

Josep Pons⁽¹⁾, Nerea Núñez^{(1)*}, Javier Saurina^(1,2), Oscar Núñez^(1,2)

⁽¹⁾ Department of Chemical Engineering and Analytical Chemistry, University of Barcelona, Martí i Franquès, 1-11, 08028 Barcelona, Spain.

⁽²⁾ Research Institute in Food Nutrition and Food Safety, University of Barcelona, Recinte Torribera, Av. Prat de la Riba 171, Edifici de Recerca (Gaudi), 08921, Santa Coloma de Gramenet, Barcelona, Spain.

INTRODUCTION

Tea (*Camellia sinensis*) is one of the most popular beverages, commonly consumed all over the world. Depending on the fermentation process, tea leaves can be categorized into three major groups: unfermented green tea, semifermented Oolong tea, and fully fermented black tea. The latter accounts for over 80% of worldwide production. The quality of tea products is determined by color, freshness, strength, and aroma. Phenolic and polyphenolic components contribute to the color and taste, whereas volatile components are directly related to the aroma. Unfortunately, food fraud is increasing globally. The widespread adulteration is the main concern for commercial functional tea extracts and tea-based nutraceuticals on the market. Especially for powdered extracts, the product quality of functional tea extracts varies highly on the market. The growing demand and interest in functional tea extracts are causing the proliferation of frauds that can seriously affect public health. Chicory, husk of pulses, and cereal starch are non-permitted materials typically employed as adulterants in tea extracts.

OBJECTIVE

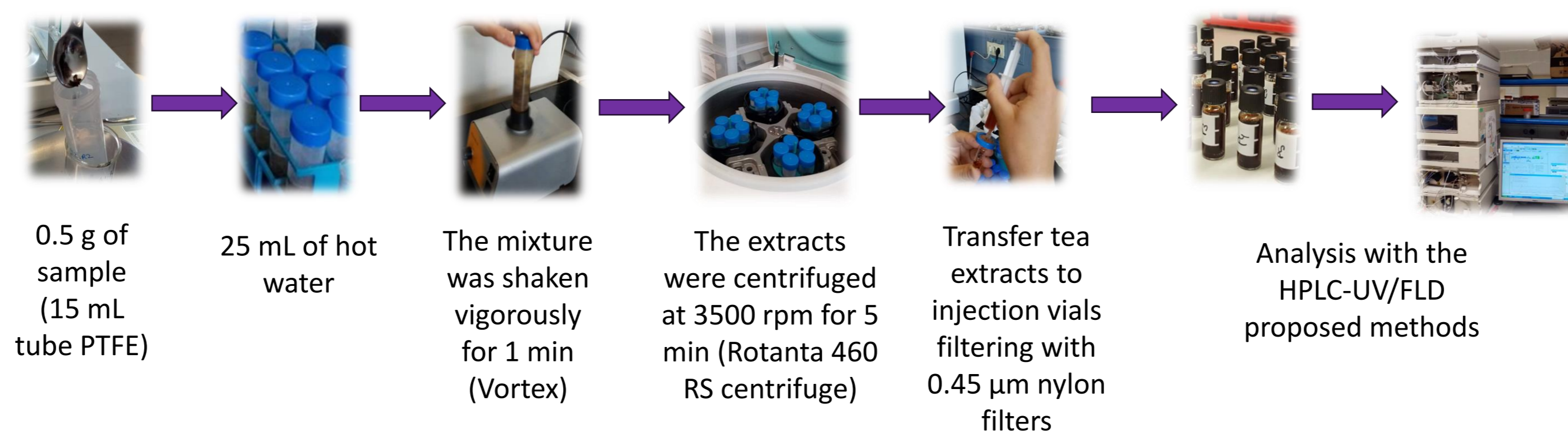
Development of non-targeted HPLC-UV and HPLC-FLD fingerprinting methods in combination with chemometrics to achieve the Characterization, Classification and Authentication of tea samples and chicory (possible tea adulterant) using partial least squares regression-discriminant analysis (PLS-DA) in order to try to prevent frauds in the future.

