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*Aromatic Potential of Some Malvasia Grape Varieties  
Through the Study of Monoterpene Glycosides*

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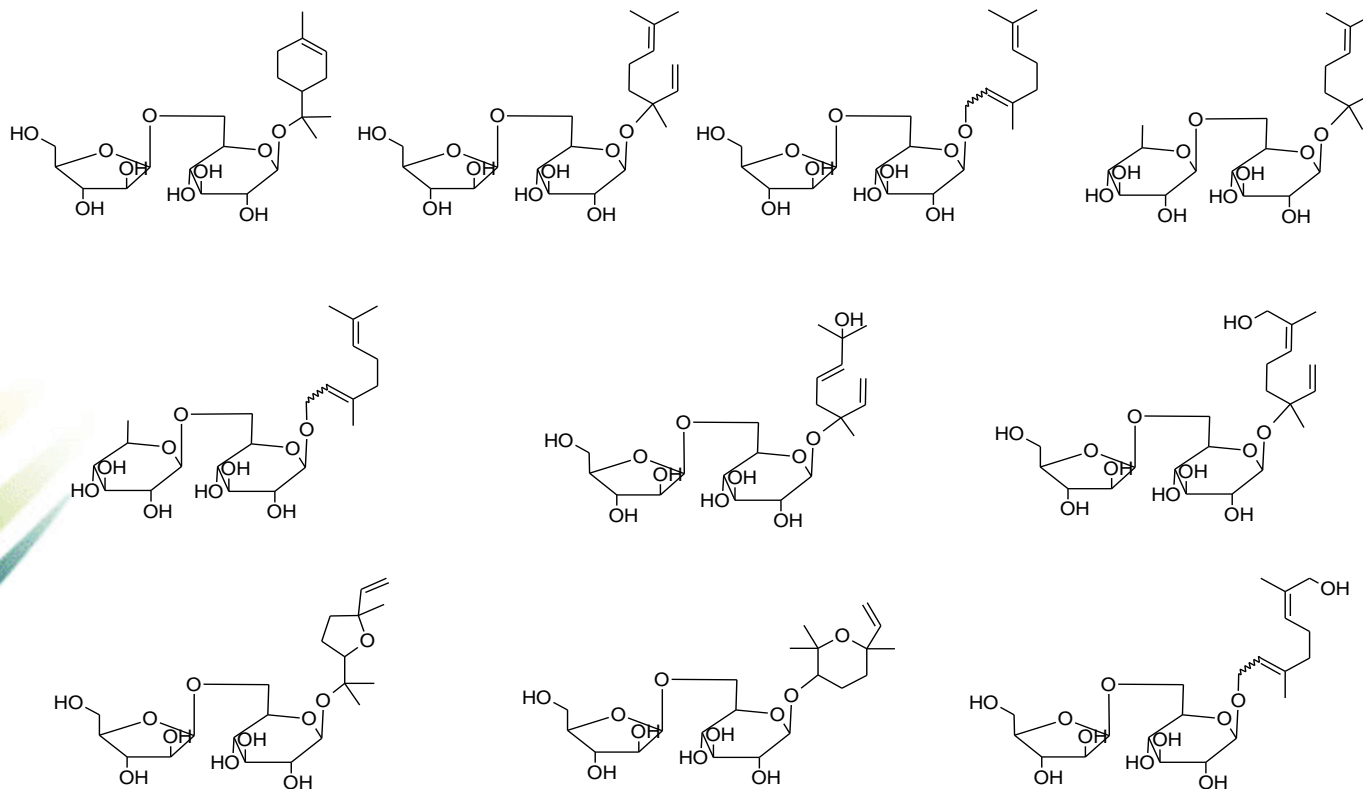
*Viticulture Research Center, CRA-VIT, Italy*

## *Malvasia Grape Varieties*

Large and heterogeneous group of varieties including both neutral and aromatic grapes.

Aromatic varieties are characterized by important contents of monoterpenes present in pulps and skins mainly in glycosidically-bound forms.

