APPLICATION OF LOW-DENSITY SNP MARKERS WITH ALLELE DOSAGE INFORMATION IN AFRICAN SWEETPOTATO BREEDING PROGRAMS

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RESUMO

Sweetpotato [*Ipomoea batatas* (L.) Lam.] is the seventh most important food crop in the world, being considered a staple food in Sub-Saharan Africa. The species is an autohexaploid and highly heterozygous, which complicates the development and application of molecular-genetic tools for this crop. Molecular markers provide useful information that can help guiding several breeders' decisions. However, breeders of autopolyploid, orphan species such as sweetpotato hardly ever take advantage of such information, and when they do, it is based on pseudo-diploid genotyping calling. In hexaploid sweetpotato, two-channel biallelic Single Nucleotide Polymorphic (SNP) data can support dosage calling (0 up to 6), which is supposedly more informative than diploidized calls (0, 1, 2), where all heterozygous classes are collapsed into a single class. Here we report the development of a Kompetitive Allele Specific PCR (KASP) marker set from sequencing data of several sweetpotato genotypes and successful application of hexaploid dosage call in sweetpotato genotypes from four African breeding programs. The genome sequence *I. trifida*, a close diploid species, was used as reference genome for SNP calling using Bowtie2 (short read alignment) and Freebayes (read count and SNP identification). The polymorphism of selected SNPs for KASP markers development were confirmed by looking at the short read alignments. Firstly, genotyping and validation of 60 KASP markers was performed in 94 individuals from a breeding population in Uganda. Thirty-eight KASP markers were polymorphic and 34 had their genotypic classes categorized with high confidence using the fitPoly R package, with genotypic classes ranging from two to seven. From the polymorphic marker set, 30 KASP markers were chosen to characterize more than 350 genotypes that are used in four African breeding programs: Tanzania Agricultural Research Insitute (TARI)-Tanzania, National Crops Resources Research Institute (NaCRRI)-Uganda, International Potato Center (CIP)-Uganda and CIP-Mozambique. Hexaploid dosage was successfully called for 27 markers, which were used to evaluate the genetic diversity and genetic structure present in the samples as well as create a genetic fingerprint for the genotypes. The markers with hexaploid dosage information outperformed pseudo-diploid calls in the differentiation of sweetpotato genotypes and in the detection

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of mislabeled samples. This work main goal was to develop a set of low-density SNP markers and evaluate their usage for sweetpotato clone identification, quality assurance/control and genetic variability assessment in current African sweetpotato breeding programs. The KASP markers and pipeline used in our analyses will be available for the whole community of sweetpotato research and may support inferences in other autopolyploid breeding populations.

PALAVRAS-CHAVE: KASP markers, Allele dosage, Sweetpotato, Quality control, Autopolyploidy

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