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Selected Yeast Strains and Varietal Identity: A Useful Tool to Shape Sicilian White Wines

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Abstract

Yeast selection plays a strategic role in winemaking, influencing not only the quality and style of the final product but also the expression of the cultivar. This study evaluated the impact of selected *Saccharomyces cerevisiae* strains on the fermentation of three white grape cultivars grown in Western Sicily: *Grillo*, *Catarratto*, and *Moscato Giallo* (*Vitis vinifera* L.). A standardized vinification protocol was applied to assess the fermentative performance and effects on the chemical composition, aromatic profile, and sensory profile. Alcoholic fermentation kinetics, major analytical parameters, free and glycosylated volatile compounds, and sensory attributes were monitored. Significant differences were observed among the yeast strains in their fermentation dynamics and production of secondary metabolites. Notably, certain strains enhanced the aromatic expressions of the cultivars, particularly in *Moscato Giallo*, modulating the free and glycosylated terpene profiles. This approach to fermentation highlights the potential to optimize wine quality through yeast selection, aligning the strain performance with the specific needs of each cultivar. Furthermore, the use of efficient yeast strains may reduce reliance on additives, contributing to more sustainable and economically viable winemaking.

Keywords: *Saccharomyces cerevisiae*; cv *Grillo*; cv *Catarratto*; cv *Moscato Giallo*; white wine; volatile organic compounds; sensory profile

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1. Introduction

Western Sicily hosts one of the largest vineyard surfaces in Italy, hosting more than 56,000 hectares out of Sicily's 97,000 hectares, predominantly planted with white grape varieties—mainly the native *Catarratto* and *Grillo* [1]—but also including international and aromatic cultivars such as *Chardonnay*, *Sauvignon Blanc* and *Moscato Giallo*. Given this diversity and scale, understanding how different yeast strains influence the sensory expressions of these cultivars is essential for optimizing wine quality and enhancing the typicity of Sicilian monovarietal white wines.

Yeast plays a crucial role in shaping both the aromatic profile and the overall composition of wine. Through its metabolic activity, yeast contributes to the formation of key volatile compounds, including ethyl and acetic esters, higher alcohols, and various other metabolites [2,3]. Additionally, yeasts possess enzymatic systems and metabolic pathways capable of influencing varietal aroma compounds. Beyond the release and transformation

of thiols [4], yeast can also affect the synthesis and liberation of terpenes, as well as other glycosylated aroma precursors, such as benzenoids, C_{13} norisoprenoids, and related molecules, which strongly modulate the varietal expression of wine [5].

In the market for young white wines, one of the essential attributes is a pleasant fresh-fruit and floral bouquet with a high initial impact and likeability among casual consumers [6]. In this context, native Sicilian grape varieties have gained increasing recognition for their aromatic diversity and capacity to convey a distinctive regional identity within this wine style [7]. This preliminary study investigates how the yeast strain selection can affect the aromatic varietal expressions of two neutral Sicilian grape varieties, *Grillo* and *Catarratto*, characterized by modest concentrations of terpenes, as well as that of *Moscato Giallo*, a highly aromatic cultivar traditionally grown in Western Sicily. Particular emphasis was placed on the impact of the yeast strains in the present trials not only on the production of esters and higher alcohols but also on the glycosylated and free fractions of odorous compounds derived from the grapes and the impact on the overall wine quality.

2. Materials and Methods

2.1. Winemaking Process

A total of 200 kg of each grape variety (*Vitis vinifera* L.) grown in Marsala (Sicily) was manually harvested on 23 August 2024 at technological maturity. The grapes were collected in an optimal sanitary state and processed in the experimental winery of the Department of Agricultural, Food and Forest Sciences of the University of Palermo (Marsala, Sicily). The grapes were kept in crates containing 20 kg of grapes each for a further 24 h at 5 °C to cool them before crushing. Traditional procedures were then applied to destem, crush and press the grapes. The juice was protected from oxidation by the addition of 5 g hL^{-1} of SO_2 and 7 g/hL of antioxidants (Friendly Wine® Stop OX Vino, HTS enologia, Marsala, Italy), and pectolytic enzymes were subsequently added (3 g/hL Hzym® Extractive FCE G, HTS enologia, Marsala, Italy) in order to enhance the degradation of pectins and favor cold settling. The correction of the acidity levels was also implemented at this stage, consisting of 1 g/L of tartaric acid for the *Grillo* juice, 1.5 g/L for the *Moscato Giallo* juice and 1 g/L for the *Catarratto* juice. An amount of 10 g/hL of vegetable-derived protein was additionally added to the *Grillo* and *Catarratto* juices (Hveg® Vegepure Juice, HTS enologia, Marsala, Italy), while in the case of *Moscato Giallo*, the lowering of the catechin concentration was achieved with the addition of 40 g/hL of PVPP (Hclar® PVPP, HTS enologia, Marsala, Italy). Cold settling was implemented at 5 °C for 24 h before the juice was racked and divided into two separate tanks of 50 L for each cultivar.

Racking was followed by the addition of 15 g/hL of Adapta® White (HTS enologia, Marsala, Italy) and the inoculation with previously activated yeast (20 g/hL), using two different strains for every cultivar. Trials on *Grillo* were conducted with SafOeno™ CK S102 (Fermentis, Lesaffre, Marquette-lez-Lille, France) and SafOeno™ SH12 (Fermentis, Lesaffre, Marquette-lez-Lille, France), while *Catarratto* was obtained with Hferm® Easy Fruit (HTS enologia, Marsala, Italy), Hferm® FL 33 (HTS enologia, Marsala, Italy), *Moscato Giallo* with SafOeno™ HD T18 (Fermentis, Lesaffre, Marquette-lez-Lille, France) and SafŒno™ BC S103 (Fermentis, Lesaffre, Marquette-lez-Lille, France). The choice of the yeast strains was made considering the interaction each yeast could exhibit have on the specific cultivar, considering the previous experience of the research group. *Grillo* is a cultivar widely known for its potential to produce wines characterized by volatile thiols (3-SH, 3-SHA, 4-SMP) [8,9], and the strains chosen are thought to produce wines with high concentrations of these compounds, but in different ratios.

Both yeast strains used for the *Catarratto* trials are recommended for this cultivar, considering their apparently high production of both acetate and ethylic ester production.

Moscato Giallo, which is characterized by its high content of free and glycosylated monoterpenes [10,11], was inoculated with one strain (SafOeno™ HDT 18, Fermentis, Lesaffre, Marquette-lez-Lille, France) thought to enhance the expression of free terpenes as well as acetate and ethyl esters, in comparison to a relatively neutral strain (SafOeno™ BC S103, Fermentis, Lesaffre, Marquette-lez-Lille, France).

The juices were then supplemented with organic nutrients at the start of alcoholic fermentation (15 g/hL) and after reaching 3% and 6% of alcohol. To prevent a sluggish finish of fermentation or sulphury off-odors, 5 g/hL of diammonium phosphate (DAP) was added at 8% of alcohol. Fermentation was carried out at 17 °C. Once the alcoholic fermentation was finished (<2 g/L of residual sugars), the wines were racked off the coarse lees, and SO_2 was added to achieve a concentration-free SO_2 of 30 mg L^{-1}. Subsequently, the wines were stored at 5 °C for two weeks, racked, added with potassium metabisulfite and bottled with 40 mg/L of free SO_2 and without filtration. A total of 45 bottles were obtained from each trial.

2.2. Juice and Wine Analysis

2.2.1. Technological Parameters

The alcohol content (% *v*/*v*), reducing sugars (g/L), titratable acidity (g/L), volatile acidity (g/L), dry extract, malic acid, tartaric acid, Yeast Assimilable Nitrogen (YAN, mg/L), glycerol (g/L) pH and potassium (g/L) were determined by means of Fourier-transform infrared (FTIR) technology through a WinescanTM FT 120 Fa. Instrument (FOSS, Hillerød, Denmark) calibrated by applying the EEC 2676 standard procedure. All the analyses were carried out in triplicate.

2.2.2. Total Flavonoids and p-DACA (p-Dimethylaminocinnamaldehyde) Reactive Flavonols

Total flavonoids and *p*-DACA assay were analyzed by means of UV–Vis spectrophotometry (UV-1800 spectrophotometer, Shimazdu Scientific Instruments Inc., Columbia, MD, USA) as being (+)-catechin equivalent [8]. Total flavonoids were determined after the dilution of the wines with distilled water (1:40), according to Corona et al., 2015 [12]. To determine the reactivity of flavanols to *p*-dimethylaminocinnamaldehyde (*p*-DACA assay), 1 mL of wine was added to 5 mL of the reagent (prepared by dissolving 100 mg of *p*-DACA in 70 mL of methanol and 25 mL of concentrated HCl, cooling the solution, and bringing the volume to 100 mL with methanol). Total flavonoid and *p*-DACA analyses were performed in duplicate.

2.2.3. Average Buffer Capacity

Following Vitaggio et al., 2025 [7], 50 mL of wine was placed in a 150 mL beaker, and the pH was measured to two decimal places (pH_0). If $pH_0 < 3.30$, 5 mL of 0.1 N NaOH was added, and the new pH value was recorded. Conversely, if $pH_0 > 3.30$, 5 mL of 0.1 N HCl or 0.1 N H_2SO_4 was added, and the pH value was recorded. The analysis was performed in duplicate.