These compounds are the precursors of floral, fruity and citrus aromas typical of aromatic wines.



Structures of some monoterpane glycosides in grape

# *Metabolomics*

*Study of **all** the metabolites within a cell, tissue or organism.*

New technologies: High-Resolution Mass Spectrometry (LC/QTOF) allows the identification of compounds through accurate mass measurements of ions formed from the molecules.

By using appropriate algorithms, it is possible to draw the molecular formulae of compounds and the search on available electronic databases provides their identification.

# High-Resolution Metabolomics

*Accurate mass measurement of the molecules*

*Use of Algorithms*

*Determination of molecular formulae ( $C_xH_yO_zN$ )*

*Search on electronic databases*

*Identification of compounds*

*Good: we perform the study of monoterpene glycosides in grapes !*

## *Grape Metabolomics*

*Problem:* does not exist any electronic database specific for grape and wine.

When we performed search by using those currently available only a few of the expected compounds, were identified.

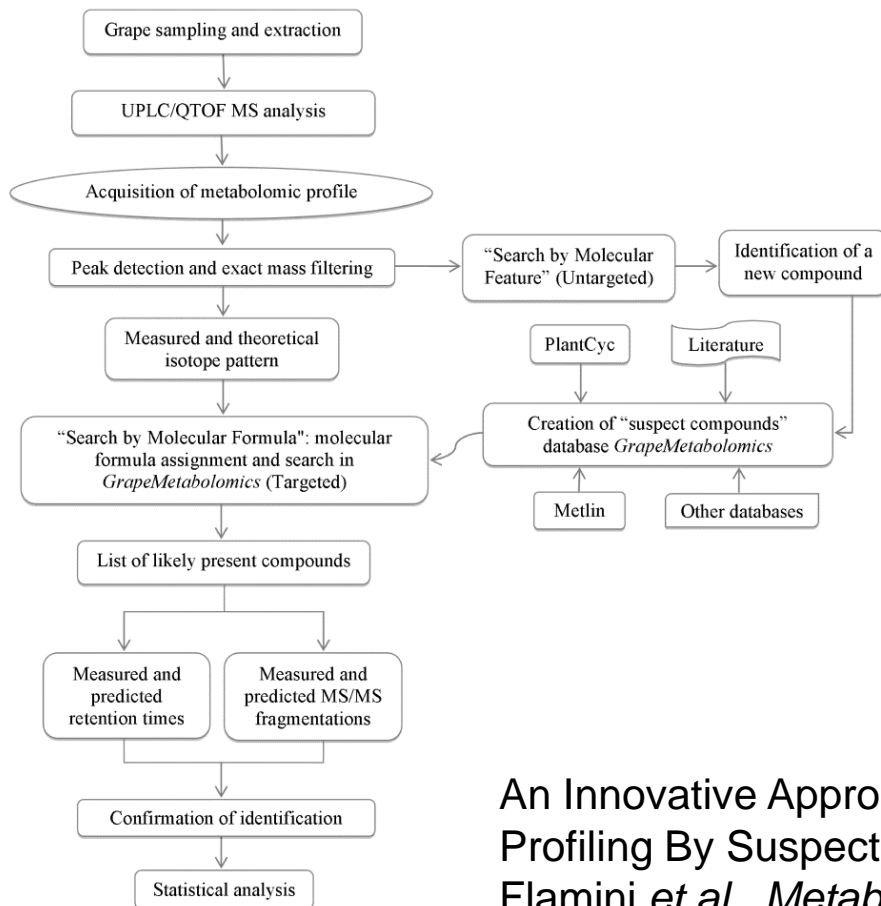
## *Suspect Screening Metabolomics*

A new method for grape and wine metabolomics, was developed.

With information from the literature and a repeated data analysis approach by using different algorithms (targeted and untargeted) a specific electronic database of grape and wine metabolites (*GrapeMetabolomics*), was constructed.

Currently, it contains about 1.000 putative compounds including monoterpene glycosides.

