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Quality characterization of products to boost their export potential

Centria University of Applied Sciences (FIN)
University of Latvia
Lithuanian Research Centre for Agriculture and Forestry (LAMMC)
Kaunas University of Technology

NovelBaltic webinar June 10th 2020: Exporting Nordic Natural Products to Asian Markets

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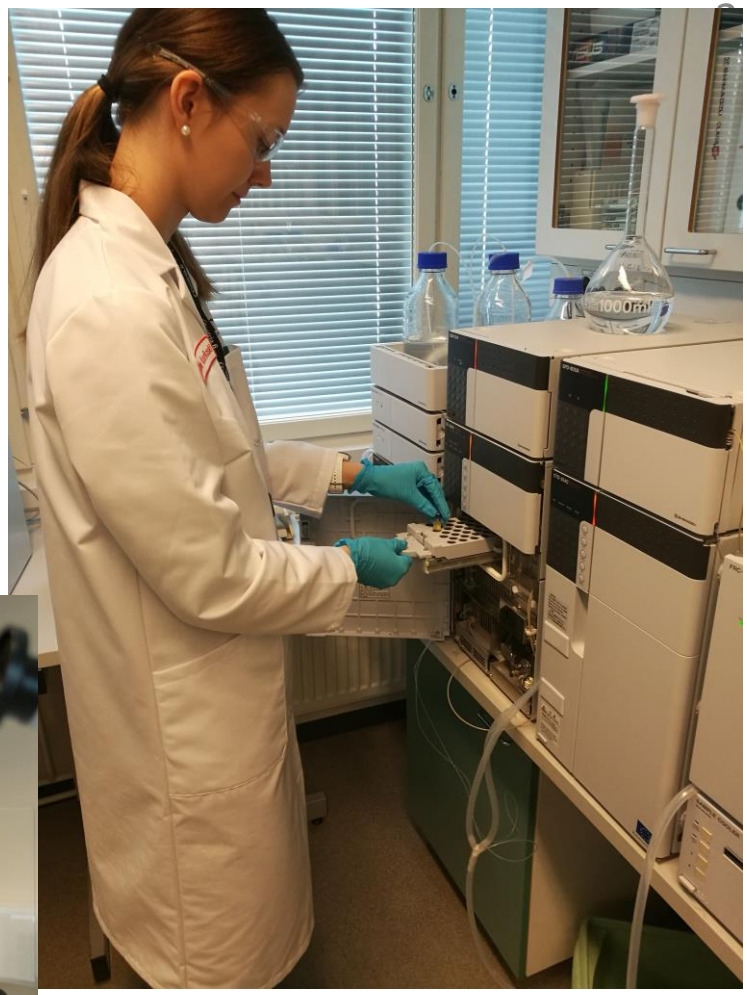

