SUPPLEMENTARY INFORMATION FOR

Volatile composition and sensory profiles of a Shiraz wine product made with pre- and post-fermentation additions of *Ganoderma lucidum* extract

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TABLE OF CONTENTS

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┌─────────────────────┐          ┌─────────────────────┐
│ Juice was x-flow    │  ──────▶ │ Juice collected     │
│ filtered and cold   │          │ from Patritti Inc.  │
│ stabilized          │          └─────────────────────┘
└─────────────────────┘                    │
                                           ▼
                                  ┌─────────────────────┐
                                  │ Juice stored        │
                                  │ at -15 °C           │
                                  └─────────────────────┘
┌─────────────────────┐                    │
│ Chemical analyses: pH│                   ▼
│ SO₂, Brix, TA, VA, Yan│ ───────▶ ┌─────────────────────┐
│ G+F, malic acid     │          │ Thawing juice at    │
└─────────────────────┘          │ room temperature    │
                                  └─────────────────────┘
┌─────────────────────┐                    │
│ 300 mg/L EC1118     │ ───────▶ ┌─────────────────────┐ ◀─── ┌─────────────┐
└─────────────────────┘          │ Ferment at 17 °C    │      │ DAP 100 mg/L│
                                  └─────────────────────┘      └─────────────┘
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Chemical analyses: pH SO_2, Brix, TA, VA, Yan, G+F, malic acid

300 mg/L EC1118

DAP 100 mg/L

Juice collected from Patritti Inc.

Juice stored at -15 °C

Thawing juice at room temperature

Ferment at 17 °C

Measuring and monitoring °Brix every day from inoculation point

Fermentation to dryness

°Brix = 2° to 0°
Sugar considered < 2.0 g/L

Rack gross lees

LAB VPN41 on day 2 of primary fermentation and remain in the cool room until malolactic fermentation (MLF) completed

MLF at 20 °C Fermentation

Monitor malic acid weekly

Completion of MLF when malic acid < 0.1 g/L

Cold stabilizing at 0 °C for 21 days

Completion of primary and secondary fermentation: 60 mg/L SO_2 added → adjusted Free SO_2 to 40 mg/L, Total SO_2 > 80 mg/L & pH → 3.6

