

DEVELOPMENT OF PREDICTIVE MODELS FOR QUALITY CONTROL OF GALA APPLES DURING DRYING

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ABSTRACT

This thesis research project is aimed at setting up prediction models based on NIR spectroscopy, for quality control of organic apple wedges (*Malus domestica* B., var. Gala) during hot-air drying process (horizontal flow) up to 8 h. Hot-water and microwave blanching were both tested at 95°C for 5 min and 850 W for 45 sec, respectively, as pre-treatments to control the occurrence of enzymatic browning during drying. However, hot-water blanching had a negative impact on the appearance of the apple wedges, which were subjected to non-enzymatic discoloration (e.g. Maillard's reaction).

PLS regression showed good performances for the prediction of a_w (RMSE = 0.03-0.04; $R^2 = 0.97-0.98$), moisture (RMSE = 0.04-0.05; $R^2 = 0.97-0.98$), SSC (RMSE = 4.54-4.99 °Brix; $R^2 = 0.96-0.97$) and changes in chroma (RMSE = 2.31-2.75; $R^2 = 0.81-0.86$) during drying. Also PLS-DA classification showed very good metrics (total accuracy > 95%) in recognising 3-drying steps, both for control and microwave-treated samples. Features selection by iPLS and iPLS-DA algorithms showed results better/equal than models based on full spectrum. For these results, the implementation of low-cost NIR sensors on drier device, seems feasible.

KEYWORDS: *apple, NIR, drying, prediction models, PLS, PLS-DA*