The buffering capacity (meq/L) is given by the following relationship:

Buffering capacity meq/L = 5 meq/L/ΔpH.

$\Delta pH = pH_1 - pH_0$, when 5 mL of NaOH was added, or $pH_0 - pH_1$, when 5 mL of HCl/H_2SO_4 was added.

2.2.4. Volatile Organic Composition

Volatile organic compounds (VOCs) were analyzed by means of Gas Chromatography (Trace 1600 GC System, Thermo Scientific, Waltham, MA, USA) coupled with Mass Spectrometry (ISQ 7610 Single Quadrupole Mass Spectrometer, Thermo Scientific, Waltham,

MA, USA) following the method described by Corona et al., 2010 [8]. In brief, 25 mL of wine was diluted to 75 mL using deionized water and supplemented with 1-heptanol standard 98% purchased from Thermofisher (Milan, Italy) (0.25 mL of a 40 mg/L hydroalcoholic solution). The diluted sample was then processed through a 1 g C18 cartridge (Isolute, SPE Columns, Uppsala, Sweden, part no. 221–0100-C) that had been preconditioned with 3 mL of methanol followed by 4 mL of deionized water. After washing the cartridge with 30 mL of deionized water, the volatile compounds were extracted using 12 mL of dichloromethane, dehydrated, and concentrated to a final volume of 0.5 mL. The residue is then dissolved in 5 mL of citrate–phosphate buffer at pH 5.0. Next, 100 mg of a pectolytic enzyme with high glycosidase activity (Hzym® Arom G, HTS Enologia, Marsala, Italy) is added, and the solution is incubated in a thermostatic bath at 40 °C for 24 h. At the end of the incubation, 0.25 mL of an internal standard (e.g., 1-heptanol at 35 mg/L) is added. The solution is centrifuged if necessary, and the supernatant is passed through a 1 g C18 cartridge previously activated with 5 mL of methanol followed by 10 mL of water. The cartridge is then washed with 20 mL of water, and the compounds released by enzymatic hydrolysis are eluted with 10 mL of dichloromethane into a 100 mL beaker. The dichloromethane extract is reduced to near dryness, dehydrated with anhydrous sodium sulfate (Na_2SO_4), further concentrated to a small volume, and then subjected to gas chromatographic analysis (hydrophilic fraction). Gas chromatography was performed using a DB-WAX column (30 m, 0.250 mm i.d., film thickness 0.25 µm, part no. 122–7032, Agilent Technologies, Santa Clara, CA, USA). The oven temperature program was as follows: 40 °C for 2 min, ramping from 40 to 60 °C at 3 °C/min, holding at 60 °C for 2 min, then increasing to 160 °C at 2 °C/min, holding for 10 min, followed by an increase to 230 °C at 3 °C/min and holding for 10 min. The injection mode was splitless, with the injector set at 250 °C and the transfer line at 230 °C. Helium served as the carrier gas, with a column flow rate of 1 mL/min. Volatile organic compounds (VOCs) were identified by comparing their mass spectra and retention indices of pure commercial standards (Table S1). When no standards were available, the NIST/EPA/NIH Mass Spectral Library (Version 2.0d, 2015 build) was used. The linear retention indices (LRI) used for compound identification are provided in Table S2. VOCs were semi-quantified relative to the peak area of 1-heptanol as the internal standard, with results expressed in µg/L.

2.2.5. Sensory Analysis

The wines underwent sensory analysis in January 2025, carried out by a trained panel consisting of 8 judges (5 men and 3 women, aged between 22 and 50 years).

To evaluate the sensory profiles of the wines, a Quantitative Descriptive Analysis (QDA) was performed. Before performing the QDA test, experts described the sample's attributes to determine its sensory characteristics. The scale used for the descriptors ranged from 1 to 9. The evaluated descriptors included the visual evaluation of green hue and yellowness, olfactory parameters including fruity, citrus, floral, spicy, aroma complexity and the gustatory characters of acidity, saltiness, sweetness, bitterness, greenness (unripe), taste persistence and taste complexity. In addition, the presence of off-flavors and overall liking were assessed. Six different bottles were used to perform sensory analysis.

2.2.6. Statistical Analysis

Student's *t*-test was performed using R software (version 4.3.1, R Foundation for Statistical Computing, Vienna, Austria). The null hypothesis was rejected when $p < 0.05$. Data of initial grape juice and during alcoholic fermentation were obtained from two different samples taking directly from tanks. Data of the final wines were obtained from a different bottle for every repetition.

3. Results

3.1. Grapes/Juice

The juice composition of the three grape cultivars—*Grillo*, *Catarratto*, and *Moscato Giallo*—revealed distinct differences in key technological and phenolic parameters (Table 1). *Grillo* exhibited the highest sugar content (229.94 ± 0.04 g/L reducing sugars), followed by *Catarratto* (218.89± 0.11 g/L) and *Moscato Giallo*, which showed significantly lower values (180.20 ± 0.12 g/L for the latter).

Table 1. Technological parameters of juices.

Cultivar	*Grillo*	*Catarratto*	*Moscato Giallo*
Reducing sugars (g/L)	229.9 ± 0.1	218.9 ± 0.1	180.2 ± 0.1
pH	3.59 ± 0.07	3.57 ± 0.06	3.80 ± 0.03
Titratable acidity (g/L)	5.1 ± 0.1	4.9 ± 0.1	4.4 ± 0.1
YAN (mg/L)	134 ± 1	102 ± 1	140 ± 5

Moscato Giallo exhibited the highest pH (3.8 ± 0.1) and the lowest titratable acidity (4.42 ± 0.01 g/L). This highlights the difference in the performance of native Sicilian cultivars, especially in hot and dry vintages like 2024, and international cultivars. Potassium levels were comparable across cultivars (1.53–1.61 g/L), with *Catarratto* slightly exceeding the others. YAN was highest in *Moscato Giallo* (139.50 ± 4.95 mg/L) and lowest in *Catarratto* (101.50 ± 0.71 mg/L).

3.2. Comparison of Fermentation Kinetics

Fermentation kinetics of *Catarratto*, monitored daily through sugar depletion, reveal distinct trends between the two trials (Figure 1). FL-33 showed a vigorous and immediate start of alcoholic fermentation, while the Easy Fruit trial showed a longer initial lag phase of about 24 h before it started fermentation with comparable kinetics as FL-33. During the last third of fermentation though, Easy Fruit showed a more consistent behavior, while FL-33 showed very slow, sluggish sugar consumption, especially after the 12th day of fermentation. Both trials completed fermentation (<2 g/L residual sugar) on the 17th day of fermentation.

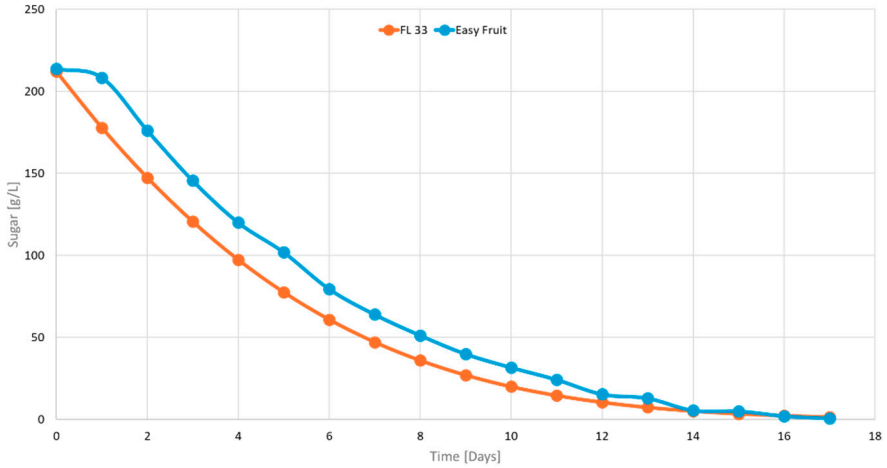

Figure 1. *Catarratto* fermentation kinetics.

The fermentation kinetics of *Grillo*, showed more vigorous fermentations for both yeast strains (Figure 2). Tracking via the sugar concentration over time revealed distinct dynamics between the two fermentation conditions. Both yeast strains demonstrated a

continuous decline in sugar content, indicative of active and regular fermentation. The CKS 102 curve exhibited a more rapid sugar depletion, particularly in the mid to late stages, suggesting a faster and more efficient fermentation process. Conversely, the SH-12 curve showed a slightly slower rate, with residual sugars persisting longer throughout fermentation. Despite these differences, both conditions achieved near-complete sugar consumption in fourteen days, indicating successful fermentation under both protocols.