# Suspect Screening Metabolomics



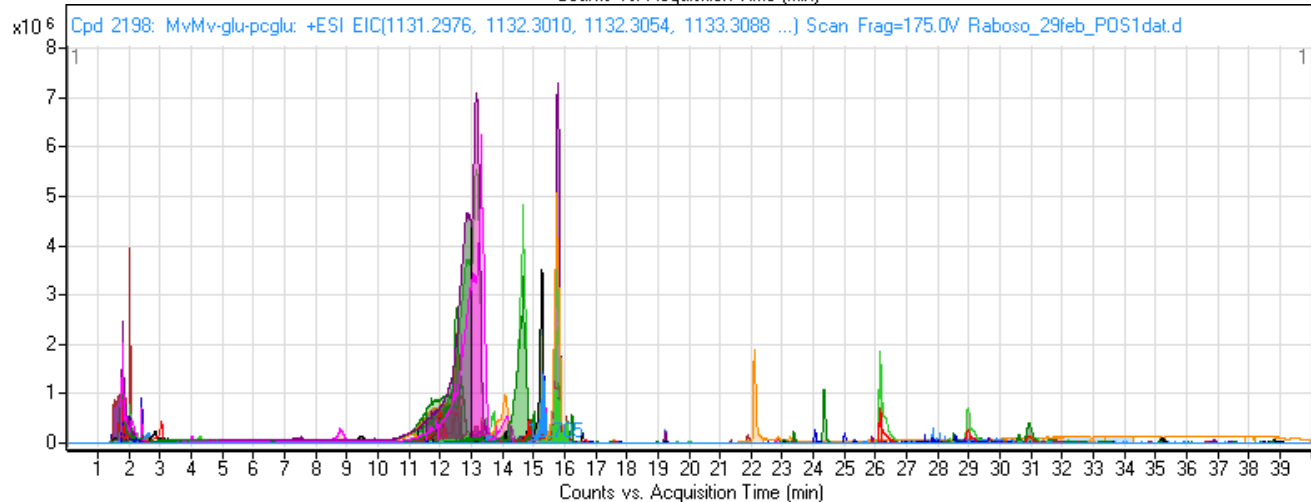
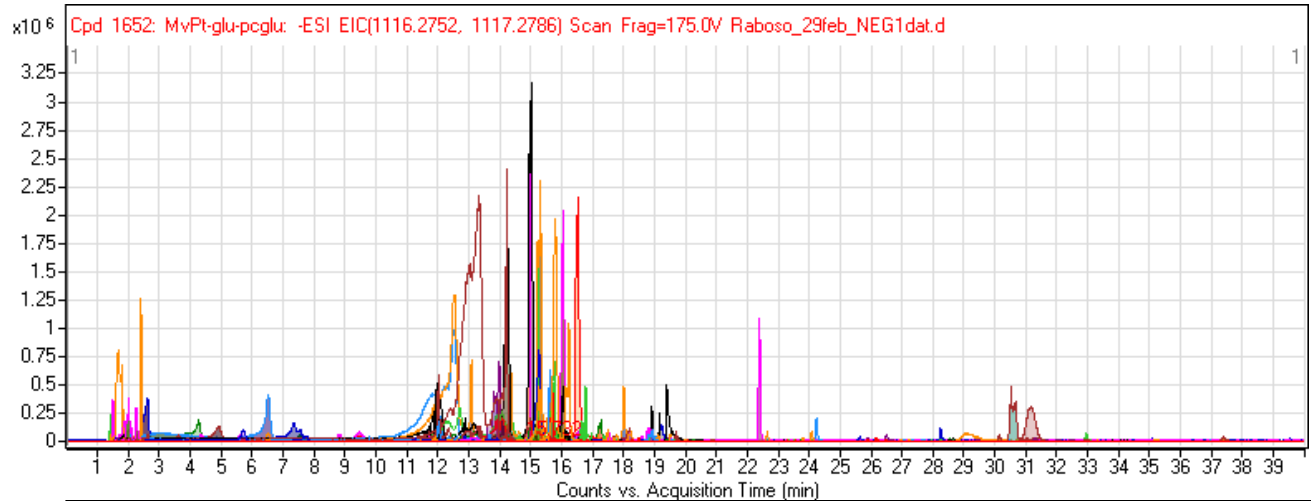
An Innovative Approach To Grape Metabolomics: Stilbene Profiling By Suspect Screening Analysis.  
 Flamini *et al.*, *Metabolomics*, 2013.



