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Syrah, Satin and Saliva:

How the wine industry deals with oral sensations

Is your mobile switched off?

Today's session

- Introduction
- Oral sensations
- Strategies for dealing with Oral sensation
  - Glossaries, Lexicons & Mouthfeel wheels
  - Touch standards
  - TI and TDS
- Role of saliva
- Practical exercise

Plumpton College Wine department

Establish 1989

- Short course and Further Education

2005

- Higher Education validated by the University of Brighton

2014

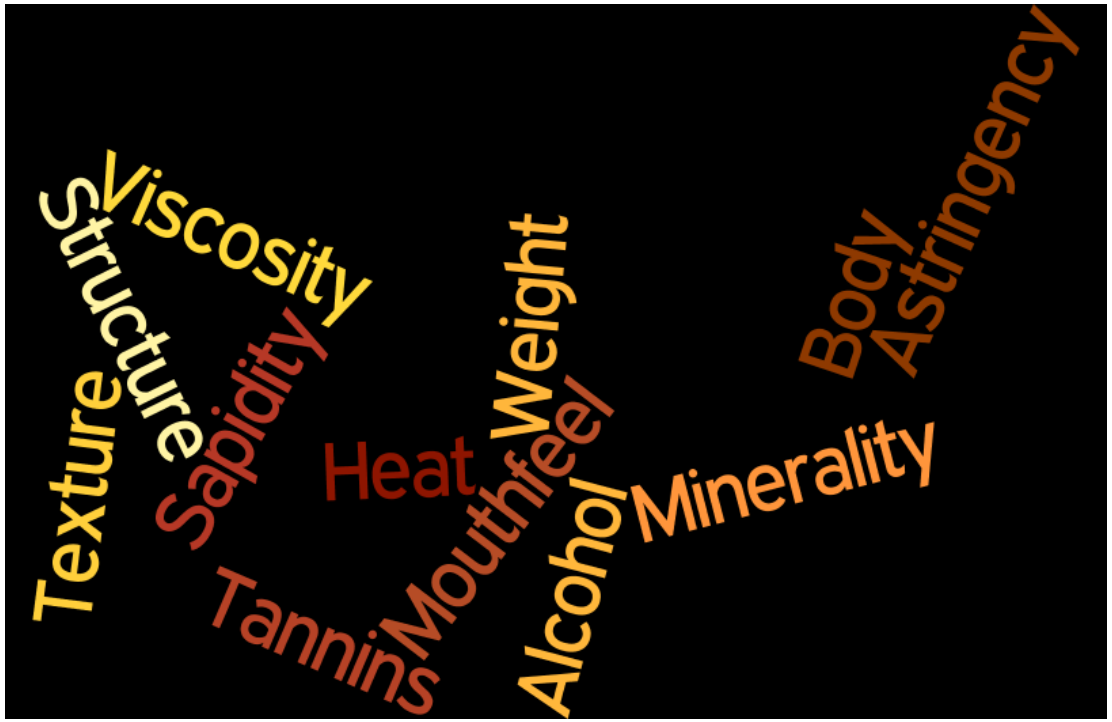
- Opening UK Wine research Centre
- Post graduate Education

Over 100 students

- Foundation Diploma
  - FDip Wine Business
  - FDip Wine Production
- Foundation Degree
  - FdA wine Business
  - FdSc Wine production
- Bachelor degree
  - BA (Hons) Wine business
  - BSc (Hons) Viticulture & Oenology
- Post graduate degree
  - MSc Viticulture & Oenology

Wine oral sensation

- Tactile/Haptic sensations in wine are often highly prized by experts and consumers
- Variously described



- Poorly defined hierarchies
- Redundant concepts
- Contradictory definitions

Components leading to oral sensations

- Phenolic material
  - Non Flavonoids
  - Flavonoids
  - Tannins
    - Condensed and polymerised
    - Heterogeneous
- Organic acids
- Proteins
- Polysaccharides
- Sugars
- Ethanol and Polyols

- Grape origin
- Oak origin
- Exogenous additives

- Grape Origin
- Microbiological origin
- Exogenous additives

Strategies for dealing with oral sensation

- Generally difficult to measure analytically
- Instead assessed through expert sensory evaluation
- Problematic in wine industry
  - Singular individual evaluation
  - Idiosyncratic language
  - Often asynchronous
  - Fragmented training
    - Mentoring
    - Divergent training systems WSET, OIV, Roseworthy, UC Davis

