

Title Determination of mechanical injuries resulted from mechanical forces exerted on apples during transport in wooden crates

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Abstract

Mechanical forces exerted on apples in wooden crates during transport period from harvest to market stage, as well as the injuries caused by these forces were determined. Standard type wooden apple crates which were identified in TS 3766 and widely used in apple transport in Turkey were used in the study. The width x length x height values of these containers are 400 x 600 x 340 mm, externally. Apples were placed into these containers in three layers. Force measurements were made from 21 measurement points, in total. Containers were placed onto free fall, horizontal impact and vibration simulators in the laboratory and the free fall force in vertical direction, horizontal impact forces in vertical and horizontal directions and vibration forces in vertical and horizontal directions were measured. The resultants of arithmetical means of forces in horizontal and vertical directions measured in horizontal impact and vibration tests were determined, and in this way, horizontal impact and vibration forces were revealed. Thereafter, the means of free fall, horizontal impact and vibration forces were taken and the values of mechanical forces formed in the crates during transport were determined. The extent of injuries on apples at the points at which the mechanical forces exerted were measured. Mechanical force (X) - Injury (Y) correlation was linear in both apple cultivars, and the regression equations of $Y = 0,9X - 3,4415$ with 0,97 correlation, and $Y = 1,24 X - 8,8856$ with 0,97 correlation were established for apple cultivars Granny Smith and Starkspur Golden Delicious, respectively. The largest and the smallest injuries were observed in the lowermost and the uppermost layers, respectively in both apple cultivars, at 5% significance level, according to the results of the statistical analyses.