

1. Record Nr.	TD18002945
Autore	A. Ciacciulli
Titolo	FRUIT FLESH IN PEACH:CHARACTERIZATION OF THE 'SLOW SOFTENING' TEXTURE [Tesi di dottorato]
Editore	Università degli Studi di Milano, 2018-01-19
Lingua di pubblicazione	Inglese
Formato	Tesi di dottorato
Livello bibliografico	Monografia
Note	diritti: info:eu-repo/semantics/openAccess In relazione con info:eu-repo/semantics/altIdentifier/hdl/2434/540666
Sommario	<p>The aim of this research was to deepen the knowledge about the slow softening texture in peach. The texture is a synthesis of several parameters detected by senses, derived from the food structure. The paramount sense in the texture perception is the tactile one, principally perceived by hand and mouth. The tactile perception is a combination of four classes of mechanoreceptors, each one specialized to perceive mechanic deformation with different speed. This combined perception influences the consumer evaluation of food quality, giving the texture importance among food characteristics. The texture could also affect the taste perception through mechanical actions on food structure. The mechanical property linked to the texture is associated with the cellular organization and the cell wall strength. The main cell wall component affecting texture in fresh fruit is pectin, a polymer of galacturonic acid. The disassembly of pectin involves several enzymatic and non-enzymatic activities acting directly in pectin cleavage or indirectly disrupting non-covalent interactions. The gold standard of texture analyses is the sensorial one, however several issues make sensorial analyses inapplicable to breeding programs to select plant with improved fruit texture. Several efforts were made to achieve instrumental analyses capable of substitute humans in texture</p>

analyses. To mimic the tactile sense, a discipline studying the material response to an applied force, the rheology, is applied. The easiest instrumental measure of rheology parameters is the penetrometer test, diffused to measure the firmness, but exploitable to collect the Young's modulus and the slope of yield stress represented respectively elasticity and fracturability. In peach, so far at least four textures were described, melting (M), stony hard (SH), non-melting (NM) and slow softening (SS). Prior to this work, no reliable objective nor fast tool were available to phenotype and select the SS trait in peach germplasm. The only reliable approach was a sensorial assessment done by a texture-trained panel, requiring repeated and time-consuming assessment. An objective, instrumental method, was set up by processing the data of a digital penetrometer test. The penetrometer itself, as reported in paragraph 2, does not support the ability to discriminate among the different texture types, as already reported in other works. In addition, this method appears to be affected by the fruit ripening season, since the early-ripening accessions tend to show faster loss of firmness, while the late-ripening exhibit a slower firmness loss. Using the data collected in our experiment, the texture dynamic (TD) model was developed from the observation of differences in the rheogram shape due to the elasticity and fracturability parameters. The TD model, that excludes the firmness effect on the fracturability and elasticity parameters, was thus developed, after testing it on 20 accessions in three years, allowing for reliable discrimination between SS and M phenotype. Differences in the TD were also found when comparing M vs SH and M vs NM textures. In particular, when comparing M and SS, TD value is explained for the 96% from the texture. The developed method was then applied (together with sensorial evaluation) to genetically dissect the SS trait. Association and QTL mapping approaches were combined by analyzing a germplasm panel and a biparental progeny, and a single locus at the end of chromosome 8 was identified. RNA-seq analysis of 2 SS and 2 M accessions suggested some common features with the SH type described in literature. In both texture types a lower auxin response was found when compared to the M type. This agrees with the already known activity of auxin in the modulation of cell wall rearrangement and expansion. Therefore, slower softening could be associated to slower cell wall rearrangement. In future, comparison of auxin content in slow softening and melting type peaches might provide further insight into the validity of this hypothesis. In detail, by RNA-seq comparing M and SS a total of 64 differentially expressed genes were found in the genomic region harboring the SS locus. Out of these 64 genes, 16 are uncharacterized, while among the characterized ones, 4 are putatively involved in auxin response based on peach genome annotation. Analysis of polymorphisms in these 4 DEGs based on resequencing data of the 'Max10' and 'Rebus 028' parents of biparental population did not uncover any variants in agreement with the observed segregation. Analyzing 2kb gene models flanking regions, 16 genes were associated with polymorphisms outside the coding sequence: the possible regulatory effects of such variants require further evaluation by expression analyses. In summary, the major results are the setup of a reliable tool to score objectively the SS texture and the detection of a major locus and his dominant mendelian inheritance. However, NGS and RNA-seq approaches are presented as a speculative data only, because they are not supported by hormones content in fruit, and the large locus detected did not allow indication of a putative variant.

These results will: a) give impetus in exploring SS genetic and physiology; b) support the design of future crosses and experiments; c) increase marker density in the locus; d) point out the possible central role of auxin (to validate the hypothesis of a similarity between SS and SH physiology); e) allow texture assessment of improved cultivars; and f) allow phenotyping of segregating progenies to develop molecular markers associated with the SS trait.

Localizzazioni e accesso

[http://memoria.depositolegale.it/\\*/http://hdl.handle.net/2434/540666](http://memoria.depositolegale.it/*/http://hdl.handle.net/2434/540666)