

SUPPLEMENTARY DATA

Onetto, C., McCarthy, J., Solomon, M., Borneman, A. R., & Schmidt, S. A. (2023). Enhancing fermentation performance through the reutilisation of wine yeast lees. *OENO One*, 58(1).
<https://doi.org/10.20870/oeno-one.2024.58.1.7749>



Supplementary data

Table S1. Chemical analysis of the Chardonnay musts used in this study.

| Parameter | Juice A | Juice B | Juice C | Unit |
|----------------------------------|---------|---------|---------|------|
| Sulfur Dioxide (free) | <3 | 3 | 8 | mg/L |
| Sulfur Dioxide (total) | <3 | 15 | 29 | mg/L |
| Malic acid | n.d. | n.d. | 2,61 | g/L |
| pH | 3,55 | 3,63 | 3,36 | |
| Titrateable acid pH 7.0 | 3,4 | 2,4 | 4,7 | g/L |
| Titrateable acid pH 8.2 | 3,7 | 2,6 | 4,9 | g/L |
| Brix | 19,6 | 14,6 | 21,1 | |
| Yeast assimilable nitrogen (YAN) | 212 | 154 | 201 | mg/L |
| Ammonia | 85 | 62 | 69 | mg/L |
| Alpha Amino Nitrogen | 142 | 103 | 144 | mg/L |
| Arsenic | <2.0 | <2.0 | <2.0 | ug/L |
| Cadmium | <2.0 | <2.0 | <2.0 | ug/L |
| Calcium | 75 | 50 | 83 | mg/L |
| Chromium | 6 | <2 | 5 | ug/L |
| Cobalt | <2.0 | <2.0 | <2.0 | ug/L |
| Copper | 0,5 | 0,7 | 1,6 | mg/L |
| Iron | <0.3 | <0.3 | <0.3 | mg/L |
| Lead | <2.0 | 10,1 | 4,1 | ug/L |
| Lithium | <5.0 | <5.0 | <5.0 | ug/L |
| Magnesium | 99 | 47 | 91 | mg/L |
| Manganese | 0,4 | <0.3 | 0,4 | mg/L |
| Nickel | 4,9 | 7,1 | 12,3 | ug/L |
| Potassium | 1303 | 623 | 786 | mg/L |
| Selenium | <2.0 | <2.0 | <2.0 | ug/L |
| Silver | <2 | <2 | <2 | ug/L |
| Sodium | 23 | 23 | 31 | mg/L |
| Strontium | 506 | 387 | 415 | ug/L |
| Tin | 3 | <2 | <2 | ug/L |
| Vanadium | <2 | <2 | <2 | ug/L |
| Zinc | 368 | 330 | 1201 | ug/L |

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Table S2. Multiple comparison of viable cells (CFU/mL) at day 4 since inoculation.

| Dunnett's multiple comparisons test | Mean Diff. | 95.00 % CI of diff. | Adjusted P Value | Mean 1 | Mean 2 | SD 1 | SD 2 |
|-------------------------------------|------------|-----------------------|------------------|----------|-----------|---------|----------|
| Control vs. 1 % Autolysis | -17333333 | -65613944 to 30947277 | 0,7906 | 85333333 | 102666667 | 6429101 | 14742230 |
| Control vs. 2 % Autolysis | -35333333 | -83613944 to 12947277 | 0,1976 | 85333333 | 120666667 | 6429101 | 13316656 |
| Control vs. 5 % Autolysis | -17333333 | -65613944 to 30947277 | 0,7906 | 85333333 | 102666667 | 6429101 | 12858201 |
| Control vs. 1 % Alcalase | -93333333 | -57613944 to 38947277 | 0,9818 | 85333333 | 94666667 | 6429101 | 14468356 |
| Control vs. 2 % Alcalase | -44000000 | -92280610 to 4280610 | 0,0802 | 85333333 | 129333333 | 6429101 | 9451631 |
| Control vs. 5 % Alcalase | -34000000 | -82280610 to 14280610 | 0,225 | 85333333 | 119333333 | 6429101 | 44557079 |

