Multivariate chemometric analysis reveals discriminant compounds in *Lupinus albus* L. cultivars from different ecotypes

Daiana Almeida[1,2*], Nathalie Harzic[4], Valérie Gagnaire[6], Manuel Ayuso[1,2,3], Ingrid Aguiló-Aguayo[5], Lillian Barros[1,2]

[1]Centro de Investigação de Montanha, Instituto Politécnico de Bragança, Bragança, Portugal;
[2]Laboratório Associado para a Sustentabilidade e Tecnologia em Regiões de Montanha (SusTEC), Instituto Politécnico de Bragança, Bragança, Portugal;
[3]Research Group on Plant Biology under Mediterranean Conditions, Universitat de les Illes Balears (UIB)/Instituto de Investigaciones Agroambientales y de Economía del Agua (INAGEA) Palma, Spain
[4]Cérience, F-86600 Saint Sauvant, France.
[5]Postharvest Programme, Institute of Agrifood Research and Technology (IRTA), Parc Agrobiotech Lleida, Parc de Gardeny, Edifici Fruitcentre, 25003 Lleida, Spain
[6] INRAE Institut Agro, UMR Science et Technologie du Lait et de l'OEuf, F-35000 Rennes, France
*daiana@ipb.pt

INTRODUCTION

Legumes are essential for human and animal nutrition, supporting sustainable agriculture by fixing atmospheric nitrogen and enhancing soil fertility [1]. However, climate change is expected to worsen the impact of abiotic stresses, affecting crop productivity. Crop diversification is one of the goals reinforced by common European agricultural policies to achieve greater sustainability, production, profitability, and climate change mitigation. Minor crops such as lupins have great historical and cultural importance at the regional level. They are well-suited to the climatic and soil conditions of Mediterranean regions, demonstrating higher tolerance to abiotic stresses compared to other legumes [2]. In addition, this species has spring and winter ecotypes, allowing it to yield and be used as a rotation crop year-round. Therefore, this research aims to analyze the chemical composition of different *Lupinus albus* cultivars using a multivariate chemometric approach. This will help identify new agronomic or breeding interest traits for farmers and increase these cultivars' knowledge.

MATERIAL & METHODS

Nutritional profile of the lupin kernels was analysed following the official AOAC methodology. **Soluble sugars** were determined using a HPLC system coupled to RI. **Fatty acid** analysis was performed via GC-FID. **Tocopherols** were analysed by HPLC coupled to a fluorescence detector. Finally, **phenolic compounds** determination was performed through HPLC-DAD-ESI/MS^n.

Lupinus albus	
Cultivar	**Ecotype**
angus	Winter
magnus	
ulysse	
orus	
feodora	Spring
sulimo	
figaro	
energy	

RESULTS

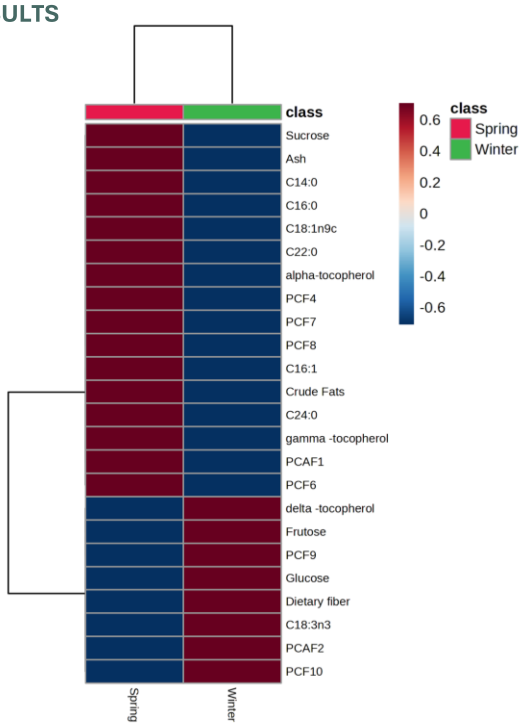

Figure 1. Heatmap of significant correlations between ecotypes and chemical composition

The winter ecotype cultivars presented a higher concentration of carbohydrates, such as fructose, glucose and fibres. The α-Linolenic acid was the only fatty acid characteristic of the winter ecotype cultivars (Figure 1). A PLS-DA (Figure 2) was performed to better understand which compounds are the most differential between samples. The generated model was able to explain 47.6% of the total variability and showed two well-separated clusters between the two ecotypes. The most discriminant compounds (based in the loadings) were found to be arachidic and docosanoic fatty acids (C20:0 and 20:1), and the phenolic compounds PCF4, PCF7 and PCF8 (apigenins derivates), which were present in higher concentrations in the spring ecotypes.

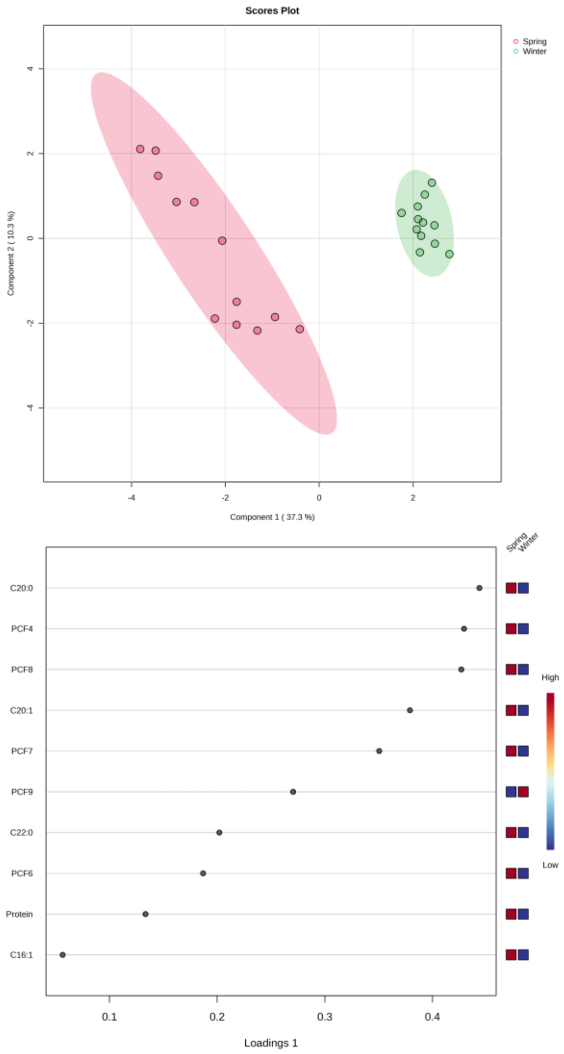

Figure 2. Score and loading plot from PLS-DA analysis of different ecotypes.

CONCLUSION

The chemical composition studied differs between the different lupin cultivars, but the discriminant analysis allowed grouping them by ecotype. Winter ecotype cultivars were more similar to those with spring ecotypes. This preliminary study allowed for the chemical characterization of eight cultivars of this species and an understanding of the specific traits exhibited by each cultivar and ecotype. Further studies will be necessary to determine which traits are more interesting for cultivation and which are more attractive for marketing their kernels.

References

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