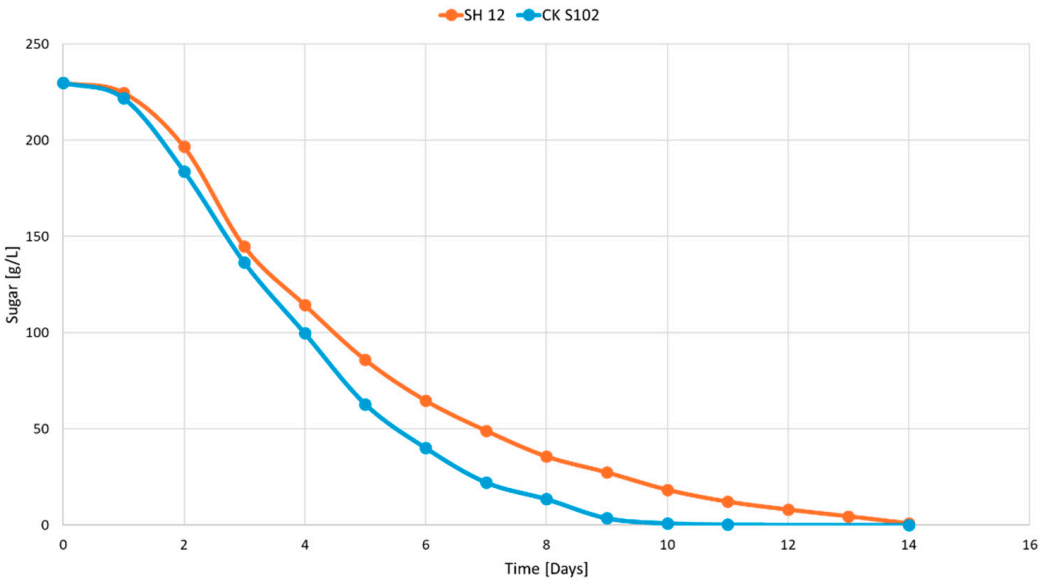

Figure 2. *Grillo* fermentation kinetics.

The graph illustrates the fermentation kinetics of *Moscato Giallo* (Figure 3). As expected, from the lower sugar content of the juices, fermentation was faster than in the case of *Catarratto* and *Grillo*. As for *Catarratto*, there was a significant difference during the initial phase of the fermentation. After 24 h, BCS 103 had consumed 24 g/L of sugars while HDT 18 only started the first day of fermentation with a consumption of 7 g/L. After six days, both conditions reach similarly low residual sugar levels, indicating near-complete sugar consumption. However, the overall kinetics suggest that the condition represented by BCS 103 is more efficient in converting sugar during the early to mid-phase of fermentation.

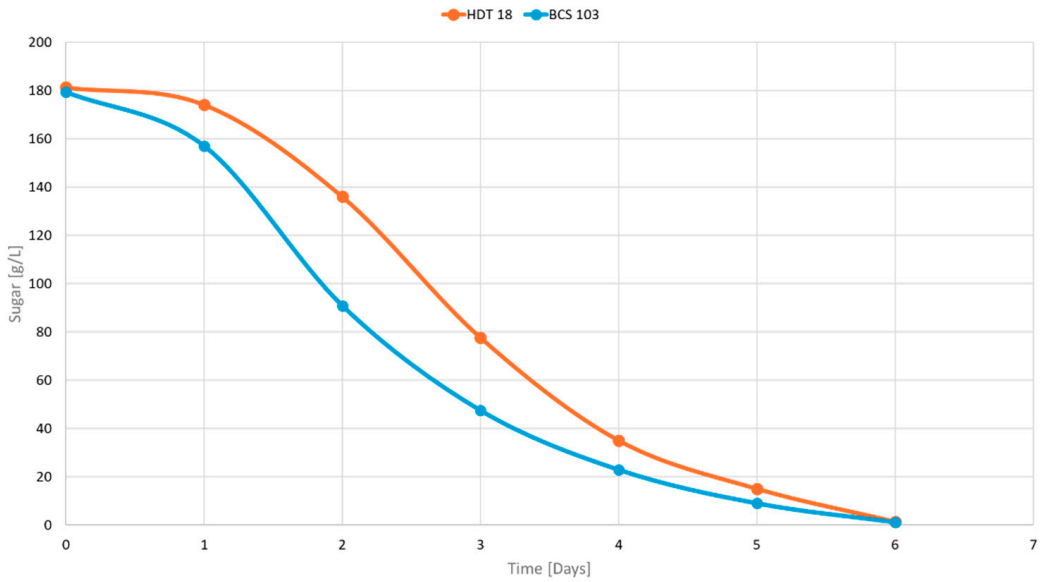

Figure 3. *Moscato Giallo* fermentation kinetics.

3.3. Wine Technological Parameters

3.3.1. *Grillo*

The two yeast strains, SH-12 and CK S 102, produced wines with distinct compositional profiles despite being fermented from the same *Grillo* grape juice (Table 2).

Table 2. Physical–chemical composition and polyphenols of *Grillo* wines.

Yeast Strain	SH-12	CK S 102
Alcohol (% *v*/*v*)	14.38 ± 0.01 ***	13.92 ± 0.01 ***
Titratable acidity (g/L)	5.03 ± 0.02 **	4.77 ± 0.01 **
pH	3.35 ± 0.02 n.s.	3.37 ± 0.01 n.s.
Volatile acidity (g/L)	1.6 ± 0.1 n.s.	1.60 ± 0.01 n.s.
Residual sugar (g/L)	0.25 ± 0.01 *	0.32 ± 0.01 *
Volatile acidity (g/L)	1.18 ± 0.01 ***	0.80 ± 0.01 ***
Malic acid (g/L)	2.14 ± 0.01 n.s.	2.17 ± 0.01 n.s.
Tartaric acid (g/L)	18.3 ± 0.2 n.s.	18.3 ± 0.1 n.s.
Dry extract (g/L)	6.0 ± 0.1 ***	6.6 ± 0.1 ***
Glycerol (g/L)	0.39 ± 0.04 n.s.	0.33 ± 0.01 n.s.
Potassium (g/L)	32.8 ± 0.8 n.s.	33.9 ± 0.8 n.s.
Buffer capacity (meq/L)	22.81 ± 0.02 ***	25.34 ± 0.01 ***
Catechins (mg/L)	94.4 ± 0.2 n.s.	94.21 ± 0.06 n.s.
Total flavonoids (mg/L)		

"n.s." = Student's *t*-test *p*-value ≥ 0.1; "*" = 0.01 ≤ "Student's *t*-test *p*-value" < 0.05; "**" = 0.001 "Student's *t*-test *p*-value" < 0.01; "***" = "Student's *t*-test *p*-value" < 0.001.

The ethanol concentration was significantly higher in wines fermented with SH-12 (14.38 ± 0.01% *v*/*v*) compared to CK S 102 (13.92 ± 0.01% *v*/*v*) ($p < 0.001$), indicating a higher fermentative efficiency of SH-12. This difference may be attributed to strain-specific variations in sugar metabolism and ethanol tolerance [13,14]. Both strains achieved dry wines, with no significant difference in the residual sugar content (1.6 ± 0.1 g/L for SH-12 vs. 1.60 ± 0.01 g/L for CK S 102), suggesting complete sugar depletion and fermentation efficiency in both cases.

Wines produced with SH-12 exhibited a significantly higher titratable acidity (5.03 ± 0.02 g/L) than those fermented with CK S 102 (4.77 ± 0.01 g/L) ($p < 0.01$), although the pH values remained similar (3.35 ± 0.02 vs. 3.37 ± 0.01; n.s.). These results imply that the higher acid content in SH-12 wines does not reflect a shift in buffering capacity but rather differences in organic acid retention or transformation during fermentation [15].

Notably, the malic acid content was significantly higher in SH-12 wines (1.18 ± 0.01 g/L) compared to CK S 102 (0.80 ± 0.01 g/L) ($p < 0.001$), indicating that CK S 102 may promote more extensive malic acid degradation. This could result from either higher malo-ethanolic activity or interactions with non-*Saccharomyces* populations if present [16]. The tartaric acid levels remained statistically unchanged between treatments (2.14 ± 0.01 g/L for SH-12 vs.

2.17 ± 0.01 g/L for CK S 102; n.s.). The comparison of volatile acidity showed a significantly lower level in SH-12 wines (0.25 ± 0.01 g/L) relative to CK S 102 (0.32 ± 0.01 g/L; $p < 0.05$).

The glycerol concentration was also significantly higher in CK S 102 wines (6.6 ± 0.1 g/L) compared to SH-12 (6.0 ± 0.1 g/L; $p < 0.001$).

No significant differences were found between strains in the dry extract (18.3 ± 0.2 g/L for SH-12 and 18.3 ± 0.1 g/L for CK S 102) or the potassium content (0.39 ± 0.04 g/L vs. 0.33 ± 0.01 g/L, respectively).

In *Grillo*, the total flavonoid levels were similar between the two yeast strains (Ck S 102: 94.21 ± 0.06 mg/L; SH 12: 94.4 ± 0.2 mg/L), while the catechin content was slightly higher in wines fermented with Ck S 102 (25.34 ± 0.01 mg/L) compared to SH 12 (22.81 ± 0.02 mg/L). The buffer capacity values were 33.9 ± 0.8 meq/L and 32.8 ± 0.8 meq/L, respectively.

3.3.2. *Catarratto*

For *Catarratto*, the two yeast strains, Easy Fruit and FL-33, yielded wines with largely similar basic chemical profiles, though some strain-specific differences were observed in volatile acidity and potentially mouthfeel-related parameters such as glycerol (Table 3).

Table 3. Physical–chemical composition and polyphenols of *Catarratto* wines.

