

Ultrasound Assisted Osmotic Drying for Production of Murabba from Ash Gourd

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Abstract—The ash gourd (*Benincasa hispida*), also called winter melon or white gourd is originated from Southeast Asia and is now widely grown in East Asia and South Asia as well. It is not used up to potential as vegetable in India compared to other vegetables like potato, brinjal, cauliflower, cabbage, okra etc. Since it possesses several nutritive and medicinal properties, it has a bright scope for value addition. The ash gourds in India are commercially utilized for manufacturing candy and a variety of sweet delicacies called Murabba (petha, in northern India). Traditionally, Murabba is processed from ash gourd under osmotic dehydration in sugar syrup. Osmotic drying is a widely used method to remove water partially from fruits and vegetables by immersion in a hypertonic solution. However, its long processing time severely affects the quality of the product and also increases the total energy consumption. So, Murabba processing system needs new innovations to overcome such long processing time. In order to increase the water removal rate in an osmotic drying process, a novel technology like ultrasonication is introduced prior to osmotic drying.

In our study the ash gourd cubes of 15 × 15 × 15 mm were exposed to ultrasonic (US) waves at a frequency of 30 ± 1 kHz for 0, 10, 20 and 30 min. Then osmotic drying was carried out by immersing the samples in 50, 60 and 70° Brix sugar solution at various osmotic temperatures of 40°C, 50°C and 60°C till equilibrium moisture contents achieved in the samples. The microstructures of pre-treated samples were examined using scanning electron microscope. The results showed that ultrasound pre-treatment performed for more than 10 min had a positive effect on the mass exchange caused by osmotic drying. The creation of micro-channels or increase of tissue porosity in the samples was measured by ImageJ image processing software. Finally, the investigation showed the ultrasound assisted osmotic treatment prior to vacuum drying reduced the final drying time in vacuum dryer by 46.8-70% and also reduced the total energy consumption by 56-63.43%.

Keywords: Ash gourd, Murabba, Ultrasound, Osmotic drying, Water loss, Solute gain, SEM