

Determination of case hardening in roots of marshmallow (*Althea officinalis* L.)

Master Thesis at the Section of Agricultural Engineering

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Summary

With the aim to identify the onset of Case Hardening during drying of Marshmallow, the values of various parameters reflecting the characteristics of this phenomenon were analyzed, as it was found in the literature review, namely:

- Falls in drying rates at high drying temperatures.
- Periods of fluctuation in the drying rate at high drying temperatures.
- Moisture content differences between the core and the outer part of the product.
- Emergence of a compact layer and the product outside.

These parameters may be divided between those which are a direct measure of Case Hardening, and those which are an indirect measure or a reflection of the emergence of the phenomenon.

Among the direct methods are: the measurement of moisture content of the core and the outer part of the product at certain times of the drying process and the measurement of the hardness of the outer layer of the product and of the center even in the later stages of the drying process.

Among the indirect methods are: the variation of the drying rate by the effect of a less permeable outer layer.

Other methods could be proposed, which would allow measuring the characteristics of Case Hardening, such as color differences between inner and outer layers or changes in the electrical characteristics of the product as a result of the variation in moisture content within. However by its difficulty in processing, and analyzing the results, simpler methods were used.

Furthermore, an analysis of the influence of the skin of the root in the drying process, and the emergence of the phenomenon was made.