

EFFECT OF DIFFERENT WINEMAKING PRACTICES ON CHEMICAL COMPOSITION, AROMA PROFILE AND SENSORY PERCEPTION OF RIBOLLA GIALLA SPARKLING WINES

Voce S.*, Battistutta F.*, Tat L.*, Sivilotti P.*, Comuzzo P.*

Università degli Studi di Udine, Dipartimento di Scienze Agroalimentari, Ambientali e Animali, via Sondrio 2/A, 33100, Udine
corresponding author: voce.sabrina@spes.uniud.it

Background and aim of the work

Ribolla Gialla is an autochthonous white grape variety, cultivated in Friuli Venezia Giulia (North-East Italy) and Slovenia.

The few scientific studies carried out till now are focused on the origin of the variety (1), the chemical characterization of grapes (2) and the metabolomic profile of sparkling wines (3, 4).

Ribolla Gialla grapes are characterized by high acidity - making it suitable to produce sparkling wines - whereas, volatile compounds mainly consist in appreciable amounts of aroma precursors that could potentially improve the overall aroma profile of the wines obtained (3).

The common method used to produce Ribolla Gialla sparkling wines is the Martinotti/Charmat method; the aroma composition of wines is mainly characterized by volatile compounds formed during pre-fermentative operations, fermentation and aging.

In the present study, different **refermentation methods** (Martinotti/Charmat and Classic method) were compared and the effects on chemical composition, aroma and sensory profile were evaluated; in a second experiment, the effects of **skin contact** and **use of enzymes** on the extraction of varietal aroma compounds and aroma precursors were investigated.

Results and discussion

First trial Refermentation method

Table 1. Basic chemical composition of sparkling wines obtained by different refermentation methods.

Parameter	MB Mean ± SD	ML Mean ± SD	CL Mean ± SD
pH	3,27 ± 0,02 a	3,50 ± 0,01 c	3,41 ± 0,01 b
Titrate acidity (g/L tartaric acid)	4,29 ± 0,09 a	3,20 ± 0,04 b	4,17 ± 0,06 a
alcohol (% v/v)	11,00 ± 0,10 b	10,77 ± 0,12 a	11,30 ± 0,00 c
total residual sugars (g/L)	4,30 ± 0,72 a	2,32 ± 0,28 b	3,81 ± 0,29 a
malic acid (g/L)	2,50 ± 0,17 b	<0,1 a	0,21 ± 0,04 a
lactic acid (g/L)	<0,01 b	1,55 ± 0,04 a	1,54 ± 0,03 a

The chemical composition of sparkling wines was affected by refermentation methods, with MB characterized by higher acidity, and the occurrence of malolactic fermentation in ML and CL sparkling wines (table 1).

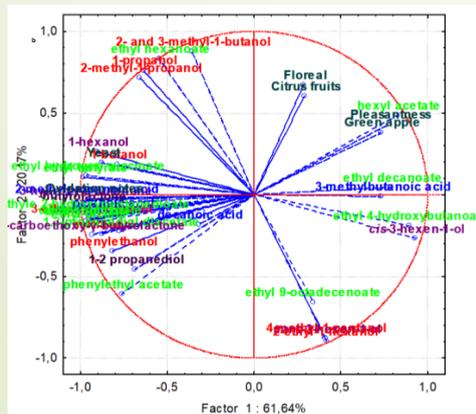
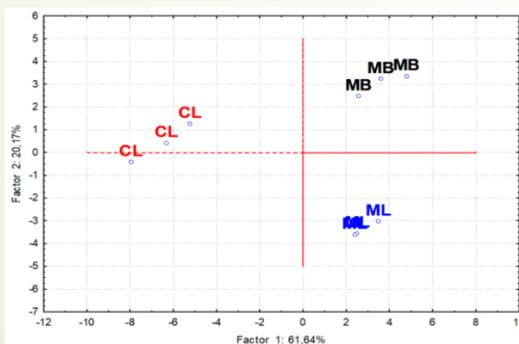
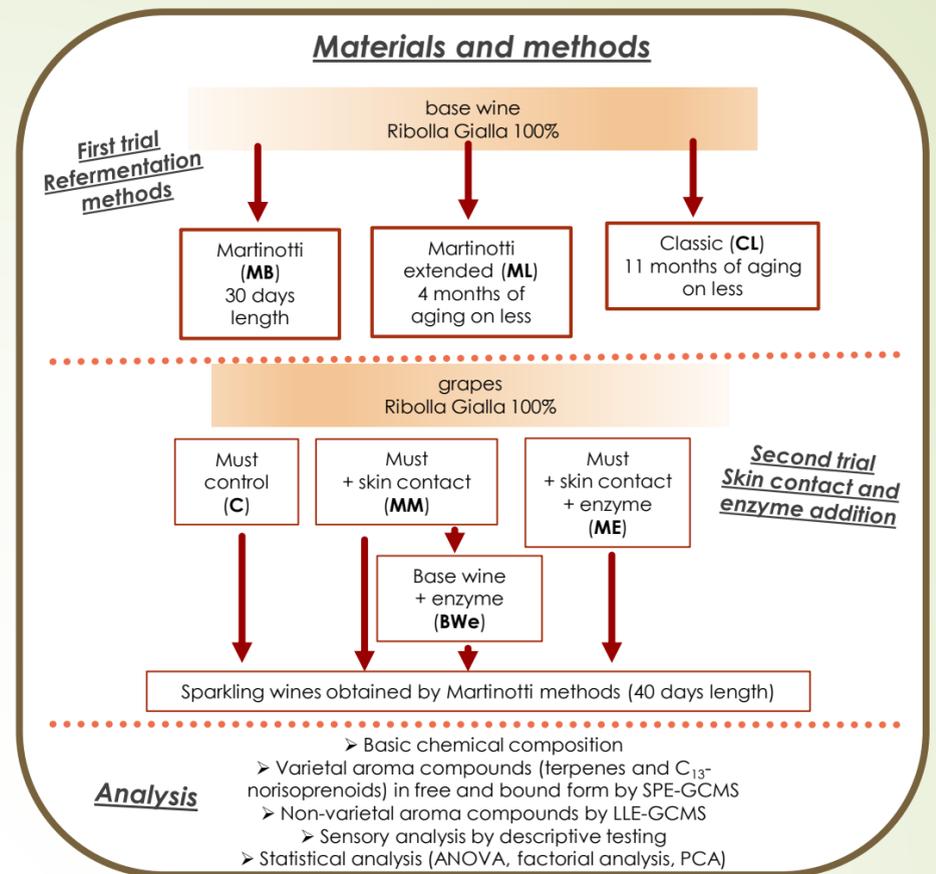


