6° simposio internazionale delle Malvasie nel bacino del Mediterraneo

PROFILO AROMATICO DI MALVASIA ODOROSISSIMA

AROMATIC PROFILE OF MALVASIA ODOROSISSIMA

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UNIMORE
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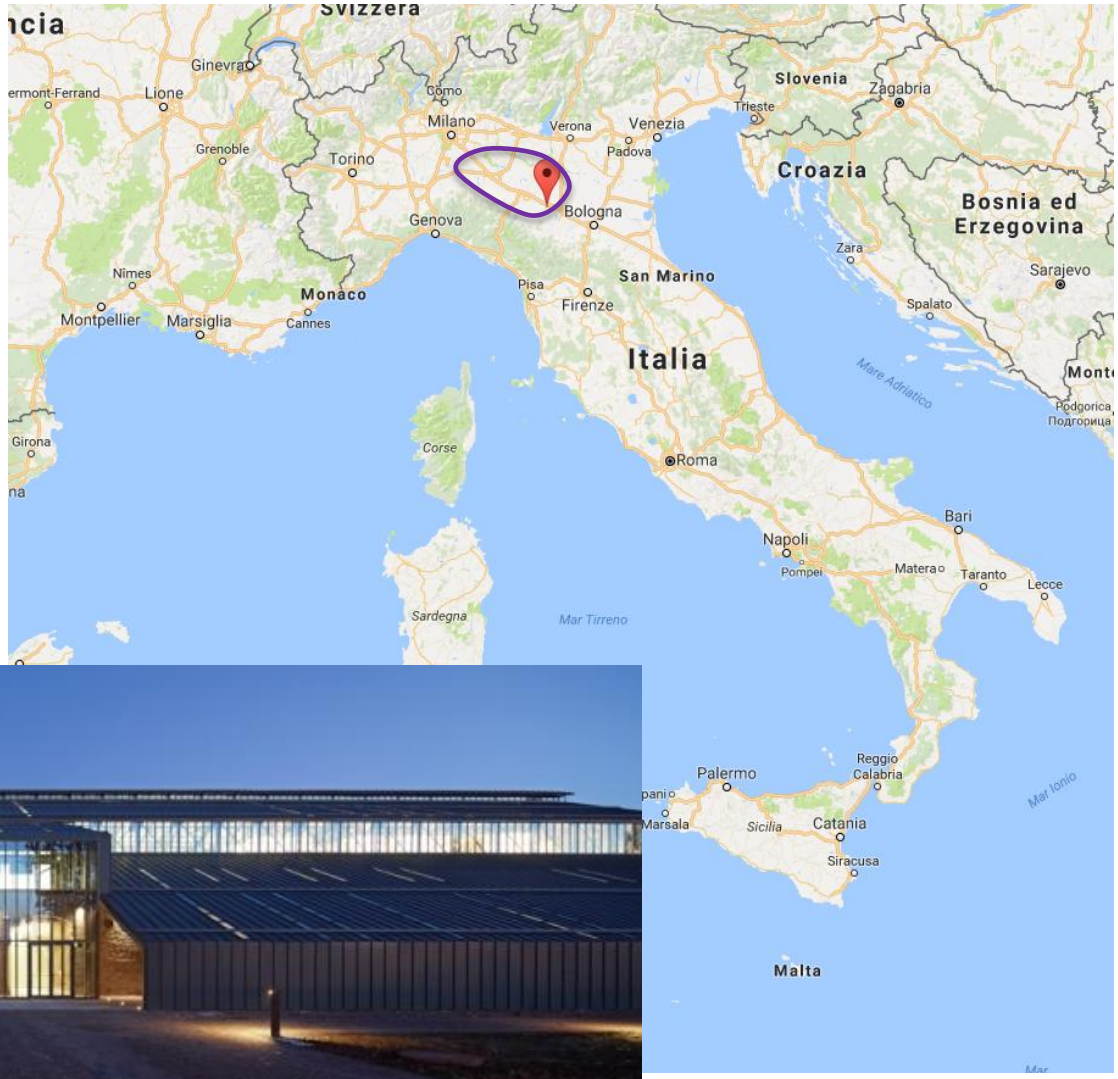
MALVASIA ODOROSISSIMA



MALVASIA ODOROSISSIMA

ITALIAN VITIS DATABASE (IVD)

Approximately 600 accessions which presumably belong to 300 varieties of *Vitis vinifera subsp. sativa*

A multidisciplinary approach for a better knowledge, safeguard, and valorization of Italian grapevine biodiversity. http://www.vitisdb.it/

The local varieties have a multiple importance within the Italian grapevine germplasm.
This is due to their ability to determine several **typical sensory** and **hedonistic characteristics of the wine** as well as to evocate historical and cultural values related to the viticulture.

IVD is an **online informative system** that allows a straightforward consultation and application addressed to researchers, technicians, and operators of the viticulture and the oenological sectors.

ITALIAN VITIS DATABASE (IVD)

Activities:

- **Ampelographic and phenological studies**, according to the minimal list of the European project GrapeGen06 based on the second edition of the OIV descriptor list for grape varieties and *Vitis spp.*
- Ampelometric measurements by using the SUPERAMPELO software
- **Analysis of the polymorphism**
  9 loci microsatellites
  some tri-, tetra- and penta-nucleotides microsatellite loci
  analysis of polymorphism of some SNPs
- **Histo-anatomical observations of berry and leaf** by optical and electronic microscopy
- Analysis of berry juice composition
- Analysis of the grape **phenolic and aroma profiles**
- Investigation on the viticultural performance

