

APPLICATION OF A GENOTYPING-BY-SEQUENCING APPROACH TO TRACE A HIGH-QUALITY YELLOW TOMATO LANDRACE ALONG THE SUPPLY CHAIN

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Solanum lycopersicum L., fruit morphology, Cleaved Amplified Polymorphic Sequences (CAPS), Single Nucleotide Polymorphism (SNP), food traceability

In the last few years considerable interest is growing for high food quality. As for tomatoes, the yellow fruit varieties are conquering the consumer markets in many Mediterranean countries. Among the great variability of yellow tomatoes, one landrace of “Pomodoro giallo del Vesuvio”, named GiaGiù (E40), differs from the traditional “Pomodoro del Piennolo” for the fruit colour and stands out for its quality traits, such as high glutamic acid, pectin content and titratable acidity of fruit, thus increasing its demand for both fresh consumption and cooking purposes. Recently, the PSR project named “Sviluppo e valorizzazione della filiera sostenibile del pomodoro giallo GiaGiù” aimed at supporting the peculiarity and the spread of this product in the Campania region through a multi-disciplinary approach, which involved genetic, pathology, agronomy and marketing aspects. Within this project, we previously identified phenotypic traits such as the potato leaf morphology and the pyriform shape with a pointed apex of the yellow fruits that were peculiar of E40 and could be used to morphologically distinguish it from the other yellow tomato genotypes. In addition, we designed a Cleaved Amplified Polymorphic Sequence (CAPS) marker targeting the Phytoene synthase 1 (psyl) gene, which allowed to trace E40 plants, fruits and processed tomatoes along the tomato supply chain “from the field to fork”. In order to unequivocally distinguish GiaGiù from other yellow tomatoes and to identify polymorphic regions targeting other peculiar traits of this genotype, we decided to design additional CAPS markers based on its private mutations. To this aim,

in the present work we investigated Genotyping-By-Sequencing (GBS) data of 27 tomato genotypes, also including one yellow and two Vesuvio genotypes. A total of 38 variants were found to be private of E40 and most of these mapped on chromosomes five and eight, which presented nine and eight mutations, respectively. In addition, in comparison with the yellow and the two Vesuvio genotypes, E40 showed 594, and 202 and 229 variations, respectively. As expected, it presented the lowest number of variants compared to the Vesuvio ones. The dCAPS3 and CAPS4 markers were designed based on two SNPs found on the first intron of Solyc05g021405, and on the third intron of Solyc10g085770 (Tomato Genome version SL4.0, available at www.solgenomics.net). The designed markers were tested on DNA extracted from different tissues and processed tomatoes (leaves, fresh fruits, conserved whole fruits, dried fruits and sauces) of 14 tomato genotypes and 19 products retrieved from the Italian market. The PCR analysis allowed to distinguish E40 in all fresh and processed tomato fruit matrices. These two CAPS markers, in combination with the one previously designed, represent a molecular tool able to prevent food fraud and authenticate GiaGiù products, enhancing this local tomato market and preserving Campania agro-biodiversity.