Rack MLF lees

Adjust SO_2 to 35-40 mg/L, TA

Bottling, labelling, packaging

Chemical analyses: pH, free & total SO_2, °Brix, TA, VA, G+F, malic acid
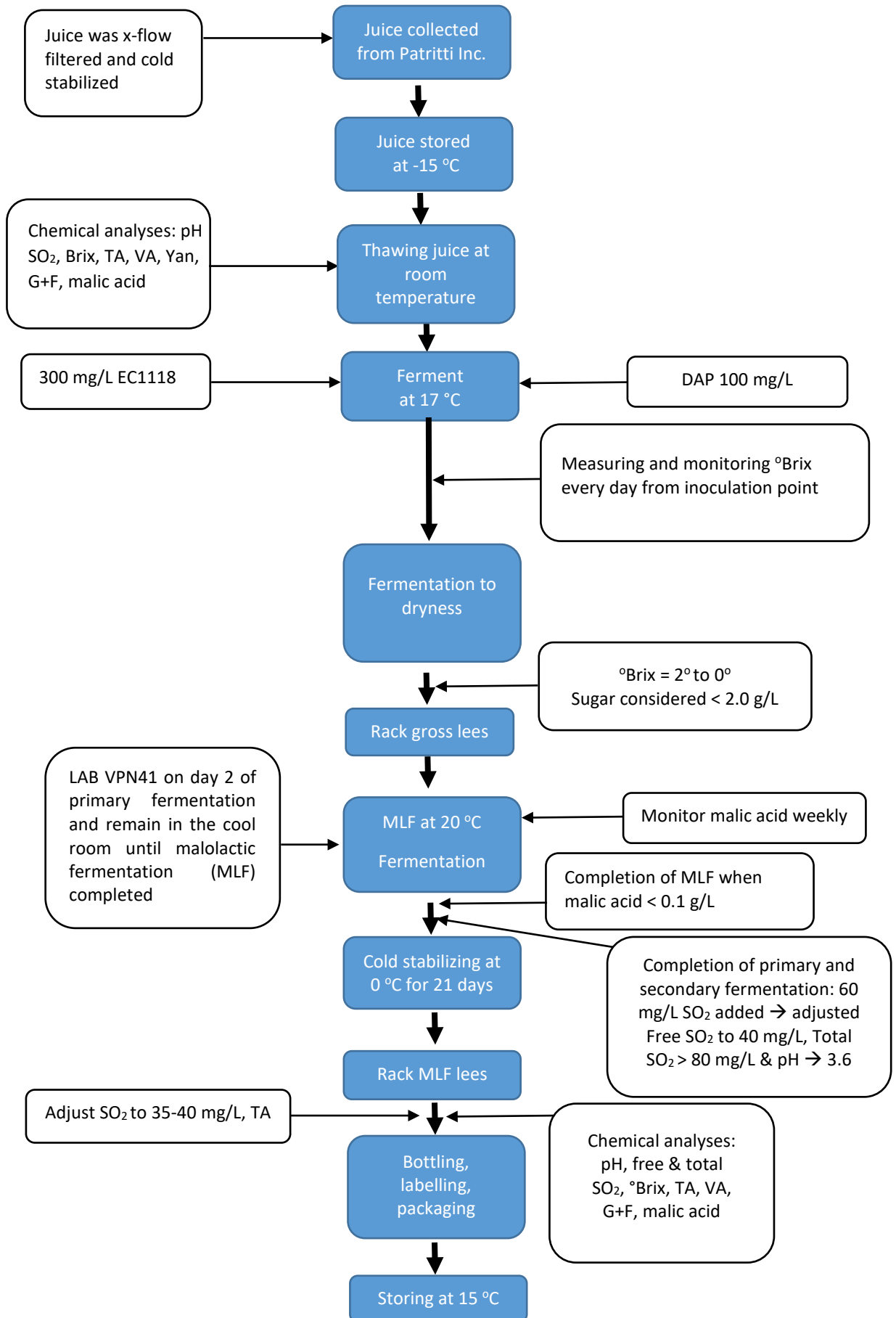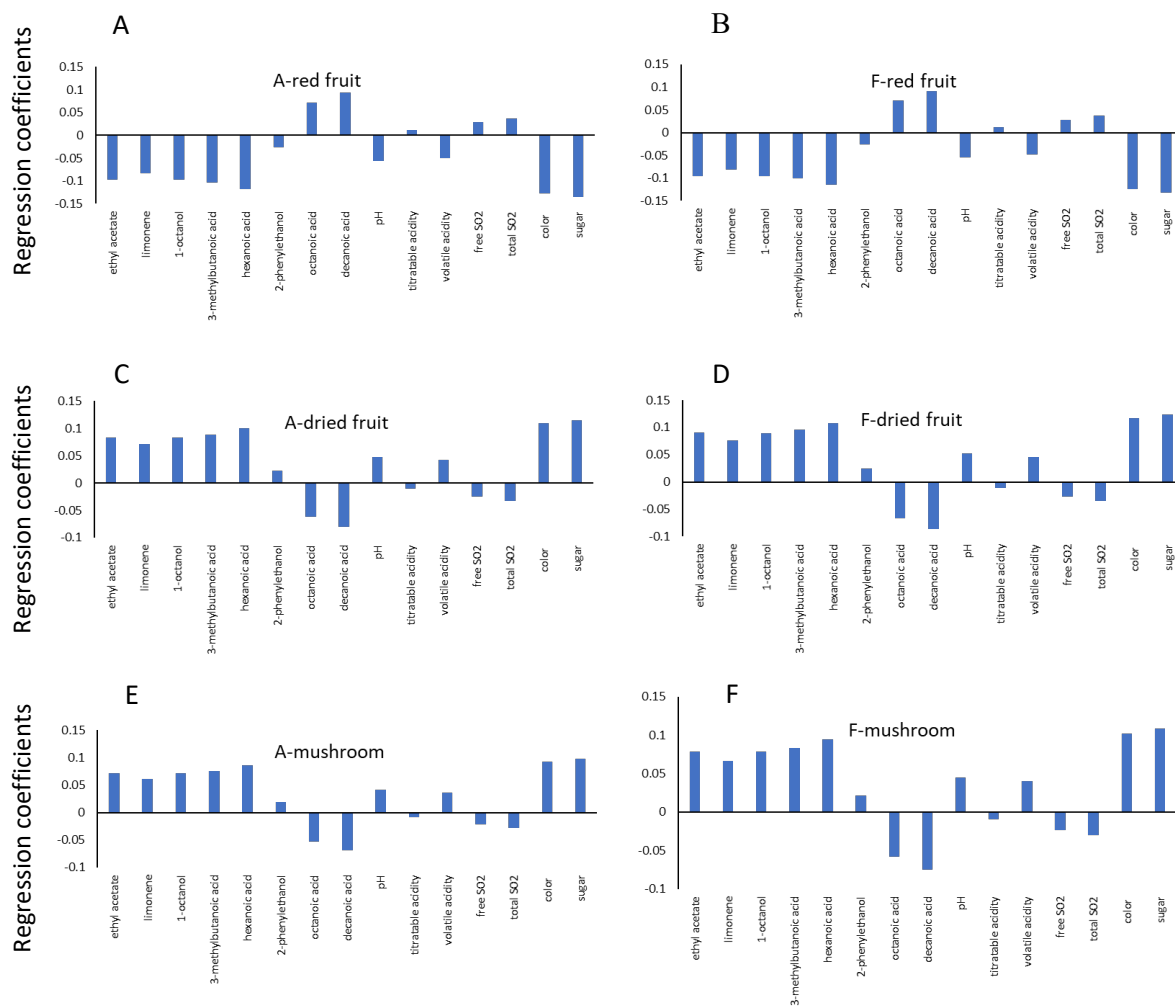
Storing at 15 °C

