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Quantification by FTIR spectroscopy of RG-II, arabinogalactan-proteins and mannoproteins from wines

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Polysaccharides are of wide importance in wines. They are involved in many wine properties, such as tartaric and protein stability, filtrability, mellowness, protective colloids, and health safety. So it is important to be able to quantify them. Unfortunately, actually only laboratories methods are available. The most useful of them [1] is based on the quantification of the monomers issued from the polymers after acidic hydrolysis, derivatisation and gas chromatography. This method needs specific material, analytical knowledge and a long analysis time. The aim of this work is to propose an alternative method based on the MIR spectroscopy. This method intends to be sufficiently accurate, easy-to-use and fast, to be a helpful tool in wine processes control such as lees breeding, or addition of pectinolytic enzymes.

Fifteen pure fractions of the 3 main polysaccharides families in wine: Rhamnogalacturonane-II (RG-II), Arabinogalactan-proteins (AGPs) and mannoproteins (MPs) were previously characterised by FTIR. Despite their high spectra collinearity, the differences are strong enough to separate RG-II, AGPs and MPs on a simple principal component analysis (PCA). Three data sets were used for calibration and validation. The first one was obtained by mixing as a Scheffe plan 4 pure fractions: RG-II dimer, AGP0 or AGP-4, and MP0. Two other data sets were obtained from a great variety of wines after a preparation step, in order to eliminate oligosaccharides, polyphenols and wine acids. The spectra were acquired on the powder by FTIR onto a Germanium ATR crystal. The reference analytical values were obtained using the reference chemical method. Each of the RG-II, AGPs or MPs wine concentrations can be calculated with the total polysaccharides weight, and its percent in the powder is given by both reference and FTIR methods.

Previously MPs quantification by FTIR spectroscopy had been proposed [2] then improved [3]. Now this quantification has been extended to the others polysaccharides: AGPs and RG-II. Calibration models were built to give RG-II, AGPs and MPs as a percent of the total polysaccharides. The RMSEP obtained are around 5 % , allowing these models to be used as a process control. But in a few cases we observed a lack of robustness of the FTIR analysis due to the presence of an unknown compound. These cases are easily detected by the spectra shape, because there is a shoulder near 1116 cm^{-1}. We will present possible solutions for the FTIR analysis to take into account this unknown compound.

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