PALATE	
Sweetness	dry – off-dry – medium-dry – medium-sweet – sweet – luscious
Acidity	low – medium(-) – medium – medium(+) – high
Tannin	low – medium(-) – medium – medium(+) – high
Alcohol	low – medium(-) – medium – medium(+) – high **fortified wines:** low – medium – high
Body	light – medium(-) – medium – medium(+) – full
Flavour intensity	light – medium(-) – medium – medium(+) – pronounced
Flavour characteristics	*e.g.* fruits, flowers, spices, vegetables, oak flavours, other
Other observations	*e.g.* texture, balance **sparkling wines (mousse):** delicate – creamy – aggressive
Finish	short – medium(-) – medium – medium(+) – long

WSET systematic approach to tasting

Glossaries, Lexicons & Mouthfeel wheels

- Many attempts have been made to define oral sensations
- Most wine tasting guides have simple glossaries to define terminology i.e. what is body, how does alcohol get evaluated
- Further attempt have made to define specific terms to describe oral sensations

Gawel, Oberholster and Francis (2000)

- Industry experts evaluated a wide range of red wines (150+)
- Initially stage was vocabulary generation
- Followed by language refinement and definition
  - Where possible association with references
- Logical relationships were determined through sorting and cluster analysis to provide a clear structured hierarchy
- Formatted into wheel reminiscent of Ann Nobles aroma wheel
- http://onlinelibrary.wiley.com/doi/10.1111/j.1755-0238.2000.tb00180.x/abstract

- Followed up by Pickering and Demiglio (2008)
- Who employ a similar strategy to develop a white wine wheel
- Expanded up RWMW by dealing with time development as well as integrated/discrete sensations
- http://www.tandfonline.com/doi/abs/10.1080/09571260802164038#.VuCIEPmLTIU

Touch standards

- Despite the development of improved definitions and hierarchies
- Providing sensory references for the vocabulary was problematic

Gawel, Iland and Francis (2001) developed the work further

- Comparison of in-mouth chemical references samples vs external touch standard
- In-mouth references where not successful due to high carry over and complex sensation elicit by the material
- External touch standards where less fatiguing, had high stability and were considered analogous to in-mouth sensations
- Despite training, between taster differences remained higher than between sample differences highlighting assessor variability
- http://www.sciencedirect.com/science/article/pii/S095032930000331

Touch screening

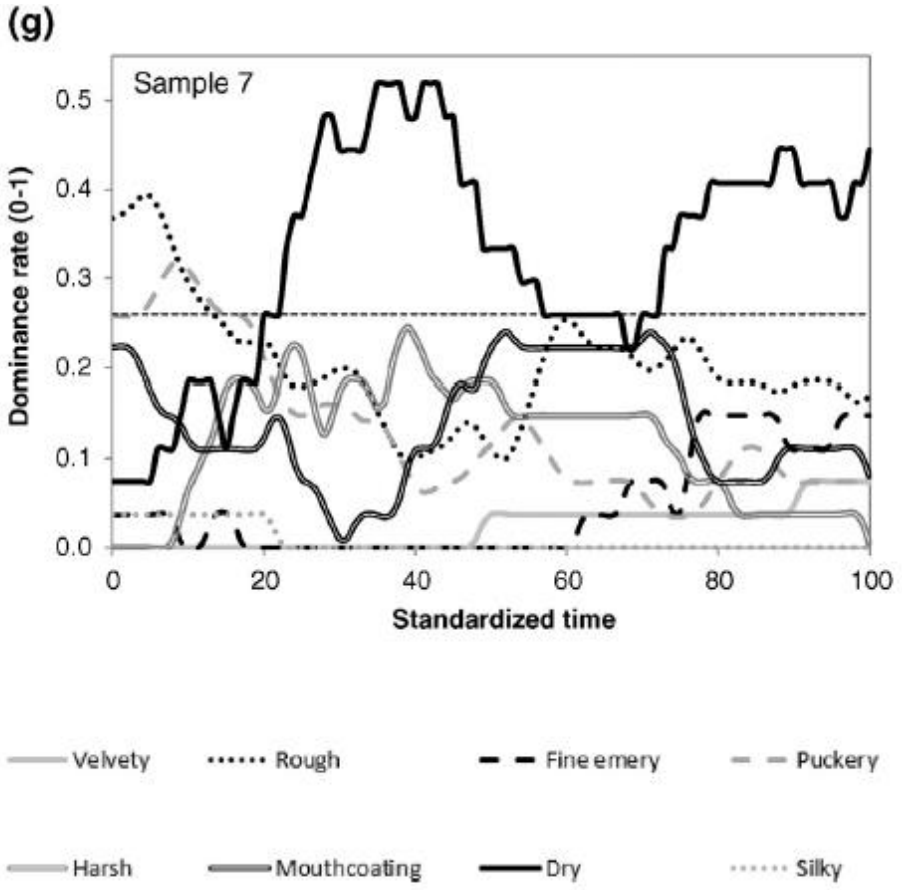
- New idea?
- Drawing on the work of Gawel, Iland and Francis and combining it with Essick et al. (2003) work on Lingual acuity
- Attempt made to screen untrained assessors for their ability to recognise touch standards
- Following 5 minute familiarisation with touch standards, panellist were blindfolded asked to identify 6 touch standards in-mouth