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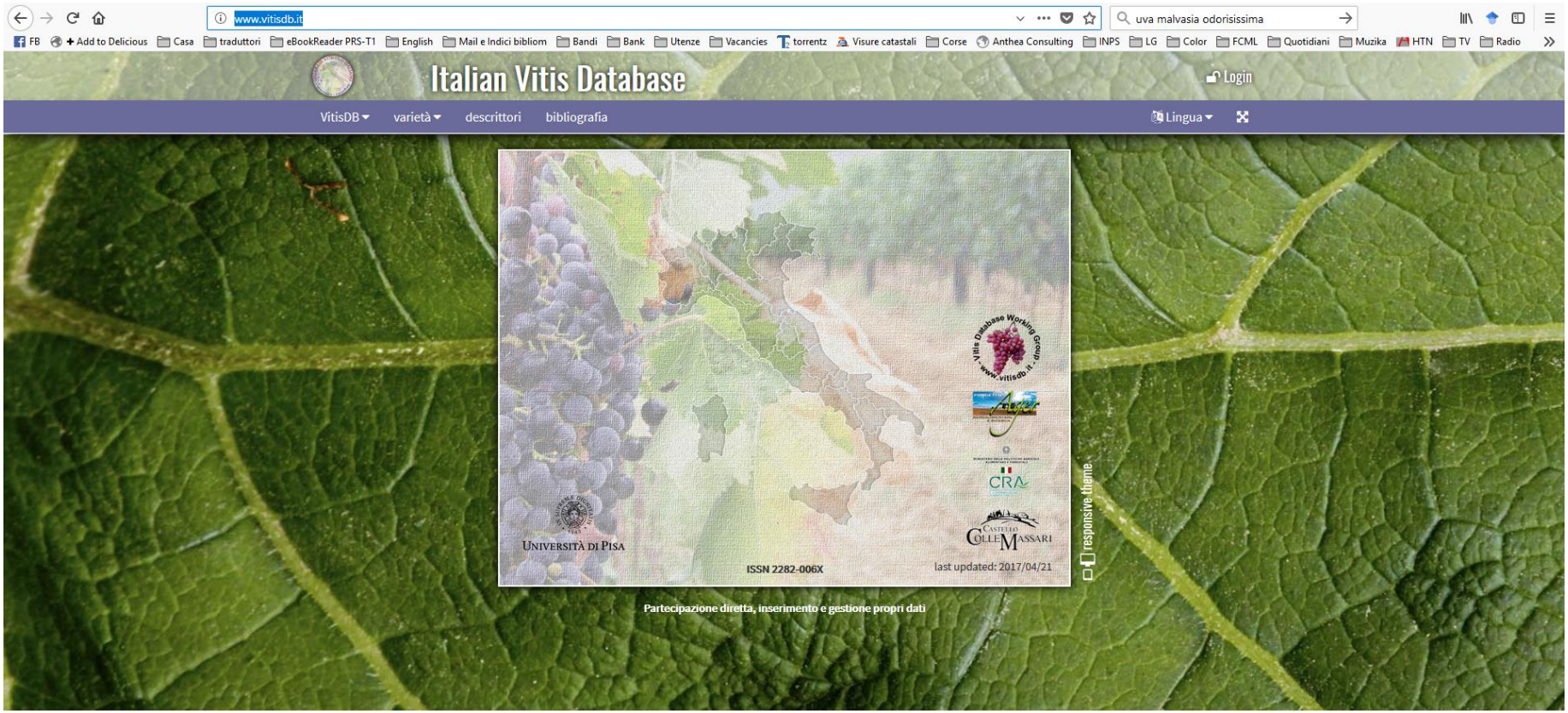

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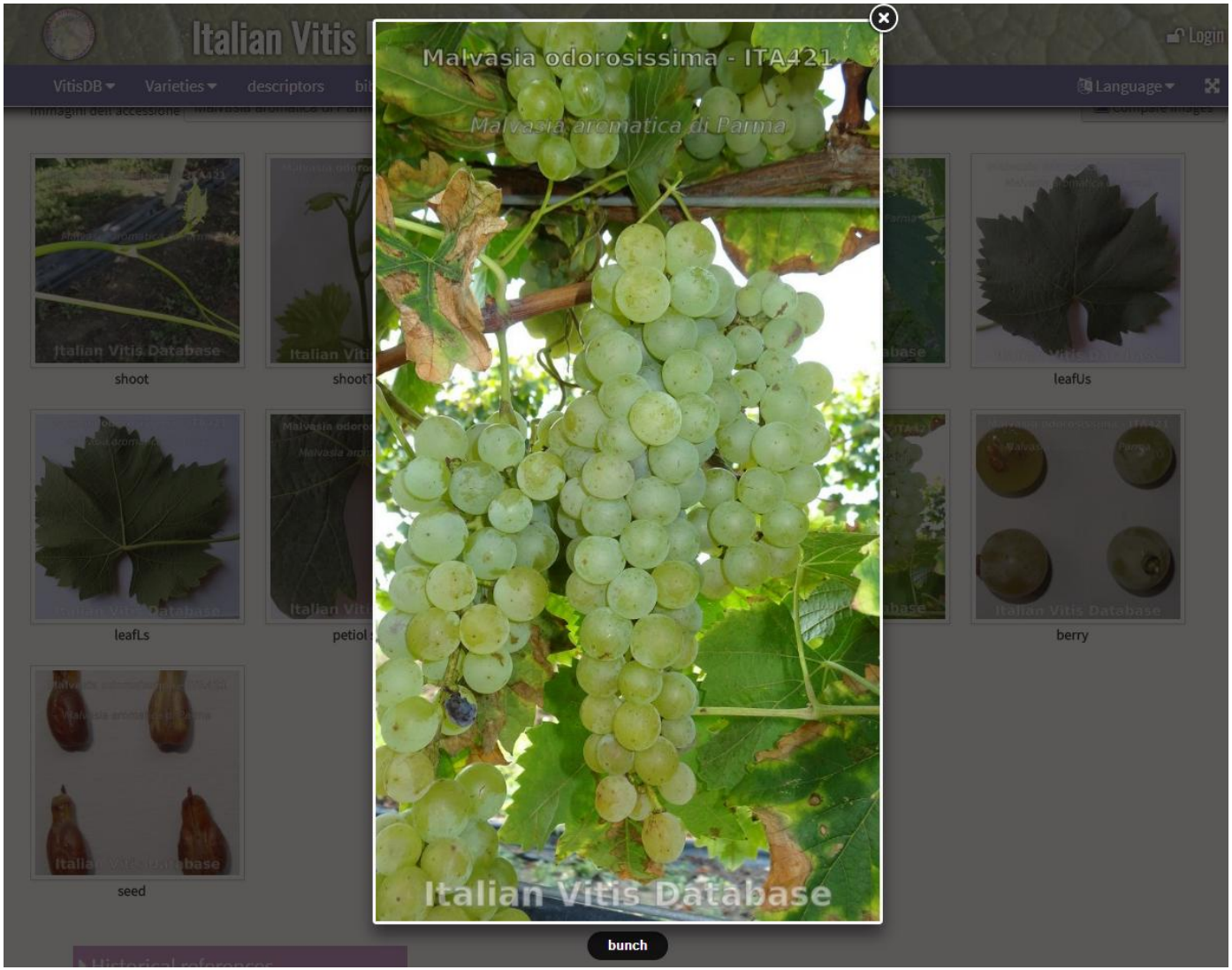