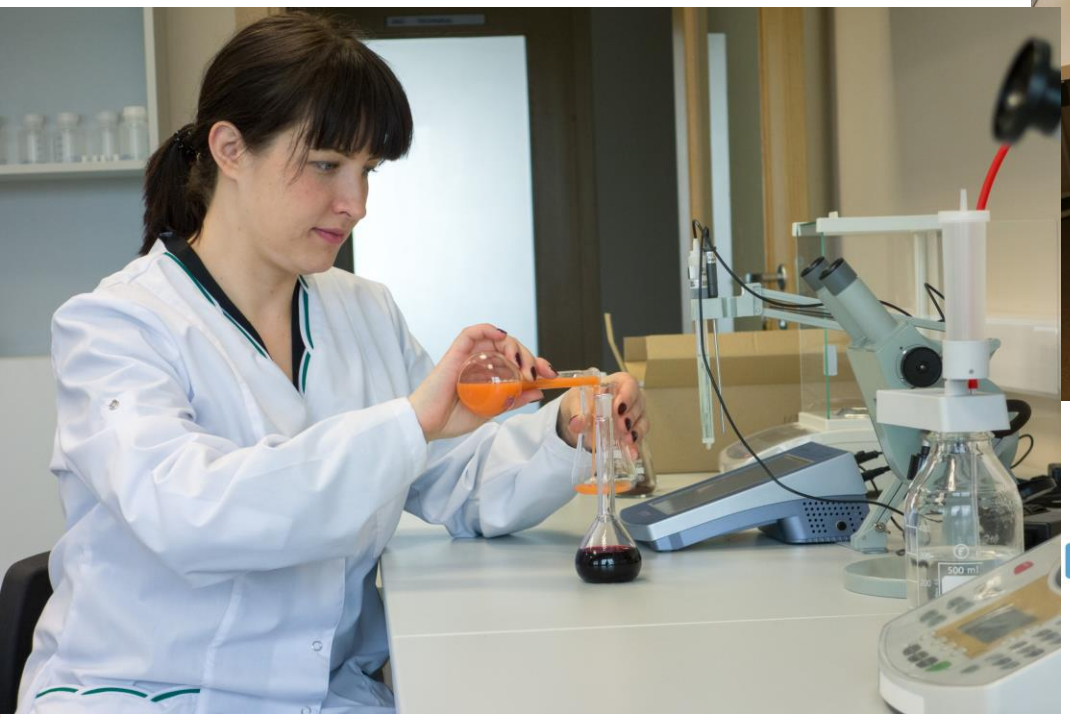

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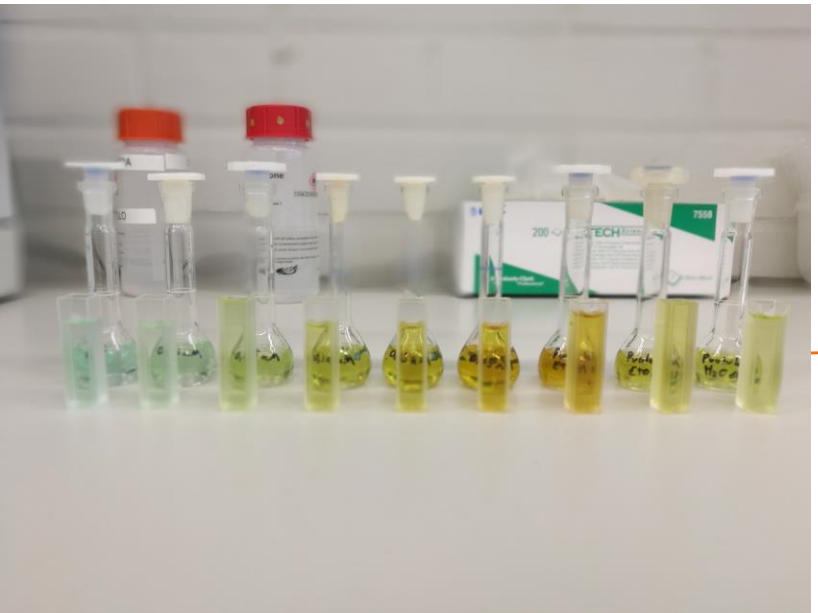
Challenges

- Regulations and quality control are an ongoing challenge (J.Kellog, 2018)
  - There are several standards/guidelines: e.g. pharmacopeias (US, EU, British, French, Japanese, Korean)
- Botanical natural products are complex mixtures
  - Composition differs depending e.g. on genetics, cultivation conditions, geographic region, processing methods
  - Most methods require expensive equipment and plenty of work(pretreatments, extractions, characterization)
- THE NEED:

  →Methods and expression of results should be standardized globally



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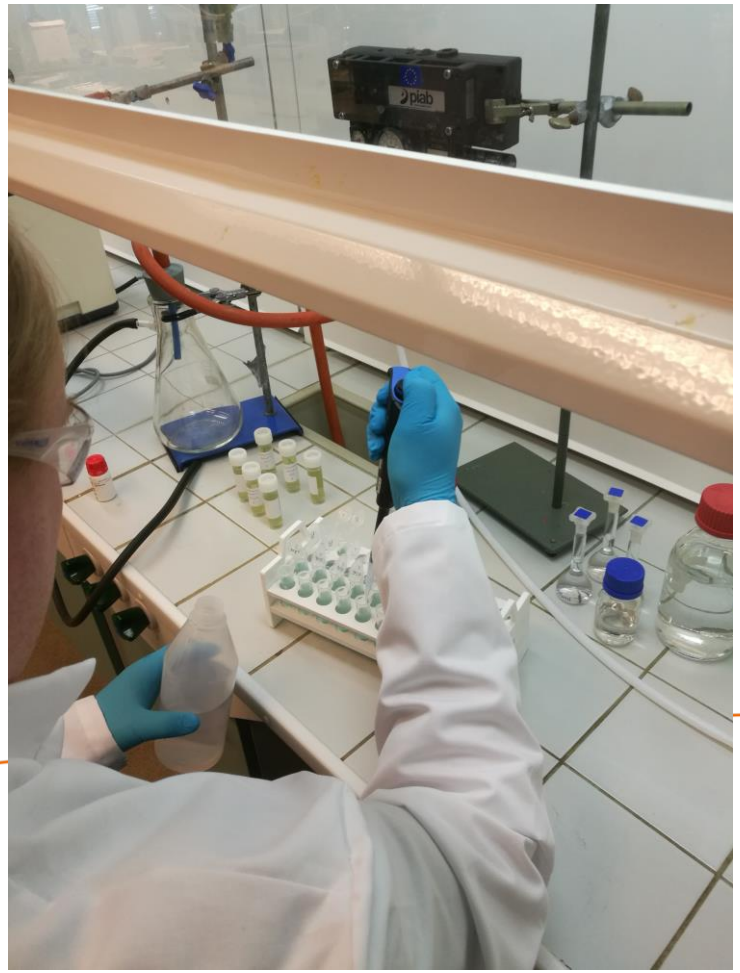
PREMIUM quality

