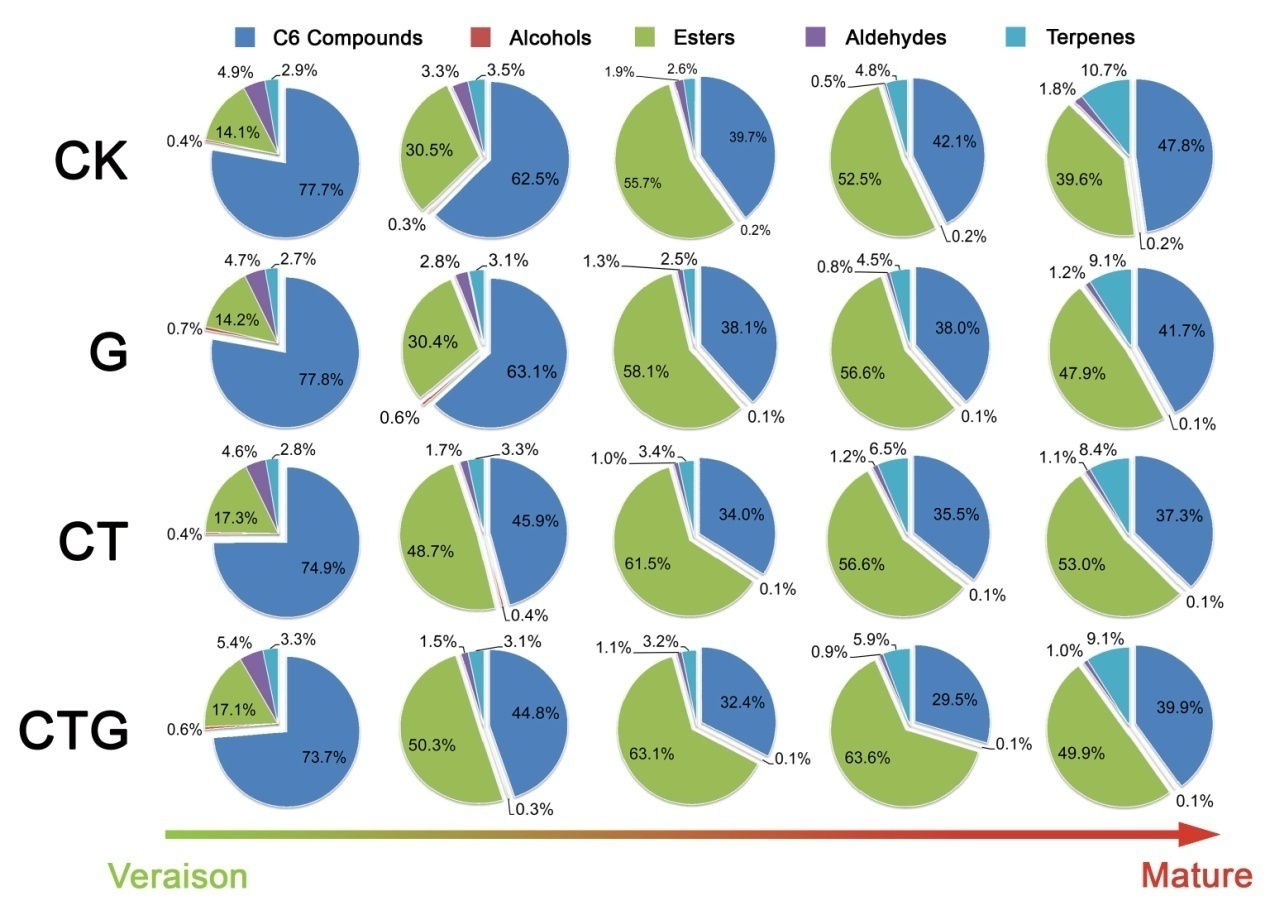
**Influence of cluster thinningand girdling on aroma composition in ‘Jumeigui’ table grape**

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Supplementary Figure S1. Changes in ratio of aromatic compounds in response to cluster thinning and girdling (alone or in combination) of ‘Jumeigui’ grape from véraison to harvest. CK, the control treatment (unthinned and ungirdled); G, trunk girdled one week before véraison; CT, 50% clusters thinned one week before véraison; CTG, 50% clusters thinned and trunk girdled one week before véraison.

