AROMA QUALITY OF FORTIFIED WINES FROM DIFFERENT MOSCATO CV. CULTIVATED IN SICILY

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AIM

Vitis vinifera L. cv. Moscato includes different varieties, mainly white grapes with a medium-sized berry, spheroidal or slightly flattened in shape, yellow greenish color which becomes golden yellow or amber when exposed to the sun. Moscato varieties are mainly used to produce sweet aromatic wines. Despite the increasing interest in sweet dessert wines, at the best of our knowledge, limited data are reported in literature on the composition of Moscato wines especially as regards the aroma volatile constituents which are determinant for the sensory features.
In this context, the research aimed to verify the aroma quality of fortified wines produced from different Moscato varieties, not present in the Sicilian ampelographic panorama, in comparison with Moscato Bianco already grown on the island. A great attention has been given to the amount of terpenes, key aroma compounds for Moscato wines.

MATERIALS and METHODS

Grapes of *Vitis vinifera* L. cv. Moscato of the different varieties (Giallo, Ottonel, Petit Grain, Rosa and Bianco), were cultivated in the experimental vineyard of the Sicilian Wine and Oil Regional Institute (IRVO) located in Partinico (Sicily, Italy); grapes of Moscato Bianco variety were also harvested in the IRVO experimental vineyard located in Noto (Sicily, Italy), the area in which the Moscato Bianco DOC is produced. The phenological, vegetative-productive and fertility data were collected. The protocol to produce fortified wines was the same for all the varieties; the fermentation was stopped when the residual sugar content of must was about 100 g/L by adding 6g/hL of sulfur dioxide and ethanol (95% v/v) up to a total alcohol content of about 15% v/v. Physico-chemical analyses will be carried out on grapes and wines according to the EEC Official Method. Wine volatile aroma compounds were analysed by Headspace Solid Phase Microextraction Gas Chromatography Mass Spectrometry (HS-SPME-GC-MS).

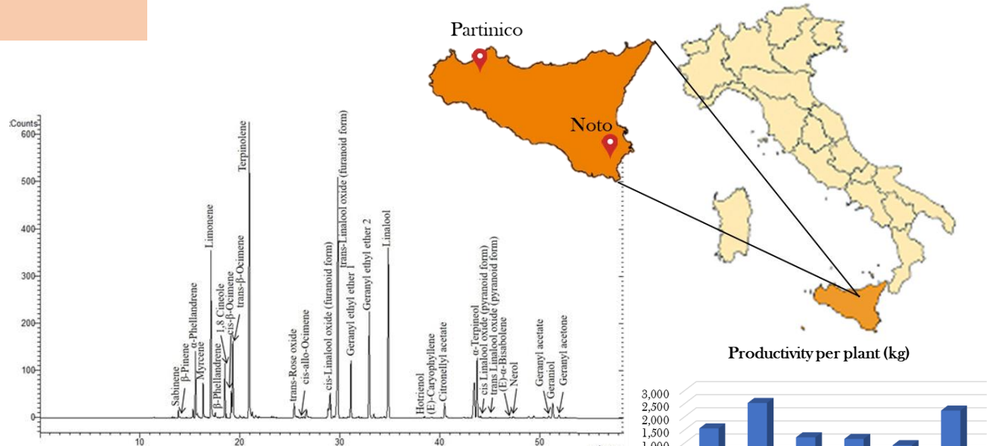
Moscato Giallo | Moscato Bianco | Moscato Ottonel | Moscato rosa.

Physicochemical parameters of fortified wines from different Moscato cv.

	Alcohol %vol.	Gross extract (g/L)	pH	Titratable Acidity (g/L)	Volatile Acidity (g/L)	Free SO_2 (mg/L)	Total SO_2 (mg/L)	Malic Acid (g/L)	Residual Sugars (g/L)	Glycerol (g/L)
M. Bianco Noto	15,30	123,60	3,45	5,00	0,54	18,00	78,00	1,17	98,00	4,30
M. Giallo	15,05	82,75	3,63	4,92	0,46	14,00	127,00	1,44	60,25	6,55
M. Bianco	16,01	113,00	3,31	5,20	0,48	4,00	83,00	1,19	81,30	7,00
M. Ottonel	16,07	95,05	3,46	5,36	0,35	18,00	119,50	0,97	62,85	7,45
M. Petit Grain	14,33	107,50	3,16	6,23	0,36	3,00	81,00	1,43	75,80	6,70
M. Rosa	15,28	122,25	3,42	6,25	0,58	17,00	65,50	1,27	87,60	7,35

Varietal volatile aroma compounds quantified in fortified wines from different Moscato cv.

