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香梨果实跌落碰撞时的接触应力分布特性

Contact pressure distribution characteristics of Korla pear fruit at moment of drop impact

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英文关键词: [fruits](#) [drop](#) [pressure sensors](#) [impact](#) [contact pressure distribution](#)

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中文摘要:

为了揭示梨果实的碰撞损伤机理, 该文采用Prescale感压胶片对香梨果实不同跌落高度与4种材料触件碰撞时的接触应力进行测量, 并分析了其分布规律, 确定接触应力分布与香梨果实损伤之间的关系。研究表明, 从20~80 cm跌落碰撞时, 香梨碰撞接触应力峰值为0.5~0.6 MPa; 与钢板和胶合板碰撞, 接触应力呈正态分布, 应力面积接近损伤面积, 0.2~0.3 MPa应力面积最高, 应力均值为0.25~0.28 MPa; 与EPE(聚乙烯发泡棉)板和瓦楞纸板上低冲击水平下碰撞, 接触应力呈非正态分布特征, 应力面积与损伤面积相差较大, <0.2 MPa应力分布面积很大, 应力均值为0.18~0.25 MPa; 随着冲击水平提高, 香梨的接触应力峰值基本不变, 应力分布面积都呈线性增大, 在钢板和胶合板上的接触应力均值变化不显著, 但在EPE板和瓦楞纸板上的接触应力均值有较明显增大; 基于接触应力分布面积和应力均值对香梨损伤面积所建立的线性回归模型, 可对香梨碰撞损伤精确预测和评估。该研究可为梨果机械化作业和自动化处理装置的减损设计提供依据。

英文摘要:

In order to understand the impact damage mechanism of Korla pear fruit, the contact pressure characteristics of Korla pear impacts against four counterfaces at varied drop heights were measured using prescale? pressure sensitive film, the distribution was analyzed and then the relationship between bruising area of Korla pear fruit and contact pressure distributions was determined. The results showed that the peak of contact pressure was 0.5-0.6 MPa for Korla pear impacting against four counterfaces. For Korla pears against steel and plywood surfaces, the pressures tended to a normal distribution with relative small pressure area which approximated to bruising area. Additional, the 0.2-0.3 MPa pressure covered largest area and the average pressure was 0.25-0.28 MPa. In the case of pear dropping onto expanded polyethylene (EPE) and corrugated board at low impact level, the pressures did not conformed to normal distribution and the pressure area was much larger than bruise area of pear. Also, it was founded that the pressure below 0.2 MPa was in larger area and the average pressure was 0.18-0.25 MPa for pear contacts with these cushion materials. With the increasing of the impact level, the pressure area increased linearly. The average pressure changed insignificantly for pear dropped onto rigid materials but tended to increase for impacts against cushion materials when impact level was increased. The linear regress models fitted by the production of pressure area and average pressure can exactly predicate and assess Korla pear bruise area. It provides a reference for designing the mechanized and automated equipment to reduce likelihood of pear bruising occurring.

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