OAK WOOD CONTRIBUTION
TO WINE AROMA

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# TABLE OF CONTENTS

Abstract ................................................................................................................................. vii
Declaration ............................................................................................................................. viii
Acknowledgements ................................................................................................................. ix
Publications arising (to August 1998) ................................................................................ x

## Chapters

### Chapter 1  Introduction, literature review and experimental design

1.1 Introduction ....................................................................................................................... 2
1.2 Volatile composition overview ....................................................................................... 2
  - Compounds present in oak wood prior to coopering ................................................. 3
  - Compounds arising during the coopering of oak wood ............................................ 5
  - Compounds arising during the wood–wine contact period ...................................... 6
1.3 Compounds selected for study ....................................................................................... 7
1.4 Current oak wood usage choices, perceived consequences and apparent mechanisms ................................................................................................................................. 10
  - Oak wood source ........................................................................................................ 10
  - Seasoning .................................................................................................................... 15
  - Coopering .................................................................................................................. 17
  - Conditioning ............................................................................................................. 20
  - Wine microbiology .................................................................................................... 23
  - Wine composition and conditions ........................................................................... 26
  - Wood–wine contact duration ..................................................................................... 28
  - Wine aeration ............................................................................................................ 30
  - Other barrel structure effects ................................................................................... 32
  - Previous use and reconditioning of barrels ............................................................... 34
1.5 Experimental design ....................................................................................................... 36
  - Aims ............................................................................................................................ 36
  - Treatment imposition ............................................................................................... 36
1.6 Conclusion ....................................................................................................................... 39

### Chapter 2  The volatile composition

2.1 Introduction ....................................................................................................................... 42
2.2 Volatile composition analysis ....................................................................................... 42
2.3 Quantification methods, confidence intervals and limits of detection ......................... 43
  - Raw quantification data .............................................................................................. 43
  - Data transformation according to standard recoveries ............................................ 44
  - Regression line slopes ............................................................................................... 55
  - Regression line y-intercepts ..................................................................................... 55
  - 95% Confidence intervals ....................................................................................... 56
  - Some quantification by extrapolation of regression lines ....................................... 57
  - Quantification in the 'control' wines ........................................................................ 57
  - Limits of detection .................................................................................................... 58
2.4 Volatile composition results .................................................. 58
2.5 The multivariate nature of the volatile composition .................. 58
  - Interpretation in the Chardonnay wines ................................ 59
  - Interpretation in the Cabernet Sauvignon wines .................... 62
  - Interpretation in the model wines ..................................... 66
  - Commonality among the wines ........................................... 67
2.6 Summary and conclusion ................................................. 67

Chapter 3 The aroma ......................................................... 71
3.1 Introduction ............................................................... 72
3.2 Wine aroma description by ranking .................................... 72
3.3 A summary of the sensory descriptive analysis method .............. 73
3.4 The Chardonnay wine aroma differentiation .......................... 74
3.5 The Cabernet Sauvignon wine aroma differentiation .................. 76
3.6 The multivariate nature of the wine aroma descriptions ............. 78
3.7 Summary and conclusion ................................................. 80

Chapter 4 A protocol for elucidating the relationships between aroma and composition ......................................................... 81
4.1 A limitation to the treatment–based experimentation, and an alternative approach .......................................................... 82
4.2 Aroma correlations with composition–PCs and volatile compounds ......................................................... 83
4.3 Difficulties in estimating the aroma effect of a single compound ... 86
  - Compound purification and its practical limitation .................. 86
  - Compound description and its practical limitations ................. 87
  - Compound threshold analysis and its practical limitations ......... 88
4.4 Potency of the overall, oak wood–derived, aroma–effect of selected individual barrel wines ................................................. 88
  - ‘Natural oak product’ potency ......................................... 90
  - ‘Coopering heat product’ potency .................................... 92
  - ‘Malolactic fermentation product’ potency ........................... 92
  - Conclusion ..................................................................... 94
4.5 A novel data analysis method, involving the interpretation of patterns arising from specific aroma differentiations in relation to compound concentration differences ........................................ 94
  - Specific aroma ‘impact–pattern conformity’ (IPC) test ............ 96
  - A naturally occurring, specific aroma ‘differentiation potency or accompaniment’ (DPA) ............................................... 98
4.6 Summary and conclusion ................................................. 99

Chapter 5 The contribution of the oak compounds that were present in the wood prior to coopering ........................................ 101
5.1 The boundaries of the variation under consideration ................. 102
5.2 Oak origin effects ........................................................... 104
  - Differences among the French oak woods ............................ 104
  - The American oak compared with each of the French oaks ..... 108
5.3 Seasoning location effects .................................................. 112
   - French oak wood ......................................................... 114
   - American oak wood ................................................... 116

5.4 Aromas associated with ‘natural oak product’ variation (estimated by correlation with the ‘emphasis on natural oak products’ principal component) .................................................. 118
   - Chardonnay wine ...................................................... 119
   - Cabernet Sauvignon wine ........................................... 120

