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COMPLETE WINEMAKING PROCESS QUALITY CONTROL IN A SINGLE ANALYSIS INSTRUMENT

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Wine quality is linked both to the knowledge of the technological production process as well as the possibility of implementing an accurate quality control. With reference to the latter aspect, current technology and the optimization of the latest analytical techniques has resulted in considerable improvements to all-round quality.

Has chemical analysis evolved over time in wine production?

Sugars, yeast assimilable nitrogen, L-malic acid and acetic acid are just some examples of analyses which have deeply evolved over the years, enabling improved quality control throughout the entire winemaking process. Indeed, the detection of sugar content has developed from a simple density assessment to the accurate measurement of reducing substances by titration, with the *Fehling* method, and the more precise and useful measurement of fermentable sugars, by enzymatic pathways. Historically L-malic acid levels were measured semi-quantitatively by paper chromatography. Here too, enzymatic techniques now enable the identification of the beginning or the end of malolactic fermentation with absolute certainty, through the analysis of L-lactic and L-malic acid, respectively. With yeast assimilable nitrogen, earlier analysis methods involved formaldehyde, an extremely dangerous and cancerous substance used in the formol method. Current detection methods are safe and enable the separation of organic substances (alpha amino acids) from inorganic ones (ammonium ions). This allows the oenologist to improve yeast nutrition and alcoholic fermentation. Volatile acid analysis, historically requiring distillation, can now be carried out enzymatically, with the measurement of acetic acid.

Is setting up a quality control laboratory in the winery a determining factor for quality? What are the potential difficulties?

The need for more effective quality control in the winery throughout the entire winemaking process may be satisfied by setting up an internal chemical laboratory to detect the most

useful parameters for oenologists, such as: sugars, L-malic acid, total and volatile acidity, pH, alcohol by volume, free and total sulphur dioxide, yeast assimilable nitrogen, gluconic acid and total polyphenol index. The list of necessary parameters for the oenologist is very long, and their measurement with "standard" methods involves the use of various instruments which require very different skills in terms of handling, calibration and not least, a knowledge of chemistry. A good knowledge of chemistry is a fundamental requirement for carrying out internal quality checks involving the use of equipment based on

different chemical-physical principles. Indeed, a traditional chemical laboratory typically contains the following equipment: a pH-meter and titrator to measure pH, total acidity and sulphites, a photometer with UV lamp for common enzymatic analyses, to measure yeast assimilable nitrogen and the Total Polyphenol Index, as well as a distiller to measure alcohol by volume and volatile acidity. All the aforementioned involves the use of glass equipment, requiring washing, chemical/enzymatic reagents, in turn requiring continuous controls and calibrations. Analyses themselves involve work carried out on must samples, which present high turbidity levels, and on red wines characterised by high polyphenol content. Therefore, analysis methods require macro quantities of samples, the centrifugation of must and de-colouration of red wine, all this in addition to already burdensome analysis activities. Common photometers used for enzymatic analysis use tungsten filament lamps, resulting in somewhat narrow absorption ranges and inevitably require dilution which in turn increases analytical error and considerably complicates the manual analysis process. Based on the aforementioned considerations, setting up an internal laboratory requires in-depth knowledge of all these analysis methods. The calibration of reagents and maintenance of equipment used to obtain accurate and precise results are inevitable parts of the process, in addition to the carrying out of analyses, essential, for the winemaking process. Last but not least, we must consider the significant investment, in terms of money, for purchasing all these instruments used to carry out numerous oenological analyses.

Does carrying out real-time analyses contribute to the qualitative wine improvement?

From an oenological point of view, increased quality can only be achieved by more rigorous and meticulous analytic control along the entire wine production chain. Therefore, the possibility to carry out checks directly at the winery, via easy-to-use systems which provide real-time results, is essential as it enables the oenologist to make rapid and timely decisions. Wine is a product which dynamically evolves throughout the entire production process, starting from the grape harvest. Rapid, real-time results are essential for ensuring a quality product.

CDR WineLab®: a unique instrument for winemaking process quality control

CDR WineLab® drastically reduces all negative aspects typically encountered when setting up an internal oenological analysis laboratory at the winery, also enabling personnel without any technical or chemical knowledge to carry out chemical analyses.

What is CDR WineLab®? What are its characteristics? How does it enable personnel without any chemistry knowledge to carry out analyses?

CDR WineLab® is a system which consists of a photometric technology instrument and specific

chemical reagents which optimise common reference methods used for wine and must analysis. This technology enables simple and rapid chemical and enzymatic analysis, thanks to the use of regents in ready-to-use pre-filled test tubes. Reagents are already calibrated so that analyses can be carried out immediately, without the need for calibration curves, thus eliminating the risk of error and consequent effects on results. The

system allows the simultaneous analysis of a single parameter on a batch of 16 samples. For example, this means that L-malic acid levels can be measured in 16 tanks at the same time during a single malolactic fermentation screening. CDR WineLab® can also carry out different analyses simultaneously and on the same sample, all in just a few minutes, with the background analysis mode, meaning that, for example, at the end of alcoholic fermentation, a classic analytical wine profile can be obtained after racking. In addition to optimising routine analysis methods commonly used in the winemaking process, CDR WineLab® also saves considerable amounts of time, especially with "difficult" samples such as high-turbidity musts or sparkling wines. Its methods are based on the use of "micro-methods" involving micro sample quantities for analysis. A simple mini-centrifuge and a small ultrasonic bath are used to process the sample in just 3-4 minutes, resulting in perfect must clarification or CO_2 elimination from sparkling wines. LED technology enables the analysis of high polyphenol-content red wine samples, without the need for de-colouration. The CDR WineLab® reading cell uses luminous LED sources rather than tungsten filament bulbs, unlike classic photometers. As previously mentioned, this important characteristic ensures a significant advantage for highly coloured wines, as well as in cases of extremely high analysed element concentration levels. The broader absorption range of LED sources means that dilution can be reduced or eliminated altogether, with obvious advantage in terms of analytical repeatability.

Conclusions

CDR WineLab® allows complete quality control for the entire winemaking process, using a single instrument, without the need for an internal laboratory or specialised personnel, for immediate results. A powerful tool for oenologists, enabling them to improve the quality of their own product.

Links:

CDR WineLab® www.cdrwinelab.com

. The correct management of alcoholic fermentation in the age of global warming

. The chemistry of wine