Impact of Latitude and Environmental Conditions on the Tocopherol and Phenolic Content of Sea Buckthorn Leaves

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FOOD DEVELOPMENT

Introduction

Leaves of sea buckthorn (*Hippophaë rhamnoides*) are known to contain many health-promoting bioactive compounds such as phenolics and tocopherols. The concentration of these compounds is influenced by latitude, harvest time, genotype, and environmental conditions[1]. This study aims to investigate the impact of latitude and environmental conditions on the tocopherol and phenolic content of sea buckthorn leaves of two Finnish cultivars of Terhi and Tytti from Kittilä (North) and Kakskerta and Paattinen (South) analyzed using UHPLC-FLD and HPLC-DAD, respectively.

Materials and Methods

North - Kittilä

Kakskerta and Paatinen Finland

Map of Finland

Tocopherol extraction and analysis

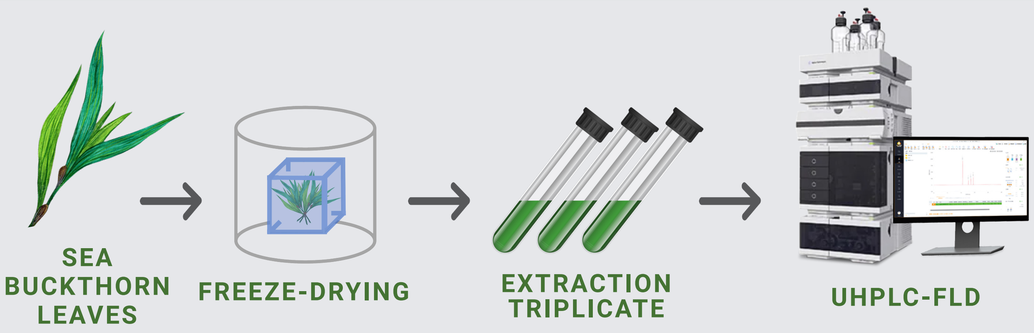

Figure 1. Tocopherol extraction steps and analysis
Extraction solvents - chloroform, methanol

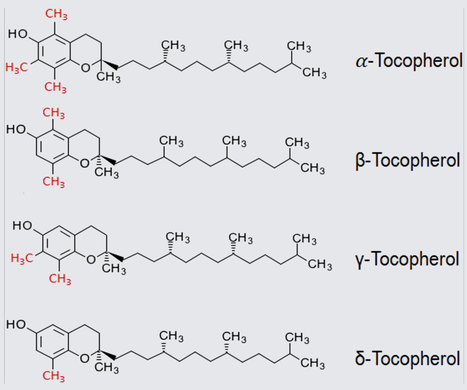

Figure 2. Structure of tocopherols

Phenolic extraction and analysis

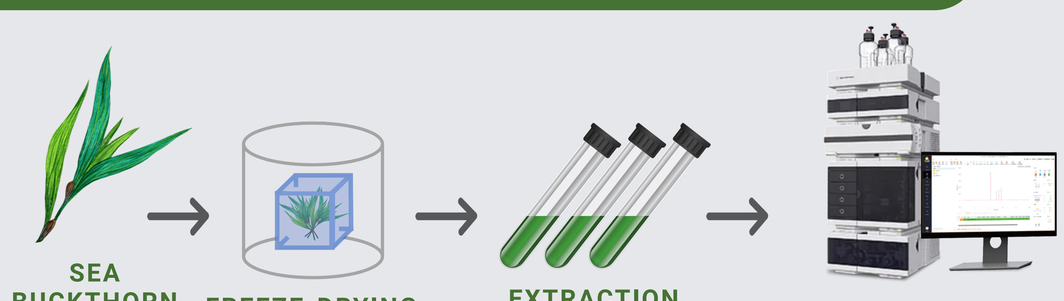

Figure 3. Phenolics extraction and analysis
Extraction solvents - 70% ethanol (1:2.5w/v)

1. Kortesniemi, M., Sinkkonen, J., Yang, B., & Kallio, H. (2017). NMR metabolomics demonstrates phenotypic plasticity of sea buckthorn (Hippophaë rhamnoides) berries with respect to growth conditions in Finland and Canada. Food Chemistry, 219, 139–147. https://doi.org/10.1016/j.foodchem.2016.09.125

2. Ye Tian, Anna Puganen, Hanna-Leena Alakomi, Aleksi Uusitupa, Maria Saarela, Baoru Yang, Antioxidative and antibacterial activities of aqueous ethanol extracts of berries, leaves, and branches of berry plants, Food Research International, Volume 106,2018, Pages 291-303, ISSN 0963-9969,https://doi.org/10.1016/j.foodres.2017.12.071

