Supplementary materials for:

# Influences of Cluster Thinning on Fatty Acids and Green Leaf Volatiles in the Production of Cabernet Sauvignon Grapes and Wines in the Northwest of China

**Xiaoyu Xu [1,2,†], Chifang Cheng [3,†], Xu Qian [4], Ying Shi [1,2], Changqing Duan [1,2], Yibin Lan [1,2,*]**

[1] Centre for Viticulture & Enology, College of Food Science and Nutritional Engineering, China Agricultural University, Beijing 100083, China; xuxiaoyu62429@163.com (X.X.); shiy@cau.edu.cn (Y.S.); chqduan@cau.edu.cn (C.D.)
[2] Key Laboratory of Viticulture and Enology, Ministry of Agriculture and Rural Affairs, College of Food
Science and Nutritional Engineering, China Agricultural University, Beijing 100083, China
[3] Xinjiang Wine Industry Innovation Research Institute, Manasi 832200, China; chengchifang@citicguoanwine.com
[4] School of Biology and Food Engineering, Changshu Institute of Technology, Changshu 215500, China;
qianxu@cslg.edu.cn
* Correspondence: lanyibin@cau.edu.cn; Tel.: +86-010-62-738-658
† These authors contributed equally to this work.

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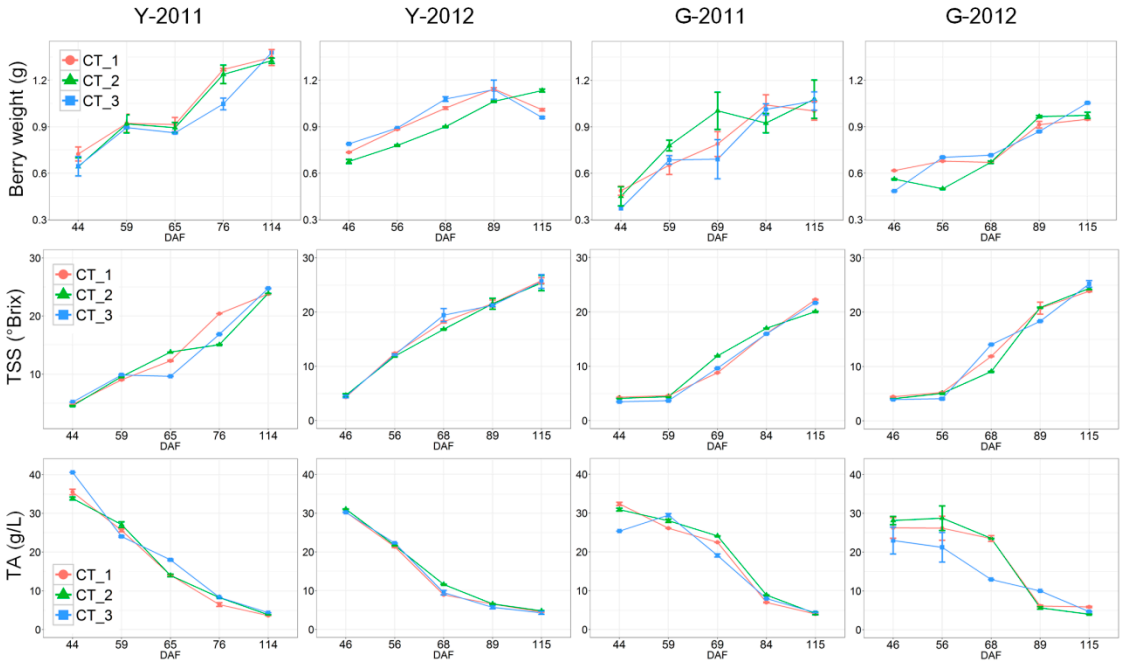


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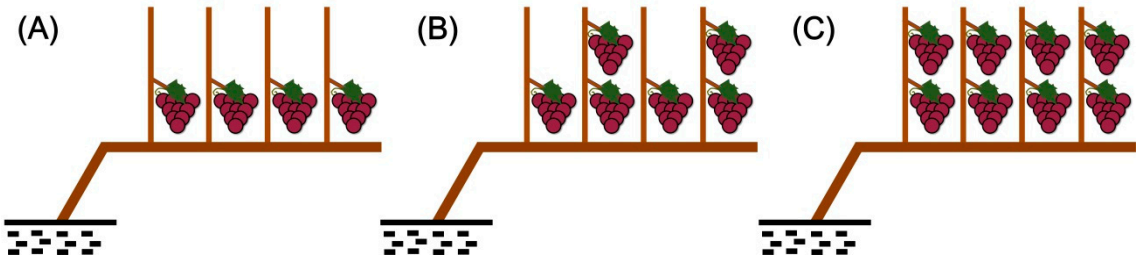


