

Table S1. FTIR, general wine parameters of dealcoholised pre-commercial Riesling wine before and after bottling (n=3, average values $\pm$ standard deviation). (*Experiment 1*).

Parameters, units		Before bottling	Treatments during bottling ¹ (addition of RCGM, SO ₂ and sorbic acid)		
		Initial	Low SO ₂	Medium SO ₂	Medium SO ₂ + Sorbic acid
Alcohol	g/L	3.0	3.0 $\pm$ 0.1 ^a	3.0 $\pm$ 0.1 ^a	2.9 $\pm$ 0.1 ^a
Alcohol	% v/v	0.4	0.4 $\pm$ 0.0	0.4 $\pm$ 0.0	0.4 $\pm$ 0.0
Total extract	g/L	25.1	83.9 $\pm$ 1.0 ^a	81.4 $\pm$ 0.1 ^a	81.3 $\pm$ 0.0 ^a
Sugar-free extract	g/L	25.0	26.6 $\pm$ 0.3 ^a	26.5 $\pm$ 0.1 ^a	26.7 $\pm$ 0.2 ^a
Residual Sugar	g/L	0.1	57.3 $\pm$ 1.2 ^b	54.8 $\pm$ 0.2 ^a	54.6 $\pm$ 0.1 ^a
Glucose	g/L	< 0,05	26.1 $\pm$ 0.5 ^b	25.0 $\pm$ 0.1 ^a	24.6 $\pm$ 0.1 ^a
Fructose	g/L	< 0,05	29.7 $\pm$ 0.6 ^a	28.3 $\pm$ 0.0 ^a	28.3 $\pm$ 0.1 ^a
pH ²		2.93	3.0 $\pm$ 0.0	3.0 $\pm$ 0.0	3.0 $\pm$ 0.0
Total acidity	g/L	7.8	7.4 $\pm$ 0.0 ^a	7.4 $\pm$ 0.1 ^a	7.4 $\pm$ 0.0 ^a
Volatile acidity	g/L	0.4	0.6 $\pm$ 0.0	0.6 $\pm$ 0.0	0.6 $\pm$ 0.0
Malic acid	g/L	3.6	3.2 $\pm$ 0.1 ^a	3.2 $\pm$ 0.1 ^a	3.1 $\pm$ 0.0 ^a
Lactic acid	g/L	0.2	0 $\pm$ 0	0 $\pm$ 0	0 $\pm$ 0
Tartaric acid	g/L	3.0	3.4 $\pm$ 0.0	3.4 $\pm$ 0.0	3.4 $\pm$ 0.0
Glycerol	g/L	7.4	5.4 $\pm$ 0.1 ^a	5.5 $\pm$ 0.0 ^a	5.5 $\pm$ 0.0 ^a
Free SO ₂	mg/L	11	10 $\pm$ 0 ^a	17 $\pm$ 0 ^b	17 $\pm$ 0 ^b
Total SO ₂	mg/L	66	64 $\pm$ 0 ^a	82 $\pm$ 1 ^b	83 $\pm$ 1 ^b
Molecular SO ₂ ³	mg/L	0.8	0.6 $\pm$ 0.0	1 $\pm$ 0.0	1 $\pm$ 0.0

¹ The analyses were done one week after bottling.

² pH was measured by pH-meter.

³ Molecular SO₂ was calculated from Free SO₂ values using the formula given in *Materials and Methods*. Values with different letters (a–b) within a row differ significantly (ANOVA followed by Tukey's test (when Levene's test, $p > 0.05$); Welch's ANOVA followed by Games-Howell test (when Levene's test, $p < 0.05$)). Statistical analysis was not performed for some variables (Alcohol (%v/v), pH, Volatile acidity, Tartaric acid, Lactic acid) as all replicates across all treatments returned identical values, resulting in zero variance and no observable treatment effect.

Table S2. Commercial dealcoholised wines used for *Experiment 4*.

