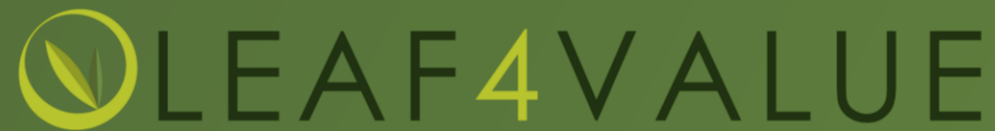




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Accelerating circular bio-based solutions  
integration in European rural areas

# Valorising side streams from olive production

Jakub Sandak, Ljubljana 26.10.2023

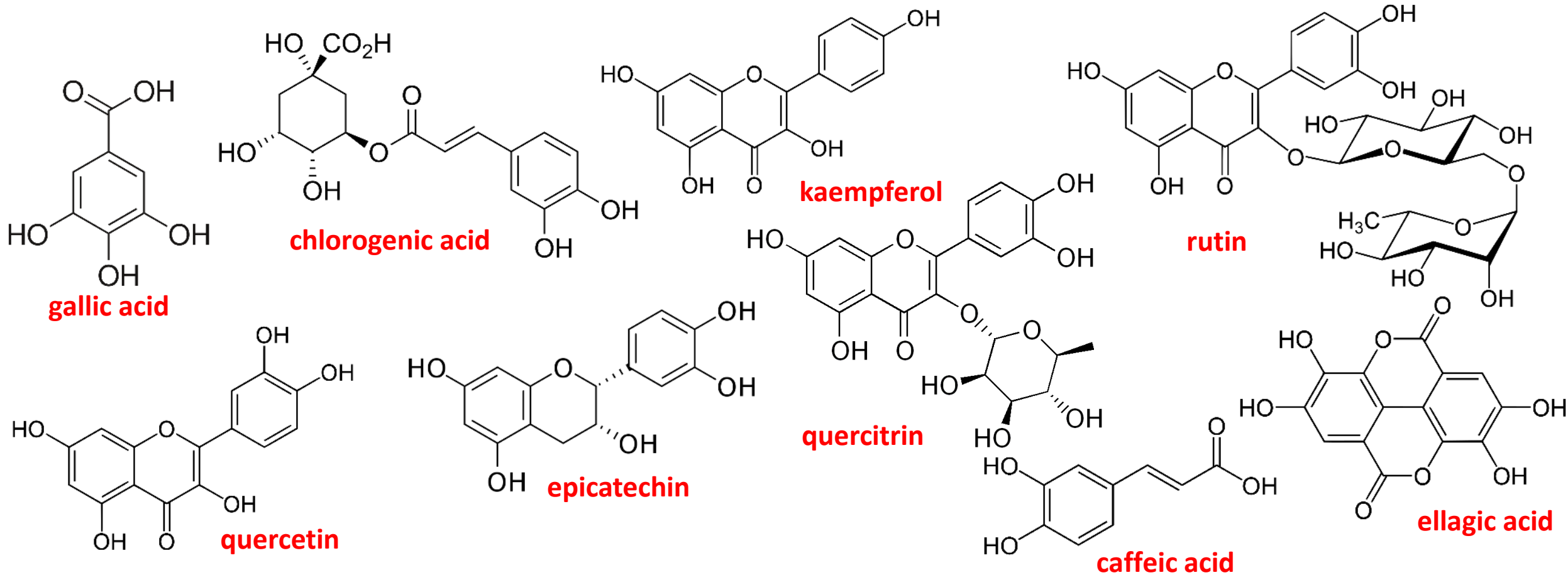




## olive leaves: potential

- **4'500'000 ton of olive leaves** are produced annually in the world by the olive oil industry
  - key industry in **southern Europe and along the Mediterranean coast** (Spain, Italy, Greece, Portugal, Slovenia, among others).
  - this recalcitrant biomass contains **high added value bioactive compounds** (polyphenols, triterpenoids, essential oils, lipids, lignocellulose) with high-market potential (food, feed, chemical, nutraceutical, cosmetic and pharmaceutical).
-

# some of chemical components that can be extracted from olive leaves



but concentration may vary due to location, season, species, tree...