- There is a growing need for safe and healthy products, e.g. health food, food supplements, natural cosmetics→ businesses growing fast
- There are also fake products on the market



→ it is important to show proof of quality

- To avoid adulteration
- To show the origin of the raw material/product
- To get **PREMIUM** price for high quality products e.g. higher concentrations of valuable ingredients in products
- No impurities/pesticides

Faster/cheaper methods

- The aim is to develop faster/cheaper methods for enterprises, e.g.:
  - Total phenolic concentration
    - Flavonoids
    - anthocyanins
  - Traditional *antioxidant* capacity methods /anti-radical activity (FRAP, CUPRAC, DPPH, ABTS, ORAC)
    - A new portable device from eBQChem

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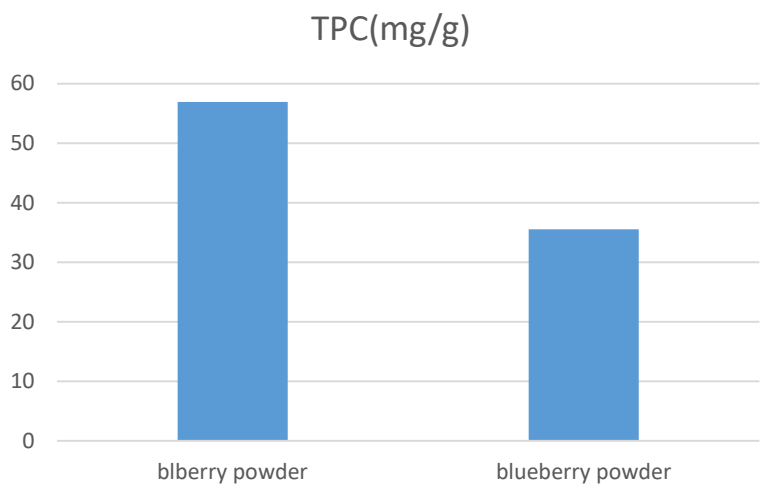
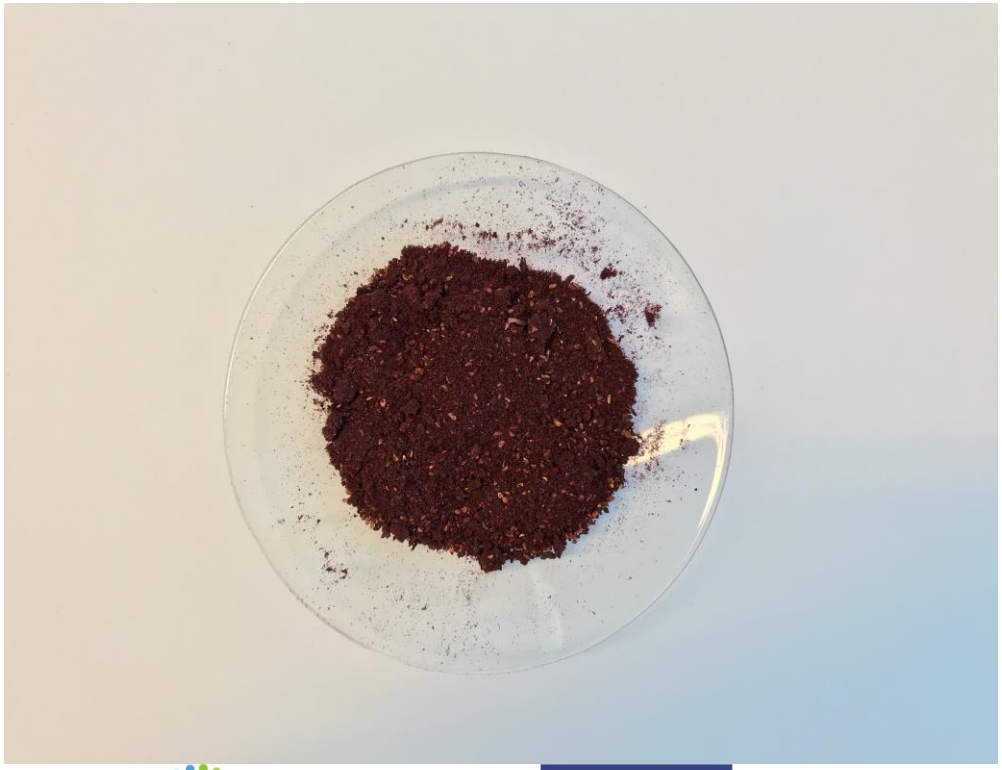
Examples of analysis results