	6/6 correct	5/6 correct	4/6 correct	3/6 correct
Number of judges	2 judges	2 judges	4 judges	1 judge

Time Intensity and Temporal Dominance of Sensation

- The complex and dynamic nature of oral sensations is not always well served by standard static sensory science techniques
- However dynamic measures such as TI and TDS are proving useful in characterising differences that exist between wine.
- Using the foundation of mouthfeel wheel and relevant references (in-mouth and touch) good results can be obtained

Vidal et al. (2016)

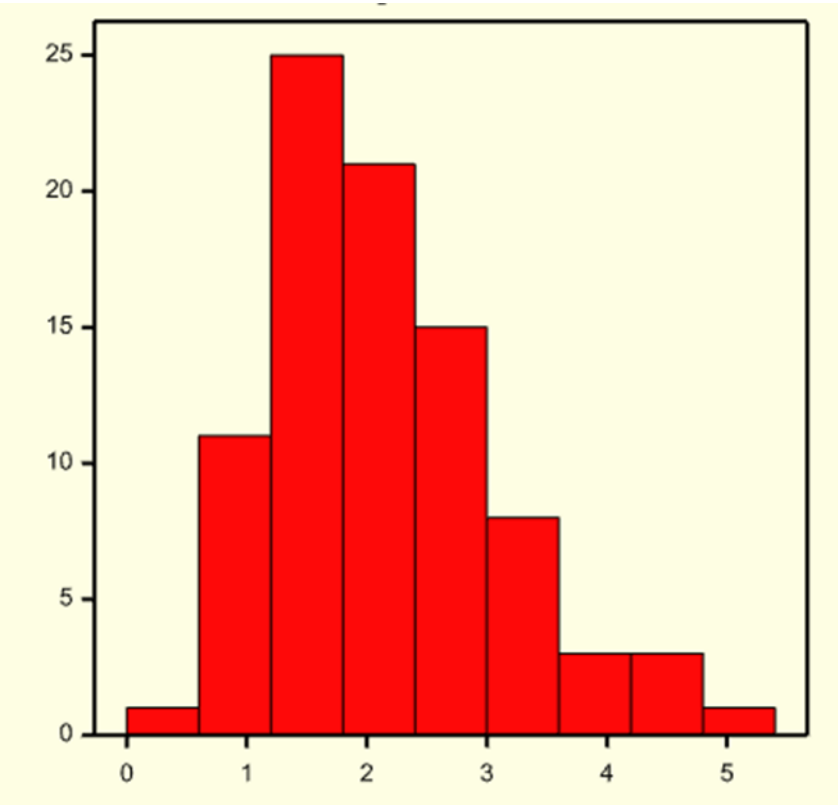


- TDS Provided more information than static analysis
- Magnitude of astringency was not correlated with astringency terms
- Wines of similar astringency magnitude could be differentiated by dynamic difference in astringency profiles
- More work needs to be done using TDS and TCATA
- http://www.sciencedirect.com/science/article/pii/S0963996916300473

Saliva

- Has been considered a fundamental part of examining oral sensation with wine
- Saliva flowrate and composition are both considered important factors in explaining between assessor variability

Saliva flowrate variability



- Data collected from May 2012 until Feb 2016 total 88 people (aged 18-60)
- Panellists were provided with a stimulus containing 10ml of citric acid monohydrate solution (0.019 M or 4 g/l).
- Each panellist was instructed to taste the acid stimulus and hold in mouth for 10 seconds before expectorating. The panellist then collected the net weight of the saliva generated for next 60 seconds

- Shapiro-Wilkes test for normality, appears to show log-normal distribution for saliva flow ($W = 0.98$, $p = 0.307$)