Odorant series.tif

Supplementary Figure S2. Changes in aromatic series values in response to cluster thinning and girdling (alone or in combination) of ‘Jumeigui’ grape at harvest. CK, the control treatment (unthinned and ungirdled); G, trunk girdled one week before véraison; CT, 50% clusters thinned one week before véraison; CTG, 50% clusters thinned and trunk girdled one week before véraison.

Figure S1.tif

Supplementary Figure S3. Air temperature and relative humidity within the greenhouse throughout the experiment.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Compounds | Sensory threshold  (μg/L) | Odorant series | Treatment | | | |
| CK | G | CT | CTG |
| **C6 compounds** |  | |  | |
| Hexanal | 4.51 | 1 | 368 | 413 | 455 | 463 |
| (*Z*)-3-Hexenal | 0.252 | 1 | 32 | 35 | 44 | 53 |
| (*E*)-2-Hexenal | 173 | 1 | 40 | 48 | 64 | 71 |
| Hexanol | 5001 | 1,2 | 0.9 | 0.8 | 1.3 | 1.7 |
| (*Z*)-3-Hexen-1-ol | 701 | 1,7 | 0.2 | 0.2 | 0.2 | 0.2 |
| (*E*)-2-Hexen-1-ol | 1004 | 1 | 1.3 | 2.2 | 1.9 | 2.3 |
| **Alcohols** |  | |  | |
| 1-Octen-3-ol | 15 | 8 | 3.3 | 3.1 | 4.8 | 7.3 |
| Heptanol | 4251 | 7 | <0.1 | <0.1 | <0.1 | <0.1 |
| 2-Ethyl hexanol\* | 2706 | 2 | <0.1 | <0.1 | <0.1 | <0.1 |
| Octanol | 1107 | 2 | <0.1 | <0.1 | <0.1 | <0.1 |
| Phenylethyl alcohol | 11008 | 2 | <0.1 | <0.1 | <0.1 | <0.1 |
| **Esters** |  | |  | |
| Ethyl acetate | 50001 | 3,5,7,9,10 | 0.5 | 0.7 | 1.0 | 1.0 |
| Ethyl propionate\* | 101 | 3 | 0.4 | 0.5 | 0.5 | 0.9 |
| Ethyl isobutyrate | 159 | 3 | nd | 1.0 | 1.8 | 3.7 |
| Ethyl butyrate | 11 | 3 | 79 | 256 | 318 | 376 |
| Ethyl 2-methylbutanoate\* | 0.0914 | 3 | 25 | 98 | 134 | 143 |
| Ethyl pentanoate | 1.52 | 1 | 21 | 74 | 51 | 23 |
| Ethyl hexanoate | 11 | 3 | 30 | 63 | 68 | 57 |
| Hexyl acetate | 67010 | 1,2,3 | <0.1 | <0.1 | <0.1 | <0.1 |
| 2-Hexenoic acidethyl ester\* | 75011 | 1,3 | <0.1 | <0.1 | <0.1 | <0.1 |
| Ethyl octanoate\* | 1941 | 2,3,4 | <0.1 | <0.1 | <0.1 | <0.1 |
| Ethyl 3-hydroxybutyrate\* | 2000012 | 3,4,6 | <0.1 | <0.1 | <0.1 | <0.1 |
| **Aldehydes** |  | |  | |
| Pentanal | 121,7 | 1,7 | 0.4 | 0.4 | 0.5 | 0.5 |
| Heptanal\* | 313 | 3,7 | 4.2 | 4.3 | 4.5 | 4.5 |
| Octanal | 0.71,2,7 | 1,2,3,7 | 9.7 | 9.7 | 12.7 | 11.6 |
| Nonanal | 11,7 | 1,3 | 60 | 48 | 65 | 54 |
| Benzaldehyde | 3501 | 2,3,4,6 | <0.1 | <0.1 | <0.1 | <0.1 |
| Phenylacetaldehyde\* | 41 | 2 | 1.2 | 0.7 | 0.8 | 0.9 |
| **Terpenes** |  | |  | |
| β-Myrcene | 368 | 1,6 | 0.6 | 0.7 | 1.4 | 1.4 |
| D-Limonene | 108 | 3 | 7.1 | 8.0 | 9.2 | 9.7 |
| β-cis-Ocimene\* | 3414 | 1,3 | 0.4 | 0.4 | 0.5 | 05 |
| p-Cymene | 11.41 | 1,3 | 0.2 | 0.2 | 0.3 | 0.3 |
| cis-Linalool oxide\* | 0.58 | 2 | 3.5 | 2.9 | 5.5 | 5.9 |
| Linalool | 68 | 2,3,4 | 73 | 78 | 94 | 100 |
| α-Terpineol | 3308 | 2,4 | <0.1 | <0.1 | <0.1 | <0.1 |
| Nerol | 3008 | 1,2 | <0.1 | <0.1 | <0.1 | <0.1 |
| Geraniol | 408 | 2 | 2.0 | 2.4 | 3.4 | 4.7 |