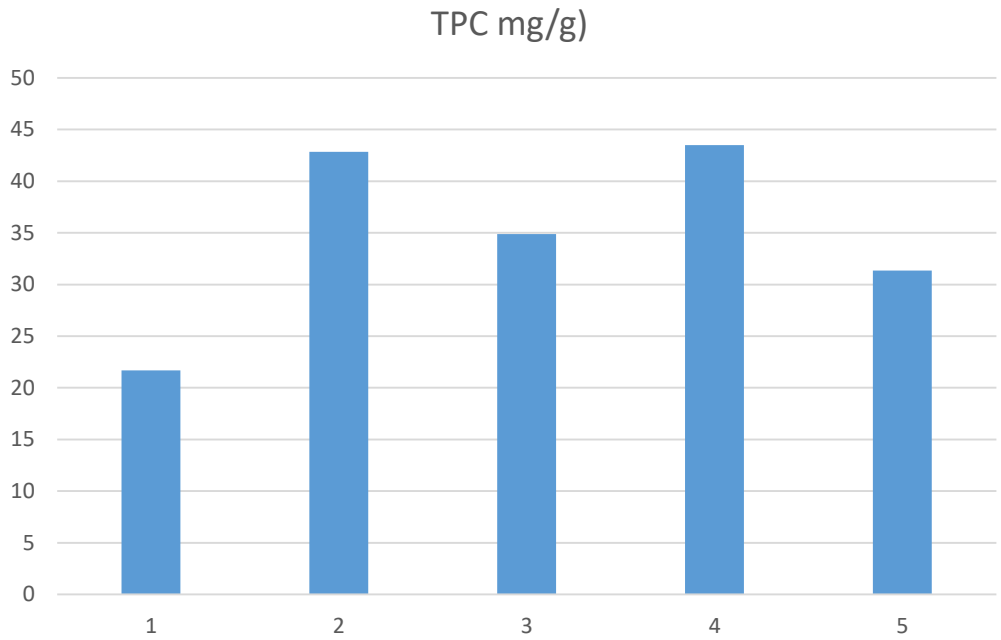
- Is this bilberry(wild) or blueberry (cultivated) powder?
  - Analyze total phenolics concentration or antioxidant capacity
  - Analyze anthocyanin profile





Examples of analysis results

5 different bilberry/blueberry powders: the concentration of total phenolics varies depending on species, treatment methods, region