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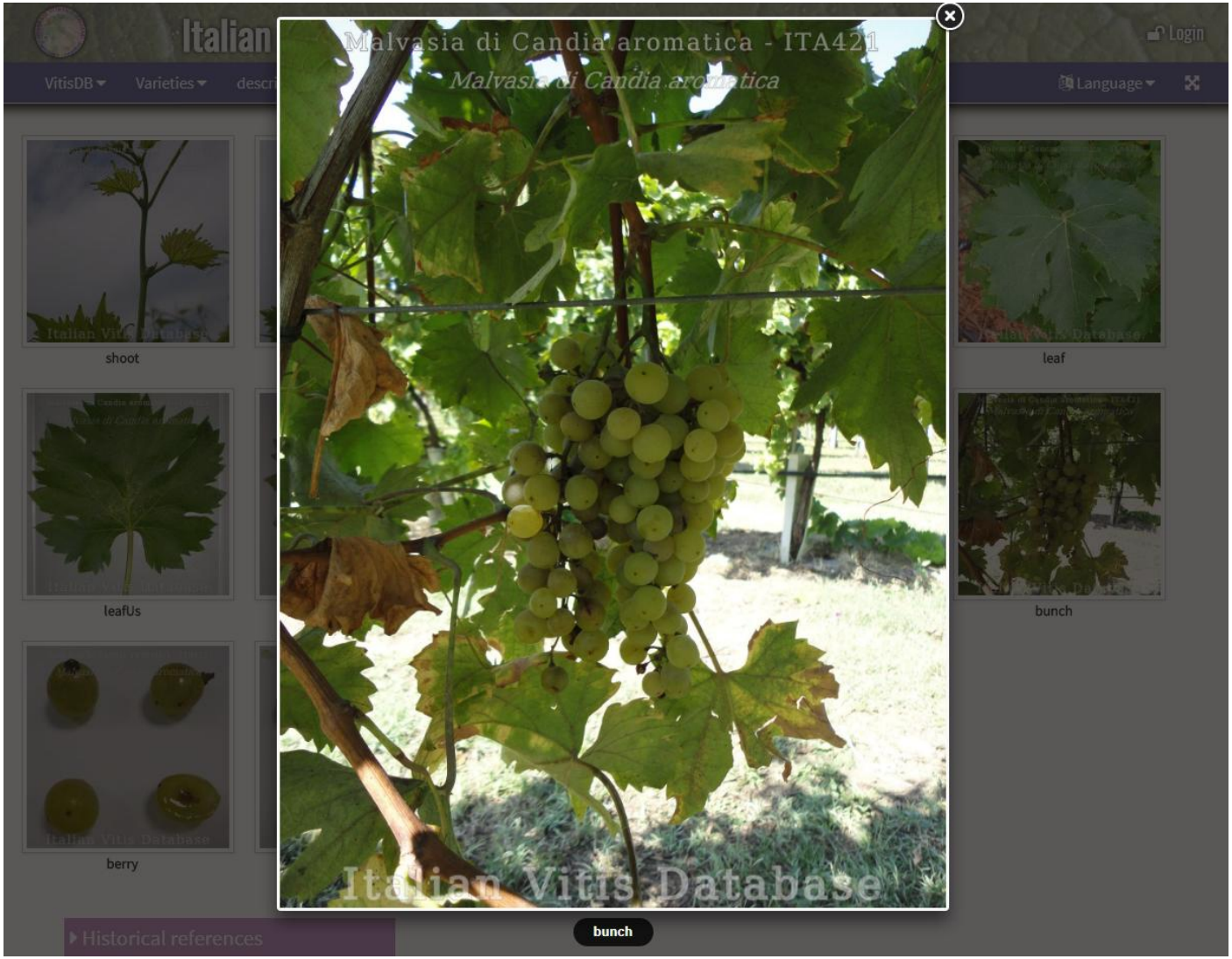

MALVASIA ODOROSISSIMA

MALVASIA

Malvasia odorosissima (MO; also known as Malvasia aromatica di Parma)

White aromatic varieties belonging to the Malvasia family
Malvasia di Candia aromatica (MC)

Malvasia grape family
A large group of cultivars commonly considered to be born in Greece (Monemvasía) and widely cultivated in the Mediterranean area, as well as North America, South America, and Australia.

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MALVASIA

MC vs. MO

MC is a well-known **aromatic** cultivar in the worldwide vine and wine scenario

MO is another **aromatic** cultivar
Known at least since the XIX century in Emilia, MO is **currently on the brink of extinction** because of its low productivity and it has often been replaced in the vineyards by the higher yielding MC

Almost unknown internationally, but historical records and local tradition attest its oenological potential, which require analytical confirmations for a targeted exploitation

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Grape aroma compounds

Quality indexes that influence the wine sensory expression:

- Terpenoids
- C_{13}-Norisoprenoids
- Benzenoids
- Aliphatic alcohols
- Esters
- Methoxypyrazines
- Sulfur-containing compounds

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Grape aroma compounds

Many of these compounds are present in grapes in 2 forms:

- **Free**
- **Glycosylated**

Their relative proportion varies according to the cultivar.

Glycosides are considered an **aromatic potential**, since they are susceptible of releasing volatile aglycones through enzymatic or acid hydrolysis.

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Grape aroma compounds

Many of these compounds in 2 forms:

- **Free**
- **Glycosylated**

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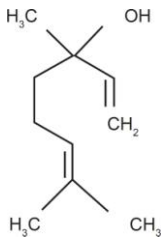
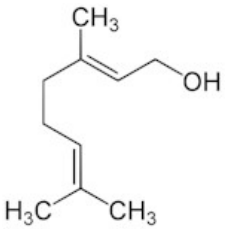
Grape aroma compounds

A different classification of the aromatic varieties can be carried out according to the prevalence of either **linalool** and its derivatives or **geraniol** and its derivatives



Linalool



Geraniol

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Grape aroma compounds

AIMS

Provide the **aromatic characterization of MO** and MC to highlight each distinctive aromatic profile and support the use for winemaking and product differentiation

Safeguard the local biodiversity

The effects of climatic conditions in two consecutive vintages were also considered

MALVASIA ODOROSISSIMA

MALVASIA
SAMPLING

The plants of MO and MC were cultivated in contiguous and homogeneous plots of the same germplasm collection located in the Reggio Emilia area (I.T.A. A. Zanelli, latitude 44.675420° N, longitude 10.584984° E)