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## Supplementary tables

**Table S1.** Meteorological data of the experimental field during the growing season (April-October) and ripening period (August-September) in 2011-2012.

| Year | Mean Temperature (°C) | | Growing Degree Days (°C) | | Sunlight Duration (h) | | Rain (mm) | |
|---|---|---|---|---|---|---|---|---|
| | Aug-Sep | Apr-Oct | Aug-Sep | Apr-Oct | Aug-Sep | Apr-Oct | Aug-Sep | Apr-Oct |
| 2011 | 22.1 | 20.3 | 740.9 | 2290.6 | 627.4 | 2173.7 | 41.2 | 181.1 |
| 2012 | 22.3 | 20.8 | 752.9 | 2356.2 | 647.3 | 2235.8 | 29.0 | 103.6 |

**Table S2.** The concentrations of $C_6$ and $C_9$ volatiles in wines made from berries with different treatments from two farms in two vintages.

| Wine volatiles (μg/L) | Y-farm | | | | | | G-farm | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2011 | | | 2012 | | | 2011 | | | 2012 | | |
| | CT-1 | CT-2 | CT-3 | CT-1 | CT-2 | CT-3 | CT-1 | CT-2 | CT-3 | CT-1 | CT-2 | CT-3 |
| Ethyl hexanoate (mg/L) | 0.84±0.30a* | 0.63±0.19a | 0.59±0.20a | 3.72±0.10a | 4.58±0.15b | 3.93±0.24ab | 0.54±0.07a | 0.75±0.03a | 0.87±0.16a | 4.42±0.47a | 3.87±0.29a | 4.54±0.11a |
| Hexyl acetate | 16.05±6.45a | 9.03±4.4a | 7.72±1.18a | 98.97±2.7b | 21.43±0.56a | 164.59±8.55c | 23.67±7.44a | 35.36±1.48a | 44.25±8.03a | 314.8±32.19a | 316.98±24.05a | 324.45±7.32a |
| Ethyl 3-hexenoate | nd** | nd | nd | 2.23±1.65a | 5.91±0.27a | 2.3±2.05a | nd | nd | nd | 6.11±0.54a | 6.17±0.12a | 6.66±0.04a |
| Propyl hexanoate | nd | nd | nd | 8.58±0.21a | 12.47±0.5b | 9.1±0.24a | nd | nd | nd | 11.79±1.47a | 10.44±1.3a | 14.59±0.53a |
| Ethyl 2-hexenoate | 12.16±3.08a | 6.38±1.83a | 8.11±1.24a | 15.52±0.24c | 11.36±0.23a | 12.61±0.16b | 6.72±0.72a | 6.56±0.25a | 9.87±0.6b | 15.35±1.13a | 14.96±0.51a | 17.13±0.51a |
| 1-Hexanol (mg/L) | 1.86±0.05a | 1.38±0.17a | 1.72±0.27a | 0.36±0.02b | 0.27±0.02a | 0.31±0.01ab | 1.56±0.01a | 2.22±0.07b | 2.41±0.09b | 0.45±0.01a | 0.46±0.01a | 0.48±0.01a |
| (E)-3-Hexen-1-ol | 23.36±1.21a | 16.83±1.37a | 23.49±4.42a | 95.79±0.58c | 71.74±0.65a | 84.01±1.81b | 22.02±1.41a | 30.08±0.6b | 35.89±0.1c | 128.78±5.98a | 137.71±4.36a | 124.29±6.3a |
| (Z)-3-Hexen-1-ol | 7.25±0.56a | 7.51±0.15a | 6.37±0.24a | 94.17±7.56a | 120.97±5.73ab | 138.59±6.17b | 9.05±0.38a | 12.1±0.35b | 11.46±0.78b | 267.49±8.25a | 278.41±5.67a | 367.08±7.93b |
| (E)-2-Hexen-1-ol | 6.77±9.57a | nda | nda | nd | nd | nd | nd | nd | nd | nd | nd | nd |
| Ethyl 8-nonenoate | 1.14±1.62a | 1.24±1.75a | 2.57±0.12a | 3.34±0.54a | 3.57±0.01a | 3.5±0.01a | 1.52±2.14a | 1.55±2.19a | 2.53±1.36a | 3.47±0.01a | 3.47±0a | 3.44±0.03a |
| (Z)-3-Nonen-1-ol | nd | nd | nd | 0.36±0.1a | 0.29±0a | 0.29±0a | nd | nd | nd | 0.29±0a | 0.68±0.16b | 0.29±0a |
| (E)-6-Nonen-1-ol | 1.02±0.03a | 0.98±0.28a | 1.06±0.01a | 1.38±0.02b | 1.08±0.1a | 1.31±0.04ab | nd | nd | nd | 1.5±0.06a | 1.34±0.13a | 1.55±0.15a |
| (E,Z)-2,6-Nonadienal | nd | nd | nd | 3.11±0.23b | 3.67±0.05b | 2.09±0.16a | nd | nd | nd | 3.35±0.47a | 3.04±0.07a | 2.97±0.02a |
| Hexanoic acid (mg/L) | 0.58±0.21a | 0.40±0.08a | 0.37±0.11a | nd | nd | nd | 0.47±0.13a | 0.56±0.12a | 0.47±0.05a | nd | nd | nd |
| Esters (mg/L) | 0.86±0.31a | 0.65±0.20a | 0.61±0.02a | 3.85±0.10a | 4.63±0.15b | 4.12±0.24ab | 0.58±0.08a | 0.79±0.03a | 0.93±0.02a | 4.77±0.51a | 4.22±0.32a | 4.90±0.12a |
| Alcohols (mg/L) | 1.90±0.06a | 1.40±0.17a | 1.75±0.28a | 0.56±0.01b | 0.47±0.02a | 0.54±0.00b | 1.59±0.00a | 2.26±0.07b | 2.46±0.09b | 0.85±0.03a | 0.87±0.01ab | 0.97±0.03b |
| $C_9$ | 2.16±1.59a | 2.22±2.04a | 3.63±0.13a | 8.19±0.68a | 8.61±0.04a | 7.19±0.21a | 1.52±2.14a | 1.55±2.19a | 2.53±1.36a | 8.62±0.55a | 8.53±0.21a | 8.26±0.16a |
| $C_6$ (mg/L) | 3.34±0.58a | 2.45±0.10a | 2.73±0.36a | 4.40±0.11a | 5.10±0.17a | 4.65±0.25a | 2.63±0.22a | 3.62±0.23b | 3.86±0.21b | 5.62±0.53a | 5.09±0.31a | 5.87±0.15a |
| Sum*** (mg/L) | 3.35±0.58a | 2.45±0.11a | 2.73±0.37a | 4.41±0.11a | 5.11±0.17a | 4.66±0.25a | 2.63±0.22a | 3.62±0.23b | 3.86±0.21b | 5.63±0.54a | 5.10±0.31a | 5.88±0.15a |

