

Abstract:

Economical losses due to mechanical damages are of major concern in practical harvest and transport processes for industrial tomatoes in Hungary. An experimental analysis of the fruit damage and influencing factors during combine harvest and road transport to the processing plant showed an accumulating effect of mechanical load on fruit damage. During combine harvest, numerous mechanical impacts (average force amplitudes between 30 and 70 N) on fruit occurred with resulting damage degree of 5 to 15 weight-% depending on fruit maturity stage. During two hours road transport, there were a static mechanical load (about 44 N) in the lower fruit layers of tomato bulk due to filling height of about 1.3 m. Additional vibrations with relatively small amplitude (peak values between 9 and 14 N) were excited by uneven road surface (roughness, potholes) as well as by truck accelerations. In general, no significant correlations were found between tri-axial accelerations of truck and mechanical loads on tomato fruits during transport. Tomato damage after transport depended strongly on mechanical pre-load due to harvest. When carefully hand-picked tomato fruits were transported by truck, then severe damages up to 4 weight-% were caused. However, the damage degree was appreciably higher, when pre-loaded tomatoes were used. A mechanical pre-load on hand-picked tomatoes by a single drop from 1 m onto wooden plate caused up to 7 weight-% severe damage. After transport, severe damage was increased to more than 30 weight-% of tomatoes. Combined effect of mechanical harvest and bulk height during transport led to high mechanical load and damage of tomato fruit.