NoAW STAKEHOLDERS' EVENT

Agro-waste based building blocks/fillers for designing new bio-materials

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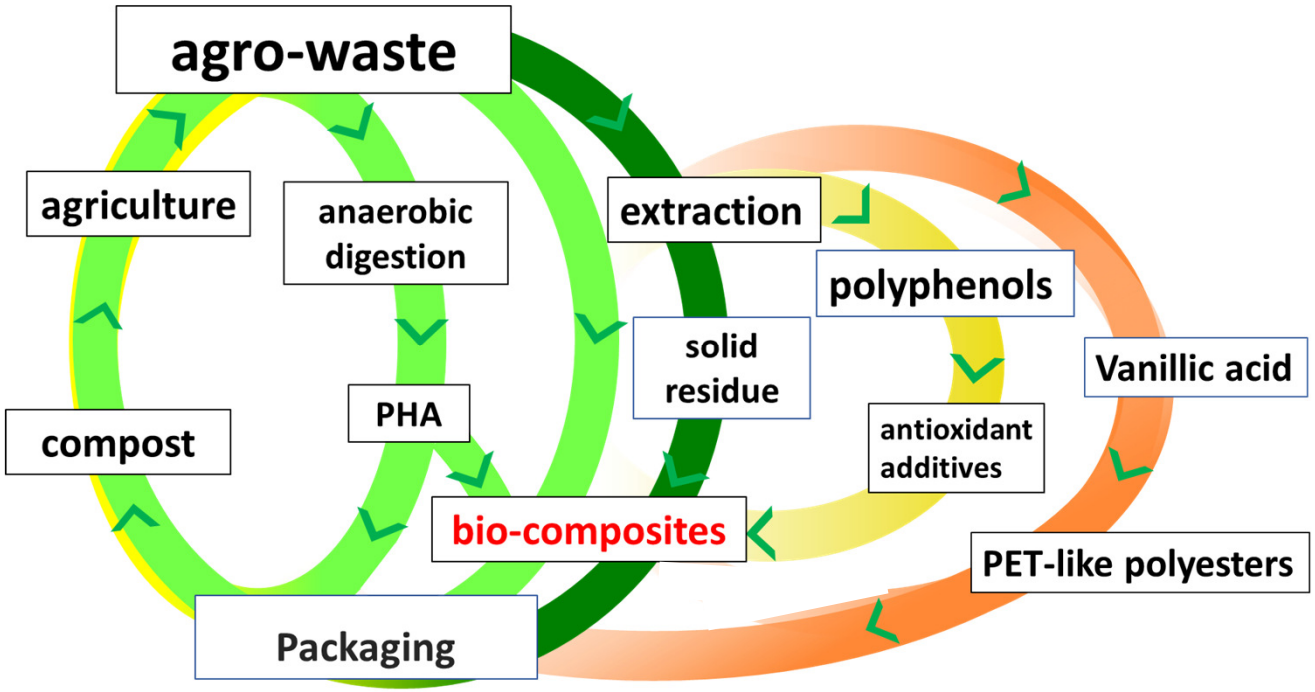
1 October 2019

