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Impact of Processing Temperature on Drying Behaviour and Quality Changes in Stinging Nettle (*Urtica dioica*)

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Abstract

Stinging nettle (*Urtica dioica*), well-known as a medicinal plant, contains health-promoting compounds like flavonoids, phenolic acids, minerals, essential oils, vitamins and pigments. In order to prolong the shelf life, the stinging nettle must be dried after harvest, like most medicinal plants. The effect of different temperatures on the drying behaviour of stinging nettle and its properties was examined in this study. Drying experiments were conducted using the high precision laboratory dryer designed at the Institute of Agricultural Engineering, University of Hohenheim (Stuttgart, Germany). The stinging nettle was dried at temperatures of 30 °C, 50 °C and 70 °C. Air velocity and absolute humidity of the air were kept constant at 0.2 ms^{-1} and 10 g kg^{-1} , respectively. The dried stinging nettle was analysed regarding the dry matter content, water activity, colour, caffeoyl malic acid, chlorogenic acid and pigments. The results indicate that the moisture content decreased slowly until desired moisture content of 10% was achieved. The total drying time decreased noticeably by an increase of the temperature. It was observed that the colour values of stinging nettle were substantially influenced during the drying process. Drying at different temperatures had no significant influence on the total phenolic content, ranging from 900.75 ± 54.28 to $1192.19 \pm 217.45 \text{ mg GAE } 100 \text{ g}^{-1}$, and luteine content (54.32 ± 1.92 to $59.72 \pm 2.65 \text{ mg } 100 \text{ g}^{-1}$) ($p > 0.05$). Although, the stinging nettle dried at 70 °C contained significantly less caffeoyl malic acid ($16.27 \pm 1.27 \text{ mg g}^{-1}$), chlorogenic acid ($1.27 \pm 0.12 \text{ mg g}^{-1}$), chlorophyll a ($237.92 \pm 15.37 \text{ mg } 100 \text{ g}^{-1}$) and chlorophyll b ($116.67 \pm 7.40 \text{ mg } 100 \text{ g}^{-1}$) compared to the stinging nettle dried at 30 and 50 °C. Furthermore, a significant difference among the beta-carotene content of the stinging nettle dried at different temperatures ($p < 0.05$) could be measured. The results show that the choice of the drying temperature affects the colour and the content of valuable ingredients of the stinging nettle. For further studies, the optimum temperature for drying of stinging nettle needs to be determined according to the purpose of the drying process.

Keywords: Color, drying behaviour, medicinal and aromatic plants, phenolics, pigments, stinging nettle