Yeast Strain	Easy Fruit	FL-33
Alcohol (% *v*/*v*)	13.52 ± 0.03 .	13.46 ± 0.01 .
Titratable acidity (g/L)	6.07 ± 0.04 n.s.	6.15 ± 0.04 n.s.
pH	3.33 ± 0.01 n.s.	3.31 ± 0.01 n.s.
Volatile acidity (g/L)	1.6 ± 0.1 n.s.	1.60 ± 0.01 n.s.
Residual sugar (g/L)	0.21 ± 0.01 **	0.29 ± 0.01 **
Volatile acidity (g/L)	0.90 ± 0.02 n.s.	0.94 ± 0.01 n.s.
Malic acid (g/L)	3.52 ± 0.04 n.s.	3.56 ± 0.06 n.s.
Tartaric acid (g/L)	21.32 ± 0.05 n.s.	21.2 ± 0.1 n.s.
Dry extract (g/L)	7.03 ± 0.01 n.s.	7.21 ± 0.06 n.s.
Glycerol (g/L)	0.68 ± 0.01 n.s.	0.63 ± 0.03 n.s.
Potassium (g/L)	36.4 ± 0.9 *	40.0 ± 0.1 *
Buffer capacity (meq/L)	26.1 ± 0.1 n.s.	27.6 ± 0.1 n.s.
Catechins (mg/L)	128.3 ± 0.2 n.s.	129.4 ± 0.1 n.s.
Total flavonoids (mg/L)		

"n.s." = Student's *t*-test *p*-value ≥ 0.1; "." = 0.05 ≤ "Student's *t*-test *p*-value" < 0.1; "*" = 0.01 ≤ "Student's *t*-test *p*-value" < 0.05; "**" = 0.001 "Student's *t*-test *p*-value" < 0.01.

The alcohol content of the wines was slightly higher in those fermented with Easy Fruit (13.52 ± 0.03% *v*/*v*) than with FL-33 (13.46 ± 0.01% *v*/*v*), though the difference was not statistically significant. Both strains thus demonstrated comparable fermentative efficiency, effectively converting sugars to ethanol. The residual sugar levels were also similar (1.6 ± 0.1 g/L for Easy Fruit vs. 1.60 ± 0.01 g/L for FL-33; n.s.).

Wines produced by FL-33 exhibited slightly higher titratable acidity (6.15 ± 0.04 g/L) compared to Easy Fruit (6.07 ± 0.04 g/L), although this difference was not significant. The pH values were also closely matched (3.33 ± 0.01 for Easy Fruit and 3.31 ± 0.01 for FL-33), suggesting comparable acid profiles and buffering capacities.

The malic acid concentrations were also closely matched in both wines with FL-33 (0.94 ± 0.01 g/L) and in those with Easy Fruit (0.90 ± 0.02 g/L). This suggests no significant impact on malic acid content by either of the strains.

A significant difference was observed in volatile acidity, with FL-33 wines showing higher values (0.29 ± 0.01 g/L) compared to Easy Fruit (0.21 ± 0.01 g/L; $p < 0.01$). The glycerol content was slightly higher in wines fermented with FL-33 (7.21 ± 0.06 g/L) than with Easy Fruit (7.03 ± 0.01 g/L), though the difference was not statistically significant, nor impactful on wine quality [17]. The dry extract levels were also comparable (21.32 ± 0.05 g/L vs. 21.2 ± 0.1 g/L), indicating similar contributions of non-volatile solids to wine body.

The potassium concentration in the final wines was slightly higher in Easy Fruit wines (0.68 ± 0.01 g/L) than in those made with FL-33 (0.63 ± 0.03 g/L), although the difference was not significant. Potassium affects bitartrate precipitation and pH buffering, but in this case, the slight variation likely had minimal enological impact [18].

For *Catarratto*, the total flavonoid concentrations were expectedly higher than for *Grillo*, amounting to 129.3 ± 0.7 mg/L and FL 33 129.3 ± 0.5 mg/L for Easy fruit and FL 33 respectively, while there was no influence by the yeast strain. Catechin content followed the same pattern, ranging from 26.07 ± 0.01 mg/L (Easy Fruit) to 27.60 ± 0.02 mg/L (FL 33). There were, however, significant differences for the buffer capacity, which was higher in FL 33 wines (40.0 ± 0.1 meq/L) compared to Easy Fruit (36.4 ± 0.9 meq/L). This might be explained by a combination of factors, such as the small differences in titratable acidity, pH as well as potassium.

The *Moscato Giallo* wines produced by the yeast strains BCS 103 and HDT 18 presented largely comparable basic compositional profiles, although some statistically significant differences emerged, particularly in the residual sugar, volatile acidity, malic acid, and glycerol concentrations (Table 4). The alcohol content was identical in both treatments.

The titratable acidity and pH values were similar between the two strains, with the titratable acidity slightly higher in HDT 18 (4.9 ± 0.1 g/L) than BCS 103 (4.77 ± 0.02 g/L) and the pH values nearly identical (3.31 ± 0.01 and 3.32 ± 0.01, respectively).

A statistical difference was observed in the malic acid concentration. Wines fermented with HDT 18 retained higher levels of malic acid (1.09 ± 0.01 g/L) compared to those with BCS 103 (0.99 ± 0.01 g/L; $p < 0.05$), indicating a lower rate of malic acid degradation. This may reflect strain-specific variation in malo-ethanolic activity or in the interaction with indigenous lactic acid bacteria if present [15].

The volatile acidity was significantly higher in HDT 18 wines (0.14 ± 0.01 g/L) than in BCS 103 wines (0.11 ± 0.01 g/L; $p < 0.05$). Both values remain well below sensory thresholds [19] and indicate optimal fermentative behavior, helped by the low initial sugar concentration of the juice. One of the most significant differences was observed in the glycerol content. BCS 103 produced wines with higher glycerol levels (5.52 ± 0.01 g/L) compared to HDT 18 (5.29 ± 0.01 g/L; $p < 0.001$). Glycerol contributes to wine viscosity and mouthfeel, suggesting that BCS 103 may yield wines with slightly rounder sensory texture. Dry extract values were similar across both treatments (18.3–18.5 g/L), indicating no notable differences in non-volatile solid content. Potassium levels were slightly higher in HDT 18 wines (0.51 ± 0.02 g/L) than in BCS 103 wines (0.49 ± 0.02 g/L), though this difference was not statistically significant. Potassium plays a critical role in wine acid chemistry because the cation interacts with organic acid anions—especially tartaric acid—through formation of potassium–bitartrate and other salts. Elevated berry or K^+ concentrations

can increase the pH and decrease the titratable acidity, by precipitating tartrate salts and neutralizing acids, thereby reducing the buffer capacity and altering the acid/base equilibrium of the wine matrix. The small variation observed is unlikely to have substantial technological implications [20]. In *Moscato Giallo*, wines fermented with BCS 103 showed higher total flavonoid levels (96.07 ± 0.03 mg/L) and catechin concentrations than those with HDT 18 (87.3 ± 0.8 mg/L). The catechin concentrations were slightly higher in BCS 103 (7.65 ± 0.04 mg/L) than in HDT 18 (7.34 ± 0.03 mg/L). Total flavonoid content and catechin concentrations are highly correlated because catechin is a major constituent of the flavonoid pool in grapes, shares similar extraction and yeast-binding behavior with other flavonoids, and contributes strongly to the total flavonoid analytical signal; therefore, differences in catechin retention largely drive differences in total flavonoid levels [21].

Table 4. Physical–chemical composition and polyphenols of *Moscato Giallo* wines.

Yeast Strain	BCS 103	HDT 18
Alcohol (% *v*/*v*)	11.29 ± 0.02 n.s.	11.29 ± 0.04 n.s.
Titratable acidity (g/L)	4.77 ± 0.02 n.s.	4.9 ± 0.1 n.s.
pH	3.31 ± 0.01 n.s.	3.32 ± 0.01 n.s.
Volatile acidity (g/L)	1.34 ± 0.03 *	1.20 ± 0.01 *
Residual sugar (g/L)	0.11 ± 0.01 *	0.14 ± 0.01 *
Volatile acidity (g/L)	0.99 ± 0.01 *	1.09 ± 0.01 *
Malic acid (g/L)	3.48 ± 0.04 n.s.	3.51 ± 0.04 n.s.
Tartaric acid (g/L)	18.3 ± 0.1 n.s.	18.5 ± 0.2 n.s.
Dry extract (g/L)	5.52 ± 0.01 ***	5.29 ± 0.01 ***
Glycerol (g/L)	0.49 ± 0.02 n.s.	0.51 ± 0.02 n.s.
Potassium (g/L)	32. ± 2 n.s.	34 ± 1 n.s.
Buffer capacity (meq/L)	7.65 ± 0.04 *	7.34 ± 0.03 *
Catechins (mg/L)	96.0 ± 0.1 **	87 ± 0.1 **
Total flavonoids (mg/L)		

"n.s." = Student's *t*-test *p*-value ≥ 0.1; "*" = 0.01 ≤ "Student's *t*-test *p*-value" < 0.05; "**" = 0.001 "Student's *t*-test *p*-value" < 0.01; "***" = "Student's *t*-test *p*-value" < 0.001.

3.4. Volatile Organic Compounds of Wines

3.4.1. *Grillo*

Glycosylated Compounds

In the glycosylated fraction of *Grillo* wines, the overall concentrations of benzenoids, $C_{13}{}^{-}$ norisoprenoids, and alcohols were similar between Ck S 102 and SH 12 (Figure 4b), though some individual compounds showed significant differences. Notably, 3,4-dihydro-3-oxoactinidol III and linalool were significantly higher in Ck S 102, while monoterpenes and benzyl alcohol were significantly more abundant in Ck S 102 than in SH 12 ($p < 0.01$ and $p < 0.01$, respectively). On the other hand, trans-furan-linalool oxide and nerol showed significantly decreased levels in SH 12 ($p < 0.001$).

