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## **Determination of the Viscoelastic Properties of Apple Flesh under Quasi-Static Compression Based on Finite Element Method Optimization**

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A procedure for determining the viscoelastic properties of apple flesh has been proposed based on compression tests and FEM optimization. Short-term simple compression tests and long-term relaxation tests were performed with cylindrical specimens of apple flesh to measure mechanical properties, and the viscoelastic behavior was predicted using FEM optimization models. Through short-term optimization, the elastic modulus and Poisson's ratio were determined by comparing two kernel functions based on 1) shear only and 2) shear and bulk terms. Long-term stress-relaxation behavior of the specimen was reasonably predicted by two FEM optimization steps within 3.8 % error. The FEM optimization algorithms developed in this research might be applied to determine the viscoelastic properties of bio-materials and also to predict mechanical behavior of these

materials under various loading conditions.

Keywords: apple flesh, compression, stress relaxation, FEM optimization, vicoelastic properties





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