METEOROLOGICAL TRENDS

- I year - **low rainfall** (700 mm) and a quite **warm** summer season (24.8 °C seasonal average temperature; 38.9 °C maximum seasonal temperature)
- II year - the summer was **cooler**, with a mean and maximum seasonal temperature of 23.4 °C and 37.2 °C, and the annual **rainfall was higher** than in the previous year (989 mm)

ORCHARDS

- Silty clay soil: sand 10.9%, clay 41.3%, and silt 47.8%
- pH = 7.5
- Organic matter = 17.5 g/kg

MALVASIA ODOROSISSIMA

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SAMPLING

The plants of MO and MC were cultivated in contiguous and homogeneous plots of the same germplasm collection located in the Reggio Emilia area (I.T.A. A. Zanelli, latitude 44.675420° N, longitude 10.584984° E)

SAMPLING DESIGN

- 10 bunches in good sanitary conditions were collected from 3 plants of each variety
- When sugar accumulation (soluble solids) almost became constant around 21 °Brix
- Harvest dates were 10 September in the I year and 17 September in the II year

GENETIC RECOGNITION

- The accessions were previously screened using a standard set of 9 microsatellite (SSR) markers.

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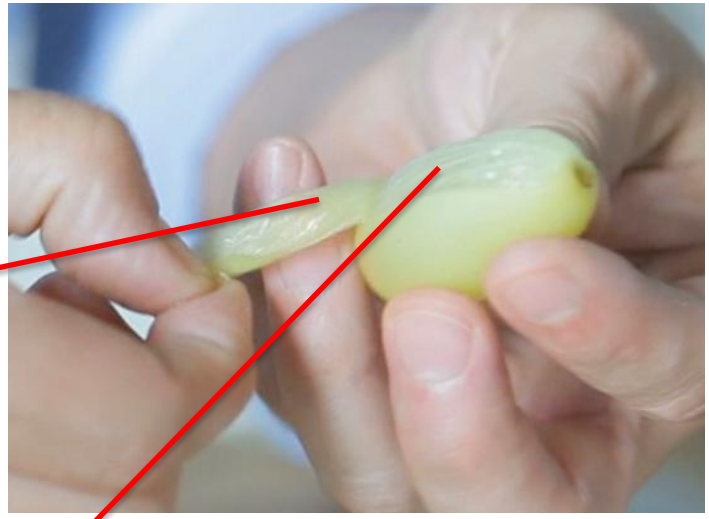
MALVASIA
SAMPLE PREPARATION

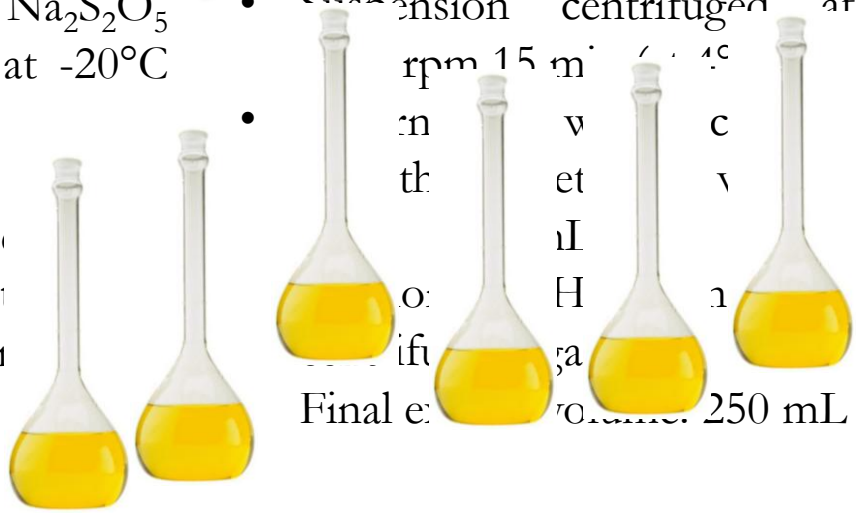


- 100 berries
- peeled and the **skins** were placed in 20 mL of methanol for 1 h in order to deactivate the enzymes and to promote the extraction of the aromatic compounds

- Deseeded **pulps** in a beaker with 100 mg of $Na_2S_2O_5$ to prevent oxidation, and temporarily kept at -20°C during the time of skins extraction

- Then the pulps were added to the m suspension of skins and they were **ground** and homogenized after the addition of 20 "must-like" tartaric solution at pH 3.2.

- Suspension centrifuged at rpm 15 mi
- n v c th et v l o H a ifu ga
Final e volume: 250 mL



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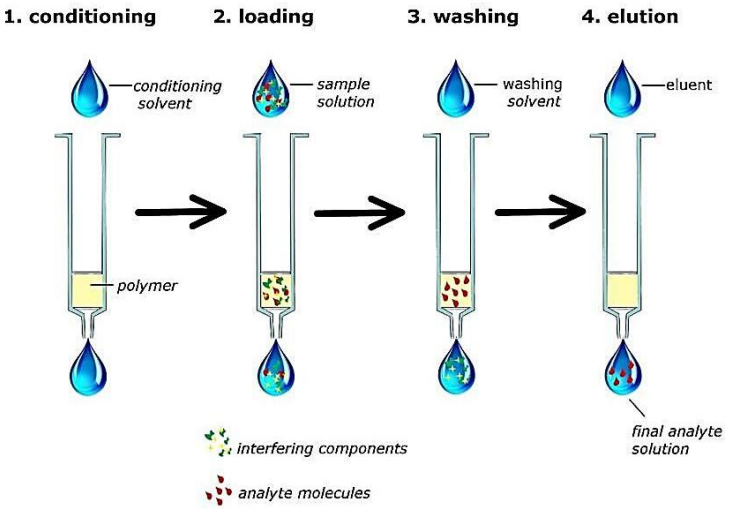
MALVASIA
SAMPLE PREPARATION

SOLID PHASE EXTRACTION (SPE)

- Free and glycosylated volatile fractions were isolated by solid phase extraction (SPE)
- Each extract was spiked with 50 µL of internal standard (2-heptanol, 1000 mg/L in ethanol)

- **Free volatiles** were loaded onto a 5-g C_{18}-endcapped cartridge and recovered with 15 mL of CH_2Cl_2
- **Glycosylated compounds** were subsequently eluted with 30 mL of MeOH, then eliminated under vacuum
- The residue was re-dissolved in 5 mL of a phosphate–citrate buffer at pH 5 and spiked with the IS
- A commercial glycosidase enzyme with β-glycosidase activity was added at 40°C for 24 h in order to release the aglycons.



