



Tropentag, October 7-9, 2008, Hohenheim

“Competition for Resources in a Changing World:
New Drive for Rural Development”

Drying of Lemon Balm (*Melissa officinalis* L.) using Stepwise Process Control

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Abstract

In this work the method of stepwise drying of medicinal plants is presented as an alternative to the conventional drying that uses a constant temperature during the whole process. The objective of stepwise drying is the decrease of drying time and energy saving. In this process, apart from observing the effects on saving process time and energy, the influence of the different combinations of drying phases on several characteristics of the product is considered. The tests were carried out with *Melissa officinalis* L. variety citronella, sowed in greenhouse. For the stepwise drying process different combinations of initial and final temperature (30/40°C, 30/50°C, 30/60°C, 40/50°, 40/60°C, 50/60°C, 50/30°C) are evaluated, with different transition points associated to different moisture contents (20, 30, 40 % and 50 %) of the product during the process. To determine the colour changes a Chromameter® device is used that carries out the colourimetric evaluation of colour coordinates and colour differences by means of the CIELAB colour space, in accordance with the norm DIN 6174. As reference for the colour change the measurement of the colour of the fresh product is used. The CIELAB coordinates of the reference colour is compared with the coordinates of the colour of the product after being exposed to the stepwise drying process.

Drying curves were obtained to observe the dynamics of the process for different combinations of temperature and points of change, corresponding to different conditions of moisture content of the product. Finally it was found that combinations of temperatures beginning with high temperature are not advisable since they produce severe changes in the colour that affect negatively the final quality of the product diminishing their commercial value.

Keywords: Drying process, lemon balm, medicinal plants, *Melissa officinalis*, stepwise drying