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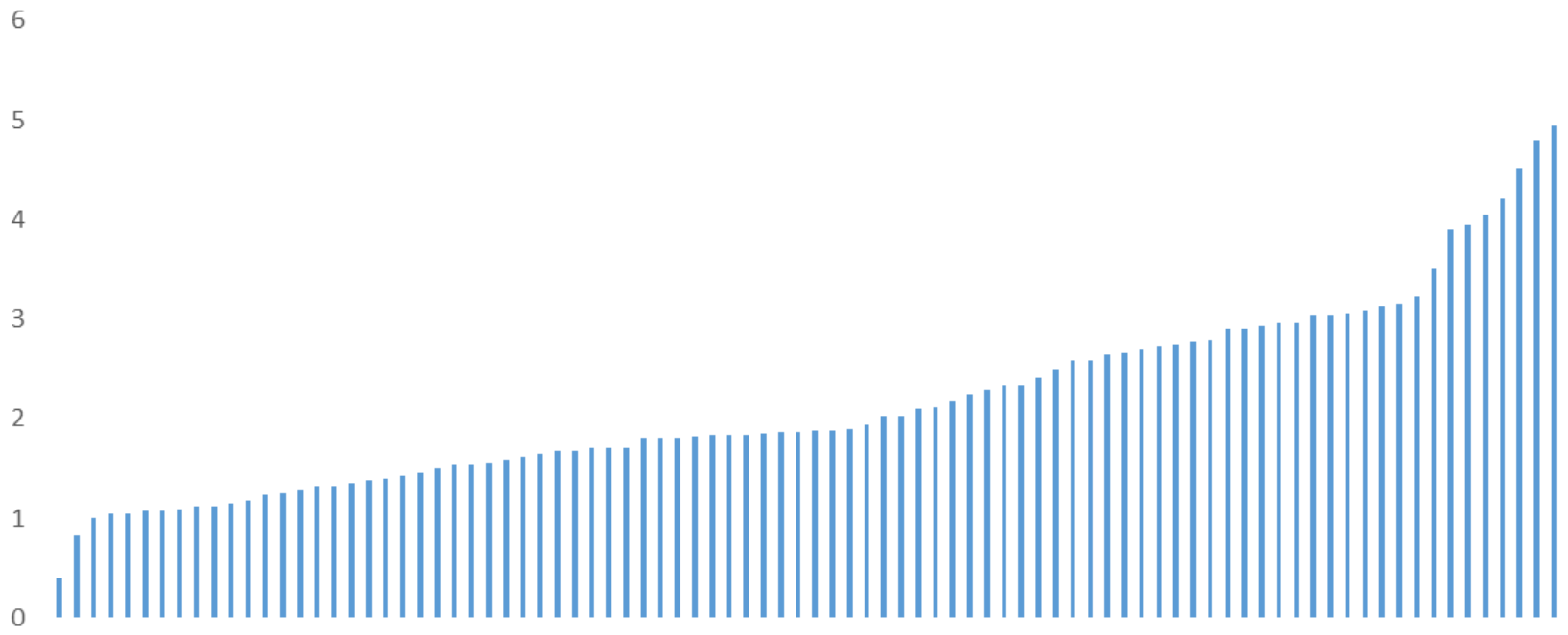
Median Saliva production	1.88g
Mean Saliva production	2.16g
Range	0.4-4.94
Lower Quartile	1.48
Upper quartile	2.76
Male vs Female	NS



- Relationship between astringency assessment and saliva production remain uncertain
- Early studies showing correlation between flowrate and astringency (Fischer et al., 1994; Ishikawa and Noble, 1995) have not been confirmed by Guinard et al. (1998) or Kallithraka et al. (2001)
- Explanation for these observations include potential compositional difference in saliva, due to proline rich protein (PRP) concentration

It could be hypothesized that

- High flowrates dilute compounds responsible for astringency reducing magnitude and duration of sensation
- High proportion of PRP would provide more tannin binding sites, leading to high viscosity and high observed astringency
- Lowest astringency sensation would be observed by high flow, low PRP% individuals
- While highest astringency would be observed in low flow, high PRP% individuals