- This hydrolyzed sample was eluted through a 1-g C_{18}-endcapped cartridge
- Free aglycons were recovered with 6 mL of CH_2Cl_2
- Concentration up to about 50 µL

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FREE AND GLYCOSYLATED VOLATILE DETERMINATION

- **GC/MS**
  - Stabilwax-DA capillary column

0.25 mm i.d. × 30 m length × 0.25 μm df

- Helium as carrier gas at a flow rate of 0.9 mL/min
- Injector port (splitless mode) and transfer line were set at 240°C
- Initial temperature 30°C. Rate 4.25°C/min up to 230°C and finally held for 20 min (66 min in total)
- Ionization energy set at 70 eV
- Mass range at 33-350 m/z, in full scan acquisition mode

Laboratory of Mass Spectrometry, at CIGS of University of Modena and Reggio Emilia.

Thanks the Bank Foundation "Cassa di Risparmio di Modena"

MALVASIA ODOROSISSIMA

MALVASIA
FREE VOLATILE DETERMINATION

- 11 Aliphatics (herbaceous scent)
- 14 Benzenoids
- 3 C_{13}-Norisoprenoids (fruity floral scent)
- 24 Terpenoids (floral scent)
- 52 Total

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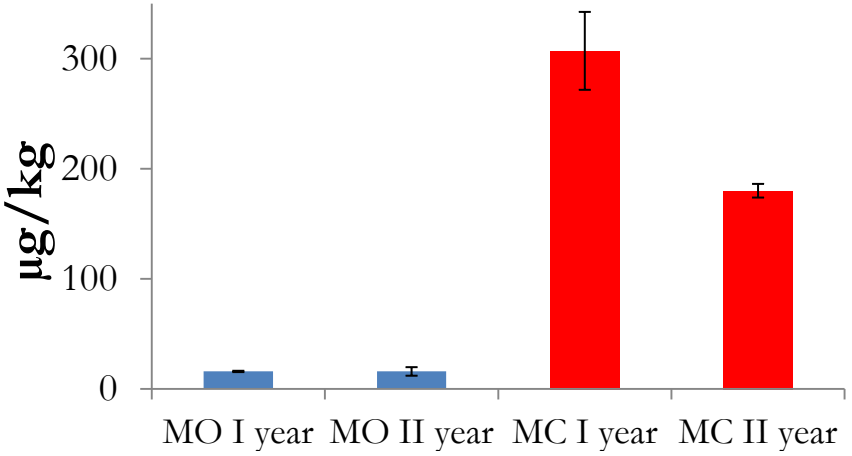
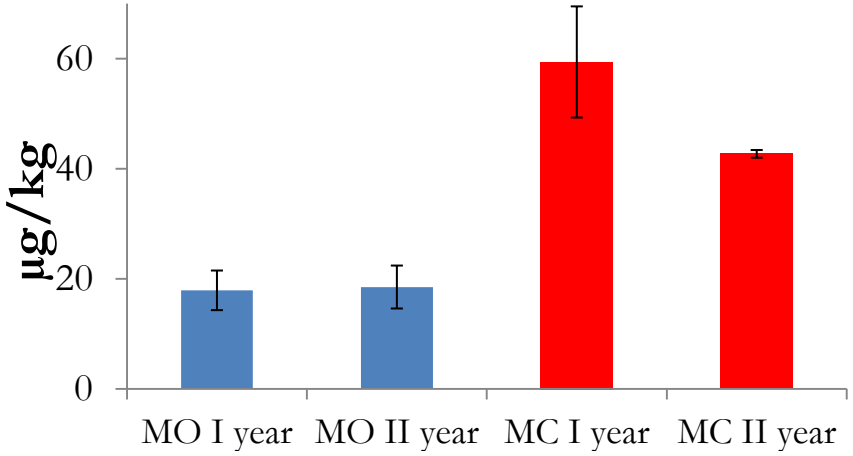
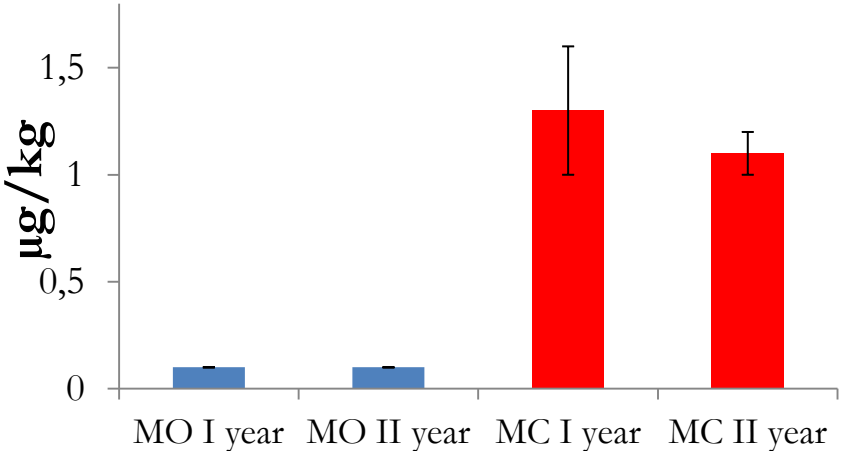
Aliphatics sum



