Extraction of condensed tannins from grape pomace for use as wood adhesives

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Grape is one of the world's largest fruit crops and wine industry produces large quantities of organic byproducts. In France, about 700,000 tons of natural dry grape pomace are produced every year. Grape pomace is currently used in distilleries as source of industrial ethanol, polyphenols,.tartrate and essential oil. Grape pomace still contains a significant amount of condensed tannins after treatments, proanthocyanidins for a large part.

The extraction process
The process has to be as green as possible and workable in the distilleries without any important investment. The extraction was first performed at the laboratory scale in a water medium with a ratio 1:8 (in dry matter), with different concentrations of basic reagents (from 0 to 5% based on weight of dry pomace of NaOH, NaHCO3 or Na2CO3 with or without Na2SO3) and different temperatures (from 70 to 120°C).

Analysis
After freeze drying, the polyphenol purity of the extract was determined with the Stiasny number. The reactivity of the extract in water (30% w/w) towards formaldehyde was characterized with gelation time (Tgel). Modulus of elasticity (MOE) of different formulations were determined with three points bending thermomechanical analysis (TMA). 13C NMR was performed in D2O on a tannin extract. The spectrum shows characteristic 13C peaks concordant with proanthocyanidins, catechinic acid and sugars.

Wood particleboard tests
Wood particleboards were made with extracts. Internal bond strength for interior dry use must be at least 0.35 MPa for a 14 mm thickness, according to European standard.

Conclusions
Conditions considered for the extraction are 2.5% of Na2CO3 and 2.5% of Na2SO3, 100°C during 1 hour. Internal bond strength of several wood particleboards are good compared to the European standard.

Perspectives
The continuation of the project will be to carry out the industrial transfer, by finding an optimal preparation of the material and checking the performance of the extracts. An important part of the work will be to define more precisely the tannins present in the extract (degree of polymerization, monomers, molar mass distribution).