

Organic apples (cv. Elstar) quality evaluation during hot-air drying using Vis/NIR hyperspectral imaging

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Introduction

- ➔ Organic and dried agricultural products is continuously growing and has high market demands
- ➔ Non-invasive and non-destructive methods are useful to detect quality metrics to improve production line settings
- ➔ Method is based on models that were developed from measured and hyperspectral data relating the visual and quality parameters

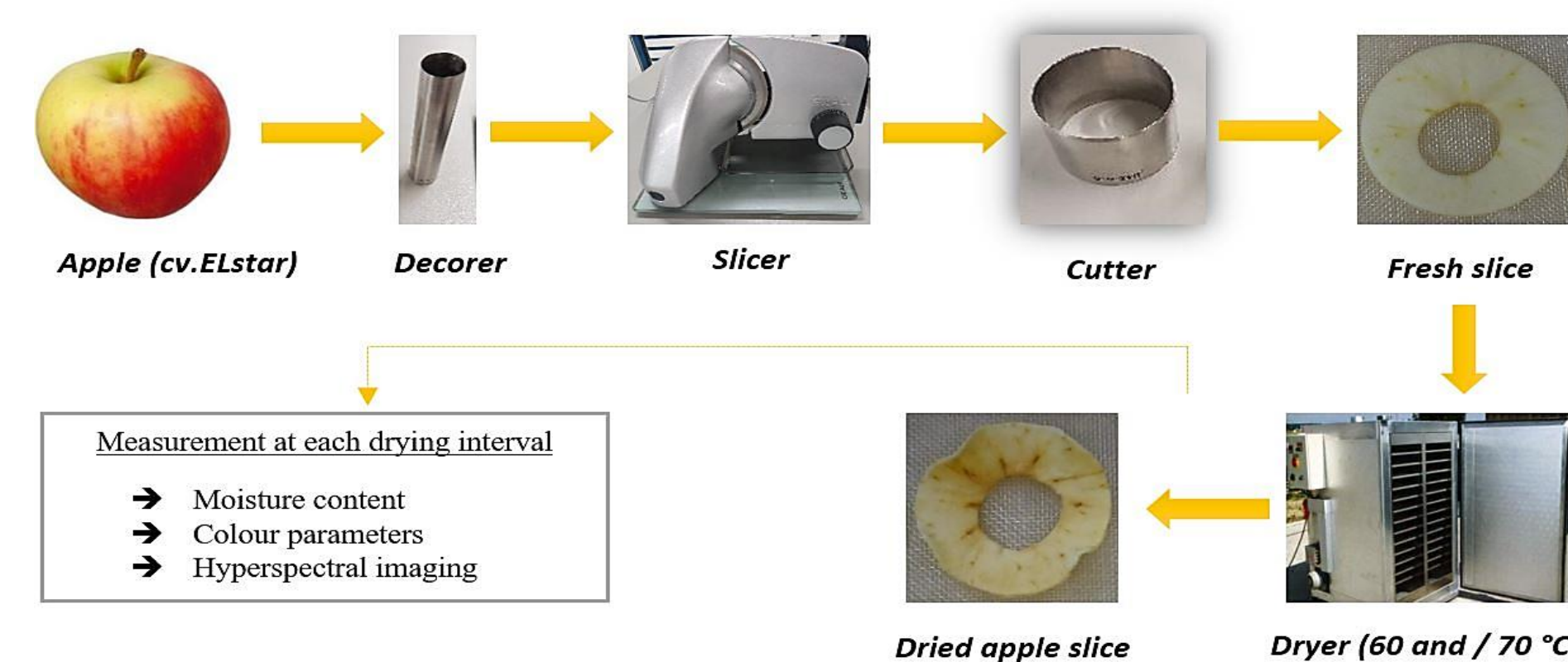


Picture 1: Dried apple slices

Objectives

- ➔ To investigate quality metrics predictions such as moisture content and chromaticity using the visible/near-infrared (Vis/NIR) spectroscopy coupled with chemometrics during the drying process