# olive leaves: sourcing



**pruning (Spring)**



**harvesting (Autumn)**





# olive leaves: problem

- it represents a **problem for both the farmers and the whole olive oil industry**, who need to remove it from the fields and the olive oil mills
  - this biomass is nowadays **underexploited**, being burnt in the fields, given to the cattle or, in some cases, burned to produce energy
  - only a very reduced portion of olive leaves (about 10kton, which represents 0,2% of the global amount) is used as starting material for production of **olive leaf extracts**
  - >1000 kton of bioactive compounds (polyphenols, triterpenoids, nonpolar fraction, etc.), >1000 kton of cellulose and >1500 kton of lignin are **being burnt every year**
-









# OLEAF4VALUE

- is a three-year project that will develop a **complete valorization system for the olive leaf**
  - The goal of OLEAF4VALUE is to set up the basis of **six smart value chains** based on a newly developed 4.0 concept:
    - Smart Dynamic Multi-Valorisation-Route Biorefinery (**SAMBIO**) for the cascade valorisation of the olive leaf biomass
    - according to its initial composition (Biomass Suitability Index – **BSI**)
-



# Biomass Suitability Index (BSI)

- is a numerical indicator (0 - 1) of raw resources quality, used for determining how a given set of biomass characteristics corresponds to the specific requirements for given biorefinery valorisation route.







# Biomass Suitability Index (BSI)

$$BSI = \frac{\sum w_i \cdot SP_i}{\sum w_i} \quad \text{and} \quad \forall SP_i > threshold_i$$

$w_i$  - weight/importance

$SP_i$  - Suitability Parameter

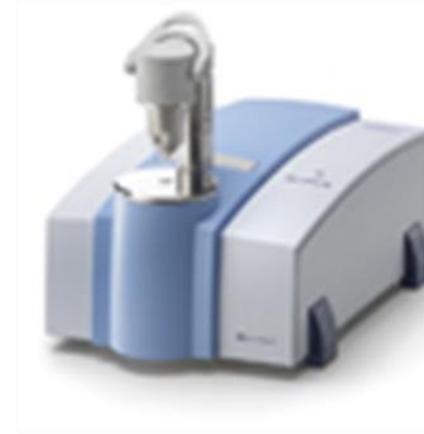
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# portable spectrometers



