

Applying electrical pulses to basil leaves before drying with different methods results in products with better quality properties.

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Nowadays the production of high quality dried herbs is gaining more importance, as the competition on the market is large and the demand is increasing, because people are used to cook with herbs throughout the whole year even if out of season. It seems to be rather hard to produce a dried basil leaves which are close in color, smell, taste and texture to the fresh leaves, as during heat treatment structural changes happen within the leaves.

Kwao et al. (2016) showed that a reduction in drying time and an increase in quality of dried basil was obtained when treating the basil leaves with short electric pulses before air drying. This pulsed electric field (PEF) treatment causes structural changes in the basil cells, that small openings, the so-called stomata, through which the water evaporation in leaves takes place stay open.

There were a few research questions which came up after digging more into prior researches made. Will the PEF treatment reduce drying times as well with other drying methods (vacuum drying and freeze drying)? Will structural changes vary with PEF induced stomata opening in combination with different drying techniques? Which drying technique is the best amongst the studied methods? From these questions the aim was set to study the impact of the PEF-induced stomata opening in combination with different drying methods on the perception of aroma, the structure, color changes and the rehydration capacity of dried basil.

It was clearly seen that the PEF treatment reduced the drying time for all drying methods tested, where it was the most for air drying and the least for freeze drying. Scanning electron microscope pictures explained this by showing that only the stomata from the PEF treated samples stayed open throughout the drying process. When looking at the freeze dried basil leaves, also the untreated sample showed open stomata, where it is assumed that ice crystals which are formed during freezing change the cell structure, keeping them open.

When looking at the quality properties of the dried basil leaves and pesto made with dried leaves, it was seen that vacuum dried basil leaves were closest to the fresh leaves.

The color changed for air dried basil leaves towards a darker, but yellower color as the heat during the drying process damaged the color pigments, whereas for vacuum-and freeze drying it changed to a darker and greener color.

The rehydration capacity, which is the amount of water that can be up taken by the dried leaves after drying, was for all the products more or less the same. But the speed of rehydration capacity varied, with the PEF treated freeze dried sample being the fastest and the untreated air dried sample being the slowest.

The structural changes were observed under the scanning electron microscope and showed almost no collapse of the cells for freeze dried samples, but for air-and vacuum dried basil leaves a clear cell collapse was observed. For the air dried sample the PEF treated one preserved the cell structure better resulting in less cell collapse, which is due to a reduction in drying time, so due to less heat damage. Whereas during vacuum drying the PEF treated sample was more collapsed, which was an unexpected finding, that was not very well understood and should be further investigated.

The work for this thesis is as well interesting for the industry. According to the results of this study, it was suggested that PEF treatment prior to drying should be implemented for air- and vacuum drying, as the drying times get clearly reduced. This is positive for the environment as less energy will be needed and it will save production costs for the industry. Not only the industry will profit, but it was also shown that the final products will have a better preservation of the essential oil glands, which keep the aroma compounds of the leaves. In contrast to freeze drying, where the prior PEF treatment was not advised, as the reduction in drying time was only small and there was no difference in the quality of the product.