EXPERIMENTAL PROCESS

SAMPLES

Sample Class	Sample Type	Number of Samples
Tea	Black tea	35
	Green tea	20
	Oolong tea	10
	Red tea	12
	White tea	10
Chicory	Chicory	20

Sample treatment



➤ **Quality Control (QC):** Solution prepared with 50 µL of each coffee sample analyzed in order to evaluate the repeatability of the method and the robustness of the chemometric results

INSTRUMENTATION AND CONDITIONS

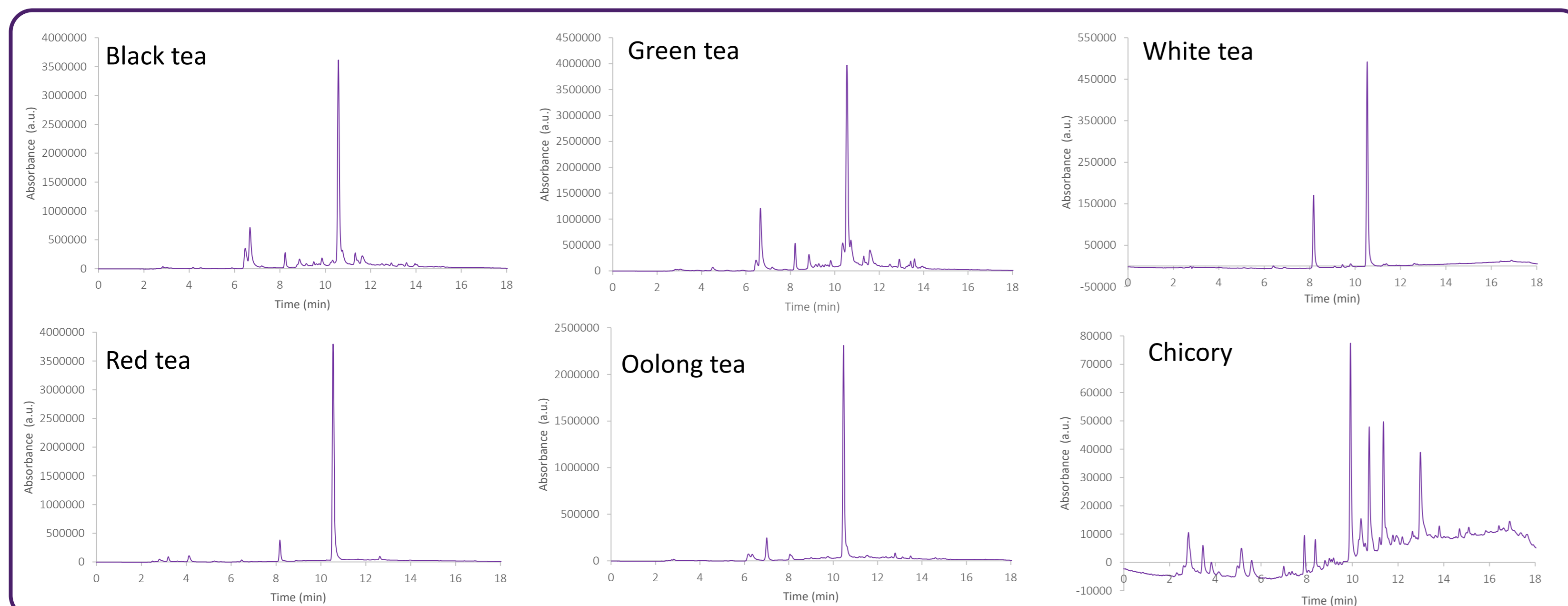
Non-targeted HPLC-UV-FLD fingerprinting method