**NIRONE (Spectral Engines)**



**FT-IR Alpha II (Bruker)**



**MicroNIR (VIAVI)**



**Spektromaster 565 (Erichsen) VIS**



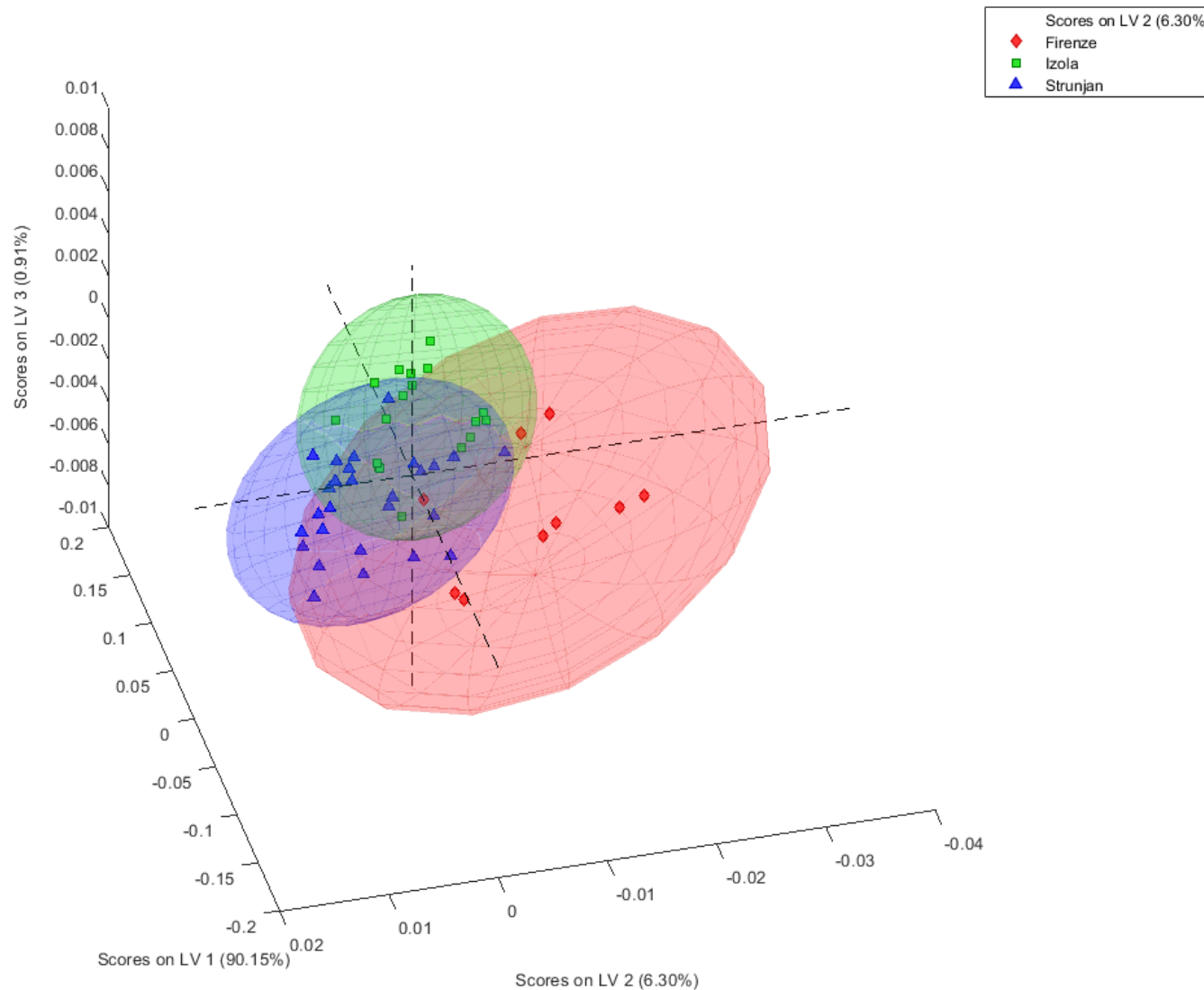




# Measurement of leaf on the standing olive tree (special accessory for sample holding)

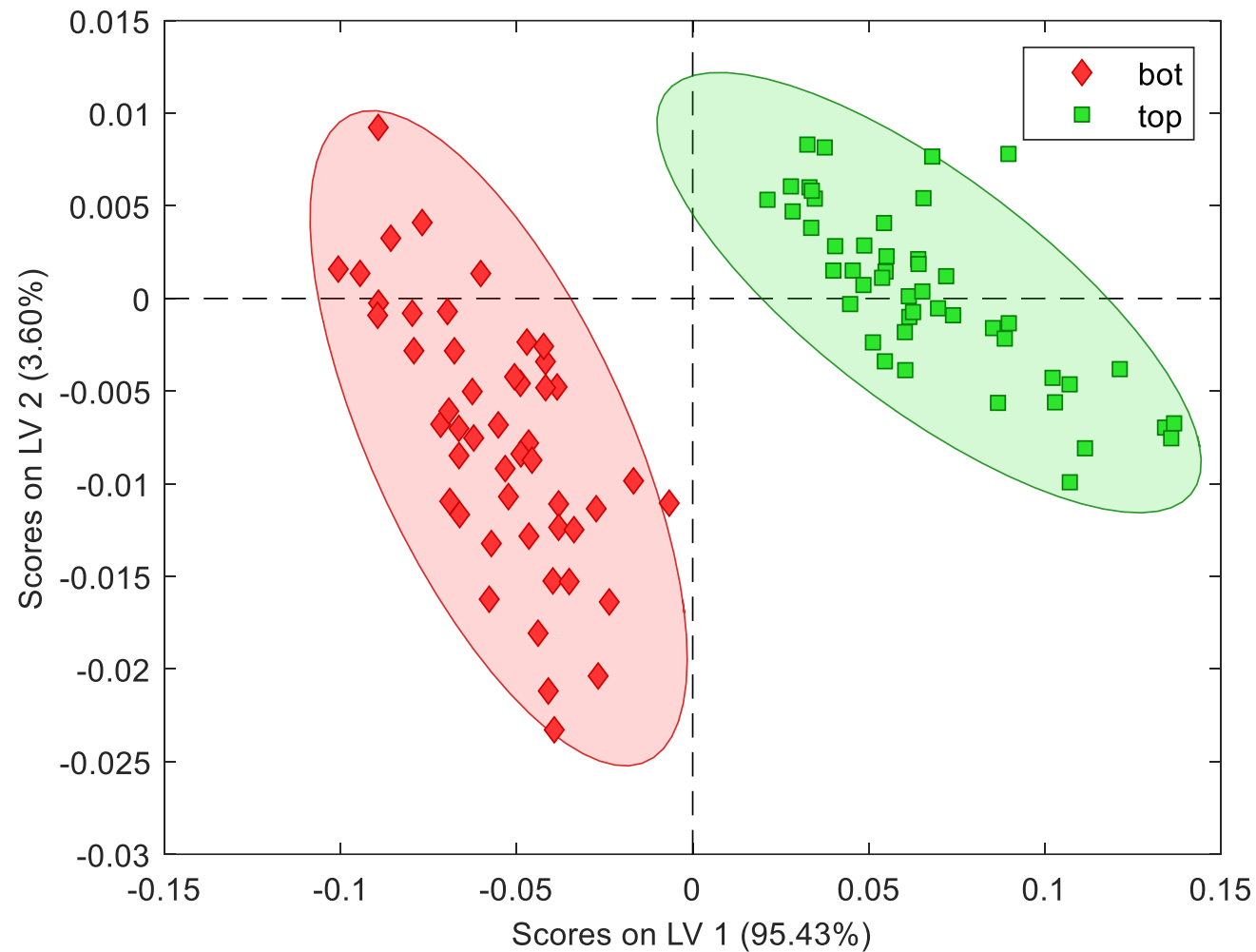