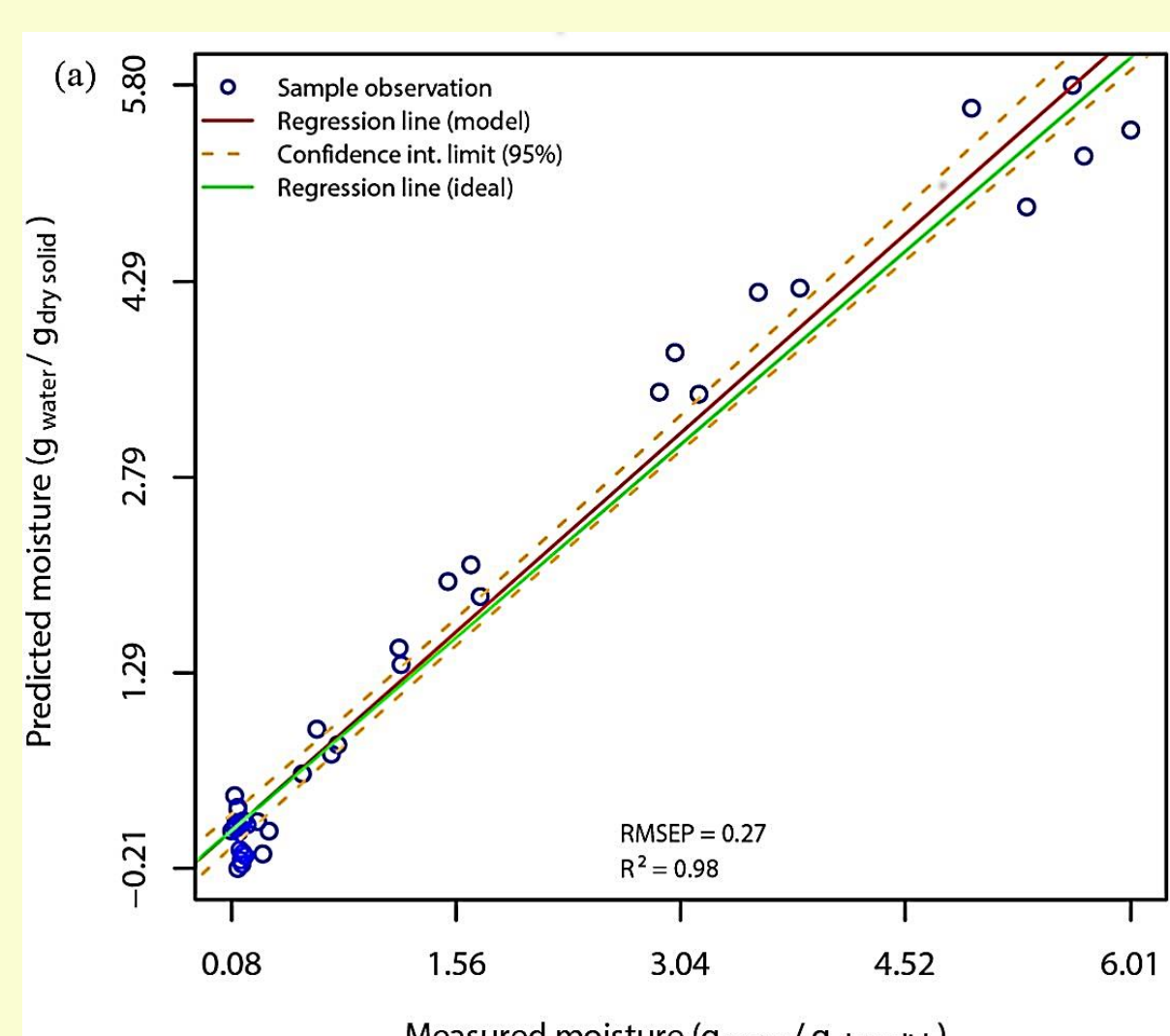
Materials, Methods and Statistics



