**Table S1.** Glucose, fructose and sulphur dioxide (SO2) concentrations of Shiraz wines produced with different yeast strains in combination with three malolactic fermentation (MLF) strategies (none, simultaneous or sequential). Values are averages of three replicates.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Treatment 1** | **Glucose****(g/L)** | **Fructose****(g/L)** | **Free SO2 (mg/L)** | **Total SO2 (mg/L)** |
| Sc | 1.18±0.11def 2 | 1.05±0.03cdefgh | 16 | 29 |
| Sc+sim MLF | 1.20±0.18def | 0.95±0.07hijk | 19 | 35 |
| Sc+seq MLF | 1.18±0.23def | 1.00±0.06fghij | 16 | 28 |
| C7+Sc | 1.34±0.14bcdef | 0.89±0.10klm | 17 | 33 |
| C7+Sc+sim MLF | 1.30±0.21bcdef | 0.89±0.04jklm | 16 | 29 |
| C7+Sc+seq MLF | 1.33±0.02bcdef | 0.99±0.07ghijk | 16 | 30 |
| H4+Sc | 1.62±0.10a | 1.16±0.07ab | 18 | 33 |
| H4+Sc+sim MLF | 1.41±0.10abcde | 1.02±0.08efghi | 17 | 31 |
| H4+Sc+seq MLF | 1.55±0.16ab | 1.20±0.02a | 18 | 32 |
| L1+Sc | 1.16±0.27ef | 1.16±0.02ab | 18 | 30 |
| L1+Sc+sim MLF | 1.54±0.10ab | 1.06±0.03bcdefgh | 16 | 29 |
| L1+Sc+seq MLF | 1.08±0.16f | 1.13±0.11abcd | 17 | 31 |
| L2+Sc | 1.43±0.12abcd | 1.12±0.04bcde | 18 | 32 |
| L2+Sc+sim MLF | 1.38±0.24abcde | 0.79±0.10m | 16 | 30 |
| L2+Sc+seq MLF | 1.45±0.20abcd | 1.14±0.03abc | 18 | 32 |
| M2+Sc | 1.18±0.24def | 1.03±0.04defghi | 18 | 31 |
| M2+Sc+sim MLF | 1.14±0.15ef | 0.94±0.07ijkl | 16 | 30 |
| M2+Sc+seq MLF | 1.23±0.08cdef | 1.04±0.11cdefghi | 17 | 31 |
| T3+Sc | 1.40±0.18abcde | 1.05±0.04cdefgh | 16 | 30 |
| T3+Sc+sim MLF | 1.29±0.13bcdef | 0.98±0.06hijk | 17 | 31 |
| T3+Sc+seq MLF | 1.19±0.22def | 1.10±0.57bcdef | 16 | 27 |
| T6+Sc | 1.35±0.14abcdef | 1.10±0.09bcdefg | 17 | 34 |
| T6+Sc+sim MLF | 1.38±0.07abcde | 0.84±0.06lm | 16 | 31 |
| T6+Sc+seq MLF | 1.48±0.10abc | 1.10±0.07bcdefg | 16 | 32 |

1 *Saccharomyces cerevisiae* (Sc), *Candida zemplinina* C7, *Hanseniaspora uvarum* H4, *Lachancea thermotolerans* strains L1 and L2, *Metschnikowia pulcherrima* M2, *Torulaspora delbrueckii* strains T3 and T6 and simultaneous (sim) MLF and sequential (seq) MLF induced with a commercial *Oenococcus oeni* culture.

2 Values in the same column followed by the same letter did not differ significantly (p ≤ 0.05).

**Table S2.** Probability (p) values1 of volatile compounds of Shiraz wines produced with different yeast strains in combination with three malolactic fermentation (MLF) strategies (none, simultaneous or sequential) and the interaction between yeast and MLF strategy.

