

Title Development of an ultrasonic device for agricultural product quality

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Abstract

Ultrasonic technique is one of the earliest nondestructive testing (NDT) methods, which is still under development for quality determination of agricultural products. Determination of fruit quality by NDT methods is a sophisticated task because of heterogeneity and porosity of fruit textures. In this study, an ultrasonic system is developed for quality determination of agricultural products. The ultrasonic system operated basis on signal passing through the fruit and proper signal conditioning. The ultrasonic "qualimeter" system (UQS) consists of fabricated pulser/receiver units with ultrasonic low frequency transducers, control software and data acquisition system, along with a portable computer. Ultrasonic parameters include propagation velocity, attenuation, RMS, and frequency spectrum. The effect of couplant type, contact force, enveloping of signals, delay line, and sample thickness on the received signal were investigated using several fruits and vegetables. The results demonstrated that it is possible to transmit ultrasonic waves through most agricultural products using couplant, signal enveloping, low contact force and suitable sample thickness. The system was successfully used, with appropriate signal conditioning, for evaluation of ripeness level and freshness of some agricultural products. Respecting to the result, for better penetration of ultrasonic waves into samples, it is need to select suitable couplant materials, low frequency and contact force. But to increase of the measurement precision, it is need to select a partly high frequency and apply enveloping signals.