



Using BevScan for wine analysis and classification



Background

Spectroscopic analytical techniques are becoming increasingly important in grape and wine analysis. Such techniques offer significant advantages over traditional laboratory methods in their speed and ability to measure multiple analytes simultaneously. Examples common in Australian wine laboratories include: Near Infrared (NIR) instruments used for measuring alcohol, Fourier Transform Infrared (FTIR) instruments developed specifically for routine wine composition analysis and Ultraviolet-Visible (UV-Vis) instruments used in a wide range of methods from enzymatic tests to pinking susceptibility to tannin (accessible via the AWRI WineCloud).

What is Bevscan?

The BevScan, a new Visible-NIR instrument developed in partnership between Jeffress Engineering Pty Ltd and the AWRI, takes the advantages of rapid spectral methods a big step further by allowing analysis through an unopened wine bottle. The ability to analyse bottled wine non-destructively for the first time offers up a huge range of potential applications never before accessible to the wine sector. The BevScan additionally provides a cuvette attachment, which gives users the flexibility to also use it as a conventional Vis-NIR instrument.



How does it work?

The BevScan has three main modes of operation:

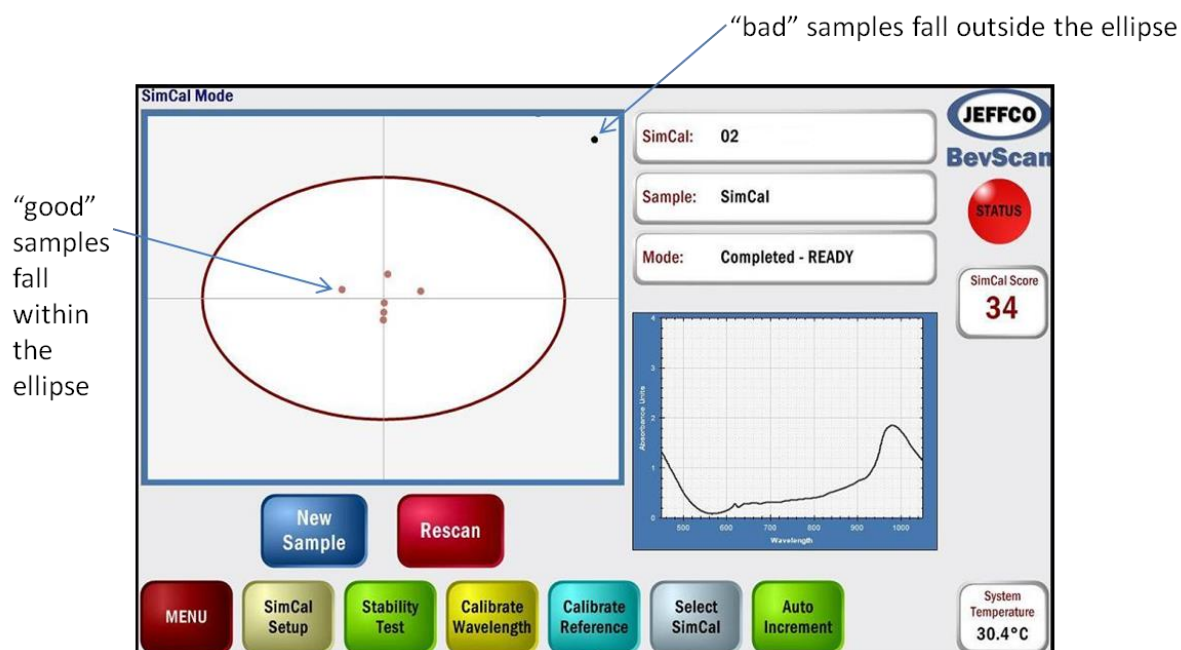
Read and Store mode

This mode enables the user to operate the BevScan as a stand-alone spectrophotometer to collect raw spectra of samples and store them electronically. This mode can be used for samples in-bottle or in-cuvette.

SIMCAL mode

In this mode, users establish a profile for a particular wine by scanning a number of different bottles. New bottles can then be scanned and compared against the profile to see whether or not they match. The level of variation represented within the profile is determined by the user's requirements.

When assessing bottles using the SIMCAL mode, users receive a simple yes/no answer, or have the option to gain an indication of how different the new bottle is from the established profile. A simple visual representation of the spectral similarities and differences among the samples scanned is displayed both during the creation of the profile, and when comparing the new bottles.



Use of the SIMCAL mode is very straightforward and does not require any statistical expertise. It is particularly useful for cases where a yes/no answer is sufficient and degrees of variation do not need to be assessed. Examples might include: checking unlabelled stock for vintage differences or checking for randomly occurring oxidised bottles.



Predictive Mode

In this mode, a previously generated spectral calibration is accessed by the BevScan and used to predict results for new samples scanned by the instrument. The required spectral calibrations are generated by obtaining spectral and reference data (usually chemical or sensory) on a subset of the overall samples. Multiple regressions are then carried out on the combined data to determine whether or not the spectral data can be used to predict the reference data. If this process is successful, the calibration file produced can be 'dropped into' the BevScan's internal software. This then allows the spectral properties of new samples to be used to predict their non-spectral properties.

Development of calibrations needed for use of the Predictive mode requires chemometrics software and a high level of technical expertise. BevScan users may prefer to engage external help in developing the calibrations needed for their business rather than attempting this process in-house.

The predictive mode is used in different ways for bottled vs cuvette samples, due to the greater error associated with in-bottle predictions.

In-bottle – this mode is useful for classifying bottles showing degrees of variation – e.g. varying levels of oxidation or varying alcohol levels.

In-cuvette – this mode can be used for measuring compositional parameters in wine samples. Once appropriate calibrations have been developed, multiple parameters can be determined in a single scan. Considerable published literature is available covering the wide range of possible applications of NIR in wine analysis.

Contact

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