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Quality assessment of oenological tannins utilising global selectivity chemical sensors array ("Electronic tongue")

By: J. Puech, A. Prida, and S. Isz

• The "electronic tongue" consists of an array of 7 sensors or electrodes. Each sensor is composed of a silicon transistor with an organic coating that determines the sensitivity and selectivity of each individual sensor. A "measurement" means a difference in voltage between each individual sensor and a Ag/AgCl reference electrode. A "reading" of a sample includes 7 measurements –one per sensor.

• The goal of this paper was to assess how well electronic tongue measurements compared with sensory evaluations by a trained tasting panel. The authors used both methods to assess various standards for *astringency* (alum) and *bitterness* (quinine), as well as various *enological tannins* from different sources (oak, chestnut, gallnut, tara, quebracho, grape seed, and grape skin). Then, they compared the **instrumental data** with the **sensory data**.

Descriptive analysis. A panel of 7 skilled enologists rated on a scale from 0 (low) to 10 (high) the intensity of the following attributes: *bitterness, astringency, body, duration of flavor*, and *similarity to wine tannins*. The samples were aqueous solutions (0.5 g/L) of the various enological tannins. The panel was previously trained using standards of alum and quinine solutions at various concentrations. Each enological tannin solution was evaluated twice.

• 1) **Tasting panel results.** 1) The tasting panel data allowed for a separation of some of the tannins into those with low intensity of most attributes (tara), and those with high intensity (quebracho and gallnut). 2) Surprisingly to the authors, the panel classified *oak* and *chestnut* as most similar to wine tannins, and *grape seed* and *grape skin* tannins as most dissimilar. As they later admit, this might not be so surprising if we consider the high degree of purification of the tannins used –no hints of the original taste-, and the fact that oak and chestnut tannins are something to be expected in a good wine. Additionally, the descriptor "similarity to wine tannins" is an <u>incredibly</u> poorly-defined one [*the word incredibly is mine. What does a true wine tannin taste like?*].

• 2) **Correlation between electronic tongue and tasting panel regarding taste standards.** When the electronic tongue was applied to standards of alum and quinine at different concentrations, the correlations were excellent. The very low standard deviations showed the stability of the output of the sensors.

• 3) **Correlation between electronic tongue and tasting panel regarding enological tannins.** The authors found an excellent correlation between the electronic tongue and the panel perception of bitterness. But the correlation for the rest of the attributes was not as good. Once again, they admit the complexity and subjectivity of attributes like "body" and "similarity of tannins". Also, astringency can be elicited by a wider range of compounds than bitterness, and therefore, it is likely that more substances in a wine interfere with the instrumental measurement of astringency than of bitterness.

In summary, the output of the electronic tongue showed excellent correlation with pure astringent and bitter solutions. It also correlated well with the "bitterness" of enological tannin solutions, but not so well with their "astringency" or "body". According to the authors, the electronic tongue can be a very useful tool for quality control and the characterization of tannins, and could replace expensive, labor-intensive and subjective tasting panels in the near future.