Examples of analysis results

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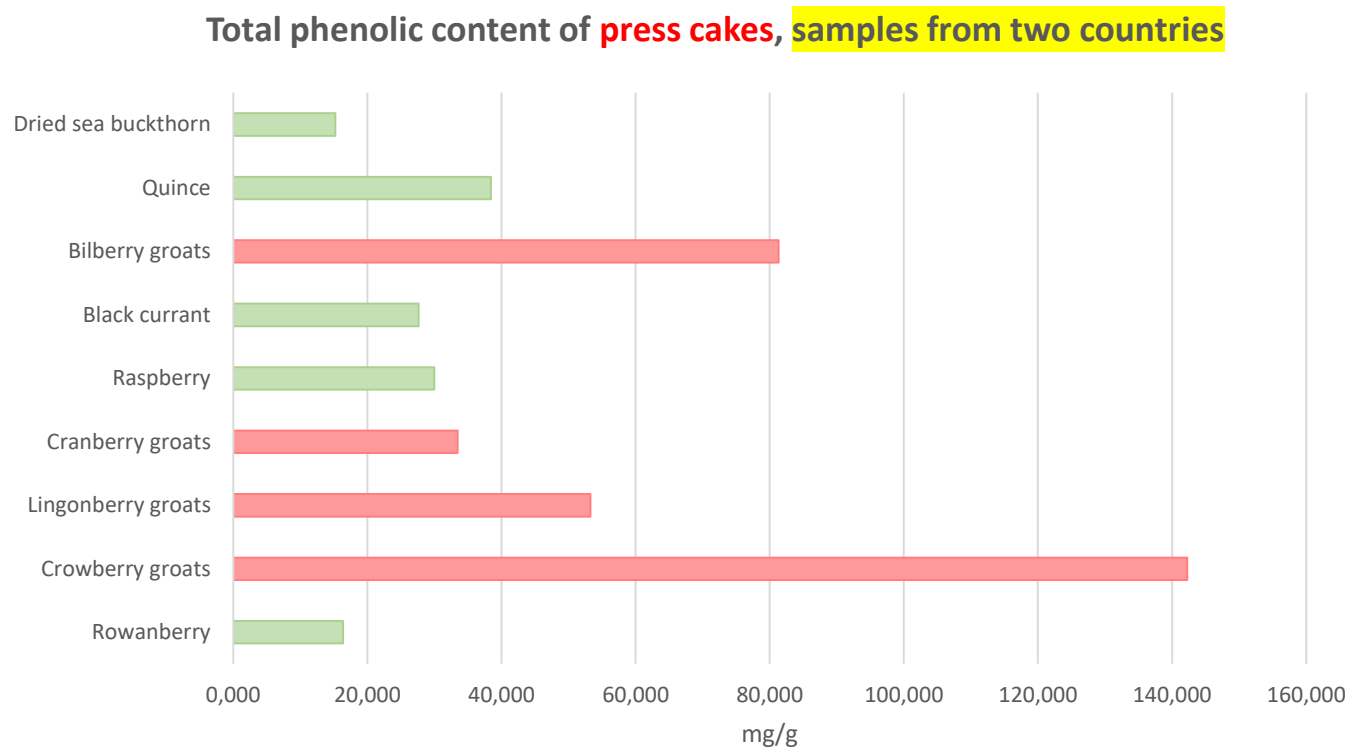

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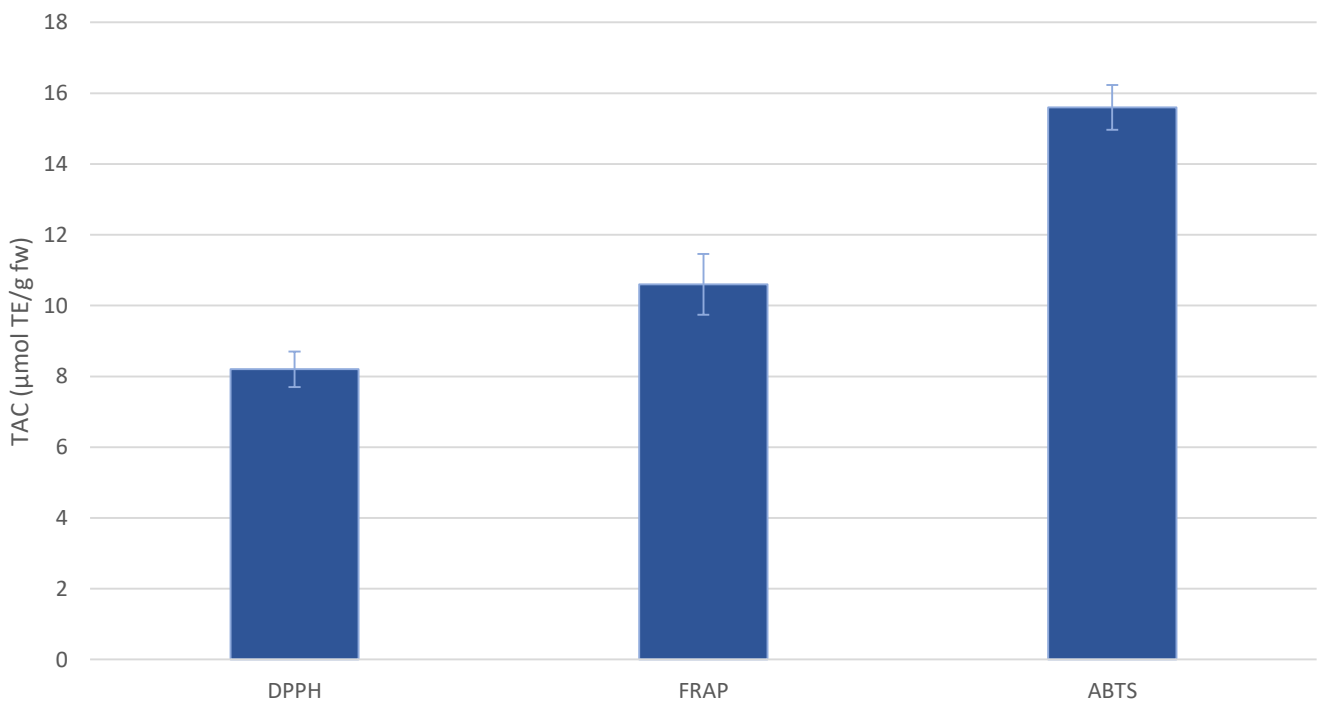
Examples of analysis results