# Grape extract analysis

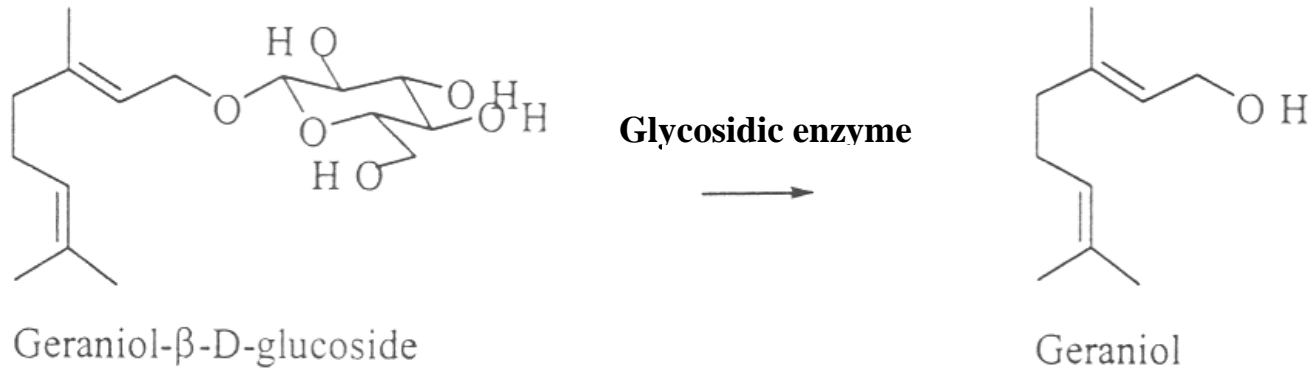
**NEG (-)**

**POS (+)**



320-450 metabolites identified by 2 analyses (depending on the variety).

## *Study focalized on monoterpene glycosides*



It is possible to study the grape monoterpene glycosides without performing the hydrolytic artifacts used by the traditional methods. Monoterpene glycosides profiles of three *Malvasia* grape varieties were studied:

*Malvasia bianca lunga*

*Malvasia del Lazio (p.n. Malvasia Istrana)*

*Malvasia delle Lipari (p.n. Malvasia di Sardegna)*

## *Study of grape monoterpene glycosides*

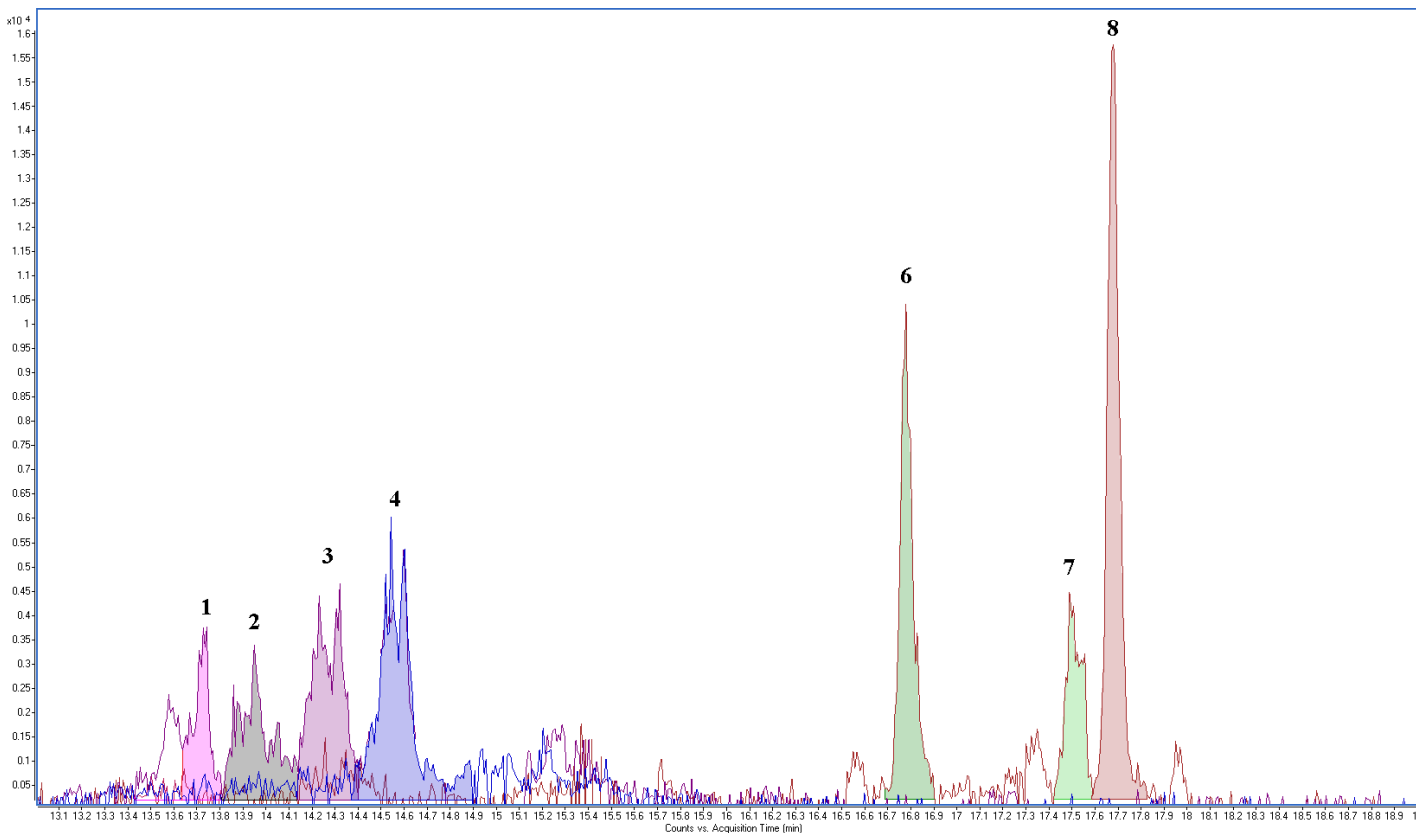
### *Methods*

100 grape berries were harvested in 2011 at full ripeness from five plants of CRA-VIT Grapevine Germplasm Collection.

Berries were weighed, powdered using liquid nitrogen and the powder was extracted with pure methanol.

