

Varietal characterization of native Maltese cultivars: Girgentina and Ġellewża

Dina M. L. Giglio^(1a), Margherita Squadrito^(2a,b), Anna Maria Titone^(3a), Giuseppe Russo^(4a), Lucio G. Monte^(5a), Daniele Oliva^(*6a)

1-dinagiglio@alice.it; 2-margherita.squadrito@libero.it; 3-anna.titone@hotmail.it;
4-giuseppe.russo@regione.sicilia.it; 5-lucio.monte@regione.sicilia.it;
6-daniele.oliva@regione.sicilia.it

^a Istituto Regionale del Vino e dell'Olio. Via Libertà 66, 90143. Palermo Italy

^b Regione Siciliana- Assessorato Regionale Risorse Agricole e Alimentari- Centro per l'Innovazione della Filiera Vitivinicola "Ernesto Del Giudice"- UOS Marsala- Contrada Bosco 421- 91025 Marsala (TP), Italy

*Corresponding author

ABSTRACT

The Italy-Malta PROMED project promotes the cultivation of the vine and the value of its derivatives as a remuneration system for protecting areas from erosion. In 2012 we studied the polyphenolic composition of the grape skins from the two most important native varieties of the island of Malta: Girgentina (white) and Ġellewża (red). The Girgentina has rather large grapes (about 3.61 g on average). A prevalence of quercetin glycosides over the other flavonols and a prevalence of trans-tartaric caffeoyl HCTAs, as typical of all white grapes, was observed also during this year. The Ġellewża features berries of an average weight of 3.19 g. The analysis of the grapes confirmed a prevalence of trioxxygenated anthocyanins, a medium-high content of acylated anthocyanins, and a ratio lower than 1 between acetated anthocyanins and p-cumarate anthocyanins. Among glycosides, quercetin ones are more abundant than myricetin ones. However the content of the latter is comparable with that of the glucosylated forms of the former. Among skins' HTCA, caffeoyl tartaric acid is more abundant than p-cumaril and p-ferulil tartaric acids. This cultivar also has an average anthocyanins content of about 650 mg/Kg and a flavonoids content of about 1780 mg/Kg. The vinification of Girgentina and Ġellewża grapes were carried out taking into account the composition and sensory characteristics of the skins.

The ProMed project is funded by the "Programma Operativo Italia-Malta 2007-2013"

RIASSUNTO

Il progetto PROMED Italia-Malta propone la coltivazione della vite e la valorizzazione dei suoi derivati quale sistema remunerativo a tutela dei territori dall'erosione. Anche per l'anno 2012, nell'ambito di questo progetto, è stata studiata la composizione polifenolica delle bucce di uve delle due principali varietà autoctone dell'isola di Malta: *Girgentina* (varietà a bacca bianca) e *Ġellewża* (varietà a bacca rossa). La *Girgentina* ha gli acini piuttosto grossi (3,61 g circa). Nel 2012 è stata confermata una netta prevalenza dei glicosidi della quercetina sui glicosidi degli altri flavonoli e la prevalenza dell'acido trans-caffel tartarico sugli altri HCTA, caratteristiche tipiche di tutte le uve bianche. La *Ġellewża* è dotata di acini con un peso medio di 3,19 g. Anche nel 2012 è stata osservata la prevalenza degli antociani triossigenati, un contenuto medio-alto di antociani acilati e un rapporto tra antociani acetati e antociani p-cumarati minore di 1. Tra i flavonoli prevalgono i glicosidi della quercetina sui glicosidi della miricetina, malgrado il contenuto di quest'ultima sia confrontabile con quello di ciascuna delle forme glucosidiche della prima. Tra gli HCTA delle bucce prevale il trans-caffel tartarico sul p-cumaril e sul p-ferulil tartarico. Questa varietà, inoltre, presenta un contenuto medio in antociani di circa 650 mg/Kg e in flavonoidi di circa 1780 mg/Kg. Le

vinificazioni di *Girgentina* e *Ġellewża* sono state condotte tenendo conto delle caratteristiche compositive e sensoriali delle bucce.