Figure S1. Shiraz winemaking process under specific conditions in the 28 L winemaking experiment.

Figure S2. Weighted regression coefficients of both aroma and flavor of red fruit (A and B), dried fruit (C and D) and mushrooms (E and F) notes.

Table S1. Brix values (°) measured by refractometer from the beginning to the end of small-scale fermentation of Chemically Defined Grape Juice Media (CDGJM) and Red Grape Juice (RGJ).

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
CDGJM-0	21.6 j	19.0 d	15.2 b	11.9 b	9.5 d	8.4 e	7.2 g	6.9 h	6.5 i	6.6 i
RGJ-0	23.6 f	19.9 b	15.9 a	13.0 a	10.8 b	9.6 c	8.3 e	8.4 e	8.3 f	8.2 ef
CDGJM-4.5	22.1 i	17.3 f	10.9 g	7.0 h	7.2 i	7.1 g	7.0 g	7.2 g	7.1 h	7.1 h
RGJ-4.5	23.8 e	19.6 c	14.6 c	11.2 c	9.1 e	8.4 e	8.2 e	8.3 e	8.2 f	8.1 f
CDGJM-9	22.6 h	17.3 f	11.1 fg	7.5 g	7.7 h	7.6 f	7.6 f	7.6 f	7.7 g	7.6 g
RGJ-9	24.1 d	19.6 c	13.7 d	10.5 d	8.9 f	8.7 d	8.6 d	8.6 d	8.6 e	8.4 e
CDGJM-18	23.4 g	17.4 f	11.2 fg	8.4 f	8.7 g	8.7 d	8.7 d	8.8 d	8.9 d	8.6 d
RGJ-18	24.6 b	19.6 c	13.5 de	10.4 d	9.5 d	9.5 c	9.3 c	9.3 c	9.2 c	9.3 c
CDGJM-36	24.3 c	17.7 e	11.4 f	9.7 e	9.9 c	9.8 b	9.8 b	9.8 b	9.7 b	9.8 b
RGJ-36	25.9 a	20.3 a	13.3 e	11.1 c	11.1 a	11.0 a	10.9 a	10.9 a	10.8 a	10.7 a

Means within a column followed by different letters are significantly different ($p < 0.05$)
Significance level at $p < 0.05$, data analyzed by one-way ANOVA, Fisher's LSD

Table S2. Impact of *GL* on liking, perceived sensory attribute overall intensity and CATA ratings from benchtop evaluations of commercial Shiraz wine spiked with *GL* (panel n = 32) and medium-scale pre-fermentation *GL* wines (panel n = 11).