Benzenoids sum



C_{13}-Norisoprenoids sum



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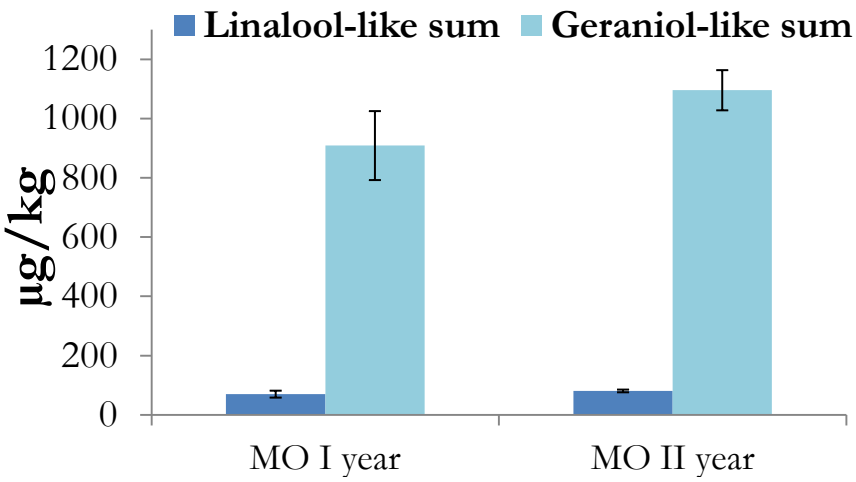
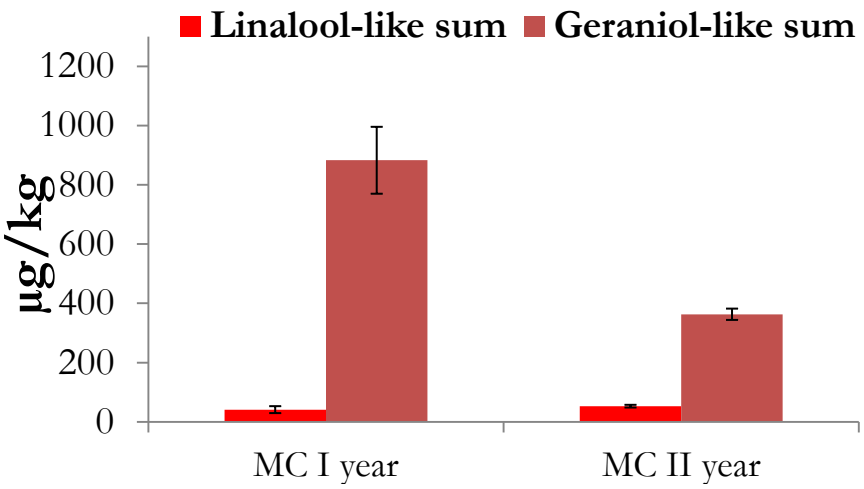
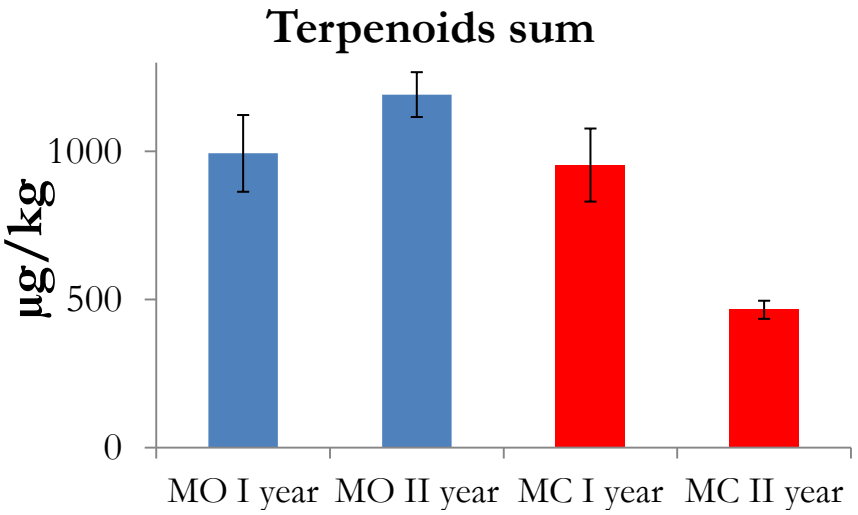
FREE VOLATILES

MALVASIA ODOROSISSIMA







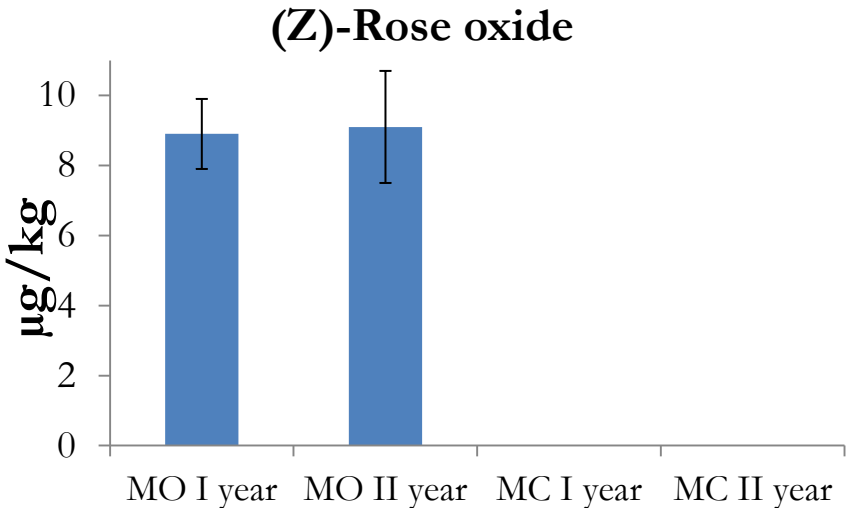
MALVASIA

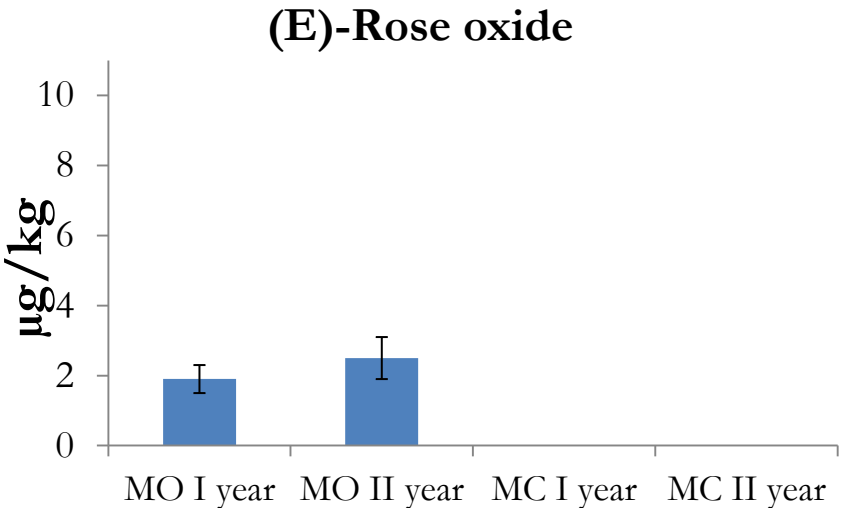
FREE VOLATILES

MALVASIA ODOROSISSIMA

ROSE OXIDE ISOMERS

Pleasant volatiles associated with a very low threshold of perception





Detected only in MO, thus supporting a sensory and a genetic similarity between MO and White Muscat.