Verona, Italy

http://noaw2020.eu/

Valorization of winery waste: cascading activities



Extractions of polyphenols from wine pomaces

Merlot

RED POMACE:
Merlot cultivar,
after wine fermentation and pressed

WHITE POMACE:
Garganega cultivar,
pressed

Garganega

Two extraction methods have been compared

Solvent-based extractions

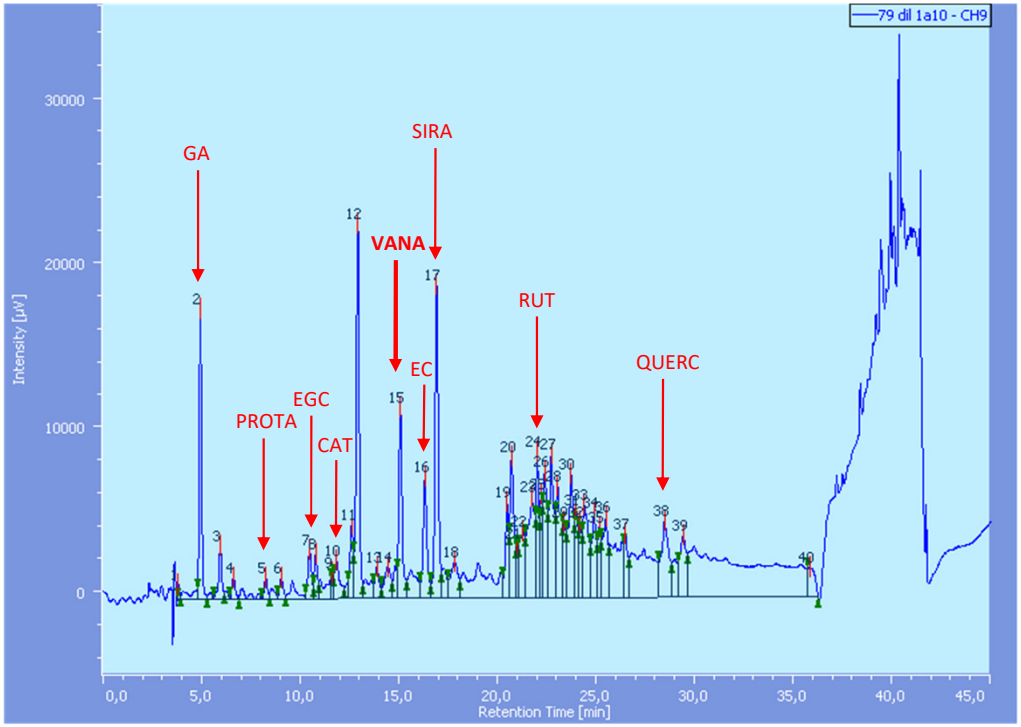
Pressurized liquid extractions

Optimised solvent-based extraction was selected as the best process for the recovery of bioactive molecules from both red and white grape pomace.

Extractions of polyphenols from wine pomaces

Complex mixture of polyphenols with antioxidant activity

Presence of a specific molecule: vanillic acid



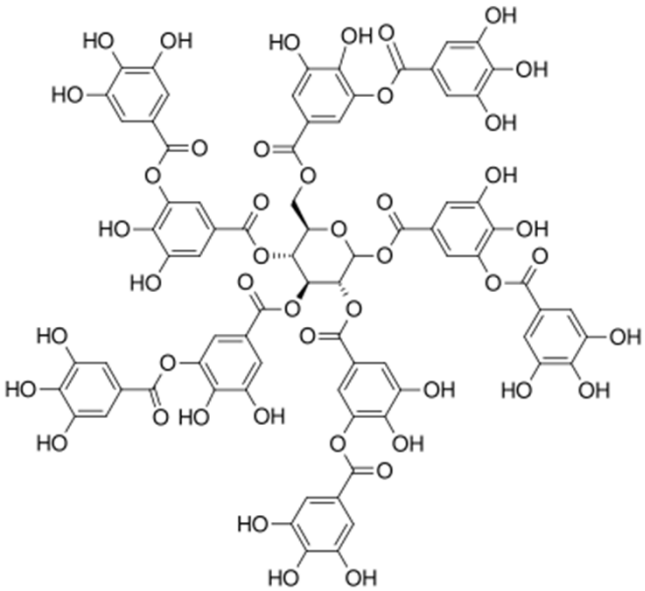
Example of HPLC-DAD characterisation of solvent extracts derived from wine pomace (CAT, catechin; EC, epicatechin; EGC, epigallocatechin; GA, gallic acid; PROTA, protocatechuic acid; QUERC, quercetin; RUT, rutin; SIRA, syringic acid; VANA, vanillic acid).

Solid residue of extraction

Merlot (RED) residue

Garganega (WHITE) residue

Valorization of the mixture of polyphenols



Polyphenols

They are characterized by antioxidant properties.

They can be used as additives for polymers.

They cannot be mixed to a polymeric matrix at the molten state because they don't have high thermal stability.

