

SunUp and Sunset genomes revealed impact of particle bombardment mediated transformation and domestication history in papaya

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Transgenic papaya is widely publicized for controlling papaya ringspot virus. However, the impact of particle bombardment on the genome remains unknown. The transgenic SunUp and its progenitor Sunset genomes were assembled into 351.5 and 350.3 Mb in nine chromosomes, respectively. We identified a 1.64 Mb insertion containing three transgenic insertions in SunUp chromosome 5, consisting of 52 nuclear-plastid, 21 nuclear-mitochondrial and 1 nuclear genomic fragments. A 591.9 kb fragment in chromosome 5 was translocated into the 1.64 Mb insertion. We assembled a gapless 9.8 Mb hermaphrodite-specific region of the Yh chromosome and its 6.0 Mb X counterpart. Resequencing 86 genomes revealed three distinct groups, validating their geographic origin and breeding history. We identified 147 selective sweeps and defined the essential role of zeta-carotene desaturase in carotenoid accumulation during domestication. Our findings elucidated the impact of particle bombardment and improved our understanding of sex chromosomes and domestication to expedite papaya improvement.