Total **antioxidant capacity** for rowanberry **with different methods**



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Examples of analysis results

Quality characterization of seed and plant oils

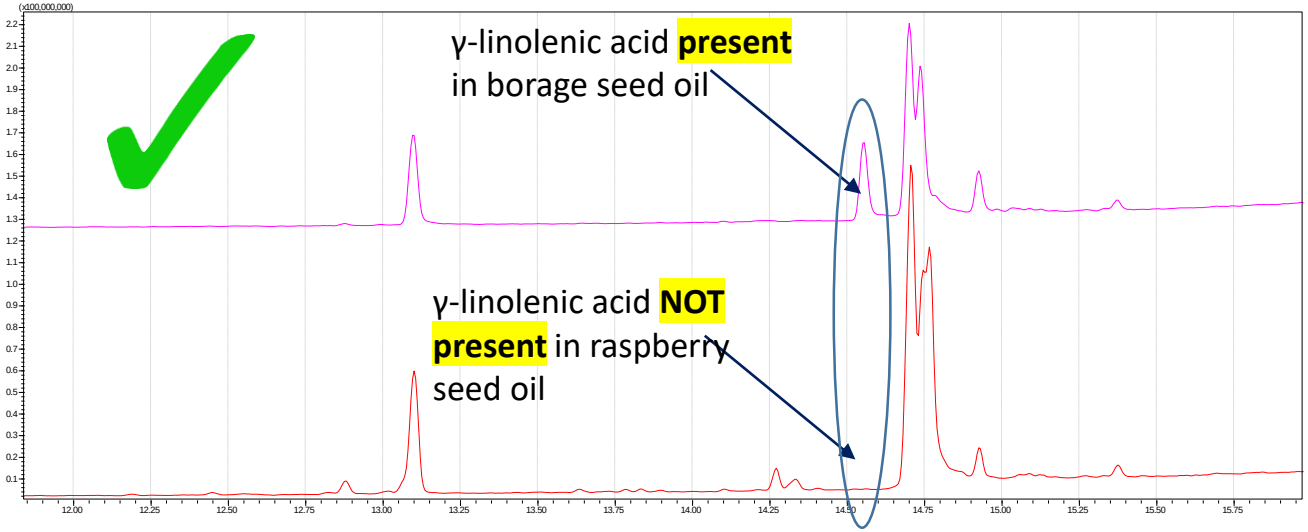
- Raspberry seed oil

	C, mg/g oil	C, %
ω-3	20.15	2.02
ω-7	0.70	0.07
ω-6	23.48	2.35
ω-9	9.58	0.96
Saturated	7.66	0.77
Total	61.58	6.16

- Borage (star

	C, mg/g oil	C, %
ω-3	0.00	0.00
ω-7	0.00	0.00
ω-6	22.13	2.21
ω-9	11.09	1.11
Saturated	6.95	0.69
Total	40.16	4.02

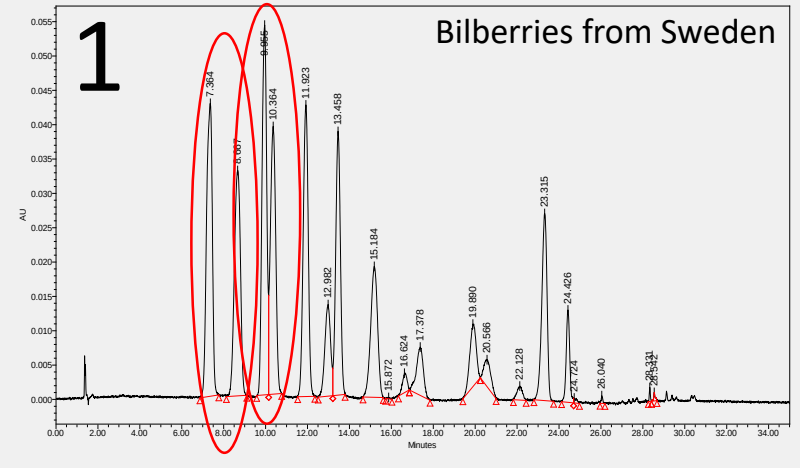
- Analysis of cosmetic ingredients to confirm the **omega fatty acid** composition using GC/MS
- Identification of possible adulteration and mislabeling of products simultaneously providing quantitative analysis for compounds of interest.

