Title Frequency Response of Non-linear Single Degree-of-freedom Systems for Biomaterials
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Abstract

Frequency response of viscoelastic biomaterials was modelled as a single-degree-of-freedom system with hysteretic damping. A laboratory-constructed mechanical vibration system was used to test the system with tobacco leaves. The experimental results for an excitation cam eccentricity of 0·15 mm matched the theoretical calculations with a value of the coefficient of determination of 0·997, indicating that a true representation of the spring constant and damping coefficient could be obtained from the test data. Increased tension force on the leaf during vibration increased the spring constant which coincided with an increased slope in the quasi-static force–deformation curve as force increased. The results indicate that this might be used as a rapid method for the evaluation of the elastic properties of the tobacco leaf. When the tobacco leaf is considered as a typical viscoelastic biomaterial, this approach also provides a potential method for the study of the elastic properties of other similar materials.