Unlike aromatic *Malvasia* grapes, White Muscat is a variety characterized by both a prevalence of linalool and its derivatives and the presence of rose oxide isomers.

MALVASIA ODOROSISSIMA

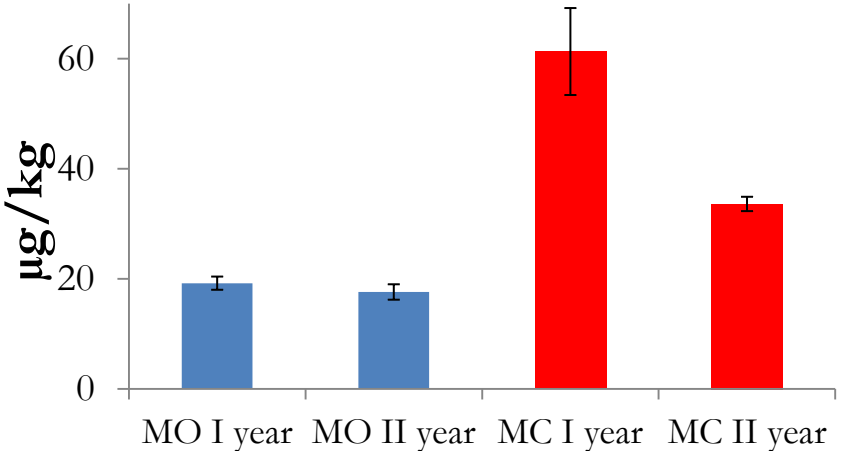
MALVASIA
GLYCOSYLATED VOLATILE DETERMINATION

- 11 Aliphatics (herbaceous scent)
- 15 Benzenoids
- 5 C_{13}-Norisoprenoids (fruity floral scent)
- 25 Terpenoids (floral scent)
- 56 Total

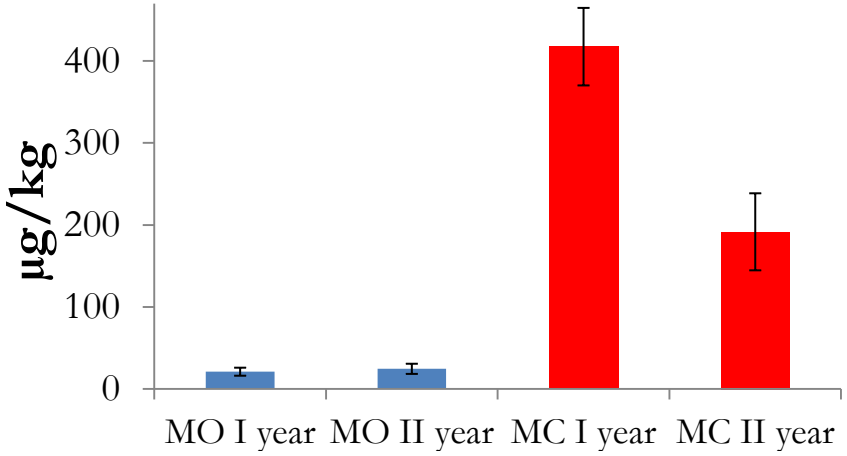
Laboratory of Mass Spectrometry, at CIGS of University of Modena and Reggio Emilia.
Thanks the Bank Foundation "Cassa di Risparmio di Modena"

