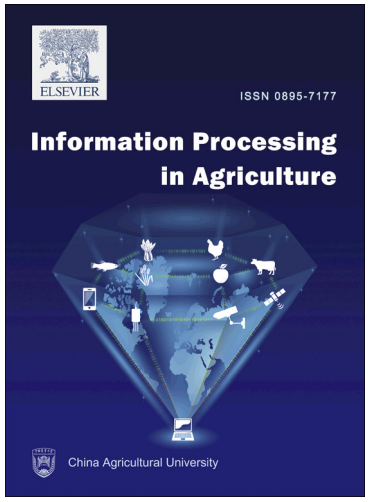

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Finite element analysis of the dynamic behavior of pear under impact loading

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ABSTRACT

Pear fruit is susceptible to bruising from mechanical impact during field harvesting operations and at all stages of postharvest handling. The postharvest shelf life of bruised fruits were shorter, and they softened rapidly under cold storage compared with non-bruised samples. Developing strategies for reducing bruising during the supply chain requires an understanding of fruit dynamic behavior to different enforced loadings. Finite Element Method (FEM) is among the best techniques, in terms of accuracy and cost-efficiency, for studying the factors effective in impact-induced bruising. In this research, the drop test of pear sample was simulated using FEM. The simulation was conducted on a 3D solid model of the pear that was created by using non-contact optical scanning technology. This computer-based study aimed to assess the stress and strain distribution patterns within pear generated by collision of the fruit with a flat surface made of different materials. The contact force between two colliding surfaces is also investigated. The simulations were conducted at two different drop orientations and four different impact surfaces. Results showed that, in both drop orientations, the largest and smallest stresses, strains and contact forces were developed in collision with the steel and rubber surfaces, respectively. In general, these parameters were smaller when fruit collided with the surfaces along its horizontal axis than when collided