Supplementary Table S1. Odor activity values (OVAs) for volatile compounds in the pulp juice of ‘Jumeigui’ grape with cluster thinning and girdling at harvest. CK, the control treatment (unthinned and ungirdled); G, trunk girdled one week before véraison; CT, 50% clusters thinned one week before véraison; CTG, 50% clusters thinned and trunk girdled one week before véraison. Odour thresholds of the compounds were determined in water solution, except for ethyl isobutyrate, hexyl acetate and ethyl 3-hydroxybutyrate determined in ethanol-water solution. nd: not detected. \* indicated the semi-quantitative determinations with the internal standards. Odorant series: 1, herbaceous; 2, floral; 3, fruity; 4, sweet; 5, spicy; 6, roasty; 7, fatty; 8, earthy; 9, balsamic; 10, solvent.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Compound  Gene | Total terpenes | | | | Linalool | | | |
| CK | G | CT | CTG | CK | G | CT | CTG |
| VvDXS1 | \_ | \_ | \_ | \_ | \_ | \_ | \_ | \_ |
| VvDXS3 | 0.970\*\* | 0.969\*\* | 0.973\*\* | 0.910\* | 0.940\* | 0.944\* | 0.942\* | 0.891\* |
| VvGPPS | 0.866 | 0.520 | 0.449 | 0.112 | 0.856 | 0.435 | 0.354 | 0.024 |
| VvCSLinNer | \_ | \_ | \_ | \_ | \_ | \_ | \_ | \_ |

Supplementary Table S2. The Pearson’s correlation coefﬁcients between terperne concentrations and gene expression levels in ‘Jumeigui’ grape berry. CK, the control treatment (unthinned and ungirdled); G, trunk girdled one week before véraison; CT, 50% clusters thinned one week before véraison; CTG, 50% clusters thinned and trunk girdled one week before véraison. \* and\*\* indicate significance at *p*<0.05 and *p* <0.01 (2-tailed), respectively; – indicate correlation coefﬁcient < 0.