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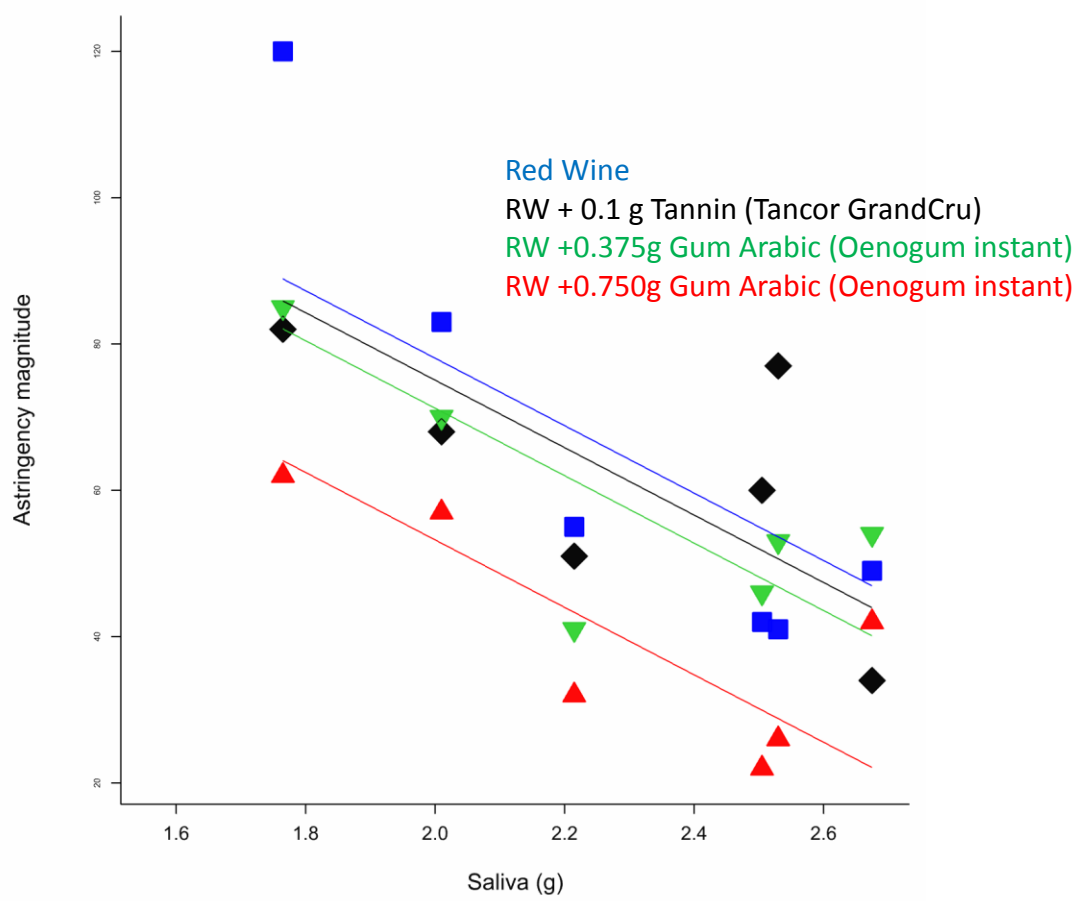
- Working with a small (n=8) and untrained panel
- Low to medium saliva flowrate judges showing a significant negative linear regression between saliva collected at rest and magnitude of astringency ($F(4,19)=9.07$, $p<0.001$)
- Accumulated ANOA shows no significant interaction between sample and saliva.

- However, high flowrate judges experienced high levels of astringency
- Further studies and training required



- Essick, G.K., Chopra, A., Guest, S. and McGlone, F., 2003. Lingual tactile acuity, taste perception, and the density and diameter of fungiform papillae in female subjects. *Physiology & behavior*, *80*(2), pp.289-302
- Fischer, U., Boulton, R.B. and Noble, A.C., 1994. Physiological factors contributing to the variability of sensory assessments: relationship between salivary flow rate and temporal perception of gustatory stimuli. *Food Quality and Preference*, *5*(1), pp.55-64.
- Gawel, R., Iland, P.G. and Francis, I.L., 2001. Characterizing the astringency of red wine: a case study. *Food quality and preference*, *12*(1), pp.83-94.
- Gawel, R., Oberholster, A. and Francis, I.L., 2000. A 'Mouth-feel Wheel': terminology for communicating the mouth-feel characteristics of red wine.*Australian Journal of Grape and Wine Research*, *6*(3), pp.203-207.
- Guinard, J.X., Zoumas-Morse, C. and Walchak, C., 1997. Relation between parotid saliva flow and composition and the perception of gustatory and trigeminal stimuli in foods. *Physiology & behavior*,*63*(1), pp.109-118.
- Ishikawa, T. and Noble, A.C., 1995. Temporal perception of astringency and sweetness in red wine. *Food quality and preference*, *6*(1), pp.27-33.
- Kallithraka, S., Bakker, J., Clifford, M.N. and Vallis, L., 2001. Correlations between saliva protein composition and some T–I parameters of astringency.*Food Quality and Preference*, *12*(2),
- Pickering, G.J. and Demiglio, P., 2008. The white wine mouthfeel wheel: A lexicon for describing the oral sensations elicited by white wine. *Journal of Wine Research*, *19*(1), pp.51-67.
- Vidal, L., Antúnez, L., Giménez, A., Medina, K., Boido, E. and Ares, G., 2016. Dynamic characterization of red wine astringency: Case study with Uruguayan Tannat wines. *Food Research International*.