# PLS-DA: provenance of Leciono olive leaves



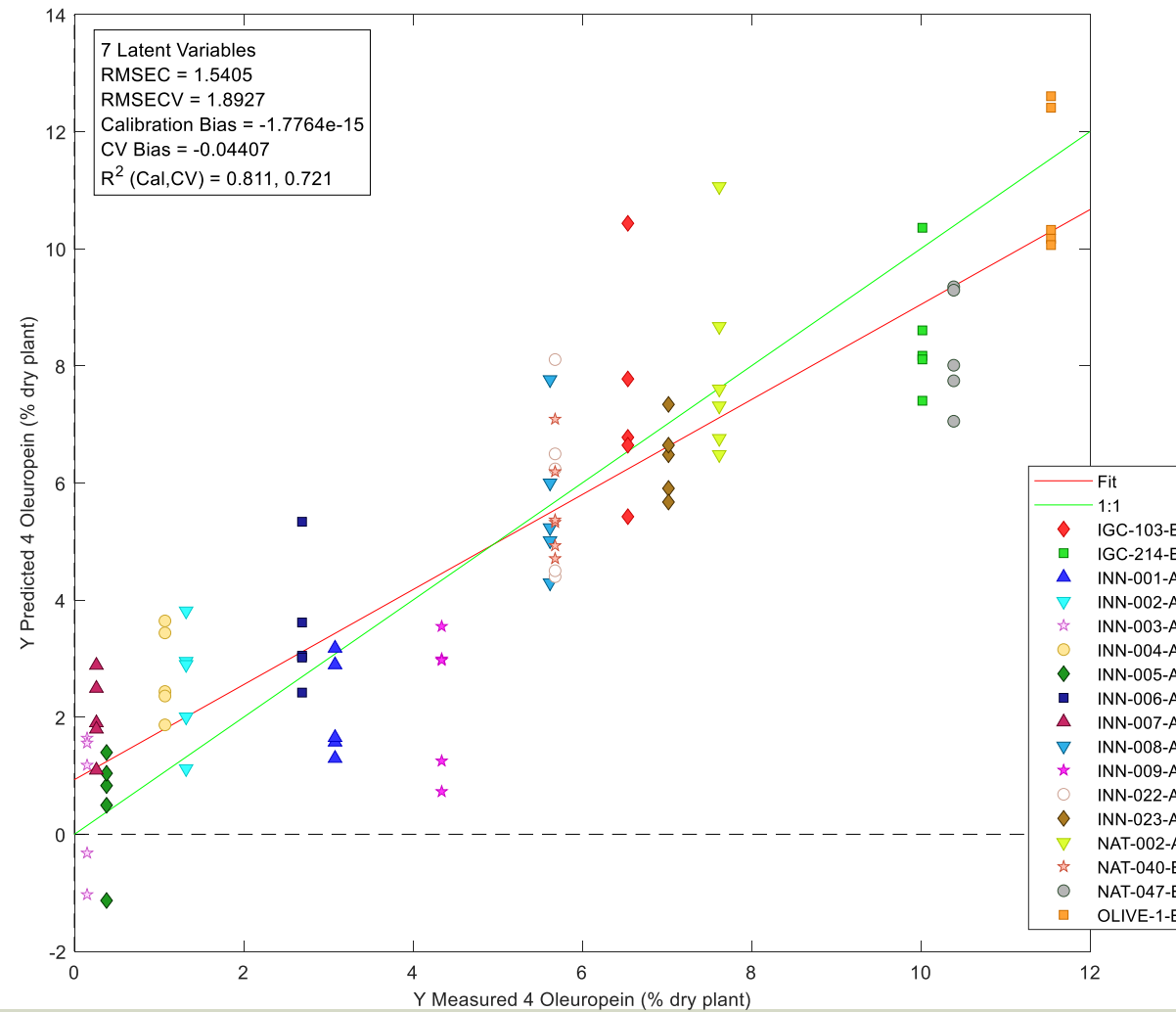


# PLS-DA: top and bottom of the olive leaf





# PLS: prediction of the oleuropein (OPA)







Thank you for your attention and  
any question is very welcome!



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**Thank you for your time.**

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