MALVASIA ODOROSISSIMA

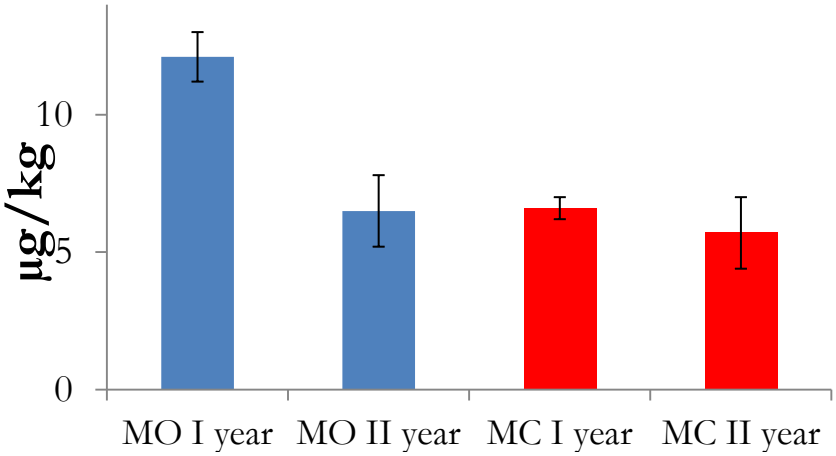
Aliphatics sum



Benzenoids sum



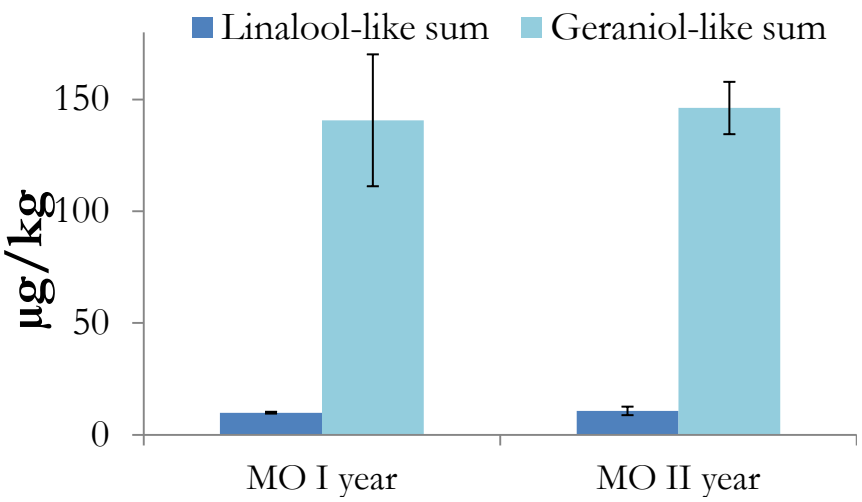
C_{13}-Norisoprenoids sum

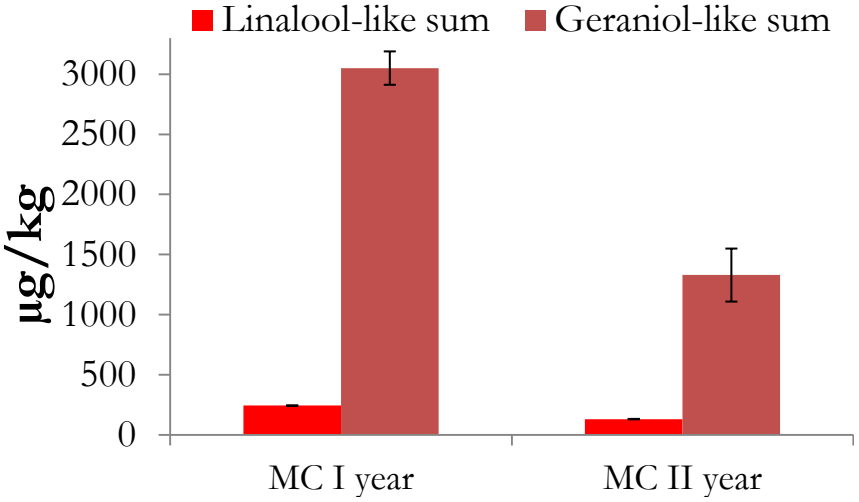


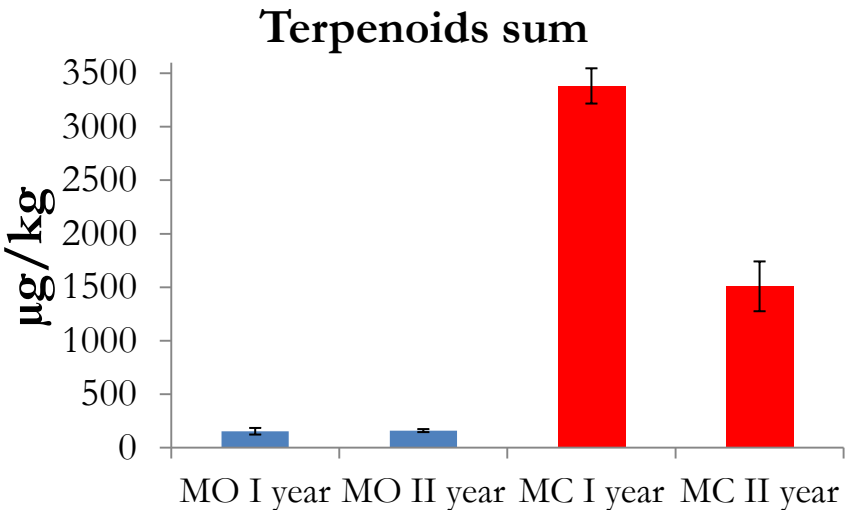
MALVASIA

GLYCOSYLATED VOLATILES

MALVASIA ODOROSISSIMA







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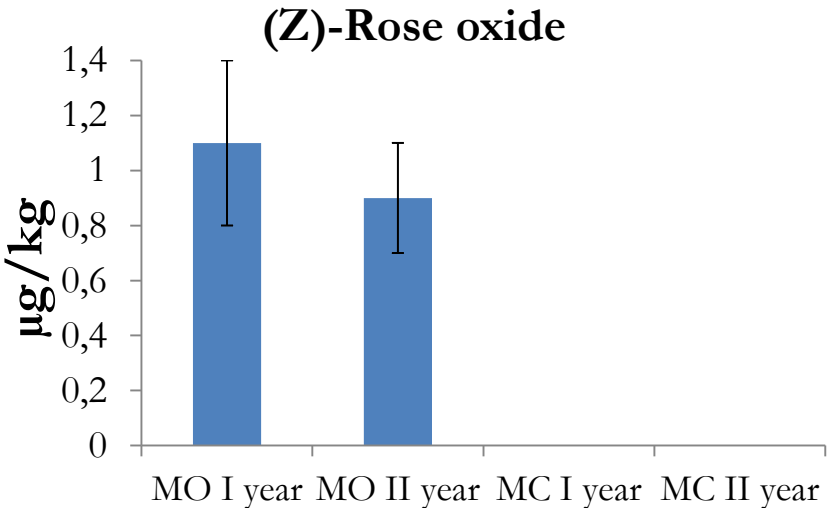
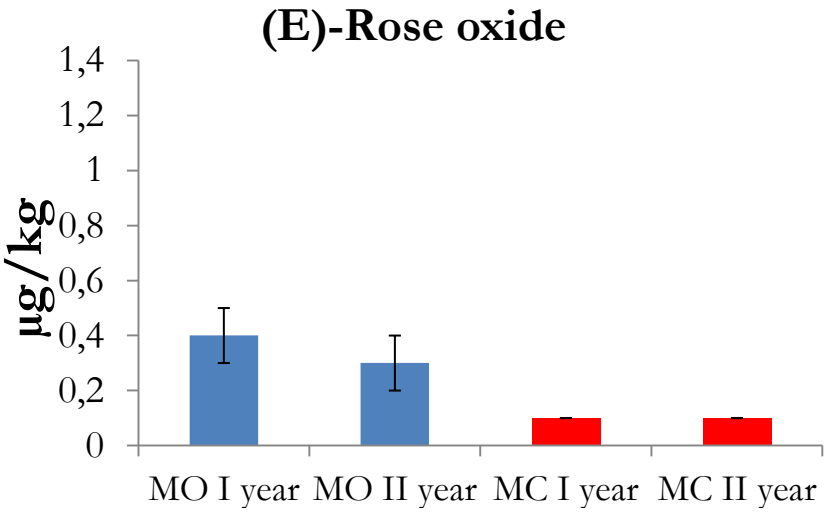
GLYCOSYLATED VOLATILES

MALVASIA ODOROSISSIMA

ROSE OXIDE ISOMERS

Pleasant volatiles associated with a very low threshold of perception





(Z)-Rose oxide was solely present in MO, albeit in lower concentrations in comparison with the free forms of the same variety.

CONCLUSIONS

The **richness of the aromatic profile** of MO is an important feature for the **oenological exploitation** of this variety, which is currently on the brink of extinction and erroneously confused with MC, even by winemakers

In addition, **MO seemed to be less susceptible to seasonal variations** in terms of quantitative expression of volatiles, as otherwise showed by MC. This supposed stability is of considerable interest and deserves further insights in the current climate change situation affecting grape and wine quality

Some evidence renders the **MO aromatic profile similar to White Muscat** one, thus giving value to the proximity already demonstrated by the genetic analysis between the two aromatic varieties

The increasing interest in Malvasia wines on the international market opens good perspective for the re-proposal of underexploited Malvasia cultivars for the oenological products diversification


Grazie per l'att