No.	Wine type	Grape variety or wine style	Additives
1	White	Doppio Passo	Sucrose
2	White	Riesling	CO ₂ , RCGM
3	White	Blend or n.a.	Citric acid and/or Yeast mannoproteins, Tartaric acid and/or Malic acid, RCGM, Natural wine flavors
4	Rosé	Blend or n.a.	
5	Red	Blend or n.a.	
6	White	Blend or n.a.	Grape must, Sucrose, CO ₂ , Ascorbic acid
7	Rosé	Blend or n.a.	
8	Red	Blend or n.a.	
9	White	Riesling	L-ascorbic acid, Citric acid and/or Arabic Gum, Tartaric acid and/or Malic acid, Concentrate grape must, CO ₂ , DMDC
10	White	Chardonnay	L-ascorbic acid, RCGM, Grape must, CO ₂

All the wines were in 750 mL bottles with screw caps.

n.a. – not available information.

RCGM – rectified concentrated grape must.

DMDC – dimethyl dicarbonate.

Table S3. FTIR, general wine parameters of ten commercial dealcoholised wines used for *Experiment 4*.

Wine type		White	White	White	Rosé	Red	White	Rosé	Red	White	White
Grape variety or wine style		Doppio Passo	Riesling	Blend or n.a.	Blend or n.a.	Blend or n.a.	Blend or n.a.	Blend or n.a.	Blend or n.a.	Riesling	Chardonnay
Wine No.		1	2	3	4	5	6	7	8	9	10
Alcohol	g/L	4.9	2.6	2.1	2.3	2.4	2.7	3.1	2.8	3.4	2.1
Alcohol	% v/v	0.6	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.3
Total extract	g/L	70.8	64	64	68	78.4	70.5	69.4	73.2	71.7	65.1
Sugar free extract	g/L	27.3	27.1	20.5	23.2	27.9	21.8	23.4	30.8	26.1	26.7
Residual sugar	g/L	43.5	36.9	43.5	44.8	50.6	48.7	46	42.4	45.6	39.4
Glucose	g/L	19.2	16.3	19.2	20.3	22.5	20.9	20	19.2	21.8	17.6
Fructose	g/L	22.5	19.1	22.4	22.6	27	25.3	23.4	21.9	23.8	21.8
pH ¹		3.34	2.99	3.38	3.32	3.20	3.15	3.35	3.42	2.92	3.17
Total acidity	g/L	5.3	7.2	4.2	4.6	5	4.9	4.6	5.3	7.4	5.2
Tartaric acid	g/L	2.4	3.3	1.8	1.9	2.5	3.3	3.1	2.8	3.4	2.3
Malic acid	g/L	2.4	2.8	1.0	0.9	0.2	1.0	1.3	0.3	3.1	1.7
Lactic acid	g/L	0.3	0	0.9	1.1	1.3	0.2	0.2	1.5	0.0	0.5
Volatile acidity	g/L	0.3	0.5	0.7	0.6	0.5	0.5	0.4	0.7	0.5	0.4
Glycerin	mg/L	5.2	5.5	4.4	5.2	6.8	3.9	3.5	6.6	5.6	4.8
Free SO ₂	mg/L	26	28	39	46	36	30	27	27	27	50
Total SO ₂	mg/L	102	112	140	159	132	115	109	112	107	153
Molecular SO ₂ ²	mg/L	0.7	1.7	1	1.4	1.4	1.3	0.8	0.6	1.9	2.1

n.a. – not available information.

¹ pH was measured by pH-meter.

² Molecular SO₂ was calculated from Free SO₂ values using the formula given in *Materials and Methods*.

Table S4. Results of CO₂ pressure measurements inside the bottles of fermented wines, variant *Low SO₂* (*Experiment 1*). The pressure values were normalized for standard conditions at 20°C (P20, bars).

	Weeks after bottling	5	6	9	11
	Pressure, bars	P20	P20	P20	P20
<i>Bottle number</i>	No. 19	4.02	5.74	5.77	6.10
	No. 20	5.35	6.36	5.96	6.62
	No. 22	5.61	6.35	6.54	6.73
	No. 80¹	n.a.	1.31	2.91	3.30

¹ Opened bottle 5 weeks after bottling for analysis and sealed again with a crown cap.
n.a. – not available value.

Table S5. FTIR, general wine parameters of dealcoholised pre-commercial Riesling after bottle opening (n=3, average values $\pm$ standard deviation; except for *Low SO₂* Day 7, n=2). (*Experiment 2*).