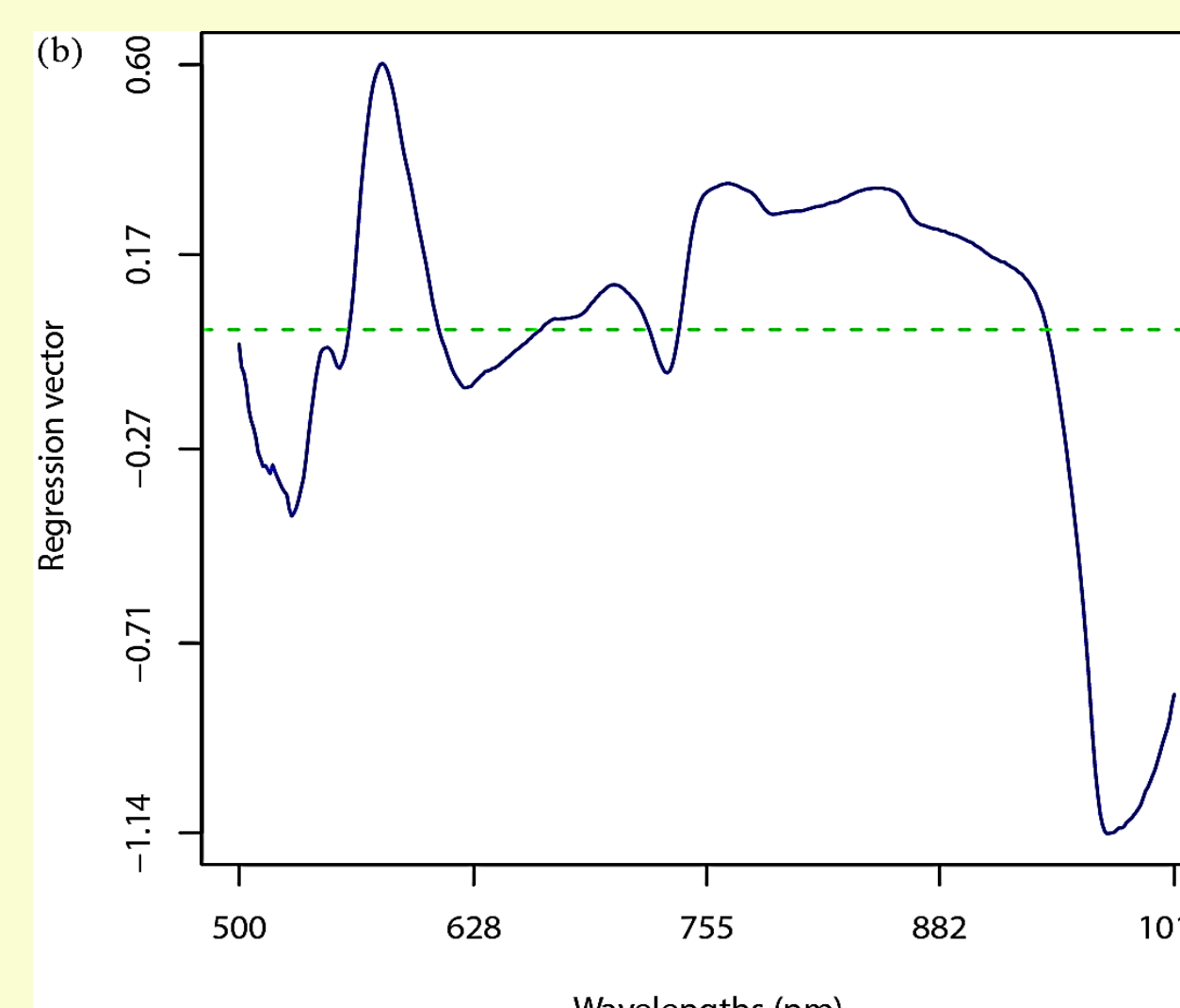
PLSR model

Determined in terms of regression vector (RV)