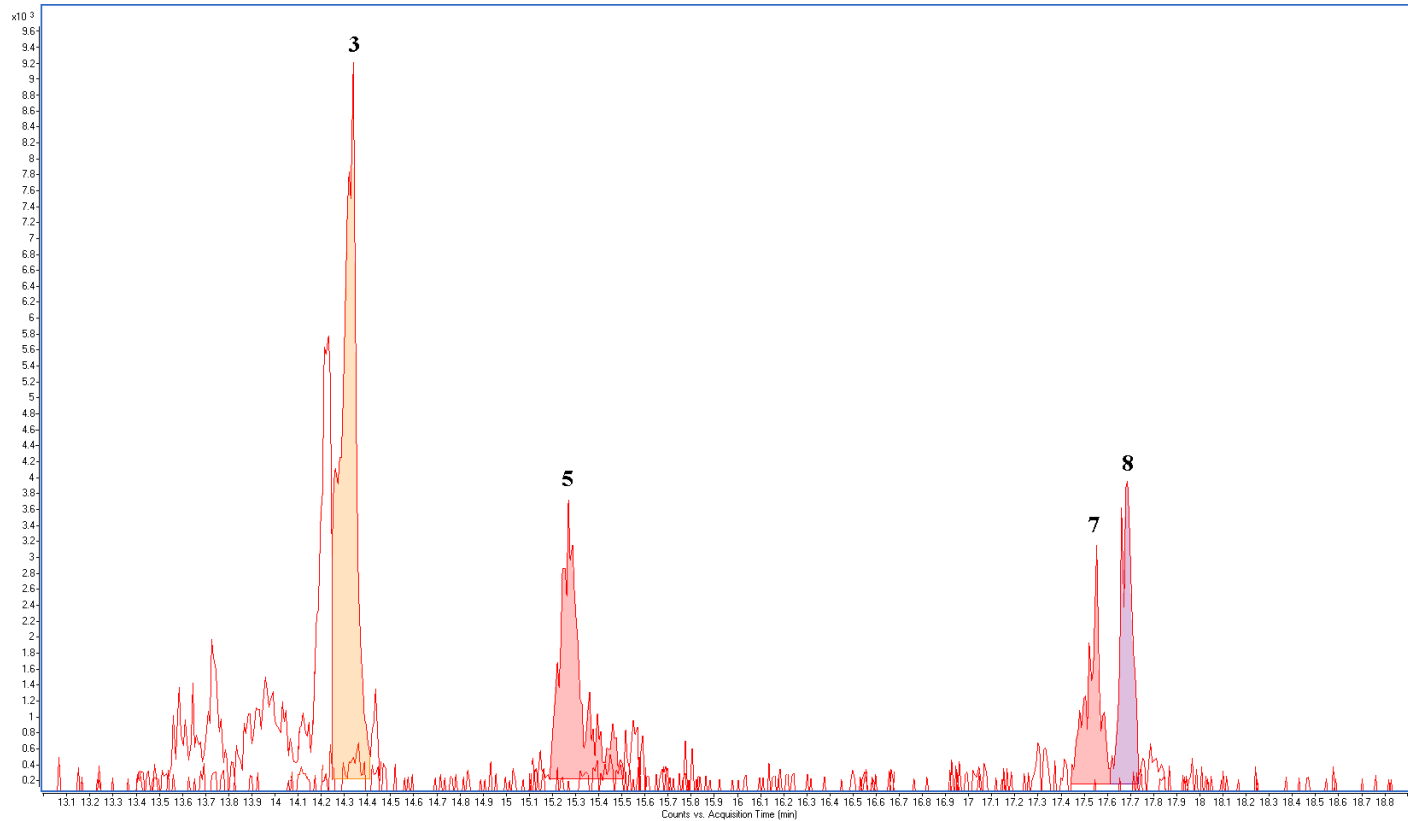
Analyses performed with a UHPLC/QTOF system (R=40.000).