Parameters, units	Treatments							
	<i>Low SO₂</i>		<i>Medium SO₂</i>		<i>Medium SO₂</i> + <i>Sorbic acid</i> (n=3)		<i>Fermented</i> <i>Low SO₂</i> (n=1)	
	(n=3)	(n=2)	(n=3)					
	Day 0	Day 7	Day 0	Day 7	Day 0	Day 7	Day 7	
Alcohol % v/v	0.4 $\pm$ 0.0	0.4 $\pm$ 0.0	0.4 $\pm$ 0.0	0.4 $\pm$ 0.0	0.4 $\pm$ 0.0	0.4 $\pm$ 0.0		2.1
Total extract g/L	83.9 $\pm$ 1.0 ^a	83.0 $\pm$ 0.6 ^a	81.4 $\pm$ 0.1 ^a	81.1 $\pm$ 0.2 ^a	81.3 $\pm$ 0.0 ^a	81.1 $\pm$ 0.1 ^a		49.6
Sugar free extract g/L	26.6 $\pm$ 0.3 ^a	28.2 $\pm$ 0.1 ^b	26.5 $\pm$ 0.1 ^a	28.1 $\pm$ 0.2 ^b	26.7 $\pm$ 0.2 ^a	28.3 $\pm$ 0.2 ^b		27.2
Residual sugar g/L	57.3 $\pm$ 1.2 ^a	55.0 $\pm$ 0.5 ^a	54.8 $\pm$ 0.2 ^a	53.0 $\pm$ 0.1 ^b	54.6 $\pm$ 0.1 ^a	52.8 $\pm$ 0.2 ^b		22.3
Glucose g/L	26.1 $\pm$ 0.5 ^a	25.7 $\pm$ 0.2 ^a	25.0 $\pm$ 0.1 ^a	24.8 $\pm$ 0.1 ^a	24.6 $\pm$ 0.1 ^a	24.5 $\pm$ 0.1 ^a		4.9
Fructose g/L	29.7 $\pm$ 0.6 ^a	29.3 $\pm$ 0.3 ^a	28.3 $\pm$ 0.0 ^a	28.2 $\pm$ 0.1 ^a	28.3 $\pm$ 0.1 ^a	28.2 $\pm$ 0.1 ^a		17.5
pH¹	3.02	2.99	3.00	2.98	3.00	2.97		3.00
Total acidity g/L	7.4 $\pm$ 0.0	7.4 $\pm$ 0.0	7.4 $\pm$ 0.1 ^a	7.4 $\pm$ 0.0 ^a	7.4 $\pm$ 0.0	7.4 $\pm$ 0.0		8.3
Tartaric acid g/L	3.4 $\pm$ 0.0	3.4 $\pm$ 0.0	3.4 $\pm$ 0.0	3.4 $\pm$ 0.0	3.4 $\pm$ 0.0 ^a	3.4 $\pm$ 0.1 ^a		3.2
Malic acid g/L	3.2 $\pm$ 0.1 ^a	3.1 $\pm$ 0.0 ^a	3.2 $\pm$ 0.1 ^a	3.1 $\pm$ 0.1 ^a	3.1 $\pm$ 0.0	3.1 $\pm$ 0.0		3
Lactic acid g/L	0 $\pm$ 0	0 $\pm$ 0	0 $\pm$ 0	0 $\pm$ 0	0 $\pm$ 0	0 $\pm$ 0		0.2
Volatile acidity g/L	0.6 $\pm$ 0.0	0.6 $\pm$ 0.0	0.6 $\pm$ 0.0	0.6 $\pm$ 0.0	0.6 $\pm$ 0.0	0.6 $\pm$ 0.0		0.8
Glycerin mg/L	5.4 $\pm$ 0.1 ^a	5.6 $\pm$ 0.1 ^a	5.5 $\pm$ 0 ^a	5.6 $\pm$ 0.1 ^a	5.5 $\pm$ 0 ^a	5.6 $\pm$ 0.1 ^a		6.9
Free SO₂ mg/L	10 $\pm$ 0 ^a	9 $\pm$ 0 ^b	17 $\pm$ 0 ^a	15 $\pm$ 0 ^b	17 $\pm$ 0 ^a	14 $\pm$ 1 ^b		9
Total SO₂ mg/L	64 $\pm$ 0 ^a	61 $\pm$ 1 ^b	82 $\pm$ 1 ^a	77 $\pm$ 1 ^b	83 $\pm$ 1 ^a	76 $\pm$ 1 ^b		64
Molecular SO₂² mg/L	0.6	0.6	1	0.9	1	0.9		0.5

¹ pH was measured by pH-meter.