5.5 Possible compositional causes or indicators of these aroma effects and variations .................................................. 120
   - Chardonnay wine ...................................................... 121
   - Cabernet Sauvignon wine ........................................... 122

5.6 Summary and conclusion .................................................. 126

Chapter 6 The contribution of proprietary and unintended heating variation around ‘medium toast’ coopering .................................................. 129
6.1 The boundaries of the variation under consideration .................................................. 130
6.2 The differences in effect resulting from the environmental and proprietary peculiarities of open-air seasoning and ‘medium toast’ coopering associated with or imposed by an Australian and a French cooper .................................................. 131
   - Wine aroma ......................................................... 132
   - Wine composition .................................................... 134
6.3 Aromas associated with unintended heating variation around ‘medium toast’ coopering (estimated by correlation with the ‘emphasis on coopering heat products’ principal component) .................................................. 142
   - Chardonnay wine ...................................................... 142
   - Cabernet Sauvignon wine ........................................... 142

6.4 Possible compositional causes or indicators of these aroma effects and variations .................................................. 144
   - Chardonnay wine ...................................................... 144
   - Cabernet Sauvignon wine ........................................... 147

6.5 Summary and conclusion .................................................. 151

Chapter 7 The modifying contribution of wine microorganisms .................................................. 153
7.1 The boundaries of the variation under consideration .................................................. 154
7.2 Alcoholic fermentation effects ........................................... 155
7.3 Malolactic fermentation effects ........................................ 158
7.4 Denatured microbial cell effects ....................................... 162
7.5 Aroma variations associated with compositional indicators of microbial activity .................................................. 165
   - Chardonnay wine ...................................................... 166
   - Cabernet Sauvignon wine ........................................... 168

7.6 Summary and conclusion .................................................. 171

Chapter 8 The contribution of the duration of contact between oak wood and wine .................................................. 173
8.1 The boundaries of the variation under consideration .................................................. 174
8.2 The accumulation of volatile 'natural oak products' and 'coopering heat products' in a periodically sterilised, American and Limousin barrel-stored model wine, over two years ............................................. 174
  - Accumulation profiles .................................................. 175
  - Discussion ........................................................................... 180
8.3 Summary and conclusion .................................................. 186

Chapter 9 'Preference,' and recommendations for oak wood use efficiency and wine quality optimisation .......................................................... 187
9.1 Shifting the focus from description to 'preference' .................... 188
9.2 Treatment effects according to 'preference' ............................ 188
9.3 Aromas associated with 'preference' ...................................... 190
  - Chardonnay wine .............................................................. 190
  - Cabernet Sauvignon wine .................................................. 190
9.4 Possible compositional causes or indicators of these 'preference' effects and variations .......................................................... 191
  - Chardonnay wine .............................................................. 191
  - Cabernet Sauvignon wine .................................................. 191
9.5 Recommendations .................................................................. 192
  - Oak selection based on cis-oak lactone quantification .............. 192
  - Consistency of coopering heat ............................................ 194
  - Control of microbial activity during and after the contact period . 195
9.6 Summary and conclusion ...................................................... 196

Appendices

Appendix A Treatment details ..................................................... 197
A.1 Oak origin ............................................................................. 197
A.2 Seasoning ............................................................................. 197
A.3 Chardonnay vinification, conventional wine measurements and sampling .................................................. 199
A.4 Cabernet Sauvignon vinification, conventional wine measurements and sampling .................................................. 200
A.5 Model wine concoction, conventional wine measurements and sampling .................................................. 202

Appendix B Volatile compound quantification materials and methods .................................................. 207
B.1 Preparation of samples for chromatography .............................. 207
B.2 Standards .............................................................................. 208
B.3 Gas chromatography – mass spectrometry conditions .................. 208
B.4 Compound identification (mass spectrometry and coinjection) ...... 208
B.5 Effects of sulfite variation on standard recovery ......................... 210
B.6 Data analysis ......................................................................... 210

Appendix C Composition principal components analysis results .................................................. 213
C.1 Chardonnay wine ................................................................. 213
C.2 Cabernet Sauvignon wine ...................................................... 216
C.3 Model wine ........................................................................... 215
Appendix D  Sensory (aroma) analysis materials and methods .................................................. 223

D.1 Sample size effects on consecutive concentrations interval statistics ................................ 223
D.2 Preparations .................................................................................................................................. 224
- Materials and environmental conditions ......................................................................................... 224
- Could glasses of the samples be shared by different panelists? ...................................................... 225
- Did the replacement of malic acid in the malolactic fermentation-affected Chardonnay wines alter their aromas? .................................................................................................................. 226
- For the replicate samples within each treatment, were the aromas significantly different, requiring the inclusion of each replicate in the sensory descriptive analysis? ........................................................................................................... 226
- The 'descriptive' panels — selection, training and demographics ....................................................... 228
- The 'preference' panels — selection and demographics ...................................................................... 230
- Aroma descriptor— and standard—generation .................................................................................... 234