## *Study of monoterpene glycosides*



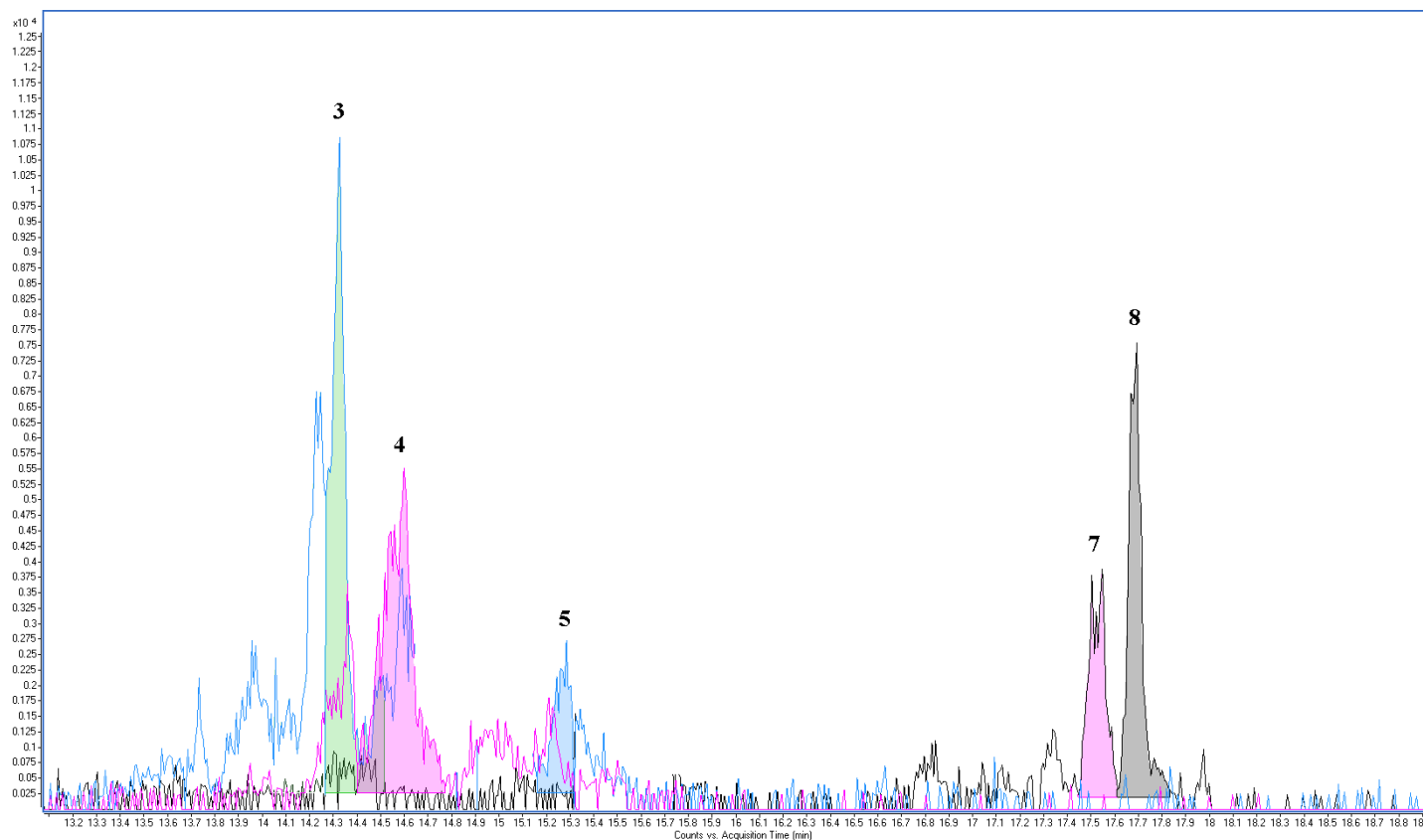
*Malvasia bianca lunga* profile

## *Study of monoterpene glycosides*



*Malvasia del Lazio* profile

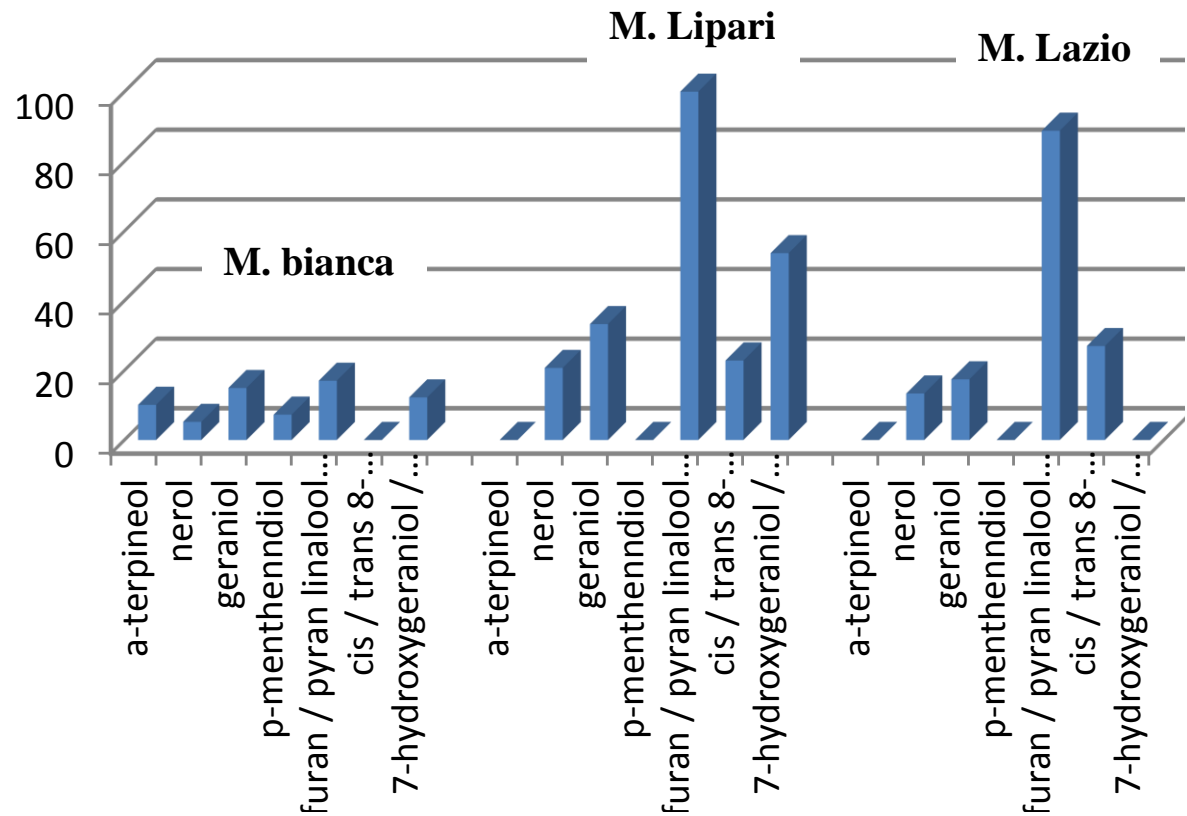
## *Study of monoterpene glycosides*



*Malvasia di Lipari* profile

## Monoterpene glycoside profiles of *Malvasia* samples

*pentosyl-hexosides*  
 α-terpineol  
 nerol  
 geraniol  
*p*-menthenediol  
 furan / pyran linalool oxides  
*cis* / *trans* 8-hydroxylinalool  
 7-hydroxygeraniol / 7-hydroxyneryl



## *Results*

- Malvasia bianca showed the signals of 7 different terpenol pentosyl-hexosides;
- Malvasia di Lipari and Malvasia del Lazio showed 5 and 4 pentosyl-hexoside aroma precursors, respectively;
- higher content of precursors was found in Malvasia di Lipari confirming the higher aromatic character of this variety previously reported (Borsa *et al.*, 2005);
- *p*-menthenediol pentosyl-hexoside was found only in Malvasia bianca lunga;
- rhamnosyl-hexoside derivatives and linalool were not found in the Malvasia grapes studied.



## Principal Volatile monoterpenes

variety	µg IS/Kg grape
<b>Malvasia bianca lunga</b>	
geraniol	4.0
<b>Malvasia del Lazio</b>	
α-terpineol	0.3
diendiol I	2.0
<b>Malvasia delle Lipari</b>	
nerol	1.0
geraniol	12.4

*Malvasia delle Lipari* confirmed its higher aromatic character.

## *Conclusions*

- This method allows to perform a detailed study of glycoside aroma precursors composition of grape.
- Grape samples were cultivated in the same vineyard and potentially were not affected from cultural or environmental variables. Therefore, differences found in the profiles are essentially due to the variety.
- Characterization of these three Malvasia varieties will have to be confirmed by the study of samples from different vineyards and collected in different harvests.
- This approach can be used to characterize others Malvasia grapes in order to study the variability, and possible common characteristics, of the varieties included into Malvasia group.

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