Fig. 1. Results of PCA carried out on the concentration (µg/L) of volatile compounds detected in sparkling wines and odor descriptors. Projection of cases (a) and variables (b) on the factorial plane are reported. Variables: esters (light green), acids (blue), higher alcohols (red), minor compounds (violet), odor descriptors and overall pleasantness (dark green).

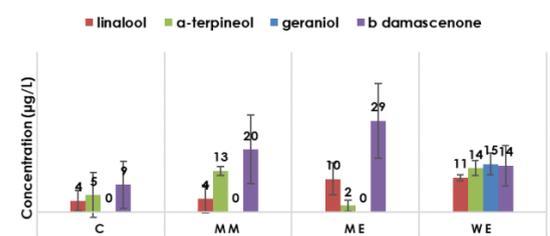
Higher concentration of esters that confer fruity and floral notes (5) were detected in sparkling wines obtained by Martinotti method (MB). Sparkling wines CL showed higher concentrations of esters formed during aging (e.g., ethyl lactate), higher alcohols and fatty acids, making their aroma profile more complex, whereas ML wines showed the poorest volatile profile. These results were confirmed by sensory analysis (fig.1).



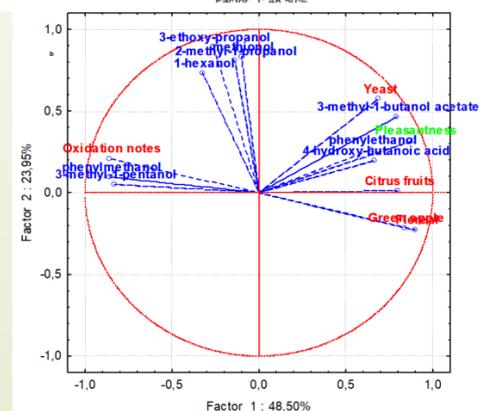
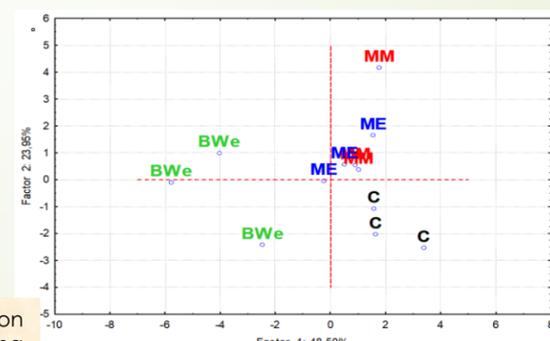
Second trial Skin contact and enzyme addition

Table 2. Main varietal aroma compounds in free form detected in sparkling wines subjected to skin contact and enzyme addition

Free varietal aroma compounds



Skin contact and enzyme addition on base wine enhanced the extraction and release of varietal aroma compounds (table 2), especially terpenes, even if they remained below their respective odor threshold (6).



Concerning non varietal aroma compounds, MM and ME sparkling wines showed higher concentrations of some esters (e.g., 3-methyl-1-butanol acetate); together with C, MM and ME sparkling wines were described with floral, citrus and green apple notes (fig. 2).

Fig. 2. Results of PCA carried out on the concentration (µg/L) of volatile compounds detected in sparkling wines and odor descriptors. Projection of cases (a) and variables (b) on the factorial plane are reported. Variables: volatile compounds (blue), odor descriptors (red), overall pleasantness (green).

Conclusion

Winemaking practices significantly influenced the whole chemical composition and sensory profile of Ribolla Gialla sparkling wines. The results obtained may address winemakers to produce sparkling wines tailored on market needs and consumer's preference.

1. De Lorenzis, G. et al. Genetic Investigation of Grapevine Varieties 'Ribolla Gialla' (Italy), 'Rebula' (Slovenia) and 'Robola' (Ionian Islands). Sci. Hort. 2013, 150, 425-431.
2. Voce, S. et al. Effects of leaf removal on aromatic precursor dynamics during maturation of Ribolla Gialla grapes (Vitis vinifera L.). BIO Web Conf. 2019, 13, 03008.
3. Voce, S. et al. Compositional characterization of commercial sparkling wines from cv. Ribolla Gialla produced in Friuli Venezia Giulia. Eur Food Res Technol. 2019, 245:2279-2292.

4. Skrab, D. et al. Cluster Thinning and Vineyard Site Modulate the Metabolomic Profile of Ribolla Gialla Base and Sparkling Wines. Metabolites. 2021, 11, 331.
5. Saerens et al. Production and biological function of volatile esters in Saccharomyces cerevisiae. Microb. Biotechnol. 2010, 3, 165-177.
6. Guth, H. Quantitation and Sensory Studies of Character Impact Odorants of Different White Wine Varieties. J Am Chem Soc. 1997, 119, 3027-3032.