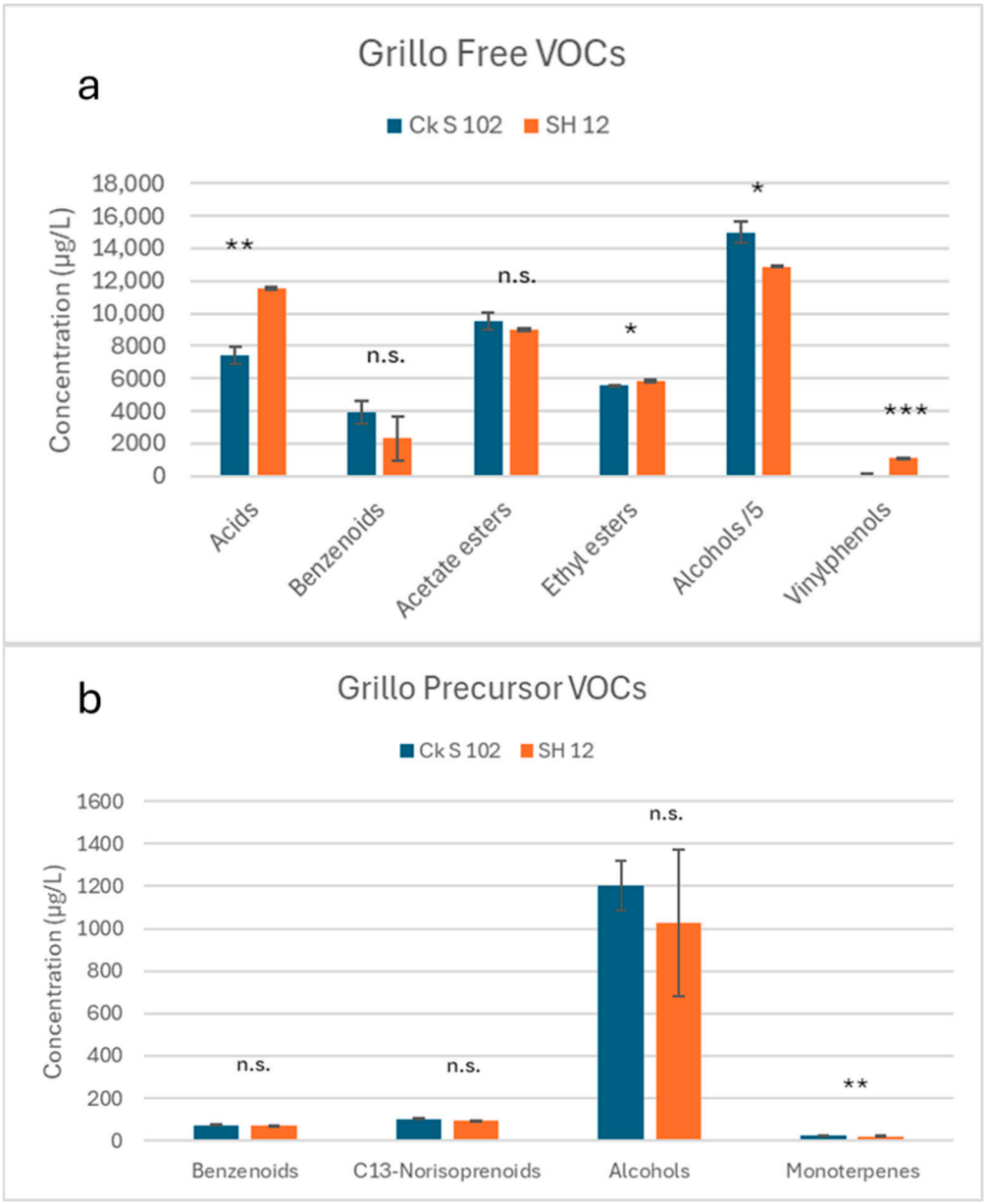

Figure 4. (**a**) *Grillo* free volatile organic compounds; (**b**) *Grillo* precursor volatile organic compounds. "n.s." = Student's *t*-test *p*-value $\geq$ 0.1; "*" = 0.01 $\leq$ "Student's *t*-test *p*-value" < 0.05; "**" = 0.001 "Student's *t*-test *p*-value" < 0.01; "***" = "Student's *t*-test *p*-value" < 0.001.

Glycosidic bound volatiles serve as aroma precursors and can release active compounds over time. The relative stability of most glycosylated compounds suggests a shared varietal signature and comparable enzymatic interaction between the yeast strain and these molecules. However, compounds like linalool, nerol, and 3,4-dihydro-3-oxoactinidol III—which were significantly higher in Ck S 102—may contribute to more pronounced floral or balsamic notes upon aging. This could give Ck S 102 a longer aromatic evolution potential [22,23].

Free Compounds

The *Grillo* wines' free VOC fraction, shown in Figure 4a, exhibited more pronounced differences between the two wines. SH 12 showed significantly higher concentrations of volatile compounds produced by yeasts, such as short- and medium-chain fatty acids such as hexanoic, octanoic, and decanoic acids ($p < 0.01$), which can confer cheesy, rancid

and sweaty flavors to wine when present in concentrations above 0.42, 0.5, and 1 mg/L, respectively, even though here, the concentrations of these compounds are much below these thresholds (values range from 667 ± 52 µg/L to 5012 ± 121 µg/L), as well as a notable increase in ethyl esters including ethyl hexanoate, ethyl octanoate, and ethyl 2-hydroxy-3-phenylpropanoate ($p < 0.001$ in most cases), responsible for green apple and pleasant fruity flavors even at low concentrations (0.014–0.005 mg/L odor threshold) [24].

Among the alcohols, 2-phenylethanol and isoamyl alcohol were significantly more abundant in Ck S 102 ($p < 0.05$), contributing to its floral and fruity notes. Conversely, SH 12 had significantly higher levels of lactones, particularly γ-butyrolactone ($p < 0.001$), volatile phenols and 4-vinylguaiacol and 4-vinylphenol, which are associated with spicy, smoky and medicinal aromas ($p < 0.001$) [25].

Additionally, monoterpene derivatives like trans-pyran-linalool oxide and diendiol I were significantly reduced in SH 12 ($p < 0.001$), suggesting a slightly diminished terpene-related aroma profile.

3.4.2. *Catarratto*

Glycosylated Compounds

The glycosylated volatile organic compounds in *Catarratto* wines displayed distinct differences between the Easy Fruit and FL-33 fermented products. Overall, Easy Fruit showed significantly higher concentrations of several aroma-relevant glycoconjugated compounds (Figure 5b). Methyl salicylate, an aromatic compound associated with minty and balsamic notes [26], was significantly more abundant in Easy Fruit (21.1 ± 0.2 µg/L) compared to FL-33 (13.5 ± 0.4 µg/L, $p < 0.01$). Similarly, the glycosylated norisoprenoids 3-oxo-α-ionol and C_{13}^{-} norisoprenoids were present in significantly higher concentrations in Easy Fruit, with 3-oxo-α-ionol reaching 213 ± 7 µg/L in Easy Fruit versus 123 ± 2 µg/L in FL-33 ($p < 0.01$).

The series of 3,4-dihydro-3-oxoactinidol derivatives also showed marked differences, with all four isomers (I–IV) significantly higher in Easy Fruit ($p < 0.01$ for I–III, $p < 0.05$ for IV). The total concentration of glycosylated benzenoids was also higher in Easy Fruit (183 ± 8 µg/L vs. 143 ± 2 µg/L, $p < 0.05$). Among the alcohols, benzyl alcohol (883 ± 5 µg/L) and 2-phenylethanol (1056 ± 2 µg/L) present in Easy Fruit were significantly more abundant than in FL-33 (551 ± 12 µg/L and 615 ± 40 µg/L) ($p < 0.001$ and $p < 0.01$, respectively), contributing to a richer pool of bound aroma precursors. The total alcohols content in the glycosidic fraction was likewise significantly higher in Easy Fruit (2029 ± 6 µg/L vs.1226 ± 51 µg/L, $p < 0.01$), suggesting a higher potential for aromatic release during wine maturation or enzymatic hydrolysis and higher release in the case of FL 33.

Free Compounds

In the *Catarratto* free VOC fraction, the pattern reversed for many fermentation-derived compounds (Figure 5a). FL-33 showed elevated levels of several esters and lactones. Ethyl lactate (56 ± 2 µg/L vs. 39 ± 2 µg/L, $p < 0.05$) and diethyl succinate (635 ± 3 µg/L vs. 429 ± 13 µg/L, $p < 0.01$) were significantly higher in FL-33, indicating favorable reaction kinetics due to precursor concentrations for this chemical esterification reaction. FL-33 also exhibited higher concentrations of lactones such as γ-butyrolactone (192 ± 7 µg/L vs. 116 ± 4 µg/L, $p < 0.01$) and γ-carboethoxy-γ-butyrolactone (24 ± 1 µg/L vs. 13.9 ± 0.3 µg/L, $p < 0.01$),which act as precursors to GHB (γ-hydroxybutyric acid) suggesting the presence of sweet, creamy, and coconut-like notes [27]. The total concentration of lactones was substantially higher in FL-33 (221.5 µg/L vs. 134.0 µg/L, $p < 0.01$).