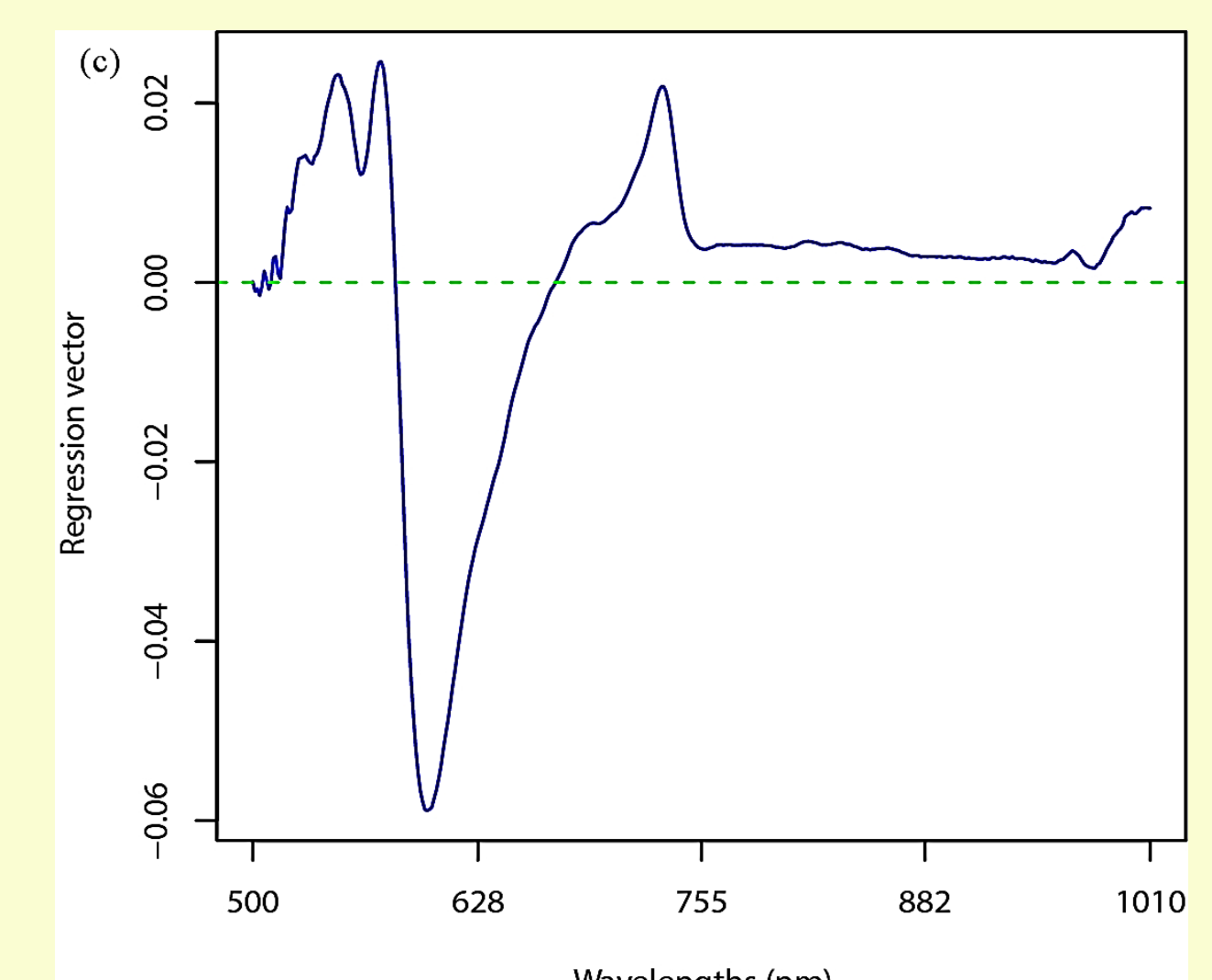
Results



(a) Plot of predicted versus measured moisture content



(b) Plot of regression vector for moisture content



(c) Plot of regression vector for a*/b* ratio

Fig 2. PLS model at full -wavelength range in the spectral range of 500 – 1010 nm

- ➔ A good moisture content prediction model was achieved on the test set with highest R^2 (0.98) and lowest RMSEP (0.27 g Water/g D.M) (Fig 1a)
- ➔ The highest peak was observed at wavelengths 580 nm and downward peaks at 680 nm and 970 nm (Fig 2b and 2c)
- ➔ At 970 nm, there might be the non-bonded O-H stretching second or third overtone vibration in water and free water molecules in the apple slices [1,2]. Specifically, 680 nm is related to change in chlorophyll content [1]

Conclusions

- ➔ Colour (a^*/b^*) parameter changed at each drying interval compared to the onset of drying
- ➔ RV model had a higher prediction accuracy indicating that wavelengths selected are powerful in predicting the MC and a^*/b^* colour of organic apple slices



Picture 2: Apple slices (4 mm) dried at 60 °C

References

- [1] Crichton S, Shrestha L, Hurlbert A, Sturm B. Use of hyperspectral imaging for the prediction of moisture content and chromaticity of raw and pretreated apple slices during convection drying. Drying Technology. 2017 Oct 11:1-3.
- [2] Moscetti R, Raponi F, Ferri S, Colantoni A, Monarca D, Massantini R. Real-time monitoring of organic apple (var. Gala) during hot-air drying using near-infrared spectroscopy. Journal of Food Engineering. 2018 Apr 1;222:139-50.

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