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Table S3. Concentration of volatile compounds in Chardonnay wines supplemented with 1 % and 2 % (v/v) of lees lysates.

| Volatile compounds | Control | 1 % Autolysis | 2 % Autolysis | 5 % Autolysis | 1 % Alcalase | 2 % Alcalase | 5 % Alcalase | Unit |
|--------------------------|--------------|---------------|---------------|---------------|--------------|--------------|--------------|------|
| Esters | | | | | | | | |
| Ethyl acetate | 33.8(10.0) | 47.9(0.3) | 46.1(1.8) | 49.4(2.3) | 42.1(2.3) | 43.4(1.0) | 48.0(3.8) | mg/L |
| Ethyl propanoate | 553.9(610.3) | 182.6(35.8) | 183.7(25.1) | 205.1(16.9) | 177.6(21.2) | 166.4(13.4) | 203.7(17.1) | ug/L |
| Ethyl 2-methylpropanoate | 7.5(3.3) | 8.0(1.8) | 8.5(1.6) | 7.9(1.2) | 7.3(1.7) | 6.8(0.6) | 8.2(0.6) | ug/L |
| Ethyl butanoate | 211.1(71.3) | 306.4(34.9) | 273.2(33.9) | 326.9(43.1) | 274.0(60.9) | 312.0(41.7) | 314.1(43.3) | ug/L |
| Ethyl 3-methylbutanoate | 2.7(0.6) | 2.8(0.3) | 2.6(0.7) | 2.7(0.5) | 2.7(0.3) | 3.0(0.1) | 3.3(0.3) | ug/L |
| Ethyl hexanoate | 663.8(184.0) | 825.7(38.3) | 741.2(49.6) | 849.1(127.3) | 689.7(89.4) | 732.1(23.0) | 756.9(95.5) | ug/L |
| Ethyl octanoate | 0.8(0.4) | 1.1(0.2) | 1.0(0.2) | 1.2(0.2) | 1.0(0.2) | 1.1(0.1) | 1.0(0.2) | mg/L |
| Ethyl decanoate | 665.5(294.2) | 443.5(149.7) | 431.4(144.8) | 701.0(101.7) | 554.0(270.4) | 569.8(119.9) | 577.1(79.8) | ug/L |
| 2-Methylpropyl acetate | 26.7(17.4) | 52.9(4.0) | 52.6(4.0) | 56.4(5.3) | 45.1(5.6) | 51.7(5.4) | 56.2(7.7) | mg/L |
| 2-Methylbutyl acetate | 130.0(76.9) | 259.0(14.8) | 237.6(19.5) | 238.7(21.5) | 209.2(18.7) | 250.6(17.9) | 272.9(46.5) | ug/L |
| 3-Methylbutyl acetate | 3.2(2.2) | 6.4(0.5) | 5.4(0.5) | 5.8(1.0) | 5.0(0.7) | 5.6(0.4) | 6.0(1.3) | mg/L |
| Hexyl acetate | 505.7(336.1) | 821.1(111.5) | 741.8(89.8) | 791.3(104.4) | 685.7(113.3) | 728.9(36.5) | 729.8(115.1) | ug/L |
| 2-Phenyl ethyl acetate | 166.1(83.6) | 299.7(23.0) | 257.1(21.2) | 302.8(50.9) | 227.6(26.4) | 250.1(14.4) | 286.2(56.8) | ug/L |
| Total | 40.8(13.1) | 58.5(1.2) | 55.5(2.8) | 59.9(3.8)* | 51.0(3.1) | 53.1(1.5) | 58.2(5.7) | mg/L |
| Higher alcohols | | | | | | | | |
| 2-Methylpropanol | 23.5(5.9) | 25.1(6.2) | 27.6(6.0) | 24.2(2.3) | 27.7(6.3) | 24.6(0.7) | 24.7(2.9) | mg/L |