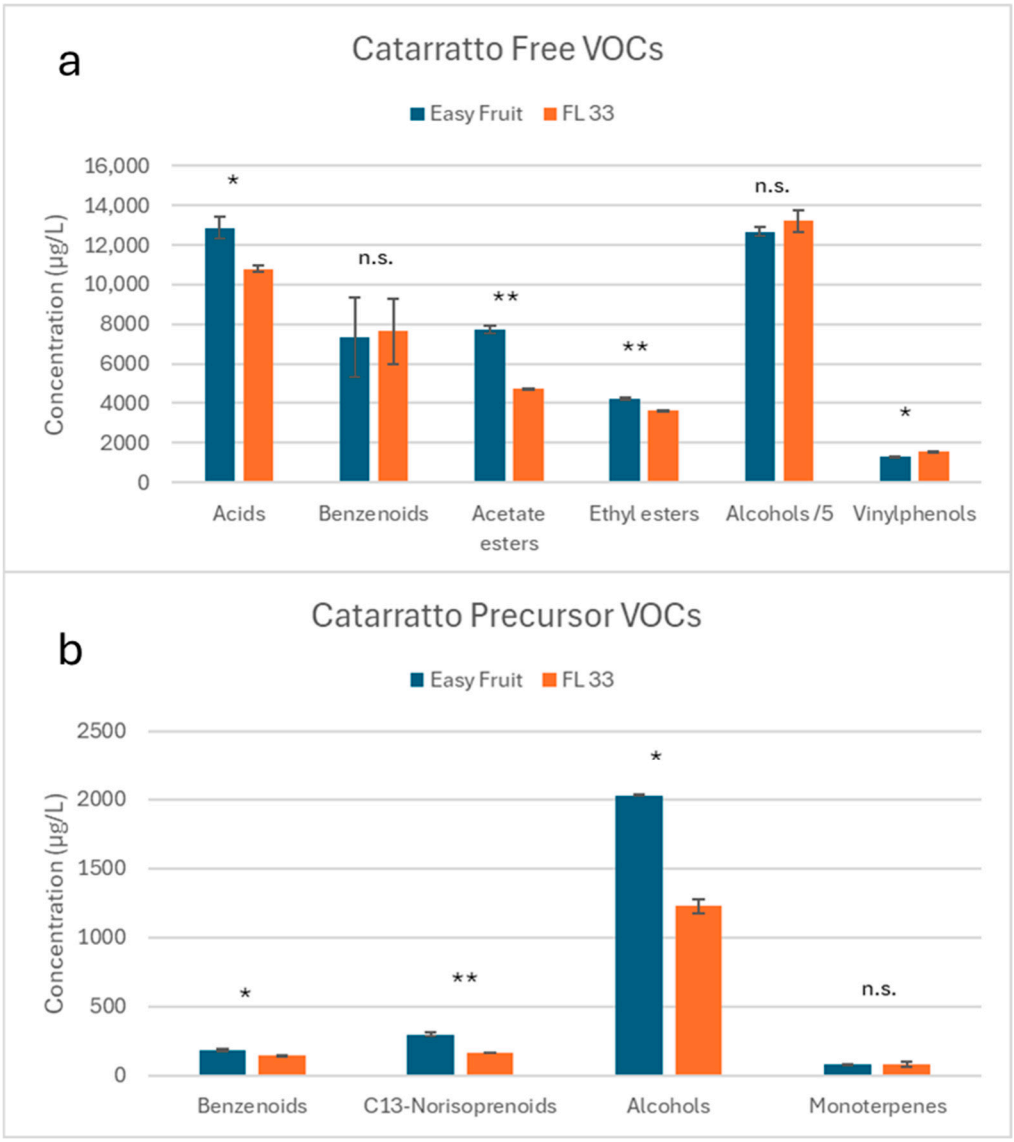

Figure 5. (**a**) *Catarratto* free volatile organic compounds; (**b**) *Catarratto* precursor volatile organic compounds. "n.s." = Student's *t*-test *p*-value $\geq$ 0.1; "*" = 0.01 $\leq$ "Student's *t*-test *p*-value" < 0.05; "**" = 0.001 "Student's *t*-test *p*-value" < 0.01.

Volatile phenols were also found in higher concentrations in FL-33 produced wines, including 4-vinylguaiacol (1302 $\pm$ 35 µg/L vs. 1060 $\pm$ 15 µg/L, $p < 0.05$) and 4-vinylphenol (244 $\pm$ 6 µg/L vs. 240 $\pm$ 1 µg/L), compounds often associated with aromas ranging from spiciness and smokiness to off-flavors, often described as medicinal or phenolic when above concentrations of 725 µg/L total vinylphenols [28]. In contrast, fruity esters such as isoamyl acetate and phenylethyl acetate were significantly more abundant in Easy Fruit. Isoamyl acetate, which imparts banana-like notes, was particularly high in Easy Fruit (5401 $\pm$ 104 µg/L vs. 2895 $\pm$ 30 µg/L, $p < 0.001$), while phenylethyl acetate, linked to floral notes, also favored Easy Fruit (2094 $\pm$ 78 µg/L vs. 1671 $\pm$ 10 µg/L, $p < 0.05$) [29]. Overall, total acetate esters were significantly higher in Easy Fruit (7726 µg/L vs. 4726 µg/L, $p < 0.01$), whereas ethyl esters were more evenly distributed, with FL-33 showing slightly lower total concentrations (4238 µg/L vs. 3645 µg/L, $p < 0.01$).

3.4.3. *Moscato Giallo*

Glycosylated Compounds

The analysis of glycosylated volatile organic compounds (VOCs) in *Moscato Giallo* wines revealed subtle but significant differences between the trials. Vanillin showed a slightly higher concentration in HDT 18 (27 ± 2 µg/L) compared to BCS 103 (21.3 ± 0.3 µg/L), approaching statistical significance ($p < 0.1$). Conversely, vomifoliol was significantly higher in BCS 103 (47.0 ± 0.3 µg/L) than in HDT 18 (36.41 ± 0.01 µg/L, ** $p < 0.001$). The glycosylated pool of benzyl alcohol and 2-phenylethanol was comparable between yeast strains.

Monoterpenes, a key aromatic group in *Moscato Giallo*, were abundant in both wines, with the total concentrations not significantly different (4818 µg/L in BCS 103 vs. 4481 µg/L in HDT 18) (Figure 6b). However, individual compounds such as linalool and hotrienol showed modest but significant decreases in HDT 18 compared to BCS 103 ($p < 0.05$). Diendiol I was significantly higher in BCS 103 (191.8 ± 0.1 µg/L vs. 136 ± 3 µg/L, ** $p < 0.001$).

