



# The use of visible and near infrared spectroscopy to measure the relative degree of oxidation in white wine

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## Introduction

Excessive colour development in white wines is visually undesirable and generally indicates that the wine has become oxidised. A commonly used indicator of the relative degree of oxidation in bottles of a particular white wine is the measurement of absorbance at 420 nm (A420). Recent studies at the AWRI have shown that whilst the A420 alone is useful for predicting relative oxidation of white wine, other wavelengths might be important when comparing different wines. The aim of this study was to investigate the feasibility of using visible (VIS) and near infrared (NIR) spectroscopy to measure several parameters, other than A420, that might be useful as indicators of the relative degree of oxidation in white wine.

## Materials and methods

Samples from the AWRI Wine and Oxygen project were scanned in transmission mode (400 – 2500 nm) in a 1 mm path length cuvette using a FOSS *NIRSystems6500* monochromator instrument. Calibration equations were developed between reference and NIR data for the concentration of free and total sulfur dioxide (SO<sub>2</sub>), A420, CIELab parameters *L*, *a*, *b* and ascorbic acid using partial least squares regression (PLS) with cross validation using *The Unscrambler* software. Reference analysis were conducted using standard laboratory methods by the AWRI Analytical Service.

## Results and conclusions

Figure 1. Free sulfur dioxide calibration

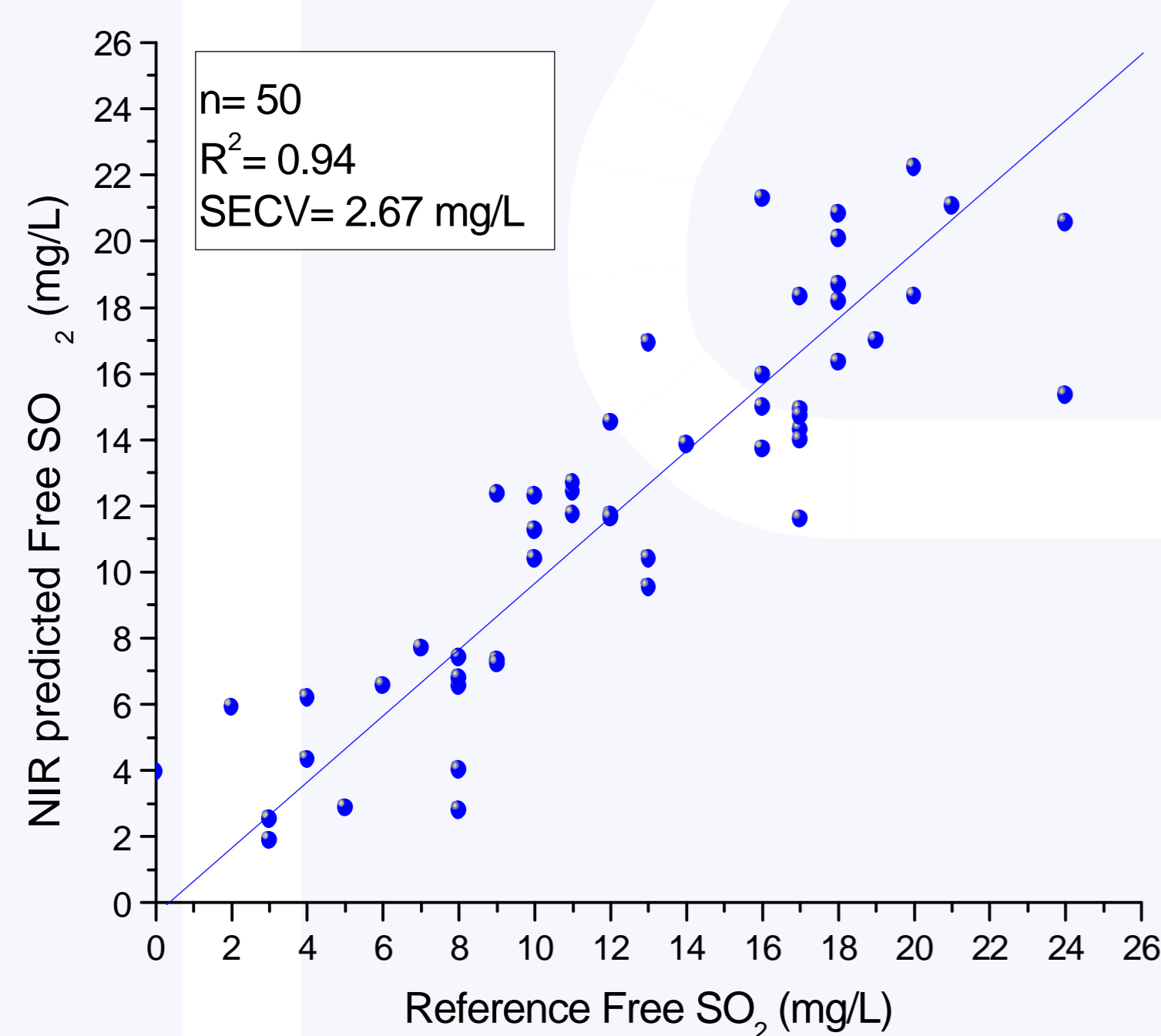


Figure 2. Total sulfur dioxide calibration

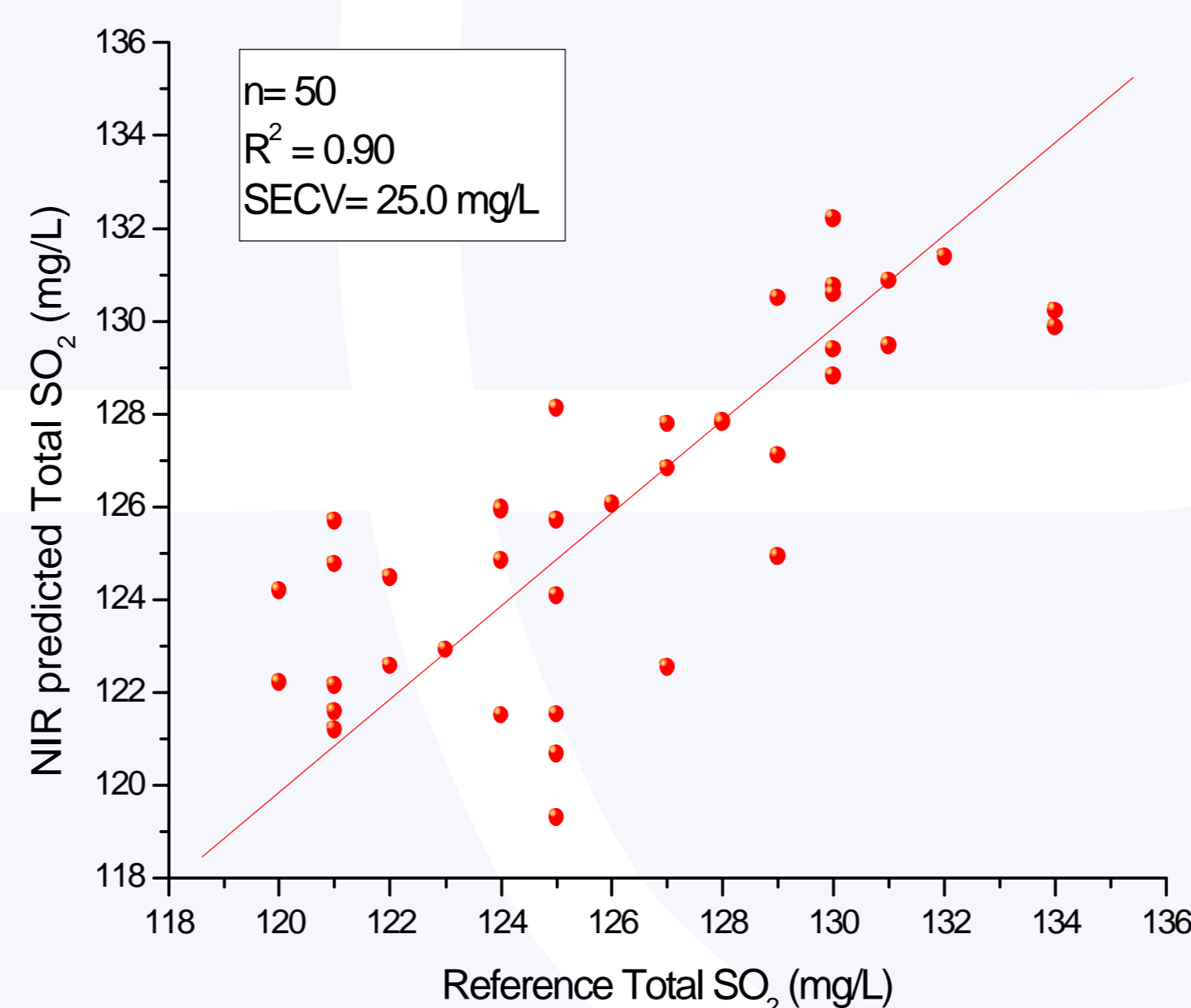


Figure 3. Ascorbic acid calibration

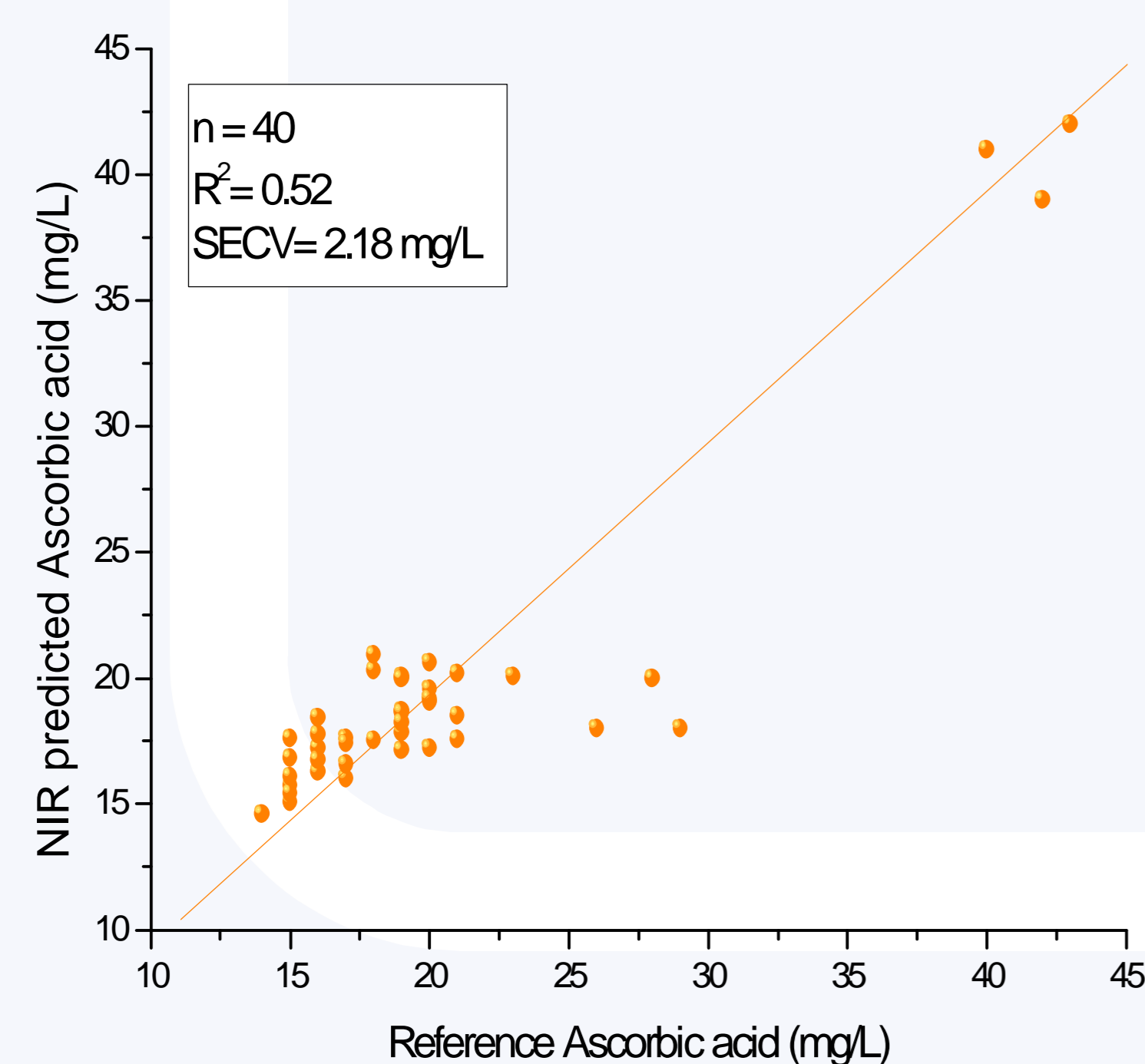
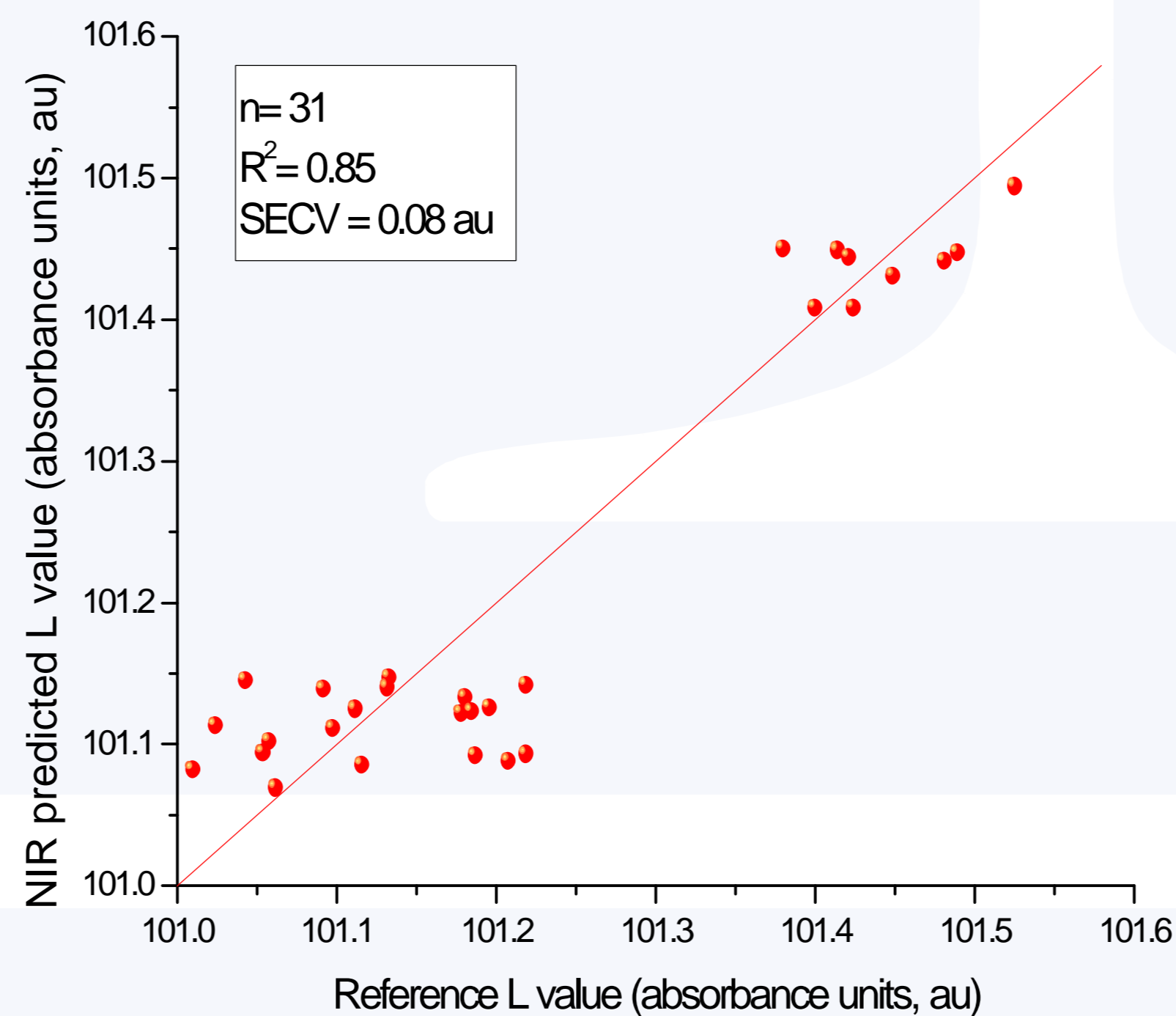


Figure 4. CIELab L-value calibration



- High coefficients of determination in calibration ( $R^2 > 0.70$ ) were obtained for free and total SO<sub>2</sub>, and CIELab L-value, but only a relatively low R<sup>2</sup> for ascorbic acid (Figures 1 to 4).

- These preliminary results suggest that NIR spectroscopy offers potential for use as a tool for the rapid prediction of parameters associated with, or indicative of, the relative degree of oxidation in white wines. The correlations between NIR data and reference data are likely to be due to collinear relationships (co-correlations) among chemical compounds in the wine matrix.

- Further studies are needed to confirm and validate the accuracy and robustness of the NIR models to measure these parameters in white wines.