

Abstract:

Texture is a complex but important aspect of fruit and vegetable quality. It relates consumer sensation to objective destructive (strength, toughness) and non-destructive (stiffness or elasticity) measurements. Environmental conditions (temperature, humidity, etc.), the product's physiology and developmental stage, and postharvest decay may affect mechanical properties. Produce bruising, splitting or breaking susceptibility may increase at low temperature and high water contents. Comprehensive and systematic studies on the influence of temperature and water status on produce stiffness and strength are rare, and their results are equivocal. Hence, we used carrot (*Daucus carota* L.) taproots and radish (*Raphanus sativus* L. var. *sativus*) tubers as model produces, differing in tissue structure and biological function, to investigate the interactive effects of external and internal parameters and the stage of tuber development on their mechanical properties. Water potential and pressure potential were positively correlated with strength and stiffness in carrot and radish, but only stiffness showed a significant correlation with water status. Beyond wilting, the effect of water potential on mechanical properties was less pronounced. In carrots, strength was higher at 10°C than at 20°C. Temperature equivocally influenced the relationship between water status and strength in radish, but a reduction of temperature from 20°C to 10°C led to a significantly increased apparent elastic modulus in almost mature tubers. In the rapidly growing radishes the stage of development partially masks any temperature response, but led to an increase in strength while stiffness declined. In carrots, the temperature effect on strength was mediated by cell wall properties and not by water status. Temperature effects on produce texture highly depended on overall tissue structure, the stage of development and the duration of the temperature treatment.