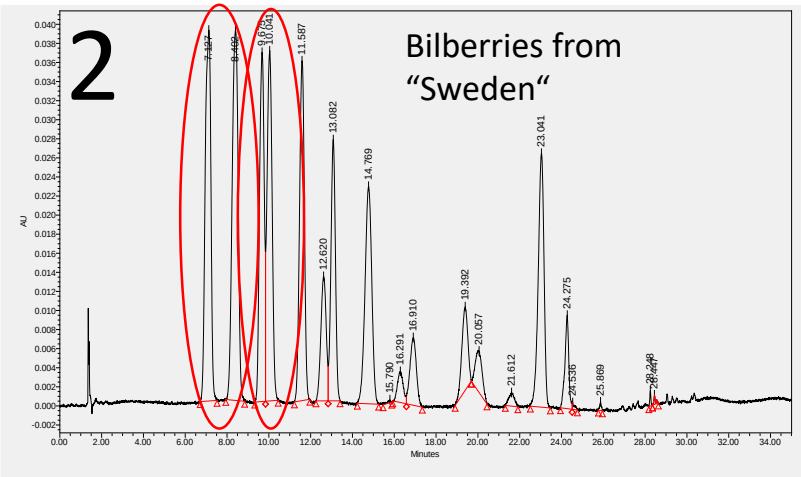


Examples of analysis results

Anthocyanin profiles in bilberries with different origin

- Two bilberry samples were tested (UPLC-PDA)
  1. Known, traceable origin – Sweden
  2. Origin provided by re-seller- Sweden
- Chromatograms reveal, that the **ratios** between identified anthocyanins in known sample (1) do not correspond with the sample (2)
- Berry sample (2) has different origin than claimed OR the sample has been adulterated with other species of berries to increase concentration of specific anthocyanins





Examples of analysis results

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Importance of extraction in quality assessment

- Studied material – press residues of American cranberry
- Compounds of interest – procyanidins
- Optimisation of extraction done using Response Surface Methodology (RSM) approach

- Optimization of extraction provides higher (>40%) extraction yields allowing more accurate and repeatable measurements
- Same extraction methods must be used by the buyer and supplier when evaluating raw material/product due to the differences caused by the used extraction process

Initially used extraction solvent

Optimized extraction solvent

	Procyanidins	Polyphenols	ABTS	DPPH	FRAP
70% ethanol	0.42	0.61	27.8	1.66	3.64
70% acetone + 0.5% acetic acid	0.74	1.0	128.2	3.42	15.06