Il progetto ProMed è finanziato dal Programma Operativo Italia-Malta 2007-2013

INTRODUCTION

The goal of the Operational Programme Italy-Malta is to support research and innovation helping sustainable development processes. The project targets soil erosion and rural abandonment in the islands of Gozo, Malta, Linosa and Pantelleria; it seeks to develop eco-friendly, remunerative activities, to increase green coverage during dry months, to safeguard the dry stone wall systems, to rationalize water resources, to obtain high-income products. The long-term maintenance of the results will be ensured by the creation of an experimental center where applied research will be continued after the conclusion of the project.

Grape cultivation and its products are proposed as a remunerative system, which can protect soil from erosion. On the islands the best vines and cultivation practices have been identified, also considering water availability. Experiments have been carried out by IRVO at the experimental winery in Marsala, to obtain products of high quality and value from the autochthonous cultivars *Girgentina* (white) and *Ġellewża* (red).

MATERIALS AND METHODS

Samples from mature grapes were taken in Malta during the 2012 vintage (Promed Project 2007-2013). From each bunch, 25 berries were randomly picked and weighted (triplicate samples). Skins were left for 4 h in 25 mL of tartaric buffer (5 g tartaric acid; 22,2 mL 1N NaOH; 2 g Na₂S₂O₅; 125 mL 95% ethanol; in a 1 L aqueous solution; pH 3.2) and then stored at -20°C. The liquid phase was then recovered after thawing at room temperature and diluted to 50 mL. To 4.5 mL, 0.5 mL of 1M H₃PO₄ were added; the sample was filtered (0,45 µm) and subjected to HPLC as in Squadrito *et al.* (2007).

For the analysis of the *Ġellewża* grape anthocyanins, a Alltech 250 mm x 4.6 mm Econosphere C₁₈ 5 mm column was used. Temperature, 45 °C; solvent A, 10% formic acid; solvent B, 10% formic acid, 50% methanol; flow, 0.48 mL/min; λ, 520_{nm}. Elution was as follows: 15 min 45% solvent B; from 45% to 70% solvent B in 20 min; from 70% to 90% solvent B in 10 min; from 90% to 99% solvent B in 5 min; from 99% to 45% solvent B in 2 min; 45% solvent B for 4 min.

For the analysis of HTCAs and flavonols of both *cv*, the same type of column was used; temperature, 40°C; solvent A, H₃PO₄ 10-3 M; solvent B, methanol; flow, 0.48 mL/min; λ, 320_{nm} and 360_{nm}. Elution was as follows: from 5% to 10% solvent B in 5 min; from 10% to 30% solvent B in 15 min; from 30% to 60% solvent B in 10 min; from 60% to 100% solvent B in 10 min; from 100% to 5% solvent B in 8 min; 5% solvent B for 5 min.

For total anthocyanins and total flavonoid determination, the C₁₈ cartridge was activated with methanol; 5 mL of 0.01N sulfuric acid and 5 mL of skin extract were injected. The cartridge was washed with 5 mL of 0.01N sulfuric acid. The eluate was collected after wash with 1 mL of methanol. After dilution with chloridric ethanol the 540_{nm} absorbance (total anthocyanins) and the corrected 280_{nm} absorbance (total flavonoids) values were determined.

RESULTS AND DISCUSSION

The *Girgentina* grapes feature rather large berries: each has an average weight of 3.61 g, within not very compact bunches of an average weight of 247.72 g.

The amount of myricetin glucoside is negligible, as often found in white grapes; quercetin glycosides prevail, in their glucuronide or glucosylated form over other flavonols. Among HCTAs, Trans-caffeoyl-tartaric acid is the most abundant (shown in table 1, below; average values of three replicates are reported; standard deviation are indicated in parentheses).