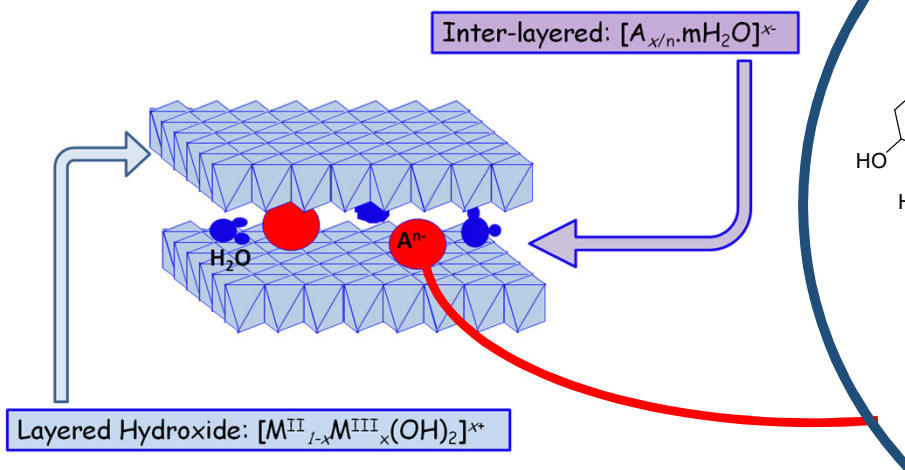
Therefore, they can be used in coating applications for food packaging: they can induce improvement in the shelf life of food and contribute to decrease the food waste.

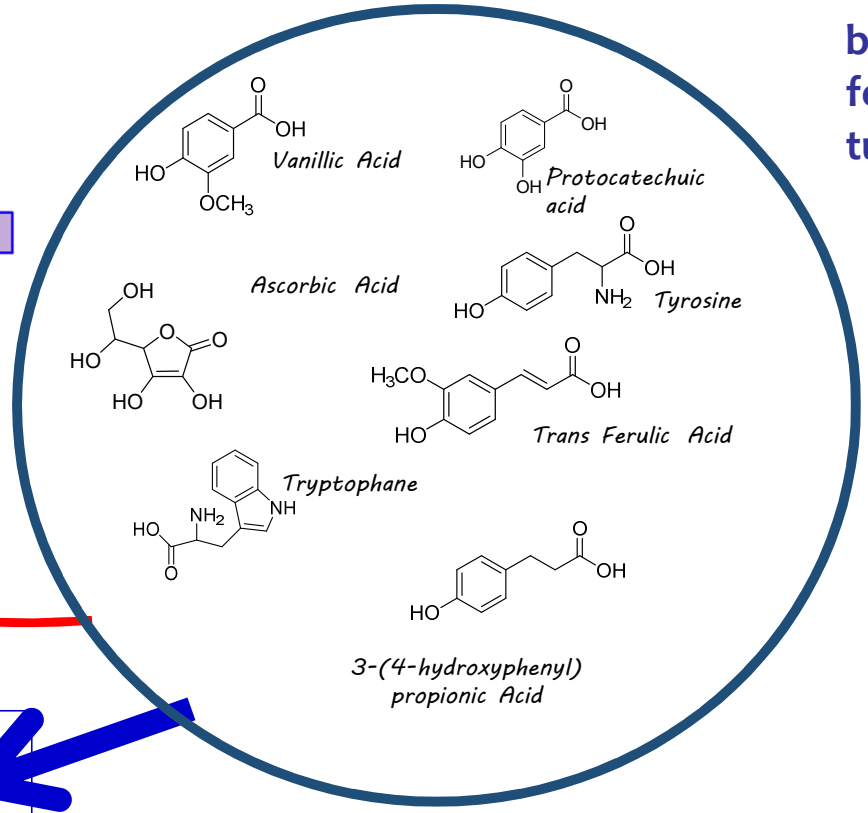
Otherwise, strategies of molecule protection can be developed.