D.3 Descriptions ..................................................................................................................................... 236
- Experimental design — Balanced Incomplete Block (BIB) ................................................................. 236
- The ranking procedure ......................................................................................................................... 236
- Determining what significant differentiation was achieved ............................................................... 236
- The ranking repeatability ..................................................................................................................... 237

D.4 Data analysis ..................................................................................................................................... 238

D.5 Oddities ............................................................................................................................................ 238
- Overcoming the shortfall in stocks for 'cinnamon' and 'green apple' in the Chardonnay wine ................................................................. 238
- BIB designs and procedures for the Chardonnay repeat rankings ..................................................... 238

Appendix E  Wine aroma ranks and Fisher—Yates rank transformations .............................................. 241

Appendix F  Wine aroma principal components analysis results ......................................................... 249
F.1 Chardonnay wine ............................................................................................................................. 249
F.2 Cabernet Sauvignon wine ............................................................................................................... 252

Appendix G  Compound and composition—PC correlations with aromas — Chardonnay barrel wine ......................................................................................................................................................... 255

Appendix H  Compound and composition—PC correlations with aromas — Cabernet Sauvignon barrel wine .................................................................................................................................................. 269

Appendix I  Potency of the overall, oak wood—derived, aroma—effect of selected individual barrel wines — materials, methods and results ........................................................................................................... 285
I.1 Materials and methods ..................................................................................................................... 285
I.2 Results ............................................................................................................................................... 286

Appendix J  Patterns arising from specific aroma differentiations in relation to compound concentration differences [incorporating the specific aroma 'impact—pattern conformity' (IPC) test and the naturally occurring, specific aroma 'differentiation potency or accompaniment' (DPA)] ........................................................................................................................................... 293
Appendix K  ANOVAs for oak origin and seasoning location / cooper treatments 365

French oak origin and seasoning location / cooper effects

- Aroma
K.1 - Both wines .................................................. 307
K.2 - Chardonnay wine ........................................... 308
K.3 - Cabernet Sauvignon wine ................................ 308

- Volatile composition
K.4 - All wines ...................................................... 309
K.5 - Chardonnay wine ........................................... 310
K.6 - Cabernet Sauvignon wine ................................ 311
K.7 - 93 week model wine ....................................... 312

American oak origin effects

- Aroma
K.8 - Both wines .................................................. 313
K.9 - Chardonnay wine ........................................... 313
K.10 - Cabernet Sauvignon wine ................................ 314

- Volatile composition
K.11 - All wines ...................................................... 315
K.12 - Chardonnay wine ........................................... 316
K.13 - Cabernet Sauvignon wine ................................ 317

American oak seasoning effects
none
K.14 - Aroma ......................................................... 318
K.15 - Volatile composition ........................................ 319

Accumulation rate comparisons for French oak wood seasoned and coopered either in France or in Australia
K.16 - Data as the percentage of the maximum reached in each barrel ...... 320
K.17 - Concentration data .......................................... 320

Appendix L  Baked grape marc — a source of ‘coopering heat products’ 321

Appendix M  Microbiological experiment materials, methods and results 323

M.1 Alcoholic fermentation effects .................................. 323
M.2 Malolactic fermentation effects ................................. 323
M.3 Denatured microbial cell effects ............................... 324
M.4 Chardonnay wine aroma associations with MLF .................. 324

Appendix N  Compound accumulation ANOVAs 329

Literature cited 331
ABSTRACT

The aroma variability arising from the maturation of a Chardonnay wine (10 descriptors) and a Cabernet Sauvignon wine (12 descriptors), each in 24 new oak barrels for 55 and 93 weeks, respectively, was described using sensory ranking, and explained in terms of the natural and cultural variability by which the oak and the wines had been subjected. These wines, along with a model wine which was matured in 16 similar barrels and sampled at five different times over a 93 week period, were analysed for 20 oak wood-derived or associated volatile compounds using gas chromatography – mass spectrometry. Four compounds, cyclotene, maltol, 5-methylfurfuryl ethyl ether and vanillyl ethyl ether were quantified in a barrel aged wine for the first time.

Principal components analysis indicated the three main ‘directions’ of variation in the composition data. The oak lactones and eugenol were strongly associated with one another and were not associated with either coopering heat or microbial activity products. The seven coopering heat products targeted were strongly associated with one another except when affected by microbial activity. This activity yielded degradation products which constituted a third composition ‘direction’.

Relationships among the composition and sensory data, along with an understanding of the genesis of the compounds, have suggested which of the natural and cultural variables are likely to have been involved in each of the aroma variations. Incorporated into these explanations are the imposed oak origin, seasoning location and cooper treatment effects, and the inferred coopering heat variability and wine microbial activity effects.

A novel data analysis method, involving compound concentration differences in relation to specific aroma differentiation, was developed. Each result is summarised graphically, as a specific aroma ‘impact-pattern conformity’ plot. The analysis tests for a naturally occurring association between compound concentration differences and specific aroma differentiation which is consistent with the existence of a causal relationship, and is estimates either the aroma potency of the compound or the concentration difference coinciding with the aroma impact of one or more unknown compounds.