

OPTIMIZATION OF TIME-TEMPERATURE COMBINATION DURING DRYING TO RETAIN THE PUNGENCY CHARACTERISTICS OF *Zingiber officinale* Roscoe (VARIETY: SIDDHA) CULTIVATED IN SRI LANKA

K.M.S.A.K Dehideniya, A.L.C.J. Liyanage

Department of Food Science and Technology, Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya 70140, Sri Lanka

janitha@appsc.sab.ac.lk

ABSTRACT

Ginger (*Zingiber officinalis Roscoe*) is a perennial plant whose underground rhizomes are used widely as a spice and flavoring agent. The maturity, temperature and time used for drying and the storage conditions of the rhizomes can affect their functional properties, especially the pungency. Freshly harvested ginger rhizomes (local variety Siddha) obtained from a commercial cultivation in Sri Lanka were subjected to hot air drying and selected physicochemical properties of the dried rhizomes were evaluated in this study. Response surface methodology (RSM) was applied to determine the optimal conditions for dehydration. The independent variables were time (7 hours-23 hours) and temperature (40^oC-60^oC) and nine treatments were assigned based on central composite design (CCD), containing one center point and four axial points. The quality of dried ginger was evaluated by determining the moisture content (AOAC, 1999), L*, a*, b* color values (Konica Minolta CR- 400 colorimeter), and total phenolic content (Folin–Ciocalteu assay) of each dried sample. A ranking test was conducted initially with 15 panelists for identifying the most suitable maturity level of the rhizomes based on perceived pungency of ginger samples. Ginger rhizomes harvested at a maturity stage of 12 months from sprouting was identified to have more pungent taste and aroma by the panelists and this sample was selected for further experiments.

The initial average moisture content of the ginger rhizomes was ~84% [wet basis (WB)]. The final average moisture content (MC) showed significant differences ($p < 0.05$) between ginger rhizomes dried at different time-temperatures combinations. The highest moisture content was observed at 3.6 hr, 50^oC drying conditions (MC:63.04%WB), and the lowest moisture content was observed at 23 hr, 60^oC drying conditions (MC:3.63%WB). Therefore, the desired final MC (10% WB) for long term storage can be obtained under 50^oC/18hr drying conditions. According to the colour analysis of the dried rhizomes, highest yellowness value and lowest redness values were observed at 7hr, 40^oC. The optimization results indicated that the best responses within the range studied were reached when the drying time was 23.34 hr, and the drying temperature was 54.43^oC, based on the observed maximum total phenolic content (4.76 mg GAE/ml). The results of this study will help to identify the most suitable time-temperature combination for drying siddha ginger for commercial applications in the food and beverage industry.

Keywords: ginger, hot air drying, moisture content, optimization, response surface methodology