Title Biomechanical characteristics of tomato fruit peels

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Abstract

Mechanical properties, such as strength and elasticity, of tomato peel (exocarp) are important in fruit used both for industrial processing and for fresh consumption, and, therefore, are also of vital interest to breeders. The food industries prefer peel to be thick and stiff for easy peeling, whereas consumers of fresh produce prefer thin, soft peel, for easy eating. The various varieties of tomato fruit genetically developed by breeders might exhibit the desired quality or biomechanical characteristics, but at the same time, might produce types of peel that do not always meet the requirements of the canneries or the fresh-fruit market. The present study evaluated the morphology and mechanical characteristics of the fruit skin and its integrated cuticular membranes, and determined their suitability for industrial processing and/or human consumption. The biomechanical and anatomical properties of fruit peels of five tomato (*Lycopersicon esculentum*) cultivars were investigated. The mechanical properties of ripe tomato peel under axial tension were characterized by measuring strength, elastic modulus, failure stress, overall stiffness and degree of stiffening, by means of deformation and puncture testing of flat strip and circular disk samples, respectively, with a Universal Testing Machine. Data were collected by two testing methods for each peel sample from up to 15 fruit of each of five cultivars. The results were analyzed statistically to determine the instantaneous elastic strains, breaking stress (strength), and work of fracture the peels. The overall stiffness and the extent to which the stress–strain curve deviated from a straight line were calculated. The results suggested a standard measure for each tomato variety, based on its mechanical integrity and suitability for processing or fresh consumption.