Commercial Shiraz wine spiked with *GL*

Wine	Liking	Overall intensity							CATA			
		Aroma	Sweetness	Acidity	Hotness	Umami	Bitterness	Astringency	Earthy aroma*	Mushroom aroma*	Red berry aroma*	Oak aroma*
0	5.25 a	4.16 b	2.51 ab	4.45	4.25	2.93	4.03 b	4.06	22b	9c	53	47a
2.25	5.17 a	4.46 ab	2.96 ab	4.34	4.37	3.18	3.90 b	3.93	13b	22bc	53	22ab
4.5	4.72 ab	4.43 ab	3.00 a	4.31	4.40	3.34	4.40 b	4.06	25b	38abc	56	19b
6.75	4.48 ab	4.53 ab	2.28 b	4.18	4.12	3.59	4.56 b	3.93	34ab	44ab	31	19b
9.0	4.06 b	5.00 a	2.53 ab	4.06	4.09	3.56	5.28 a	4.18	56a	56a	28	28ab

Medium-scale pre-fermentation *GL* wines

Wine	Liking	Overall intensity							CATA		
		Aroma	Sweetness	Acidity	Hotness	Umami	Bitterness	Astringency	Floral flavor*	Tropical flavor*	Lychee flavor*
0	4.27	5.54	6.27 a	4.00 b	2.18 b	2.36	2.36 b	2.50	55a	73	73a
4.5	4.90	5.40	3.00 b	5.80 a	3.80 a	3.30	3.80 a	3.30	0b	36	9b
9.0	4.44	5.67	3.22 b	5.56 a	3.78 a	3.56	4.33 a	3.22	18ab	27	9b

Values for liking and aroma and palate attribute overall intensities are mean values. Means within a column followed by different letters are significantly different ($p < 0.05$) analyzed by one-way ANOVA, with Fisher's LSD. *Only significantly different attributes from the CATA evaluations shown as selection frequency percentage based on Cochran's Q tests are presented. Sheskin critical difference pairwise comparison was used to test significant differences between wine treatments and indicated by lower case letters.

Table S3. Significant sensory attribute intensity means of *GL* wines (from 28 L ferments) generated by RATA panel.

