

## Preservation of High Quality Fruit Products: Microwave Freeze Drying as a Substitute for the Conventional Freeze Drying Process

**Authors :** Sabine Ambros, Ulrich Kulozik

**Abstract :** Berries such as blue- and raspberries belong to the most valuable fruits. To preserve the characteristic flavor and the high contents of vitamins and anthocyanins, the very sensitive berries are usually dried by lyophilization. As this method is very time- and energy-consuming, the dried fruit is extremely expensive. However, healthy snack foods are growing in popularity. Especially dried fruit free of any additives or additional sugar are more and more asked for. To make these products affordable, the fruits have to be dried by a method that is more energy-efficient than freeze drying but reveals the same high product quality. The additional insertion of microwaves to a freeze drying process was examined in this work to overcome the inconveniences of freeze drying. As microwaves penetrate the product volumetrically, sublimation takes place simultaneously all over the product and leads to a many times shorter process duration. A range of microwave and pressure settings was applied to find the optimum drying condition. The influence of the process parameters microwave power and chamber pressure on drying kinetics, product temperature and product quality was investigated to find the best condition for an energy-efficient process with high product quality. The product quality was evaluated by rehydration capacity, crispiness, shrinkage, color, vitamin C content and antioxidative capacity. The conclusion could be drawn that microwave freeze dried berries were almost equal to freeze dried fruit in all measured quality parameters or even could overcome it. Additionally, sensory evaluations could confirm the analytical studies. Drying time could be reduced by more than 75% at much lower energy consumption rates. Thus, an energy-efficient and cost saving method compared to the conventional freeze drying technique for the gentle production of tasty fruit or vegetable snacks has been found. This technique will make dried high-quality snacks available for many of consumers.

**Keywords :** blueberries, freeze drying, microwave freeze drying, process parameters, product quality

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