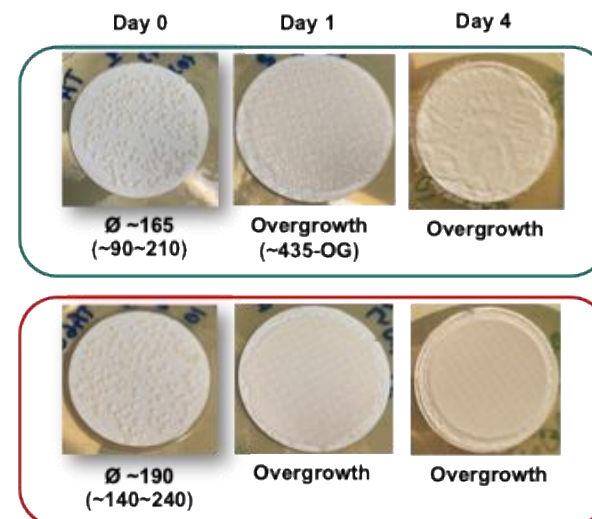
² Molecular SO₂ was calculated from Free SO₂ values using the formula given in *Materials and Methods*.

One-way ANOVA analyses were conducted for each treatment independently, using Days as a fixed factor. Values with different letters (a–b) within a row differ significantly (ANOVA followed by Tukey's test (when Levene's test, $p > 0.05$); Welch's ANOVA followed by Games-Howell test (when Levene's test, $p < 0.05$)). Statistical analysis was not performed for some variables (Alcohol (%v/v), pH, Total acidity, Volatile acidity, Tartaric acid, Malic acid, Lactic acid) as all replicates across all treatments returned identical values, resulting in zero variance and no observable treatment effect.

Figure S1. Results of membrane filtration of dealcoholised Riesling wine (50 mL) after yeast inoculation: colony counts (cfu) on filters. The values represent the mean of three replicates (in brackets, the cfu ranges for the replicates are given; or cfu for each of three replicates (d)). Photos are examples of one replicate for each variant. (*Experiment 3*).

a)

	Free SO ₂	Low SO ₂ (9 mg/L)	Medium SO ₂ (13 mg/L)	Medium SO ₂ (13 mg/L) + Sorbic acid	High SO ₂ (29 mg/L)
pH 3					
Molecular SO ₂		~ 0.5 mg/L	~ 0.8 mg/L	~ 0.8 mg/L	~ 1.8 mg/L
pH 3.3					
Molecular SO ₂		~ 0.3 mg/L	~ 0.4 mg/L	~ 0.4 mg/L	~ 0.9 mg/L



b)

	Free SO ₂	Low SO ₂ (9 mg/L)	Medium SO ₂ (13 mg/L)	Medium SO ₂ (13 mg/L) + Sorbic acid	High SO ₂ (29 mg/L)
pH 3					
Molecular SO ₂		~ 0.5 mg/L	~ 0.8 mg/L	~ 0.8 mg/L	~ 1.8 mg/L
pH 3.3					
Molecular SO ₂		~ 0.3 mg/L	~ 0.4 mg/L	~ 0.4 mg/L	~ 0.9 mg/L