Sensory attributes	Control	POST 1	POST 4	PRE 1	PRE 2	PRE 4
Ap-red	4.2 a	4.0 b	3.9 b	4.0 b	4.1 b	3.7 c
Ap-brown	2.3 d	2.8 c	3.7 a	2.5 d	2.9 c	3.4 b
A-red fruit	3.7 a	3.3 b	2.9 c	3.6 a	3.5 ab	3.0 c
A-dried fruit	1.6 d	1.8 cd	2.2 a	1.6 d	1.9 bc	2.1 ab
A-jammy	2.0 ab	2.1 a	2.0 ab	1.7 b	2.0 a	2.0 ab
A-confectionery	2.9 ab	2.7 bc	2.1 e	3.0 a	2.5 cd	2.3 de
A-cooked vegetable	0.4 b	0.4 b	0.6 a	0.3 b	0.5 ab	0.7 a
A-earthy	0.7 c	0.8 bc	1.1 a	0.7 c	1.0 a	1.0 ab
A-floral	2.2 a	2.2 a	1.8 b	2.2 a	2.0 ab	1.7 b
A-mushroom	0.4 c	0.5 bc	0.8 a	0.4 c	0.6 ab	0.7 ab
A-leather	0.5 abc	0.5 bc	0.7 ab	0.4 c	0.6 ab	0.7 a
A-savory	0.7 b	0.7 b	1.2 a	0.7 b	1.0 a	1.1 a
A-spice	1.4 ab	1.3 b	1.5 a	1.4 ab	1.4 ab	1.2 b
A-toasty	0.8 cd	0.8 d	1.4 a	0.8 d	1.0 bc	1.1 b
A-woody	0.8 bc	0.9 bc	1.2 a	0.7 c	1.0 ab	1.0 ab
A-tobacco	0.5 c	0.6 bc	0.9 a	0.6 bc	0.6 bc	0.7 b
T-bitter	3.0 b	3.2 b	3.6 a	3.1 b	3.5 a	3.7 a
T-sweet	2.7 a	2.6 a	2.5 ab	2.5 ab	2.7 a	2.4 b
T-sour	2.7 b	2.8 ab	2.8 ab	2.9 ab	2.7 b	3.0 a
F-dark fruit	1.4 bc	1.6 ab	1.8 a	1.4 c	1.6 abc	1.6 abc
F-red fruit	3.5 ab	3.3 b	2.9 c	3.6 a	3.2 b	2.9 c
F-dried fruit	1.4 c	1.6 bc	2.0 a	1.4 a	1.7 ab	1.8 ab
F-jammy	1.7 a	1.9 a	1.9 a	1.4 b	1.9 a	1.6 ab
F-confectionery	2.4 a	2.2 ab	2.0 bc	2.3 a	2.2 abc	1.9 c
F-cook vegetable	0.4 ab	0.4 ab	0.5 a	0.3 b	0.5 ab	0.5 ab
F-earthy	0.7 cb	0.7 bcd	1.0 a	0.7 d	0.9 ab	0.9 abc
F-floral	1.9 a	1.8 a	1.5 b	1.8 a	1.8 a	1.5 b
F-mushroom	0.4 c	0.4 bc	0.7 a	0.4 bc	0.6 ab	0.6 a
F-green capsicum	0.5 ab	0.4 b	0.6 ab	0.5 ab	0.5 b	0.6 a
F-herbaceous	1.1 ab	0.9 b	1.1 ab	1.0 ab	1.0 ab	1.2 a
F-leather	0.4 bc	0.5 abc	0.7 a	0.4 c	0.6 ab	0.7 a
F-pepper	0.7 ab	0.6 b	0.8 ab	0.6 b	0.8 a	0.7 ab
F-savory	0.6 c	0.8 bc	1.0 ab	0.7 c	1.1 a	1.0 ab
F-spice	1.4 bc	1.4 bc	1.6 a	1.3 c	1.6 ab	1.4 abc
F-toasty	0.7 d	0.9 bcd	1.1 ab	0.8 cd	1.0 abc	1.2 a
F-woody	0.8 c	0.9 c	1.2 a	0.9 bc	0.9 bc	1.1 ab
F-tobacco	0.5 b	0.6 b	0.9 a	0.5 b	0.8 a	0.8 a
M-body	3.3 b	3.4 ab	3.5 a	3.3 ab	3.4 ab	3.3 ab
M-alcohol/heat	3.7 ab	3.8 ab	3.9 a	3.7 b	3.9 a	3.9 a
M-astringency	2.6 bc	2.8 ab	2.8 ab	2.5 c	2.7 ab	2.8 a
M-smoothness	3.5 a	3.3 abc	3.2 bc	3.4 ab	3.3 abc	3.1 c
M-roughness	2.4 bc	2.6 ab	2.6 ab	2.3 c	2.5 abc	2.7 a
FL-fruit	3.5 a	3.6 a	3.2 c	3.4 ab	3.5 ab	3.3 bc
FL-non-fruit	3.5 cd	3.5 bcd	3.7 ab	3.4 d	3.7 abc	3.8 a

Means within a row followed by different letters are significantly different. Significance level at $p < 0.05$, data analyzed by one-way ANOVA, Fisher's LSD. Prefix A- = aroma attribute, T- = taste; F- = flavor attribute, M- = mouthfeel, Ap- = appearance, FL- = aftertaste (fruit and non-fruit). Prefix PRE = *GL* added prior to fermentation (PRE 1, PRE 2 and PRE 4) and POST = *GL* added after fermentation (POST 1 and POST 4).