Instrument	- Agilent 1100 Series HPLC instrument
Column	- Kinetex® C18 reverse phase column (100 × 4.6 mm i.d., 2.6 µm particle size)
Flow	- 0.4 mL/min
Injection volume	- 5 µL
Gradient	- Solvent A: water with 0.1% formic acid - Solvent B: Methanol
Acquisition	- UV at 280 nm - FL at 280 nm (excitation) and 350 nm (emission)

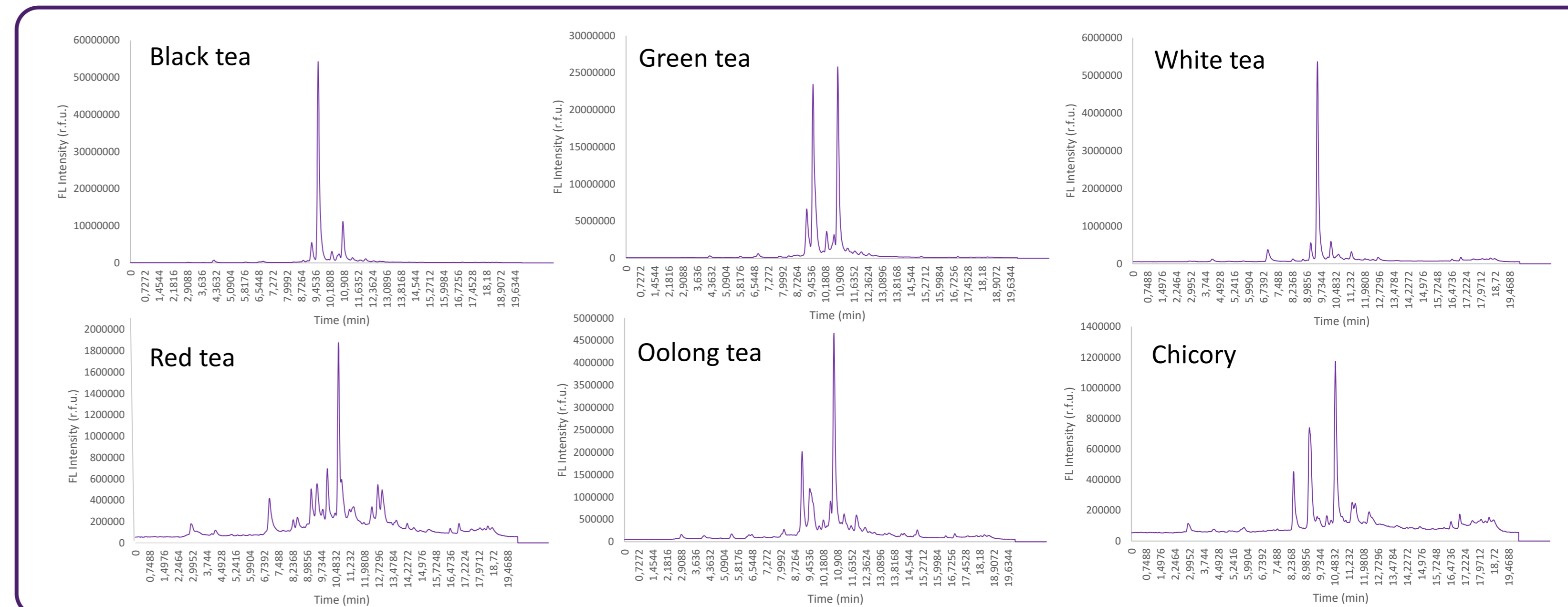
