

Abstract:

Raspberries have a short shelf life, which limits their fresh market potential. Fruit firmness is one of the most important characteristics for a fresh market cultivar, which is related to both the stage of maturity and the variety itself. Fruit retention strength define as the tension force needed to remove the receptacle from the fruit, decreases as fruit mature, and it is also cultivar dependent. The objectives of this work were to evaluate fruit firmness and fruit retention strength in 14 raspberry cultivars in Chile, and also to examine some morphological changes that occur during the fresh-frozen-thaw cycles fruits at the cellular level. To do these fresh berries were harvested at 3 different maturity stages: pink-red, red-ripe and over-ripe (processing ripe). Fruit firmness was measured using a Texture Expert TA-XT2 with a 2 mm embol. Fruit strength was measured with an adaptation of a Dindometer, an instrument that registers the tension force needed to remove the receptacle from the fruit. Electron microscopy was used to examine changes at cellular level between fresh and freeze-thaw berries in three cultivars. We found that in all 14 cultivars fruit firmness decreased with maturity. The largest differences in fruit firmness among cultivars were established at early stages of maturity. The firmest cultivar at pink-red stage was 'Chilliwack' (1.23 N), followed by 'Tulameen' (0.91 N), 'Heritage' (0.73 N) and 'Skeena' (0.68 N). 'Autumn Bliss' was the softest cultivar (0.24 N). Fruit strength also decreased as fruit matured in all 14 cultivars. In this case larger differences among them were also established at pink-red stage. 'Amity' (6.9 N) and 'Fallgold' (6.22 N) required higher amounts of force to remove the receptacle, producing in many cases broken fruits with missing drupelets. 'Yellow Meeker' (1.61 N) and 'Heritage' (2.12 N) had the lowest retention force, and therefore are the easiest cultivars to pick at early stages of maturity. Cellular dehydration was observed in 'Tulameen' after a freeze-thaw cycle. 'Heritage' showed cell dehydration and partial damaged on its epidermis. In 'Amity' a general plasmolysis was observed after a freeze-thaw cycle. Fruit firmness was not necessarily associated with morphological changes of individually quick frozen (IQF) berries. There are probably some physical characteristics of the epidermis of the fruit in the different cultivars that make some cultivars more susceptible to damage during the freeze-thaw process.