Thin-layer Drying Characteristics and Modeling of Two Varieties Green Malt

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Abstract: Malting process includes steeping, germination and kilning of cereal grains in controlled conditions. The Kilning process is the most expensive stage of malting industry. In the present study, drying behavior of green malt of two different barley varieties (Sahra and Dasht) were evaluated at air temperatures ranging from 40 to 85 ℃, at constant air velocity of 6 m/s. The main objective of this research was to select the best drying equations, in order to use them for the calculation of drying time and energy consumption. For that the experimental data was fitted to five thin layer drying equations (Lewis, Henderson and Pabis, Page, Modified page and Two-term). The coefficients of the equations were compared by three statistical parameters as residual sum of squares, standard error of estimate and mean relative deviation. The effect of temperature on the coefficients of the five selected equations was evaluated by linear regression. The results show that The Page model was found to be most suitable in describing the drying characteristics of green barley malt because of that has the lowest statistical parameters. The color of green barley malt was determined after drying using a spectro-colorimeter (Hunter Lab) in terms of Hunter L, a, and b values. Color measurement indicated that the ΔE index increased with an increase in drying air temperature.

Key words: Thin-layer drying equation, green barley malt, Hunter Lab, air temperature.

1. Introduction

Drying is the most common food preservation method used in practice [1-3] and drying (kilning) of green malt with aim of arrest modification and render malt stable for storage, ensure survival of enzymes for mashing and introduce desirable flavour and colour characteristics and eliminate undesirable flavors have been done [4].

Rocha et al. (1992) found that temperature is the main factor in controlling the drying rate and color of basil and mint. It was observed that as drying temperature increased, basil developed brown colour [5].

The moisture content of green malt is about 42%-

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48% and usually an air temperature ranging from 30 ℃ to 85 ℃ or a constant temperature of air may be used to kilning of green malt. High energy cost and the all year round nature of the malting process have led to number of developments in energy conservation. However, the effectiveness of those depends greatly on a theoretical knowledge of the drying process. But a little information about simulation of green malt drying is available.

The development of a deep bed drying simulation model is a valuable tool for optimization of design and prediction of performance of the drying system for germinated barley (malt kilning). Thin layer drying models are required for simulation of deep bed drying of germinated barley, hereafter referred to as 'malt'. Simulation models provide an opportunity for the assessment of the energy conservation and saving