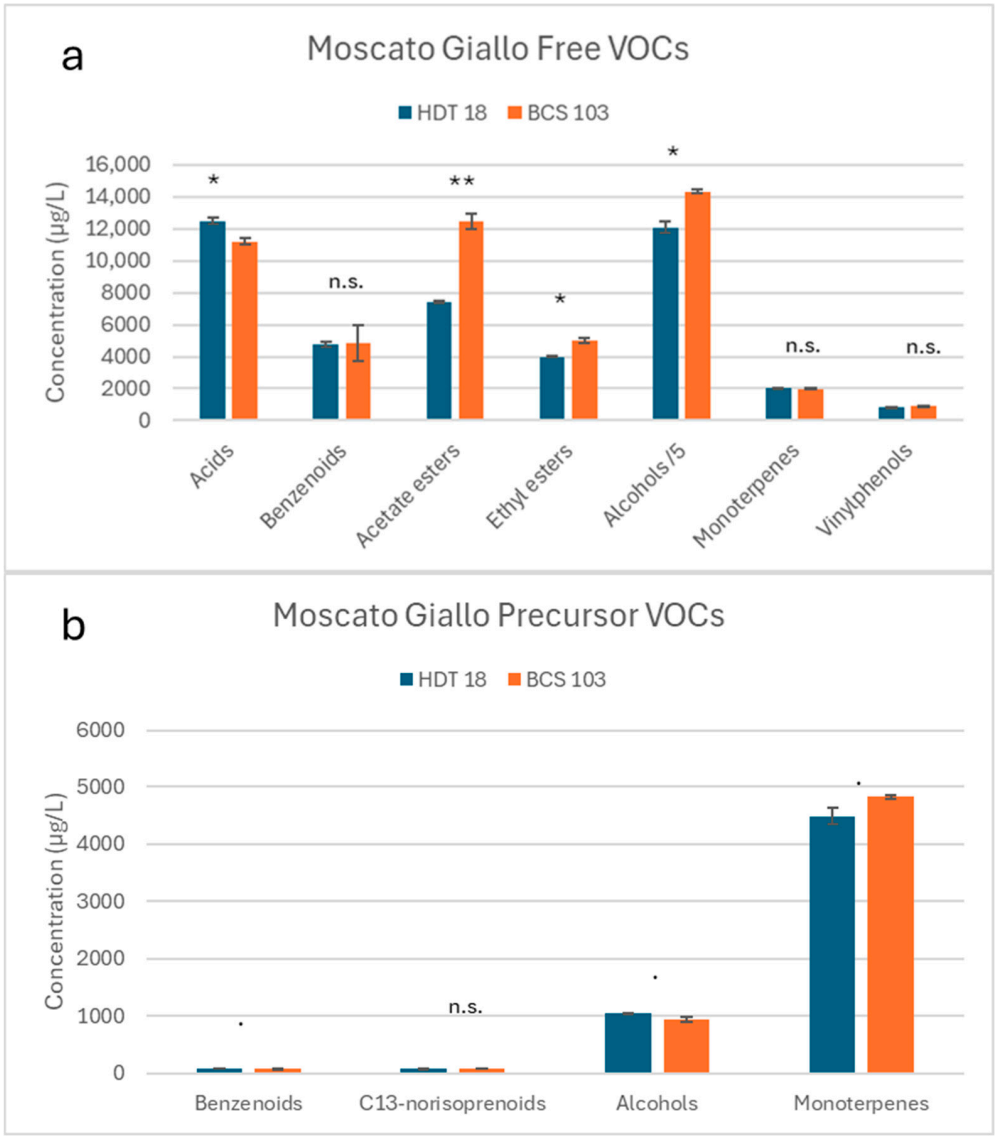

Figure 6. (**a**) *Moscato Giallo* free volatile organic compounds; (**b**) *Moscato Giallo* precursor volatile organic compounds. "n.s." = Student's *t*-test *p*-value ≥ 0.1; "." = 0.05 ≤ "Student's *t*-test *p*-value" < 0.1; "*" = 0.01 ≤ "Student's *t*-test *p*-value" < 0.05; "**" = 0.001 "Student's *t*-test *p*-value" < 0.01.

Free Volatile Organic Compounds

The *Moscato Giallo* free volatile fraction exhibited more pronounced differences between the two strains, as shown in Figure 6a. HDT 18 showed significantly higher concentrations of medium-chain fatty acids such as octanoic acid (6214 ± 122 µg/L vs. 4404 ± 17 µg/L, $p < 0.01$), decanoic acid (1026 ± 13 µg/L vs. 788 ± 17 µg/L, $p < 0.01$), and 9-decenoic acid (175.2 ± 0.3 µg/L vs. 76 ± 2 µg/L, ** $p < 0.001$). Conversely, tetradecanoic acid was markedly higher in BCS 103 (88 ± 8 µg/L vs. 6 ± 1 µg/L, $p < 0.01$). The total free acid concentration was significantly higher in HDT 18 (12,473 ± 201 µg/L) compared to BCS 103 (11,197 ± 208 µg/L, $p < 0.05$).

Esters associated with fruity and floral aromas [24,29], such as isoamyl acetate and phenylethyl acetate, were significantly more abundant in BCS 103 (8047 ± 189 µg/L and 4070 ± 264 µg/L, respectively) compared to HDT 18 (5062 ± 109 µg/L and 1933 ± 16 µg/L, $p < 0.01$). Correspondingly, the total acetate ester concentrations were higher in BCS 103 (12,455.5 µg/L vs. 7410.0 µg/L, $p < 0.01$). In contrast, ethyl esters such as ethyl hexanoate and ethyl octanoate showed elevated levels in HDT 18 ($p < 0.05$), indicating a yeast-dependent modulation of ester profiles.

Alcohols were abundant in both trials, with a significantly higher total alcohol content in BCS 103 (71,634.0 µg/L) than HDT 18 (60,428.0 µg/L, $p < 0.05$). Key aroma alcohols such as 2-phenylethanol followed this trend ($p < 0.01$). Interestingly, hexanol and 2-methylbutanol were higher in HDT 18 ($p < 0.05$), which may influence herbaceous and green notes [30]. Lactones and volatile phenols did not show significant differences between strains, suggesting similar contributions to wine aroma from these classes.

Free volatile profiles demonstrated more pronounced differentiation. HDT 18 wines contained significantly higher amounts of medium-chain fatty acids and their corresponding ethyl esters. Conversely, BCS 103 was characterized by markedly higher concentrations of acetate esters, notably isoamyl and phenylethyl acetate, which are well-known contributors to fruity and floral aromas such as banana and rose [24,29]. These differences likely reflect strain-specific variations in yeast metabolism or grape precursor availability influencing fermentation pathways [31,32].

3.5. Sensory Analysis

3.5.1. *Grillo*

As shown below (Figure 7), wines produced with yeast strain SH-12 exhibited significantly higher floral intensity (7.5 ± 0.8) compared to Ck S 102 (5.8 ± 1.0; $p < 0.05$). SH-12 also resulted in higher aroma complexity (6.2 ± 1.0 vs. 5.5 ± 1.0), fruitiness (6.5 ± 0.8 vs. 5.7 ± 0.8), and unripe perception (3.7 ± 1.2 vs. 3.2 ± 1.0). In contrast, wines from Ck S 102 scored higher in citrus (6.2 ± 0.8 vs. 5.5 ± 0.8) and sweetness (4.8 ± 0.7 vs. 3.8 ± 0.8; $p < 0.05$). Both strains produced wines with absent off-flavors (1.7 ± 0.8 for Ck S 102 and 1.0 ± 0.0 for SH-12). The overall enjoyment scores were similar: 6.0 ± 1.7 (Ck S 102) and 6.2 ± 1.5 (SH-12).

3.5.2. *Catarratto*

In the *Catarratto* group (Figure 8), the Easy Fruit strain generated wines with higher fruitiness (7.0 ± 0.6) and overall enjoyment (6.2 ± 1.7) than FL 33 (5.7 ± 0.8 and 6.0 ± 1.4, respectively). FL 33 wines displayed stronger floral intensity (6.3 ± 1.0 vs. 4.7 ± 1.0), while both strains yielded low off-flavor perception (1.0 ± 0.0 for Easy Fruit and 1.2 ± 0.4 for FL 33). The taste persistence and complexity scores were comparable, with FL 33 slightly ahead in persistence (6.2 ± 0.8 vs. 5.8 ± 0.6).

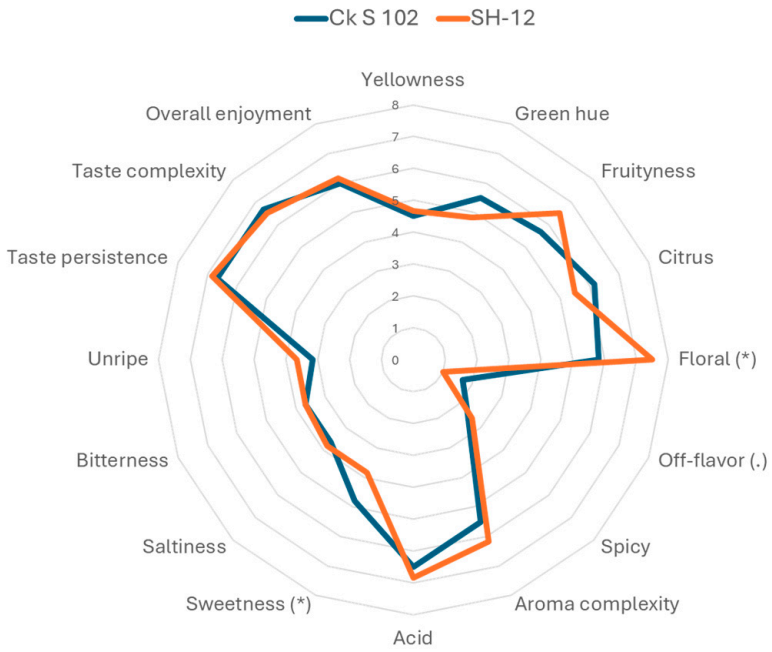

Figure 7. *Grillo* sensory profile. "." = 0.05 ≤ "Student's *t*-test *p*-value" < 0.1; "*" = 0.01 ≤ "Student's *t*-test *p*-value" < 0.05.

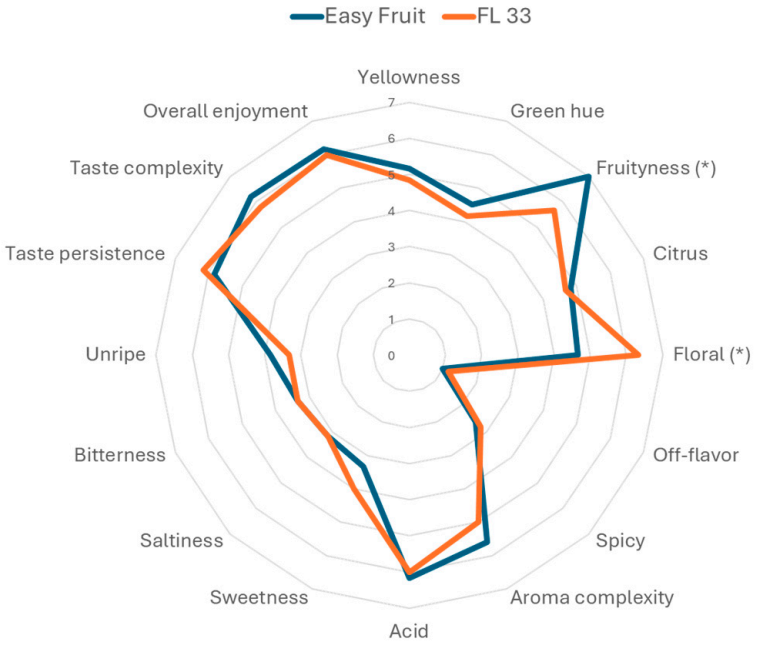

Figure 8. *Catarratto* sensory profile. "*" = 0.01 ≤ "Student's *t*-test *p*-value" < 0.05.

