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Effect of microwave roasting of pistachios on the quality characteristics of its oil and optimization of process conditions

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Abstract

Since the roasting process is done before the extraction of pistachio oil, in order to produce the desired oil, the roasting process must be done optimally, and considering that one of the new technologies is the use of microwaves in the processing of food products, in this research the roasting process Pistachio cooking was done using microwaves with powers of 300, 600 and 900 watts and quality parameters such as peroxide number, anisidine number, polyphenol, heat resistance, antioxidant activity, pigment and the total amount of polar compounds in three moisture levels of 0.5 /%, 2% and 3.5% were measured. Items of peroxide number, anisidine number, polyphenol content, antioxidant activity, pigment using spectrophotometric method; The thermal resistance item was measured using Rancimet device and the total amount of polar compounds was measured using TESTO device. The resulting data were analyzed using a split-plot experiment in the form of a completely randomized block design with "SAS" version 9/4 software. Comparison of average data was done using Duncan's method at a significance level of 5%. Optimization was done in MATLAB software version b2017 to select the best process conditions. The results showed that with the increase of microwave power, the efficiency of oil extraction has increased significantly. By increasing the power and duration of the process, the peroxide number showed a significant increase. The obtained results clearly showed the oxidative stability of pistachio oil with increasing roasting time. Also, microwave roasting of pistachio oil significantly reduced the amount of P-anisidine. The results of the amount of polyphenols in the roasted oil showed that the amount of polyphenols is higher in higher microwave powers, and during the process, with the passage of time and the decrease in humidity, these values continue to increase in all three tested powers. The amount of chlorophyll and carotenoid measured have almost the same trend. At the beginning of the process, the amount of chlorophyll and carotenoid showed close values. But in higher power, their value was also measured higher, and during the process and the passage of time and the decrease in humidity, these values show a significant increase, and this increase showed more intensity in higher powers. The highest index of oxidative stability in this test was measured for the roasted treatment with 900 power and 0.5% humidity, and during the process, with the passage of time and decrease in humidity, this stability against oxidation continued to increase significantly. The total amount of polar compounds increases with increasing power and also with the passage of time and decreasing moisture content. In higher powers, the amount of activity of antioxidant compounds is in a higher value, and with the passage of time and the decrease in humidity, this value also increases, and in the humidity below 0.02%, this increase is more intense in all powers. The optimization results showed that the best oil sample during the process is the sample processed with 900 watts of power and absolute humidity of 0.02.

Keywords: roasting; microwave, optimization; pistachios; Oil; Oxidative stability