RESULTS

FINGERPRINTS

HPLC-UV FINGERPRINTS

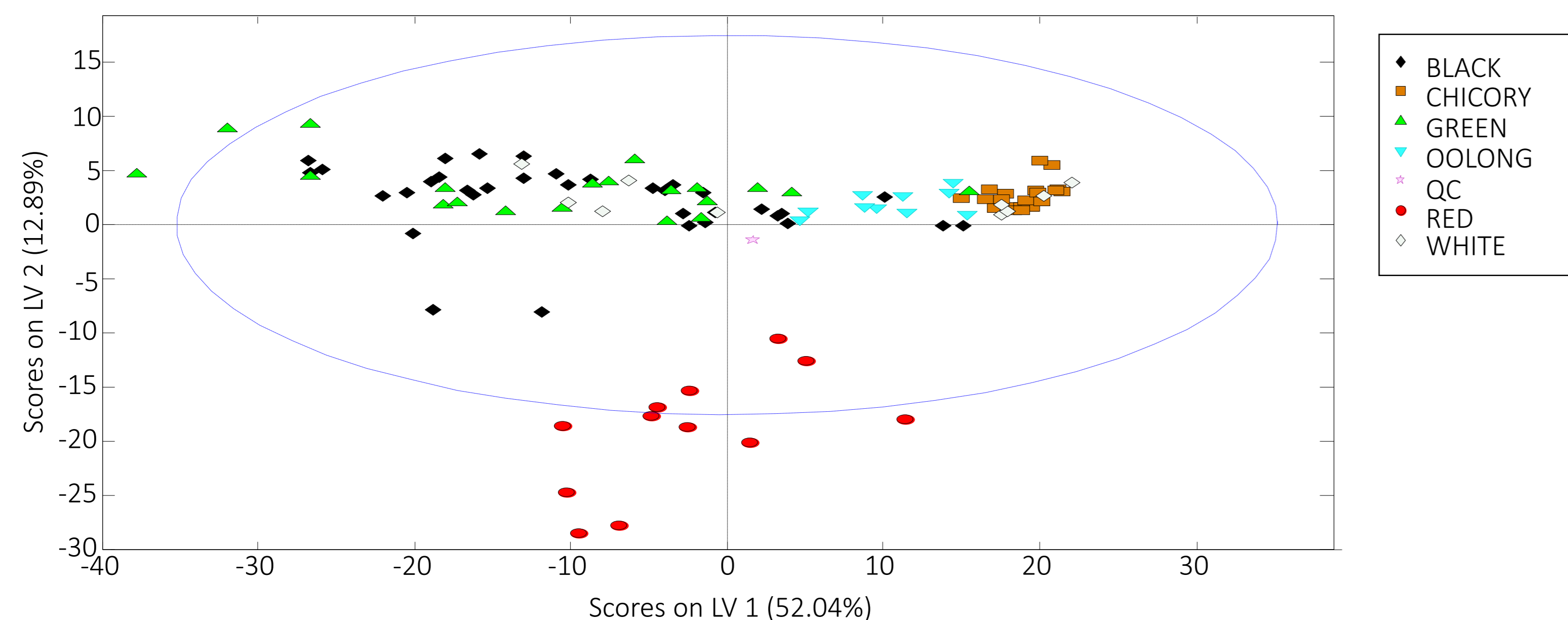


HPLC-FLD FINGERPRINTS

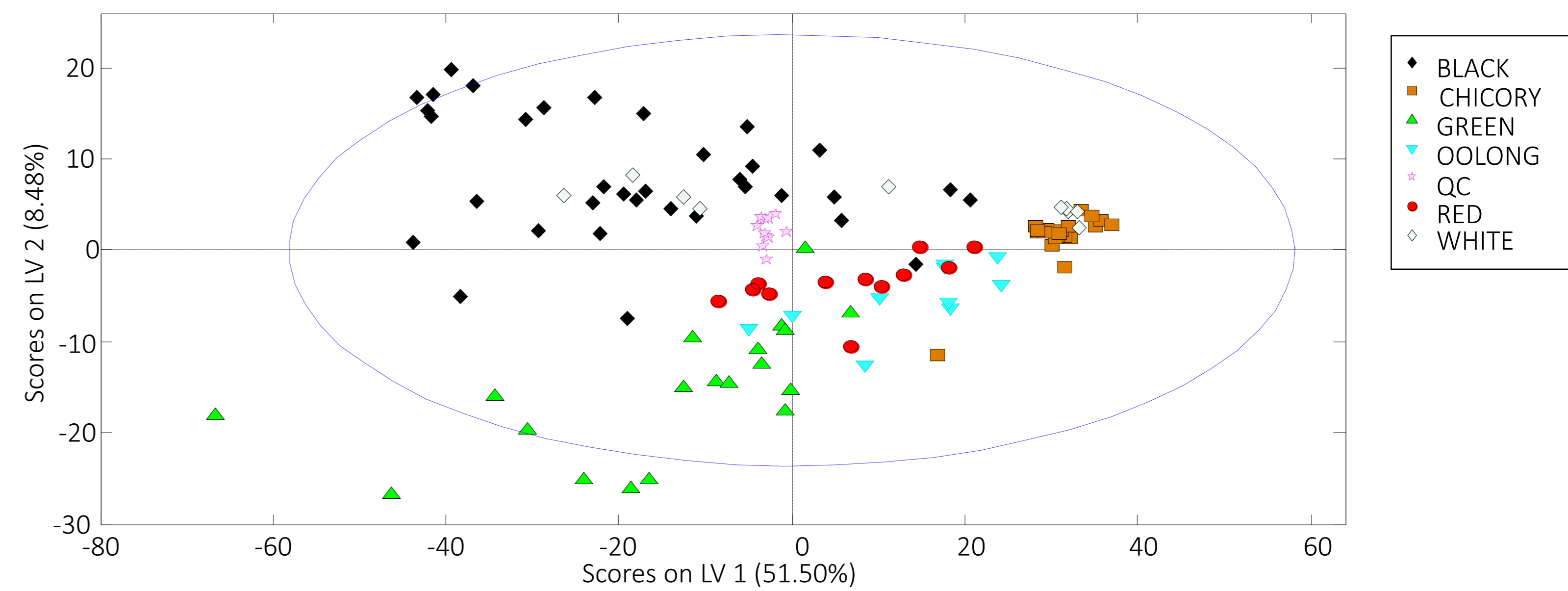


CHEMOMETRICS (PLS-DA)