|  |  |  |
| --- | --- | --- |
| Compounds | Calibration graphs | r2 |
| **C6 compounds** |  |
| Hexanal | y = 4.5912x - 0.1010 | 0.9975 |
| (*Z*)-3-Hexenal | y = 1.8035x - 0.0040 | 0.9992 |
| (*E*)-2-Hexenal | y = 4.5531x - 0.0035 | 0.9994 |
| Hexanol | y = 9.2890x - 0.1199 | 0.9965 |
| (*Z*)-3-Hexen-1-ol | y = 11.0240x - 0.0027 | 0.9853 |
| (*E*)-2-Hexen-1-ol | y = 13.9480x - 0.0047 | 0.9994 |
| **Alcohols** |  |
| 1-Octen-3-ol | y = 1.3250x - 0.0069 | 0.9980 |
| Heptanol | y = 1.1881x - 0.0076 | 0.9970 |
| Octanol | y = 0.9754x - 0.0027 | 0.9928 |
| Phenylethyl alcohol | y = 0.6585x - 0.0074 | 0.9912 |
| **Esters** |  |
| Ethyl acetate | y = 33.1230x - 0.1999 | 0.9981 |
| Ethyl isobutyrate | y = 6.4466x - 0.0788 | 0.9910 |
| Ethyl butyrate | y = 3.4627x - 0.0602 | 0.9818 |
| Ethyl pentanoate | y = 12.8954x + 0.0218 | 0.9980 |
| Ethyl hexanoate | y = 0.9127x + 0.0215 | 0.9983 |
| Hexyl acetate | y = 0.9114x - 0.0003 | 0.9990 |
| **Aldehydes** |  |
| Pentanal | y = 1.8075x - 0.0040 | 0.9967 |
| Octanal | y = 1.4606x - 0.0019 | 0.9965 |
| Nonanal | y = 3.9123x - 0.0087 | 0.9950 |
| Benzaldehyde | y = 7.3396x - 0.0116 | 0.9988 |
| **Terpenes** |  |
| β-Myrcene | y = 1.4759x + 0.0083 | 0.9989 |
| D-Limonene | y = 1.6730x - 0.0056 | 0.9994 |
| p-Cymene | y = 0.8372x - 0.0021 | 0.9999 |
| Linalool | y = 1.0045x - 0.0052 | 0.9995 |
| α-Terpineol | y = 2.2722x + 0.0023 | 0.9978 |
| Nerol | y = 2.6263x - 0.0117 | 0.9927 |
| Geraniol | y = 4.4518x + 0.0223 | 0.9961 |

Supplementary Table S3. Quantitative standards and calibration graphs for quantification of volatile compounds in ‘Jumeigui’ grapes. y, concentration ratio of a compound to the 2-octanol (internal standard); x, peak ratio of a compound to the 2-octanol; r, regression coefficient.

|  |  |  |  |
| --- | --- | --- | --- |
| Gene name | Accession number | Forward (5’→3’) | Reverse (5’→3’) |
| VvDXS1 | CU459219 | CTCATTTCCTGCCCATTTTAGC | CTTACTCCTTTGCTGGGATTGG |
| VvDXS3 | CU459223 | GAAGGCTCTGTTGGAGGGTTT | TCCTCTGGTGATGCCTGTTCT |
| VvDXR | CU459229 | AGAGGCTTTGGCTGACTGTGA | AACCTGCGCAACCTACTATTCC |
| VvHDR | CU459225 | TCTTCCTCGTCTGTGGCTGTT | GCGATTCATGAGCTCCAGAGT |
| VvGPPS | AY351862 | AGAATCTGGGATTGGCATTCC | TGGCGGATGTCAGACAATGA |
| VvCSLinNer | HM807393 | TGGGATTCTCTCCTGCCTTTT | GCAGTAGGCACAAGCACAACA |
| VvActin1 | XM\_002282480 | CTTGCATCCCTCAGCACCTT | TCCTGTGGACAATGGATGGA |
| VvGAPDH | VIT\_17s0000g10430 | TTCCGTGTTCCTACTGTTG | CCTCTGACTCCTCCTTGAT |

Supplementary Table S4. Primers used for the quantification of gene expression levels by qRT-PCR of ‘Jumeigui’ grape.

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