Protection of bioactive molecules

Matrix: PBS and PBSA

+ LDH containg active molecules





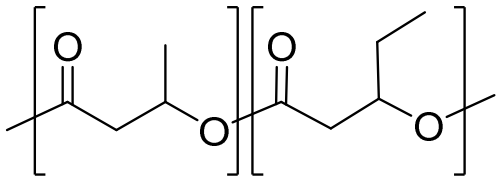
biocompatible
food compatible
tunable composition

MULTIFUNCTIONAL MATERIALS

With antibacterial, antioxidant, barrier, mechanical properties

Valorization of the solid residue: bio-based composites

PHBV matrix + solid residue after extraction



Commercial PHB/PHV: 98/2 (mol/mol)

PHBV thermal properties:

T_{onset}: 288°C
T_D: 302°C

T_m: 172°C, ΔH_m: 78 J/g
T_c: 114°C, ΔH_c: 73 J/g

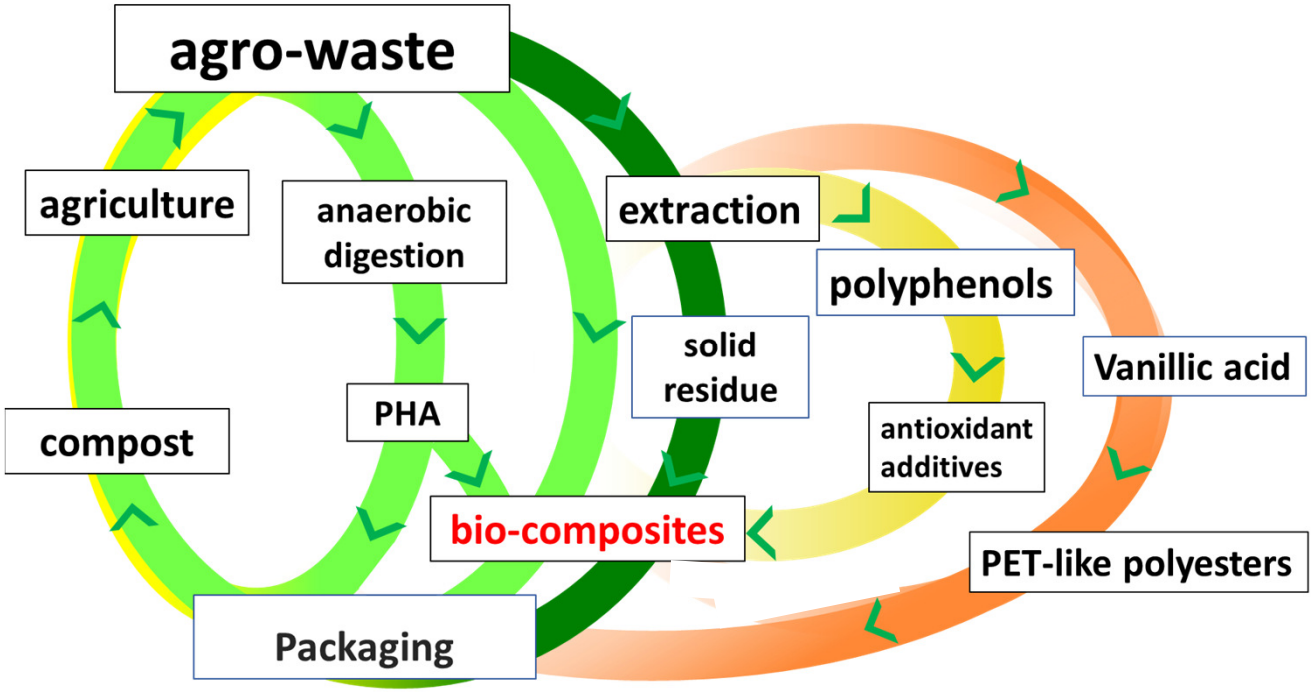
The composites have been prepared by melt mixing in a **Brabender microcompounder**.

Different blends were prepared containing **5, 10** or **20 wt%** of residue.

FIRST RESULTS

- Coating with antioxydant properties have been obtained exploiting a polyphenol mixture obtained from wine pomace
- New bio-composites have been prepared by melt compounding PHBV and residues after polyphenol extraction from wine pomace
- The content of filler has been **5, 10** or **20** wt%.
- The bio-composites are thermally stable and easily processable.
- Mechanical properties are maintained meanwhile the material cost decreases.
- This could be an example of general valorization of residues rich in fibers and derived from different agro-industrial processes.

Conclusions



An example of the application of the principles of the circular economy has been successfully developed and can be extended to other agro-wastes or agro-industry wastes.