Abstract

The compression test of cylindrical specimen of apple flesh taken from Yataka(Fuji) was conduced to determine the viscoelastic properties such as elastic modulus, Poisson's ratio, and viscous coefficient. Using the data of compression test, stress relaxation, and nonlinear regression, a computer model of finite element method (FEM) was developed including its validity test while the status of apple flesh texture was quasi-static constant-strain. To adjust the S-curve of the initial force-deformation curve using the raw data which was deviated from the origin point, the second order polynomial was fitted using the data from bioyield point to 0.15BP. The results indicated that the coefficient of determination (r^2) was 0.9992-0.9999 and the average horizontal deviation deviation was 0.45 mm. Finally, the elastic modulus, the Poisson's ration and the viscous coefficient of the apple flesh optimized by the developed FEM algorithm were 2,328.4 kPa, 0.29 and 26805.8 MPa : s, respectively. The accuracy of the optimized computer model was found about 1% in comparison of the compression stress for the constant strain rate of 0.005 per second and about 5.6% compared with the relaxation stress within 600 seconds. In conclusion, it was proved that it is very reliable to study the mechanical properties of viscoelastic materials of apple flesh.