3.5.3. *Moscato Giallo*

Both BCS 103 and HDT 18 strains produced wines with highly expressive sensory profiles, as can be seen in Figure 9. BCS 103 yielded the highest scores in the descriptors of fruitiness (8.2 ± 0.4 vs. 7.3 ± 0.8) and citrus (6.8 ± 0.8 vs. 5.7 ± 0.8), while HDT 18 exhibited the highest floral expression (8.0 ± 0.6 vs. 7.0 ± 1.1) and comparable complexity (7.0 ± 1.4 vs. 7.2 ± 0.6). Both yeasts resulted in wines with low bitterness, saltiness, and off-flavor (1.0 ± 0.0). The overall enjoyment was similar: 6.3 ± 1.6 for BCS 103 and 6.2 ± 1.8 for HDT 18.

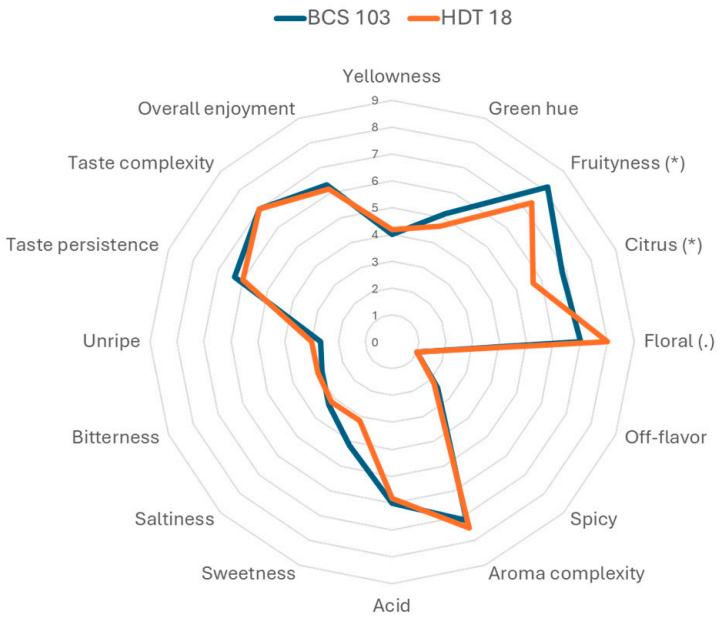

Figure 9. *Moscato Giallo* sensory profile. "." = 0.05 ≤ "Student's *t*-test *p*-value" < 0.1; "*" = 0.01 ≤ "Student's *t*-test *p*-value" < 0.05.

4. Discussion

4.1. Grillo

Grillo wines obtained with SH-12 and CK S102 exhibited significantly different acid compositions. From a technological standpoint, these differences may appear negligible; however, they correspond well with the observed variations in malic acid content and titratable acidity, suggesting malic acid degradation during the CK S102-guided fermentations. Differences in the ethanol and glycerol content can influence the sensory characteristics. Glycerol is known to contribute positively to mouthfeel and perceived sweetness [33,34]. The dry extract and potassium levels were comparable across trials, as these parameters are primarily determined by must composition and winemaking technique rather than by yeast strain [35].

Overall, the yeast selection had a substantial impact on the chemical composition of *Grillo* wines. SH-12 produced wines with higher alcohol and total acidity, lower volatile acidity, and higher malic acid retention that may enhance freshness and stability [36]. Conversely, CK S102 generated wines with slightly lower alcohol and total acidity but markedly higher glycerol levels, which may increase roundness and softness. These findings emphasize the practical relevance of strain selection for achieving distinct stylistic and quality outcomes in white wines.

The free VOCs profile of SH-12 revealed a richer matrix of fermentation-derived compounds, including fatty acids, ethyl esters, and lactones. In contrast, CK S102 displayed higher levels of terpenoids and higher alcohols, such as 2-phenylethanol and isoamyl alcohol, aligning with a more floral aromatic profile.

The balance between free and glycosylated VOCs is crucial for *Grillo* wine aroma development. SH-12, with its ester- and acid-rich profile, may exhibit higher immediate aromatic intensity and a more contemporary sensory appeal. CK S102, with its larger precursor pool, may yield enhanced complexity through aging. Together, these results suggest that SH-12 may be well suited for young fruit-forward *Grillo* wines, whereas CK S102 seems to enhance the floral and age worthy expression of *Grillo*.

4.2. Catarratto

Both Easy Fruit and FL-33 strains demonstrated comparable fermentative efficiency and similar sugar-to-ethanol conversion, although they differed in the production of key quality-related compounds. Acetic acid production, a strain-dependent trait that influences wine cleanliness, varied between the strains but remained within acceptable sensory thresholds [37,38].

Overall the differences between the strains were subtle, and both yielded chemically balanced wines. Easy Fruit produced significantly lower volatile acidity, potentially preserving aromatic clarity, whereas FL-33 generated slightly higher glycerol levels that may enhance palate volume.

FL-33 exhibited a more complex free VOC profile, particularly in fermentation-related esters, succinates, and lactones. Elevated concentrations of γ-butyrolactone, diethyl succinate, and monoethyl succinate indicate a wine that is more expressive and complex at a young age. Although the total free alcohols were slightly higher in FL-33, Easy Fruit maintained higher concentrations of key fruity esters such as isoamyl and phenylethyl acetate—compounds known to drive consumer-friendly aromas such as banana, pear, and floral notes. This may indicate the Easy Fruit yeast's ability to produce more aromatic, fruit-forward wines, though with less varietal typicity [39].

These findings suggest two possibly divergent oenological potentials: Easy Fruit seems to be more suited for fresh aromatic wines, while FL-33 may be preferable in styles emphasizing structure and richness, given its elevated fermentation volatiles and maturation-related compounds. However, FL-33's slightly higher production of phenolic-related volatiles warrants attention to avoid loss of aromatic finesse.

4.3. Moscato Giallo

Although BCS 103 and HDT 18 yielded broadly similar wines, notable differences suggest a divergence in specific metabolic pathways. BCS 103 produced higher glycerol and slightly elevated residual sugar, whereas HDT 18 retained more malic acid but displayed higher production of volatile acidity.

Moscato Giallo was the only cultivar cluster treated with PVPP, and its wines showed catechin concentrations within ranges typically accepted by winemakers, considering their influence on oxidative stability [40] and potential impact on pinking [41]. The results also confirm that the yeast strain did not substantially influence the catechin levels under these conditions, while PVPP remained an effective fining agent for these compounds [42].

The comparison of glycosylated aroma precursors highlighted only minor quantitative differences, though these may influence the aromatic potential. Lower levels of key monoterpenes such as linalool and hotrienol in HDT 18 wines may suggest enzymatic activity that facilitated precursor hydrolysis during fermentation [6,43], though not justifying the proclaimed impact on terpenic precursors.

Under the tested conditions, BCS 103 produced higher total alcohols, particularly 2-phenylethanol, supporting a more pronounced floral aromatic profile. In contrast, increased hexanol and 2-methylbutanol in HDT 18 may contribute subtle green or herbaceous nuances, which can add complexity or detract from fruitiness depending on the concentration.

Overall, the findings demonstrate that the two yeast strains may produce diverging yet equally valid aromatic expressions. HDT 18 favors a distinct floral/rose-like profile, while BCS 103 seems to enhance the fruit- and citrus-driven characteristics of *Moscato Giallo* wines, while no major impact on free terpenes can be proven.

5. Conclusions

This study highlights the role of yeast strain selection in shaping the chemical, aromatic, and sensory characteristics of wines produced from Sicily-grown white cultivars, both aromatic and neutral. The observed strain-dependent differences in metabolite production demonstrate the potential for the targeted modulation of the varietal expression, particularly in aromatic profiles. It also gives an insight into how oenologists can modulate wine aroma during fermentation with a certain target, meaning the influence on age-ability and the adaptation to certain markets based on distinct profiles. By aligning yeast performance with specific cultivar traits, winemakers can also enhance wine quality while promoting more efficient and sustainable practices. These findings support the integration of tailored microbial strategies in modern enology, particularly for indigenous cultivars.

Supplementary Materials: The following supporting information can be downloaded at https://www.mdpi.com/article/10.3390/fermentation12050227/s1. Table S1: Volatile acids composition at the end of alcoholic fermentation; Table S2: Ethyl esters of fatty acids at the end of alcoholic fermentation; Table S3: Alcohols at the end of alcoholic fermentation; Table S4: Acetate esters at the end of alcoholic fermentation; Table S5: Esters of organic acids at the end of alcoholic fermentation; Table S6: Lactones at the end of alcoholic fermentation; Table S7: Benzenoids at the end of alcoholic fermentation; Table S8: $C_{13}{}^{-}$ norisoprenoids and monoterpenes at the end of alcoholic fermentation; Table S9: Glycosylated $C_{13}{}^{-}$ norisoprenoids at the end of alcoholic fermentation; Table S10: Glycosylated monoterpenes at the end of alcoholic fermentation; Table S11: Glycosylated benzenoids at the end of alcoholic fermentation; Table S12: Glycosylated alcohols at the end of alcoholic fermentation.

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