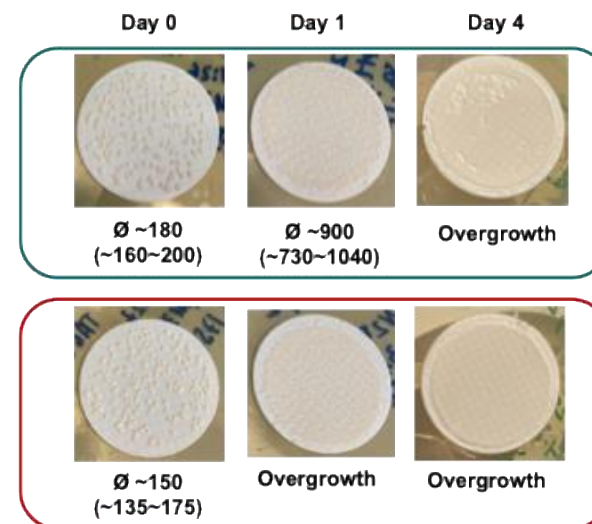
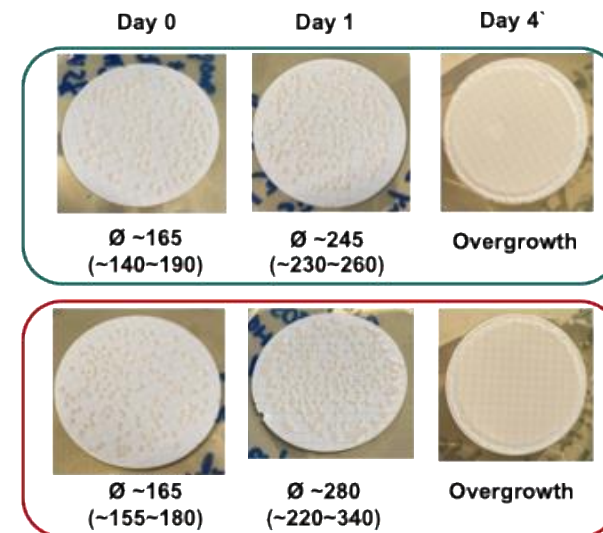


Figure S1. (Continuation).

c)

Free SO ₂	Low SO ₂ (9 mg/L)	Medium SO ₂ (13 mg/L)	Medium SO ₂ (13 mg/L) + Sorbic acid	High SO ₂ (29 mg/L)
pH 3				
Molecular SO ₂	~ 0.5 mg/L	~ 0.8 mg/L	~ 0.8 mg/L	~ 1.8 mg/L
pH 3.3				
Molecular SO ₂	~ 0.3 mg/L	~ 0.4 mg/L	~ 0.4 mg/L	~ 0.9 mg/L



d)

Free SO ₂	Low SO ₂ (9 mg/L)	Medium SO ₂ (13 mg/L)	Medium SO ₂ (13 mg/L) + Sorbic acid	High SO ₂ (29 mg/L)
pH 3				
Molecular SO ₂	~ 0.5 mg/L	~ 0.8 mg/L	~ 0.8 mg/L	~ 1.8 mg/L
pH 3.3				
Molecular SO ₂	~ 0.3 mg/L	~ 0.4 mg/L	~ 0.4 mg/L	~ 0.9 mg/L