*Different letters represent significant differences among treatments from individual farm in each vintage according to Duncan test ($P < 0.05$).

**nd means not detected. ***Sum represents the total concentration of all $C_6$ and $C_9$ volatiles.

**Table S3.** The average values of the selected soils parameters in two vineyards.

| Vineyards | Sand (%) | pH | Organic Matter (%) | Water Content (%) | Elements (mg/kg) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Na | Ca | Mg | N | P | K |
| Y-farm | 35.2 | 7.9 | 0.8 | 25.1 | 33.0 | 3711.4 | 231.1 | 59.1 | 4.7 | 133.2 |
| G-farm | 29.9 | 7.3 | 6.1 | 36.5 | 58.3 | 3798.0 | 367.0 | 79.9 | 23.4 | 104.9 |

**Table S4.** Wine parameters made from berries with different treatments from two farms in two vintages.

| **Treatment** | Ethanol (%vol) | | Residual sugar (g/L) | | pH | |
|---|---|---|---|---|---|---|
| **Y-farm** | 2011 | 2012 | 2011 | 2012 | 2011 | 2012 |
| CT-1 | 13.70 | 15.20[b] | 2.90 | 2.68[a] | 3.99 | 3.88[a] |
| CT-2 | 13.70 | 14.00[a] | 2.88 | 3.33[b] | 3.98 | 3.94[b] |
| CT-3 | 14.00 | 15.10[b] | 2.55 | 2.70[a] | 3.94 | 3.87[a] |
| Significance | ns | * | ns | * | ns | * |
| **G-farm** | 2011 | 2012 | 2011 | 2012 | 2011 | 2012 |
| CT-1 | 13.10 | 13.30 | 3.30 | 3.61 | 4.00[b] | 3.76[b] |
| CT-2 | 12.30 | 13.70 | 3.11 | 3.90 | 3.93[a] | 3.76[b] |
| CT-3 | 12.70 | 13.20 | 3.23 | 3.80 | 3.93[a] | 3.75[a] |
| Significance | ns | ns | ns | ns | * | * |

Different letters represent significant differences among treatments in each vintage according to Duncan test. *: significant at 0.05 level. Cluster thinning treatments: CT-1, one cluster per shoot thinned, 1 cluster/shoot reserved; CT-2, one cluster every other shoot thinned, average 1.5 clusters/shoot reserved; CT-3, not thinned, 2 clusters/shoot reserve.