Title	Finite element method for interpretation of sample vibrations
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Abstract

The acoustic response method is one of the most important dynamic methods used for assessment of the mechanical texture of different horticultural products. The method is based on the mechanical excitation of the sample and assessment of its resonant frequency. Different approaches are known for the interpretation of the vibration behavior of the samples, but they are mostly limited in shape and mechanical factors taken into account. According to the most widely used interpretation, the stiffness of the sample (s) is depending on the resonant frequency (f) and the mass (m) of the sample.

Our aim was to extend the acoustic response method to typically non-spherical samples (carrot, cucumber, etc.), to find a correct interpretation of the behavior of the samples and to introduce a stiffness coefficient suitable for characterization of the mechanical properties of a long shaped sample. Finite element modeling (ANSYS 8.0) was used to analyze the behavior of the samples, to extract the possible vibration modes and to find the correlation between the vibration frequency values and the physical properties.

According to the Finite Element Modeling and experimental tests on carrot samples a reverse linear correlation was found between the resonant frequency and the vibrating length of the sample in given shape ranges. New models were constructed to describe the behavior of the samples including the effect of the mechanical factors as well. The new stiffness coefficient was found to be suitable to characterize the hardness of the real samples in a wide size range.