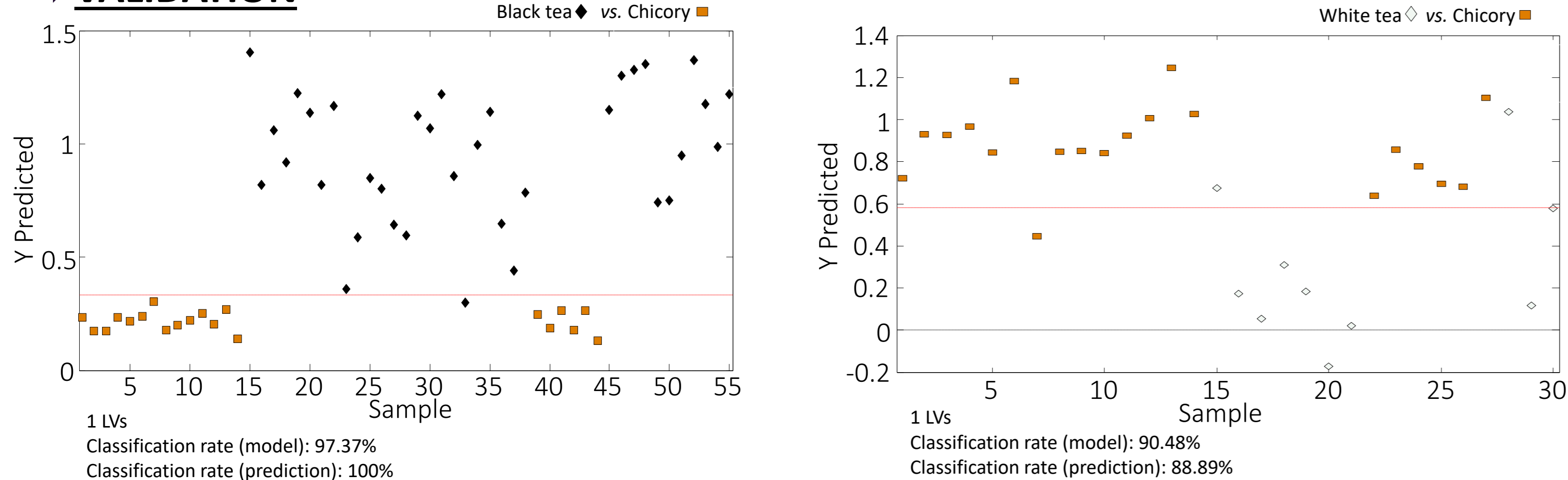
HPLC-UV



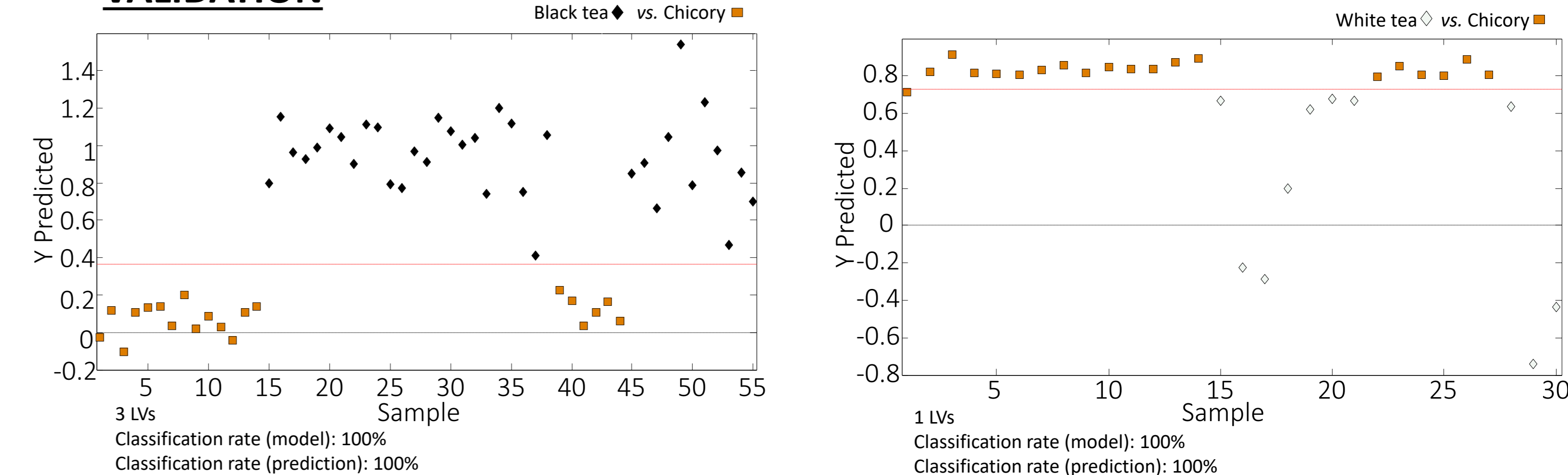
HPLC-FLD



VALIDATION



VALIDATION



CONCLUSIONS

- Simple HPLC-UV and HPLC-FLD fingerprinting methods were developed for the classification of teas and chicory.
- The proposed HPLC-UV and HPLC-FLD methods provided suitable chemical descriptors to address the characterization, classification and authentication of tea samples and chicory samples. The classification between different types of teas is not achieved but some trends are observed.
- The best results were obtained when HPLC-FLD fingerprinting method was employed. However, non-targeted UV fingerprinting methods also allowed an acceptable classification and authentication of the analyzed samples.
- Chemometric analysis of the obtained chemical descriptors allowed the classification of the analyzed tea samples with PLS classification rates above 90%.
- The proposed methods will be useful in the future in the field of tea authentication for the prevention of frauds.

REFERENCES

- [1] A.B. Sharangi, Medicinal and therapeutic potentialities of tea (*Camellia sinensis* L.) – a review, 42 (2009) 529 - 535

ACKNOWLEDGEMENTS

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