EFFECTS OF LOW-TEMPERATURE AND LOW-HUMIDITY DRYING ON THE PHYSICO-CHEMICAL, SENSORY AND MICROBIOLOGICAL PROPERTIES OF DEHYDRATED FOOD (MANGO)

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BACKGROUND

Most processes used to preserve food products involve drying. However, conventional high-temperature drying decreases food nutrient content and acceptability. The high relative humidity in the Philippines (71-85% from March to September) also slows the rate of drying, resulting in long processing times.

OBJECTIVES

The study aimed to determine the physico-chemical, sensory and microbiological properties of the Low Temperature and Low Humidity (LTLH)-dehydrated product (mango). Specifically, it aimed to design and fabricate the LTLH dryer and test its effects on the properties of mango as test materials.

METHOD

A prototype LTLH drying system was designed, fabricated and tested on raw-ripe mangoes as test material using temperatures of 50-70°C and relative humidity of 10-25%. Samples were dried to constant weight and analyzed for vitamin C content, physico-chemical, sensory and microbiological properties. Experimental drying curves and moisture sorption isotherms were also determined.

RESULTS

A prototype all-stainless steel dryer with two chambers controlled by a 2kW heater was fabricated. The first chamber is for the samples and the second chamber is for the desiccant. The flow of air inside the dryer is controlled by a 2kw centrifugal blower using 220V and 3-phase electricity. The LTLH dryer can maintain a temperature of 50°C even without using a heater.

Mango pieces dried at 50°C and 20% relative humidity had a final moisture content of 14% (w.b.) after 6 hours of drying, which is half the drying time required by conventional hot-air systems (12 hours).

Vitamin C content of the LTLH-dried mangoes was 239 mg/100 g (w.b.), which is 3.7 times higher than that in commercial dried mangoes. Since vitamin C is more easily degraded by heat compared to other vitamins, it is likely that most nutrients (e.g. Vitamin A) were retained in the LTLH-dried mangoes. Color analysis showed that b* (yellowness) values of dried mangoes (43.09) were significantly different from the fresh values (53.09) at p<0.05. The product was highly acceptable, having a sensory evaluation rating of 8 (like very much) using a 9-point Hedonic Scale. The moisture sorption isotherms of the dried samples had a Type II (J-shaped) isotherm which is typical for foods with high sugar content (Aqualab University, 2017). The aerobic plate count of the dried samples was within the acceptable range (<250 CFU/gram).

CONCLUSION

Dried mangoes with minimal nutrient loss, reduced color degradation, high acceptability, and microbiologically safe were obtained using the fabricated LTLH dryer.

RECOMMENDATIONS

It is recommended to optimize the operation of the LTLH drying system and be tested on other agricultural crops, particularly those sensitive to high temperatures. It is also recommended that further comparison of the efficiency of LTLH dryer and conventional dryers be done.