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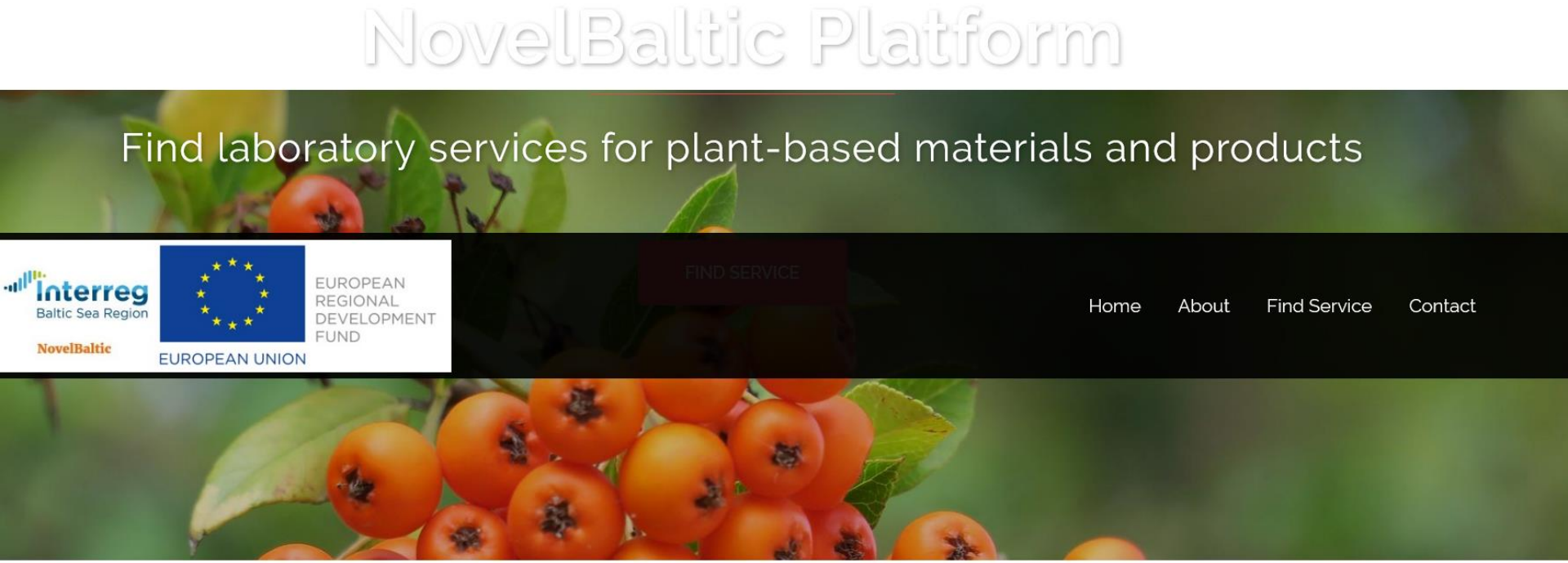

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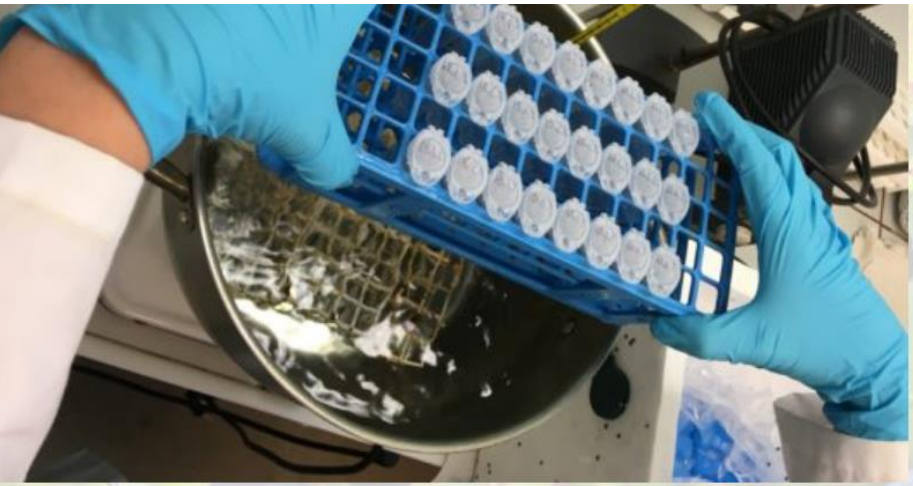

PROVE QUALITY

PROVE AUTHENTICITY

BERRY JUICE

BILBERRY

BIRCH SAP

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Select the analyses you're interested in by checking the box ☑

You can get more information about the analysis by clicking the INFO button.

★★★ *= analysis is very useful*

INFO ☐ Anthocyanin profile

INFO ☐ Antioxidant capacity

INFO ☐ Individual anthocyanidins

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INFO ☐ Sugars

INFO ☐ Total anthocyanins

INFO ☐ Total carbohydrates

INFO ☐ Total polyphenols

INFO ☐ Total proanthocyanidins

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Antioxidant capacity

- Natural antioxidants are polyphenolic compounds, which inhibit or delay oxidation of other molecules. In animal organisms, they prevent oxidation of cell structures and therefore have positive impact on health. In food industry, antioxidants can be applied to make shelf life of groceries longer. Measuring antioxidant capacity gives an estimate of the antioxidant content of the biomass.

Sources:

Y. S. Velioglu, G. Mazza, L. Gao and B. D. Oomah. "*Antioxidant Activity and Total Phenolics in Selected Fruits, Vegetables, and Grain Products*." Journal of Agricultural and Food Chemistry, no. 46 (1998): 4113 – 4117.
Dejian Huang, Boxin Ou and Ronald L. Prior. "*The Chemistry behind Antioxidant Capacity Assays*." Journal of Agricultural and Food Chemistry, no. 53 (2005): 1841 – 1856.

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