Compounds	M. Bianco di Noto	M. Giallo	M. Bianco	M. Bianco Petit Grain	M. Ottonel	M. Rosa
Terpenes (µg/L)						
Sabinene	2.00	1.00	-	-	1.12	1.00
β-Pinene	-	-	-	0.76	1.06	-
α-Fellandrene	4.00	10.90	1.67	0.62	4.48	3.72
Myrcene	4.00	2.06	0.15	0.08	2.13	4.08
Limonene	28.00	33.30	8.19	3.48	22.71	30.50
β-phellandrene	-	1.00	-	-	1.23	1.00
1,8 Cineole	-	-	-	-	1.34	-
cis-β-Ocimene	1.00	3.60	5.86	0.06	16.33	5.73
trans-β-Ocimene		11.00	-	-	11.45	16.00
γ-Terpinene	10.00	-	-	-	0.19	-
p-Cimene	30.00	28.94	5.81	2.91	28.34	21.15
Terpinolene	-	9.00	-	-	3.13	9.00
6-Methyl-5-hepten-2-one	-	-	-	-	-	0.65
cis-Rose-oxide	0.432	0.82	0.39	0.04	0.10	0.74
trans-Rose oxide	2.15	2.79	2.49	0.52	1.41	2.88
cis-Allo-ocimene	-	1.00	-	0.20	0.65	-
cis-Linalool oxide (furanoid form)	-	9.00	-	-	6.34	-
trans-Linalool oxide (furanoid form)	37.00	88.49	109.48	9.58	58.74	103.18
Geranyl ethyl ether 1	11.00	16.88	1.57	1.25	0.76	10.74
Geranyl ethyl ether 2	30.00	46.43	5.62	4.24	31.26	28.01
Linalool	202.00	240.44	88.18	55.57	255.08	204.53
Hotrienol	1.97	3.23	0.84	0.55	2.85	0.37
(E)-Cariophyllene	7.00	0.70	-	-	-	-
Citronellyl acetate	0.00	-	1.91	0.79	0.68	2.13
α-Terpineol	45.00	73.35	0.98	3.19	60.43	41.64
cis-Linalool oxide (pyranoid form)	-	-	-	-	-	-
trans-linalool oxide (pyranoid form)	-	2.00	-	-	-	-
(Z-E)-α-Farnesene	-	-	-	-	-	1.06
(Z)-β-Bisabolene	3.00	2.00	0.64	-	2.78	1.08
Nerol	1.00	13.04	17.42	15.60	7.46	19.16
Geranyl acetate/Citronellol	25.00	2.04	0.33	0.25	0.05	1.17
Geraniol	207.00	207.96	138.67	185.45	165.60	72.14
Geranyl acetone	0.45	0.75	0.71	0.89	0.60	0.42
All	***655.57***	***811.72***	***390.90***	***286.02***	***688.29***	***582.07***



Headspace Solid-Phase Microextraction-Gas Chromatography–Mass Spectrometry (HS-SPME-GC-MS) chromatogram in SIM mode (m/z= 93.0+121.0+136.0) of a Moscato wine sample.

CONCLUSIONS

The results obtained allowed to characterize the behavior of different Moscato varieties in the Sicilian pedoclimatic environment both as regards productivity, and oenological aspects and wine aroma quality. Among the studied varieties, Moscato Rosa cv stands out above all for the peculiarity of its aroma.

RESULTS

Among the studied varieties, Moscato Giallo showed the highest productivity ($P<0,05$) whereas Ottonel the lowest. As regards the wine aroma profile, several volatiles have been identified and quantified, both fermentation and varietal aromas. The volatile profiles of the wines from the different varieties showed statistically significant differences mainly regarding the quantity of the varietal aromas, when compared with that one of the Moscato Bianco of Noto. Moscato Rosa wines evidenced a distinctive aroma profile especially as regards the ratio between varietal aromas (floral notes) and esters (fruity notes).