Table 1

Girgentina					
HTCAs	mg/100 berries	mg/Kg	Flavonols	mg/100berries	mg/Kg
Cis Caffeoyl Tartaric	0.17 (0.02)	0.45 (0.05)	Myricetyn-glucuronide	0.05 (0.01)	0.16 (0.02)
Trans Caffeoyl Tartaric	12.33 (0.93)	35.91 (3.95)	Myricetyn-glucoside	0.05 (0.02)	0.10 (0.01)
Cis p-cumarate	1.78 (0.25)	4.73 (0.52)	Quercetin-glucuronide	3.74 (0.39)	10.54 (1.16)
Trans p-cumarate	4.17 (0.47)	11.83 (1.30)	Quercetin-glucoside	5.08 (0.53)	14.23 (1.56)
Trans feruoyl Tartaric	0.45 (0.23)	0.67 (0.07)	Kaempferol-3-glucuronide	0.33 (0.06)	0.83 (0.09)
			Kaempferol-3-glucoside	1.02 (0.20)	2.65 (0.29)

Ġellewża grapes features berries of an average weight of 2.13 g, with a average bunch weight of 304,668 g. Total anthocyanin content is about 621mg/Kg. Malvidine prevails over the other anthocyanins (amounting to about 55%). Petunidine and delphinidine (the other tri-oxygenated anthocyanins) amount to 3-4%. Among di-oxygenated anthocyanins, cyanidine is rather scarce, while peonidine amounts to about 3%.

Acylated anthocyanins are rather abundant (31%); the p-cumarate anthocyanins/acetate anthocyanins ratio is about 2. Among flavonols quercetin glycosides prevail over myricetin ones although the amount of the latter is comparable to the glycosidic forms of the former.

Among skin HTCAs, caffeil tartaric acid prevails over p-cumaroyl and p-feruloyl tartaric acids, (shown in table 2, below; average values of three replicates are indicated; standard deviation are reported in parentheses. Abbreviated HTCAs and flavonols names refer to the same compounds in table 1).

Table 2

Ġellewża							
Anthocyanins %		HTCAs	mg/100b	mg/Kg	Flavonols	mg/100b	mg/Kg
Delphinidine	3.40 (0.16)	Cis Caf.Tart	0.15 (0.01)	0.43 (0.04)	Myr.-glucur.	1.05 (0.27)	2.61(0.25)
Cyanidine	0.23 (0.03)	Trans Caf.Tart.	15.11 (1.32)	43.17 (4.11)	Myr.-glucos.	6.18 (0.65)	17.57 (1.67)
Petunidine	4.66 (0.10)	Cis p-cum.	0.72 (0.15)	1.86 (0.18)	Quer.-glucur.	6.57 (0.45)	19.10 (1.82)
Peonidine	3.16 (0.09)	Trans p-cum.	3.86 (0.39)	10.92 (1.04)	Quer.-glucos.	9.22 (0.44)	27.69 (2.64)
Malvidine	55.46 (0.59)	Trans Fer. Tart.	0.47 (0.08)	1.27 (0.12)	Kamp.-glucur.	0.67 (0.19)	1.55 (.015)
Acetates	11.28 (0.26)				Kamp.-glucos.	2.36 (0.38)	6.43 (0.61)
Cinnamates	22.06 (0.25)						

CONCLUSIONS

The work presented here, which is part of the ProMed project and it is funded by the Operational Programme Italy-Malta 2007-2013, has achieved the set goals of acquiring a knowledge of the physical and compositional features of two indigenous Maltese cultivars. This provides a basic information which will be instrumental to define and establish vinification procedures and technologies. These data allow a deeper understanding of the wines that can be produced. The large size of the Girgentina berries translated into a lower sugar concentration leading to reduced alcohol levels. Gellewza wines featured a persistence of total anthocyanins content, which is consistent with the higher malvidine content, a tri-

substituted anthocyanin which is less prone to oxidation by Polyphenols Oxydases. This knowledge will be important in the development of Maltese wines and for their further improvement.

ACKNOWLEDGEMENTS

Funds for this work were provided by the Operative Programme Italy-Malta

BIBLIOGRAPHY

Squadrito M., Corona O., Ansaldi G. and Di Stefano R., 2007. Relazioni fra i percorsi biosintetici degli HTCAs, dei flavonoli e degli antociani nell'acino d' uva. Riv. Vitc. Enol. 60: 59–70.