. We revealed frequent recombination between A and B all along the genomes with a few exceptions. The exceptions consisted in the absence of recombination recorded in the inverted segment between A and B on chromosome 5 and a reduced recombination rate near the translocated regions on chromosome 1 and 3. We also observed 62% of aneuploids in the progeny involving mainly the three chromosomes that differed in their global structure between A and B genomes. Implication of these results on the origin of plantain banana cultivars and on breeding of allopolyploid bananas will be discussed based on the patterns of recombination revealed.