

## **PILOT SCALE FREEZE-DRYING OF POMEGRANATE JUICES AND ROSELLE EXTRACTS**

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### **ABSTRACT**

A series of experimental test runs were conducted to investigate the possibility of freeze-drying single strength (17 °Brix) and concentrated (34 °Brix) pomegranate juices and similar concentrations of roselle extracts using a pilot scale freeze-dryer. The investigation included determining suitable process conditions and relevant chemical composition and physical properties of the original liquid products and the produced freeze-dried powders.

The time required to reach a freezing temperature of -25°C for both pomegranate juices and roselle extracts was about 80 min. which is considered as a slow freezing process resulting in large ice crystals. Temperature of the primary freeze-drying phase was kept constant at -40°C because of the high sugar content of the pomegranate juices. The primary freeze-drying times were 40 and 48 h for single and concentrated pomegranate juices, and 5 and 8 h for the single and concentrated roselle extracts, respectively. Secondary drying of juices and extracts was carried out by raising the platen temperature from -40°C to +25°C.

Attempts were successful to produce freeze-dried powders from single strength pomegranate juice and both concentrations of roselle extracts. The high sugar content of the 34 °Brix pomegranate juice was primarily responsible for the difficulties to freeze-dry it.

The results of chemical analysis indicated that roselle extract of 17 °Brix is a very good source of vitamin C as having a four times concentration of ascorbic acid as compared to the 17 °Brix pomegranate juice. The bulk density of powder produced from 34 °Brix roselle extract was higher than the one obtained from the 17 °Brix. Hygroscopicity data showed tendency of the 34 °Brix roselle powder to absorb more moisture than the 17 °Brix roselle powder. Two models describing the hygroscopic behavior of freeze-dried pomegranate and roselle were given.

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