Table olive debittering without chemical solution by using power ultrasound

Table olive is one of the most important products in the world, with a total production of 2,512,500 tons in the 2012/2013. Different processing methods are applied for producing table olives with the objective of eliminating their natural bitterness. Polyphenol compounds of olive fruit, particularly oleuropein, are chiefly responsible of the bitterness taste which must be, completely or partially, removed to be palatable and consumer acceptable. Directly-brined olives, without prior debittering with sodium hydroxide (caustic soda, NaOH) solution is gaining more and more acceptance in the market because of the current customer preference for natural and organic products, which do not receive severe chemical treatments. Table olives debittered without NaOH solution accounts for about 30% of the world's table olive market. The amount of produced wastewater in NaOH-free debittering process (0.9–1.9 m^3/ton) is significantly lower than that of debittering with NaOH (3.9–7.5 m^3/ton). In NaOH-free debittering process, the epidermis of the olives remains intact and acts as a barrier against the diffusion of bitter compounds, so a portion of these compounds leaved intact, which results in good nutritional characteristics such as antioxidant activity. Nevertheless, so far, a major drawback to the extension of olive processing without chemical solution has been its lengthy processing time which causes technological and economic problems.

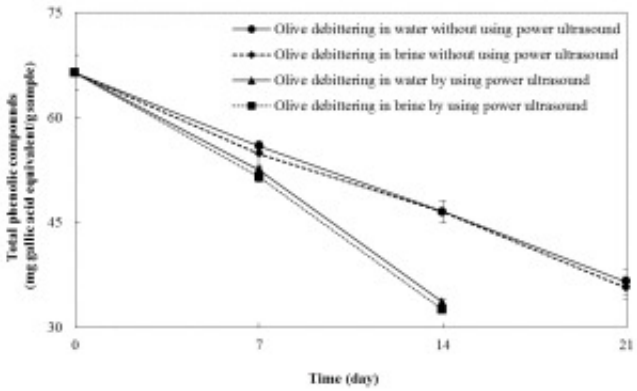

Fig. 1. The changes of olive fruits total phenolic compounds contents during debittering process.

Power ultrasound technology is one of the newest, promising non-thermal food processing methods, that perceived to be safe, non-toxic, and environmentally friendly and is regarded as benign by the public. Therefore, it is one of the fast growing technologies in food processing. Ultrasound- assisted extraction offers advantages like improved efficiency, reduced extraction time and low solvent consumption in comparison with conventional extraction techniques. Therefore, the efficacy of power ultrasound to speed up of NaOH-free olive debittering process was investigated in a laboratory scale.

Olive fruits were sonicated in water or brine and the effects of ultrasound on physicochemical and textural properties of them were evaluated in comparison with common debittering in water or brine. The debittering process was continued until total phenolic compounds level decreased by approximately 50%. The results showed that the required processing time decreased by 37.8% and 38.6% when debittering was done in water and brine, respectively. Fig. 1 shows total phenolic compounds level changes versus processing time for better understanding. Ultrasound can generate very tiny pores in the skin of olive fruits, so it can speed up bitter compounds extraction. As mentioned before, the amount of produced wastewater in NaOH-free debittering process is lower for about 75% than that of NaOH debittering process and in the case of using ultrasound, this reduction was much more as a result of decreasing processing time. Also, no amount of NaOH could be found in the produced wastewater by this method and the wastewater of NaOH-free debittering process in water was also sodium chloride free.

The chemical composition, color and firmness of the sonicated olive samples remained unchanged, while their antioxidant activity was significantly higher than the non-sonicated olives.

According to the obtained results, power ultrasound could speed up olive fruits debittering process in brine or water and could help solve one of the most challenging problems of NaOH-free debittering process. This method had no negative side-effects. Therefore, it can be introduced as an environmentally friendly technology. In order to scale up ultrasound debittering, large tanks equipped with power ultrasound generators are available in the market and can be easily adapted for the olive debittering process.

Publication

NaOH-free debittering of table olives using power ultrasound.
Habibi M, Golmakani MT, Farahnaky A, Mesbahi G, Majzoobi M
Food Chem. 2016 Feb 1