Fermentative volatile aroma compounds quantified in fortified wines from different Moscato cv.

Compounds	M. Bianco di Noto	M. Giallo	M. Bianco	M. Bianco Petit Grain	M. Ottonel	M. Rosa
Esters (µg/L)						
Ethyl acetate	2356.00	14948.76	2043.97	1339.34	7244.93	2720.87
Ethyl butanoate	3.86	2.47	1.16	0.78	2.13	1.00
2-Methyl-ethyl butanoate	0.39	0.26	0.54	0.43	0.54	0.21
3-Methyl-ethyl butanoate	0.50	0.47	0.49	0.46	0.92	0.40
Isoamyl acetate	46.81	20.47	30.20	21.42	18.94	16.07
Ethyl hexanoate	204.48	105.50	108.18	65.64	109.10	59.15
Hexyl acetate	31.18	3.26	17.02	9.07	2.81	1.42
3-Hexenyl acetate	0.77	0.46	0.39	0.64	0.05	0.40
Ethyl heptanoate	1.52	1.29	1.35	1.13	1.16	2.91
Ethyl lactate	760.00	710.00	390.00	220.00	810.00	810.00
Methyl octanoate	1.09	1.03	1.05	0.70	1.05	0.75
Ethyl octanoate	1287.87	1056.83	942.13	586.38	1251.96	502.53
Isoamyl hexanoate	2.91	1.65	1.30	0.96	4.48	1.43
(*E*)-4-Ethyl octenoate	0.83	0.93	0.92	1.10	0.68	0.61
Propyl octanoate	1.20	0.95	0.51	0.48	0.88	0.46
Ethyl nonanoate	3.63	2.53	2.15	1.19	0.78	1.28
Butyl octanoate	0.84	1.09	2.68	1.68	0.63	2.28
Methyl decanoate	1.86	0.80	0.94	0.74	0.66	1.43
Ethyl decanoate	679.39	637.73	651.87	379.39	557.79	308.79
Isoamyl octanoate	3.87	4.79	3.86	2.99	5.06	2.48
Diethyl succinate	5970.00	4960.00	4460.00	3450.00	4380.00	7480.00
(E)-4-Ethyl decenoate	0.95	1.50	1.63	0.80	0.42	2.44
(Z)-4-Ethyl decenoate	83.65	159.63	159.77	119.62	86.29	144.50
(E)-3-Ethyl decenoate	2.63	3.73	3.99	1.75	1.76	0.53
(Z)-3-Ethyl decenoate	1.87	3.98	1.86	0.79	0.86	0.46
Isobutyl decanoate	0.47	0.32	0.47	0.31	0.26	0.23
Methyl dodecanoate	0.31	0.29	0.28	0.22	0.26	0.41
β-Phenyl-ethyl acetate	3.73	4.95	4.45	2.39	4.77	2.98
Ethyl dodecanoate	41.43	29.37	36.50	19.77	32.80	24.47
Isoamyl decanoate	0.66	1.32	0.99	0.90	1.13	0.88
Ethyl tetradecanoate	0.74	2.26	0.45	0.84	1.14	0.80
All	***11495.44***	***22668.62***	***8871.1***	***6231.91***	***14524.2***	***12092.2***
Alcohols (mg/L)						
Isoamyl alcohol	38.18	30.06	28.64	23.59	41.90	45.66
1-Hexanol	1.92	1.45	0.88	1.15	1.42	3.11
(Z)-3-Hexen-1-ol	0.03	0.03	-	-	0.03	0.15
β-phenyl-ethyl alcohol	5.37	10.18	5.16	4.36	14.72	15.84
All	***45.51***	***41.71***	***34.69***	***29.09***	***58.07***	***64.76***
Acids (mg/L)						
Octanoic acid	0.53	2.36	2.71	2.65	1.07	0.49
Decanoic acid	0.57	0.96	0.48	0.58	0.11	0.47
All	***1.10***	***3.32***	***3.19***	***3.23***	***1.18***	***0.96***
Others (mg/L)						
4-Methyl tiazole	0.040	0.031	0.021	0.010	0.04	0.050