Results and discussion

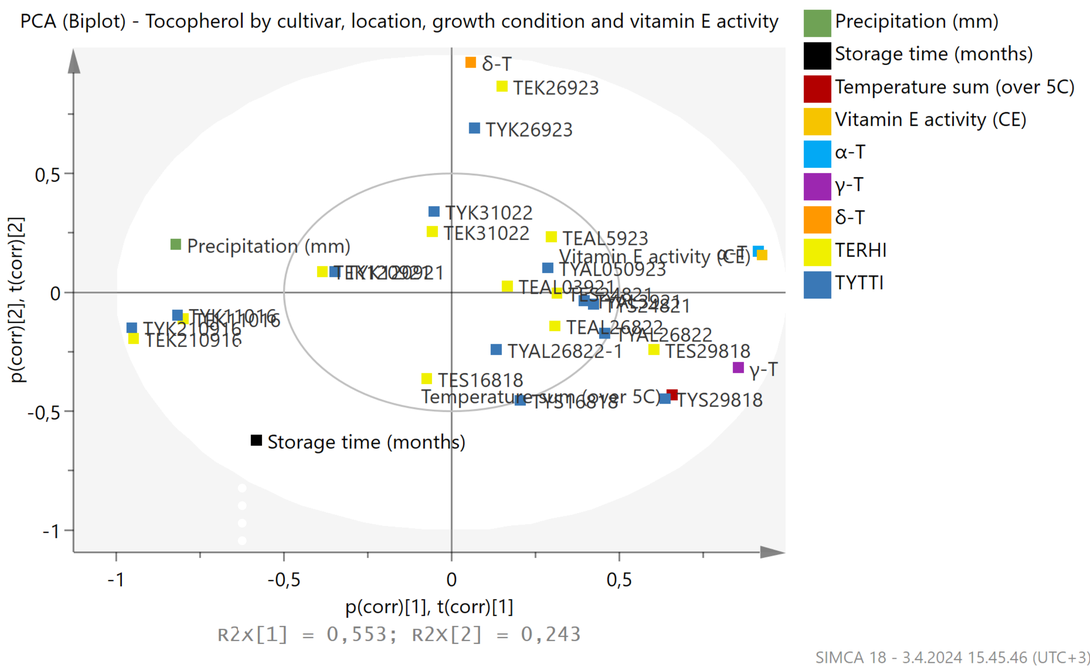

Figure 4. Principal component analysis (PCA model)

Tocopherols were lower in northern samples than in southern ones.

A positive correlation between tocopherols and higher temperatures in the south.

In the north, a positive link between precipitation and lower tocopherol levels.

Storage time showed a positive correlation with tocopherol levels in the northern samples and negative, with southern samples being fresher and having higher concentrations.

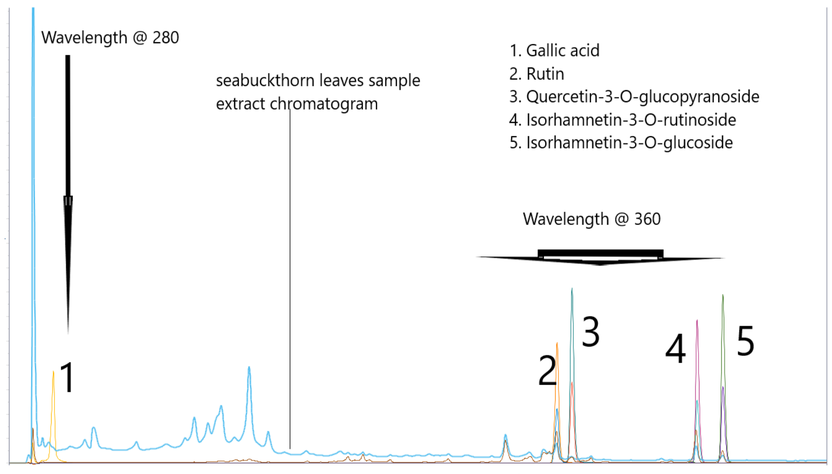

Figure 5. Exemplary chromatogram for phenolics[2] acquired at 280nm and 360nm respectively.

Conclusion

The findings from the study highlight the effect of geographical location, climatic conditions, genotype and post harvest handling of sea buckthorn leaves. Further study on the effect of soil type and other weather variables will beam more light to the study.