| 2-Methylbutanol | 55.0(21.9) | 48.8(7.8) | 51.3(7.6) | 43.0(4.6) | 54.9(11.0) | 49.9(2.4) | 52.4(5.4) | mg/L |
| 3-Methylbutanol | 166.4(20.4) | 194.4(25.1)* | 201.0(18.2)* | 185.3(12.4)* | 204.9(26.7)* | 196.5(3.9)* | 207.3(7.7)* | mg/L |
| Hexanol | 5.0(0.5) | 3.1(0.0) | 3.4(0.4) | 3.7(0.2) | 4.2(0.5) | 4.2(0.2) | 4.4(0.2) | mg/L |
| 2-Phenyl ethanol | 25.5(6.2) | 24.5(3.5) | 24.2(2.2) | 23.9(0.5) | 25.5(3.2) | 25.1(3.6) | 26.5(2.0) | mg/L |
| Total | 275.3(53.1) | 295.9(42.5) | 307.6(34.0) | 280.1(19.3) | 317.3(47.3) | 300.2(9.3) | 315.3(18.0) | mg/L |
| Volatile acids | | | | | | | | |
| Acetic acid | 95.9(66.8) | 214.0(5.2)* | 315.8(7.6)* | 371.1(37.9)* | 245.3(43.6)* | 268.0(37.1)* | 325(30.1)* | mg/L |
| 2-Methylpropanoic acid | 527.1(60.0) | 597.2(79.9) | 639.7(88.2) | 676.4(44.1) | 591.6(103.9) | 507.9(61.0) | 686.8(115.4) | ug/L |
| 2-Methylbutanoic acid | 199.2(101.8) | 221.0(52.0) | 265.8(44.6) | 256.5(52.7) | 235.1(54.9) | 214.1(13.7) | 280.9(53.0) | ug/L |
| 3-Methylbutanoic acid | 318.0(99.0) | 409.1(94.6) | 520.4(107.7) | 556.7(113.1) | 416.3(51.9) | 452.4(34.1) | 578.1(111.9) | ug/L |
| Octanoic acid | 3.6(1.6) | 4.7(1.0) | 4.1(0.8) | 4.7(0.8) | 4.1(1.0) | 4.4(0.5) | 4.2(0.7) | mg/L |
| Decanoic acid | 1.9(0.9) | 1.8(0.6) | 1.3(0.3) | 1.4(0.2) | 1.8(0.6) | 1.7(0.2) | 1.3(0.3) | mg/L |
| Hexanoic acid | 3.2(1.0) | 3.9(0.3) | 3.6(0.3) | 4.3(0.6) | 3.4(0.4) | 3.8(0.3) | 3.9(0.5) | mg/L |
| Total | 102.5(69.0) | 221.7(3.9) | 322.7(6.8) | 378.8(37.2) | 252.5(43.0) | 275.4(37.7) | 331.6(29.4) | mg/L |

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Table S4. Multiple comparison of viable cells (CFU/mL) at day 4 since inoculation.

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|-------------------------------------|------------|------------------------|------------------|----------|----------|----------|----------|
| Control vs. 2 % Autolysis | 386667 | -89009034 to 89782367 | >0.9999 | 74801667 | 74415000 | 10343351 | 18999962 |
| Control vs. 5 % Autolysis | -360000 | -89755701 to 89035701 | >0.9999 | 74801667 | 75161667 | 10343351 | 25362461 |
| Control vs. 2 % Alcalase | -11718333 | -101114034 to 77677367 | 0,9854 | 74801667 | 86520000 | 10343351 | 72850060 |
| Control vs. 5 % Alcalase | -19000000 | -108395701 to 70395701 | 0,9248 | 74801667 | 93801667 | 10343351 | 27480761 |