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Application of Microwave and Polymer to Control of Sitotroga Cerealella on Iranian Walnut for Export Along with Quality Evaluation Using an Image Processing Method

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Abstract : Annually, more than hundreds of millions of tons of grain are lost due to damage caused by storage pests and neglect of scientific warehousing principles. It is estimated that, on average, about 10-30 percent of agricultural products, including dried products, are destroyed by arthropods in the post-harvest stages. One of the methods to combat warehouse pests is microwave irradiation through the production of high heat in food and the body of insects without any residue on food products, which is used as an alternative to chemical methods. The type of packaging is also one of the most effective factors in maintaining the quality of the product during storage. Walnuts are one of the most important dried products in Iran, which accounts for a significant part of dry fruit exports every year. In this research, the mortality rate of Sitotroga cerealella larvae under microwave radiation at 900, 600, and 180 watts with exposure times of 20, 40, and 60 seconds in two packages (kraft paper and white polymer) was investigated. The results showed that the percentage of larval death increases with the increase of microwave power and exposure time. The type of polymer also had a significant effect on the mortality rate of S. cerealella larvae. The complete pest mortality was observed at 900 watts and 60 seconds. Moreover, the results of the colorimetric test showed that increasing the power and time of microwave treatment caused an increase in the changes in brightness (ΔL*), redness (Δa*), and yellowness (Δb*) in the color of the walnut sample. In addition, the results obtained from the sensory evaluation of 25 male and 25 female evaluators indicated that the effect of using microwave radiation and two different types of polymers did not affect the moisture level and overall acceptance of the sample, but other characteristics (including color, aroma, taste, texture, sharpness, bitterness, and sourness) changed significantly. However, the aroma of the samples, according to the female evaluators, and the sharpness, bitterness and sourness of the samples, according to the male evaluators, did not differ significantly from each other in different treatments. In general, the results of this research showed that microwave treatment and the use of polymer packaging can be used as a suitable and environmentally friendly method to control storage pests in walnuts.

Keywords : sitotroga cerealella, microwaves, mortality, quality control, image processing
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