Variability of Tyrosol, Hydroxytyrosol and Tryptophol contents in *Sangiovese* wines produced by a single strain of *Saccharomyces cerevisiae*

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Tyrosol, hydroxytyrosol and tryptophol are reported to possess several health-enhancing activities, deriving from their **free radical scavenging**, **anticarcinogenic**, **cardioprotective** and **antimicrobial properties** [3; 5].
Tyrosol and tryptophol are **produced by yeasts** during alcoholic fermentation from the catabolism of amino acids tyrosine and tryptophan, respectively [4], whereas hydroxytyrosol is produced by hydroxylation of its precursor tyrosol [5].
Tyrosol and tryptophol are described as **quorum sensing molecules** in different yeast species. These aromatic alcohols allow *S.cerevisiae* to respond to both **cell density** and **nutritional state of the environment** [1].

Aim

The aim of this work was to investigate on the factors, other than yeast strain, affecting the accumulation of tyrosol, hydroxytyrosol and tryptophol in wine

Materials and methods

Laboratory micro-vinifications were carried out in triplicate using grape juice with its skins and seeds, obtained by manual stemming and crushing of Sangiovese grape clusters harvested in 8 different vineyards (A-H) in three different viticultural areals of Tuscany (Brunello di Montalcino, Chianti Classico and Chianti colli Aretini) in two different vintages (2011 and 2012) and stored at -20°C. The 16 microvinifications were carried out by inoculating the musts with a single strain of *Saccharomyces cerevisiae*. All fermentations were completed in 15 days.
The yeast strain above mentioned was previously isolated from a commercial alcoholic fermentation of Sangiovese must (Brunello di Montalcino) and is included in the yeast culture collection of GESAAF, University of Florence, Italy.
Chemical analysis: fusel alcohols were determined by high performance liquid chromatography (HPLC) equipped with an UV-DAD detector at 280nm. N-α-aminocid content was determined by the NOPA procedure [2].

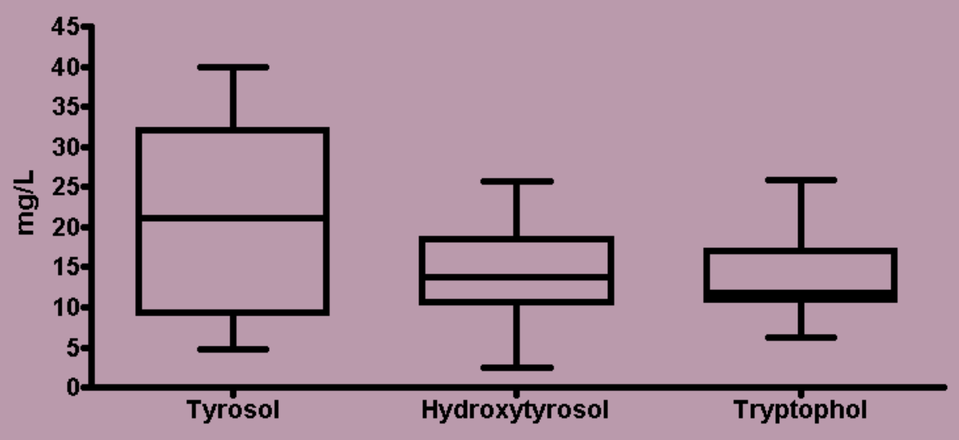
Results

The Sangiovese musts were characterized in terms of pH, sugar and total N-α-amino acid content. Fermentation progress was monitored daily through CO_2 loss to determine fermentation vigor (VF48) and maximum rate of sugar consumption (Vmax). Highest and lowest detected values of the parameters are reported in table 1.

Tab.1

	Chemical and kinetic parameters	
	min	max
pH	3.47 ± 0.00	4.03 ± 0.00
N-α-amino acid (mg/L)	69 ± 11	297 ± 14
VF 48 (gCO_2)	11.0 ± 0.0	52.0 ± 0.0
V max (gCO_2/day)	4.2 ± 0.0	22.6 ± 0.0

Values reported are expressed as mean ± standard deviation



High variability in terms of tyrosol, hydroxytyrosol and tryptophol contents were assessed in the wines as reported in fig.1.
In particular:
- Tyrosol content ranging from **4.7** to **40.0** mg/L.
- Hydroxytyrosol content ranging from **2.5** to **25.7** mg/L.
- Tryptophol content ranging from **6.3** to **25.9** mg/L.

As reported in Table 2:

- N-α-amino acid content of the musts and Vmax of alcoholic fermentations are significantly and inversely correlated (p<0.01) with tyrosol and hydroxytyrosol contents of the wines.
- VF48 is significantly and inversely correlated (p<0.05) with hydroxytyrosol contents of the obtained wines.
- No correlation was found between tryptophol concentration and chemical and kinetic parameters.
- Tyrosol is significantly and directly correlated with hydroxytyrosol (p<0.01) and tryptophol (p<0.05) content of the obtained wines.

Tab.2

	Correlations (r)						
	pH	N-α-amino acid (mg/L)	VF48 (gCO_2)	Vmax (gCO_2/day)	Tyrosol (mg/L)	Hydroxytyrosol (mg/L)	Tryptophol (mg/L)
Tyrosol (mg/L)	-0.11	**-0.59****	-0.19	**-0.54****	-	**0.82****	**0.43***
Hydroxytyrosol (mg/L)	0.08	**-0.65****	**-0.44***	**-0.70****	**0.82****	-	0.23
Tryptophol (mg/L)	-0.27	0.06	0.33	0.04	**0.43***	0.23	-

*p<0.05; **p<0.01

Conclusions

The contents of tyrosol and hydroxytyrosol in wines fermented by a single strain of *Saccharomyces cerevisiae* are higher as the fermentation rate is slower.

References
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