|  |  |
| --- | --- |
| **Compounds** | **Treatment** |
| **Yeast** | **MLF strategy** | **Yeast x MLF strategy** |
| Diethyl succinate | <0.0001 | <0.0001 | <0.0001 |
| Ethyl acetate | <0.0001 | <0.0001 | <0.0001 |
| Ethyl butanoate | <0.0001 | <0.0001 | 0.0002 |
| Ethyl decanoate | <0.0001 | <0.0001 | <0.0001 |
| Ethyl hexanoate | <0.0001 | <0.0001 | <0.0001 |
| Ethyl-3-hydroxybutanoate | <0.0001 | <0.0001 | <0.0001 |
| Ethyl lactate | <0.0001 | <0.0001 | <0.0001 |
| Ethyl octanoate | <0.0001 | <0.0001 | <0.0001 |
| Ethyl phenylacetate | <0.0001 | <0.0001 | <0.0001 |
| Isoamyl acetate | <0.0001 | <0.0001 | <0.0001 |
| 2-Phenylethyl acetate | <0.0001 | <0.0001 | <0.0001 |
| Butanol | <0.0001 | <0.0001 | <0.0001 |
| 3-Ethoxy-1-propanol | <0.0001 | <0.0001 | <0.0001 |
| Hexanol | <0.0001 | <0.0001 | <0.0001 |
| Methanol | <0.0001 | <0.0001 | <0.0001 |
| 3-Methyl-1-pentanol | <0.0001 | <0.0001 | <0.0001 |
| Isoamyl alcohol | <0.0001 | <0.0001 | <0.0001 |
| Isobutanol | <0.0001 | <0.0001 | <0.0001 |
| Pentanol | <0.0001 | <0.0001 | <0.0001 |
| 2-Phenylethanol | <0.0001 | <0.0001 | <0.0001 |
| Propanol | <0.0001 | <0.0001 | <0.0001 |
| Acetoin | <0.0001 | <0.0001 | <0.0001 |
| Acetic acid | <0.0001 | <0.0001 | <0.0001 |
| Butyric acid | <0.0001 | <0.0001 | 0.0573 |
| Decanoic acid | <0.0001 | <0.0001 | <0.0001 |
| Hexanoic acid | <0.0001 | <0.0001 | <0.0001 |
| Isobutyric acid | <0.0001 | <0.0001 | <0.0001 |
| Isovaleric acid | <0.0001 | <0.0001 | <0.0001 |
| Octanoic acid | <0.0001 | <0.0001 | <0.0001 |
| Propionic acid | <0.0001 | 0.0002 | <0.0001 |
| Valeric acid | <0.0001 | <0.0001 | 0.0049 |

1Values are significant if p ≤ 0.05.