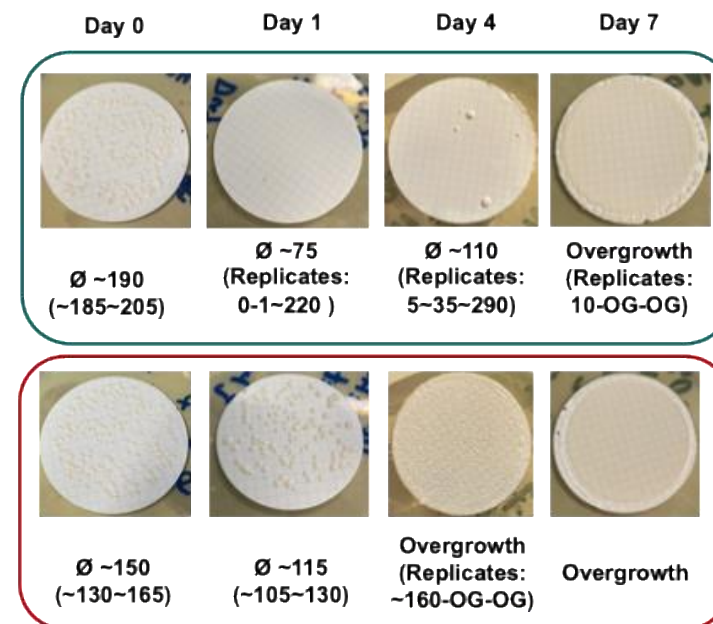
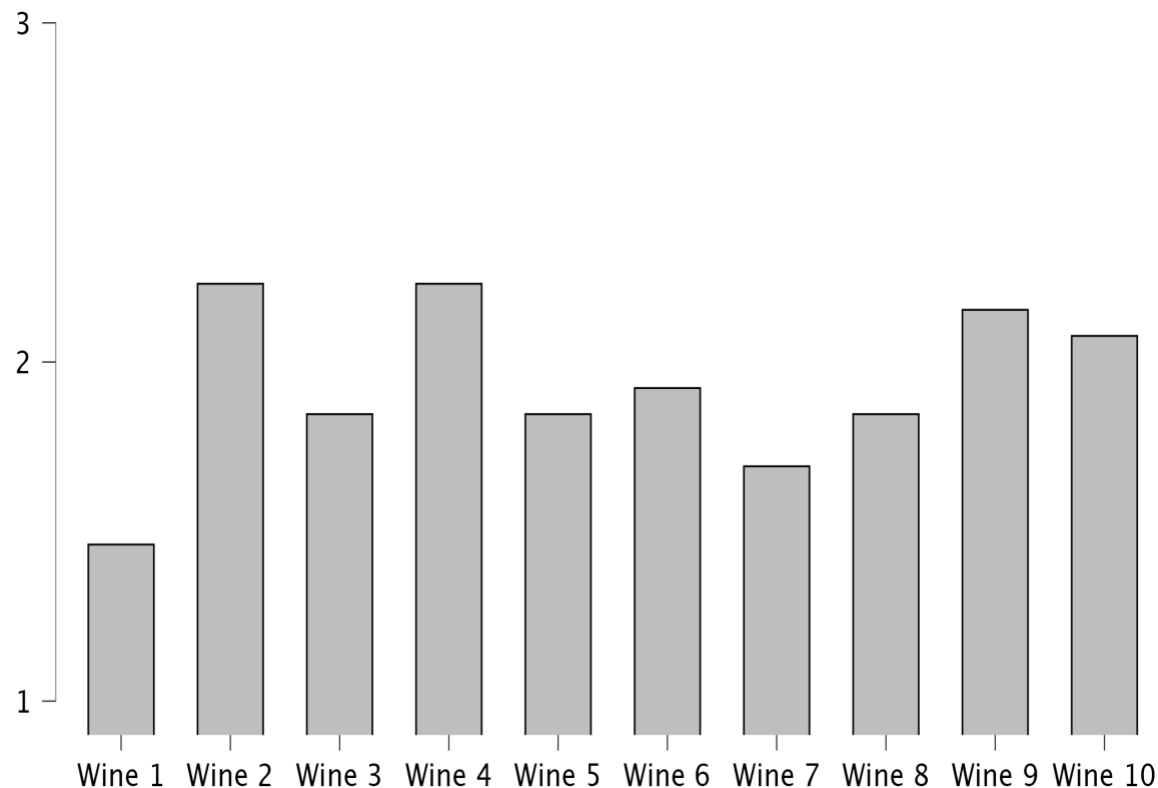


Figure S2. Mean SO₂ perception ratings of ten wines on a three-point ordinal scale (1 = Low, 2 = Medium, 3 = High) by 13 panelists (bars show mean values). Descriptive statistics include mean, standard deviation (SD), standard error of the mean (SE), and coefficient of variation (CV). (Experiment 4).



Descriptive statistics

Wines	Mean	SD	SE	CV
Wine 1	1.462	0.776	0.215	0.531
Wine 2	2.231	0.927	0.257	0.415
Wine 3	1.846	0.801	0.222	0.434
Wine 4	2.231	0.725	0.201	0.325
Wine 5	1.846	0.689	0.191	0.373
Wine 6	1.923	0.760	0.211	0.395
Wine 7	1.692	0.855	0.237	0.505
Wine 8	1.846	0.689	0.191	0.373
Wine 9	2.154	0.801	0.222	0.372
Wine 10	2.077	0.862	0.239	0.415

Results of Friedman test conducted to compare sensory perception of SO₂ in ten wines by 13 panelists on a three-point scale (Low (1), Medium (2), High (3)). The test indicated no significant differences among wines, $\chi^2_F = 12.01$, $p = 0.213$, Kendall's $W = 0.103$.