**Table S3.** Sensory data of Shiraz wines produced with different yeast strains in combinations with three malolactic fermentation (MLF) strategies (none, simultaneous and sequential). Values are averages of three replicates.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Treatment 1** | **Berry** | **Fruity** | **Fresh Vegetative** | **Cooked vegetative** | **Spice** | **Floral** | **Acidity** | **Body** | **Astringency** | **Bitterness** | **Overall quality** |
| Sc | 56.78abcde 2 | 36.91de | 33.00abc | 16.09b | 32.12abcde | 14.96ab | 49.51ab | 58.40abcd | 40.40abc | 15.13bc | 55.59abcd |
| Sc+sim MLF | 56.26abcdef | 36.60e | 32.32abc | 15.99b | 34.68abcd | 15.72ab | 46.50bcd | 59.74ab | 43.16ab | 15.99bc | 57.61abc |
| Sc+seq MLF | 49.71g | 37.18cde | 31.96abc | 19.22ab | 34.62abcd | 14.33ab | 47.27abcd | 54.91cde | 39.04bc | 19.88ab | 52.74d |
| C7+Sc | 59.91abc | 39.91abcde | 32.93abc | 16.60ab | 32.69abcde | 15.13ab | 48.44abc | 55.57bcde | 37.54c | 15.91bc | 57.71abc |
| C7+Sc+sim MLF | 59.96abc | 40.91abcde | 32.13abc | 18.82ab | 35.24ab | 16.94a | 50.13a | 60.40a | 40.73abc | 18.72abc | 59.45a |
| C7+Sc+seq MLF | 57.11abcdc | 38.06cde | 28.85abc | 17.92ab | 36.36ab | 16.02ab | 47.67abcd | 58.13abcde | 38.58c | 15.75bc | 57.62abc |
| H4+Sc | 55.00cdefg | 39.47abcde | 30.44abc | 18.13ab | 28.63cde | 14.69ab | 47.51abcd | 58.56abc | 39.64bc | 16.59bc | 57.05abcd |
| H4+Sc+sim MLF | 56.00bcdef | 38.41bcde | 27.78c | 18.49ab | 31.27bcde | 15.62ab | 49.46ab | 59.32ab | 39.33bc | 17.89bc | 57.14abcd |
| H4+Sc+seq MLF | 49.77g | 37.92cde | 31.89abc | 21.78ab | 33.89abcde | 16.31ab | 46.76bcd | 59.01ab | 40.21abc | 16.73bc | 54.19bcd |
| L1+Sc | 55.72bcdef | 39.26abcde | 34.39abc | 17.13ab | 34.25abcd | 15.74ab | 48.16abcd | 54.43de | 38.29c | 16.67bc | 54.23bcd |
| L1+Sc+sim MLF | 61.33a | 40.14abcde | 35.28ab | 16.36ab | 38.06a | 13.53ab | 48.28abcd | 57.98abcde | 40.09abc | 18.93abc | 56.50abcd |
| L1+Sc+seq MLF | 53.29efg | 36.06e | 31.46abc | 18.51ab | 32.22abcde | 15.18ab | 46.57bcd | 56.42abcde | 40.82abc | 17.53bc | 53.80cd |
| L2+Sc | 57.29abcde | 44.36a | 29.58abc | 21.04ab | 33.94abcde | 16.78ab | 48.02abcd | 58.55abcd | 36.81c | 16.96bc | 57.94abc |
| L2+Sc+sim MLF | 54.51defg | 36.74e | 32.14abc | 17.41ab | 31.64bcde | 15.79ab | 48.10abcd | 57.31abcde | 38.22c | 14.51c | 55.86abcd |
| L2+Sc+seq MLF | 51.22fg | 38.87abcde | 29.17abc | 23.10a | 27.83e | 12.54b | 45.93cd | 55.69bcde | 36.83c | 17.36bc | 56.26abcd |
| M2+Sc | 55.47bcdef | 40.56abcde | 32.07abc | 17.42ab | 32.08abcde | 13.76ab | 48.37abc | 59.37ab | 42.89ab | 18.49abc | 55.67abcd |
| M2+Sc+sim MLF | 58.71abcd | 42.67abc | 32.29abc | 17.79ab | 34.02abcde | 16.93a | 47.90abcd | 56.41abcde | 40.49abc | 19.81ab | 57.45abcd |
| M2+Sc+seq MLF | 56.12abcdef | 37.34cde | 34.02abc | 23.08a | 33.34abcde | 13.53ab | 46.56bcd | 57.84abcde | 37.09c | 18.07bc | 58.53ab |
| T3+Sc | 55.24cdef | 40.83abcde | 35.70a | 16.44ab | 33.11abcde | 13.13ab | 49.54ab | 57.37abcde | 39.46bc | 18.07bc | 57.58abc |
| T3+Sc+sim MLF | 53.64defg | 36.59e | 34.92abc | 17.50ab | 28.45cde | 13.03ab | 48.60abc | 59.35ab | 43.98a | 23.55a | 54.24bcd |
| T3+Sc+seq MLF | 57.63abcde | 38.73abcde | 33.30abc | 20.43ab | 30.63bcde | 14.13ab | 47.83abcd | 59.07abcd | 37.13c | 18.90abc | **59.85a** |
| T6+Sc | 57.40abcde | 43.93ab | 27.83bc | 17.60ab | 34.62abcd | 17.42a | 45.27d | 54.04e | 39.33bc | 16.07bc | 56.19abcd |
| T6+Sc+sim MLF | 60.64ab | 42.36abcd | 28.96abc | 16.69ab | 34.76abc | 16.98a | 48.87abc | 59.38ab | 40.51abc | 16.82bc | 56.77abcd |
| T6+Sc+seq MLF | 57.13abcde | 38.24cde | 27.87bc | 15.96b | 28.33de | 16.24ab | 45.10d | 57.84abcde | 38.47c | 15.00bc | 58.49ab |

1*Saccharomyces cerevisiae* (Sc), *Candida zemplinina* C7, *Hanseniaspora uvarum* H4, *Lachancea thermotolerans* strains L1 and L2, *Metschnikowia pulcherrima* M2, *Torulaspora delbrueckii* strains T3 and T6, simultaneous (sim) MLF and sequential (seq) MLF induced with a commercial *Oenococcus oeni* culture.

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