Quality potential of “new-old” white winegrape genotypes from Daunia (northern Apulia region): back to the future?

QUALITY POTENTIAL OF "NEW-OLD" WHITE WINEGRAPE GENOTYPES FROM DAUNIA (NORTHERN APULIA REGION): BACK TO THE FUTURE?

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Summary

In the Northern province of the Apulia Region (Foggia, syn. Daunia, Italy), several old white wine-grape genotypes were found in the area called "Alto Tavoliere". The quality potential of some of these varieties was tested by obtaining, for the first time, experimental wines from them. In the present trial, grapes of the genotypes named Malvasia Bastarda, Squaccianosa and Tuccanese Moscio were wine-processed separately. On grapes of the genotype named Selvaggio, very rich in polyphenols, a pre-fermentative cold maceration was applied in order to test their suitability to produce a type of "orange wine". Grapes of all these genotypes, mixed with those of other two varieties, named Uvarilla e Palumma, were used to produce a blended wine. Moreover, in order to compare the characteristics of these grapes with those of a well-known winegrape genotype, cv. Falanghina was also enclosed in the trial. The wines were analyzed to assess their standard physical and chemical parameters, to evaluate their sensory properties and to detect their main aromatic compounds. The results showed that physical and chemical characteristics were normal for wines obtained by small-lot winemakings. Malvasia Bastarda and, to a lesser extent, the blended wine, tended to be more alcoholic (about 0.8 degrees); on the other hand, Selvaggio and Squaccianosa wines had the highest total dry extract. At the sensory evaluation, Selvaggio differed for its deeper color intensity and tonality, as expected because of its winemaking style. On the whole, the blended wine was preferred, followed by Squaccianosa and, thereafter, by Tuccanese Moscio. The blended wine was the most appreciated for aroma purity and intensity and, together with Selvaggio wine, it was rated higher for bodiness. The blended wine was also found the most harmonic, followed by Squaccianosa. This latter, moreover, expressed aromas of almond, white peach and white flowers. The GC-MS analysis showed that Squaccianosa wine was the richest in volatile compounds, also when compared to the reference Falanghina wine. These results encourage to pursue the obtaining of new enological products from the "new-old" genotypes individuated in the "Alto Tavoliere" area of Daunia, either as blend or as mono-variety wines.

INTRODUCTION

The Northern province of the Apulia Region (Foggia, syn. Daunia, Italy) occupies the fifth position among all those producing Italian wines and musts. According to the tradition, the viticulture of this area dates back to the age when the ancient Greek hero Diomede colonized the Northern Apulia; nevertheless, during the Middle Ages, the flock pasture was largely imposed over these lands, hence, most of the old grapevine germplasm probably grown at that time was likely lost.

In the XIX century the growing of both black- and white-berry grapevine genotypes was gradually resumed while, in the XX century, the cultivation of white-berry genotypes became traditional, although the semi-arid environment of Daunia might favor browning reactions into white berries. The same production took place also in other warm Italian regions, such as Sicily; it was stimulated by the need of neutral grapes, coming from "generous" varieties, that are the most suitable to produce the vermouth base-wines required by winemaking industries of Northern Italy. Hence, many minor white grape varieties were introduced and grown in Northern Apulia and there became "naturalized"; their grapes were often added to those of the main varieties, or were mixed altogether, to produce local wines. However, due to the simplification of the cultivated varieties that characterized the agriculture of the last decades (Scarascia Mugnozza, 1974), the cultivation of these genotypes was progressively abandoned.

The University of Foggia, since 2005, collaborates with the "Società Cooperativa Agricola Fortore" of Torremaggiore (Foggia province) to resume, characterize and study old grapevine varieties with two main aims: i) to preserve the biodiversity; ii) to individuate genotypes suitable to obtain new typology of wines, joining tradition and innovation. In these years several genotypes have been found and their main characteristics have been described (de Palma *et al*., 2007; de Palma *et al*. 2008, de Palma *et al*., 2010).

In 2010, the Apulia Region Local Government supported this research providing a scholarship within the call named "Back to the Future". This contribution allowed to study in depth the potential quality of several genotypes and to obtain experimental wines from their grapes. The present work summarizes the main results concerning the assessment of physical and chemical parameters, sensory properties and aromatic traits of these wines. In order to compare the results with those achievable with a well-known white wine-grape genotype, cv. Falanghina was also included in the trial.

MATERIAL AND METHODS

The study was carried out in the vintage 2010. At a vineyard affiliated to "Società Cooperativa Agricola Fortore" (Torremaggiore, Foggia province, N Lat. 41°41'; E Long. 15°17'), 10 vines of the genotypes named Malvasia Bastarda, Selvaggio, Squaccianosa, Tuccanese Moscio, and 5 vines of the genotypes named Palumma and Uvarilla were individuated. Moreover, since cv. Falanghina is widely grown in Southern Italian regions and provides appreciated white winegrapes, it was also included in this

trial as a reference for wine quality. Thus, 10 vines of this cultivar were also sampled. The vines were VSP trained and pruned according to the Guyot system. The vineyard, planted in a clay-sandy soil, was more than 60-year old, and was conducted according to the traditional viticultural practices typical of that growing area, as already reported (de Palma *et al*., 2010).

From the last week of August, 100 berries per cultivar were sampled, every week, in order to analyze their composition: total soluble solids (T.S.S.), titratable acidity (A.T., as tartaric acid) and pH. Aiming to obtain a sufficient alcohol degree, grapes were harvested when reached at least 18 °Brix; in the 2010 vintage, this threshold was reached starting from the last week of September. The occurring of some rainfalls in that period influenced the sanitary state of grapes; bunches of Malvasia Bastarda were the most sensitive to rot, while those of Falanghina were the most resistant. Selvaggio, Tuccanese Moscio and Falanghina vines produced from 3.5 to 4.5 kg per vine; Malvasia Bastarda, that resulted very productive in previous trials (de Palma *et al*., 2010), and Squaccianosa gave about 7.0 kg of grapes per vine. Grapes of each genotype were used to realize mono-variety small-lot winemakings. Palumma and Uvarilla, due to the low number of vines available in the vineyard, did not produce enough grapes to realize mono-variety winemakings, thus their bunches were mixed with some of those produced by the other genotypes aiming to obtain a blended wine. This latter was composed as follows: Palumma 30 %, Malvasia Bastarda 30 %, Uvarilla 23 %, Selvaggio 10 %, Squaccianosa 7 %.

The winemakings were made basing on the protocol for white wines described by Savino and coll. (2007). Since previous trials showed Selvaggio grapes as characterized by a high skin polyphenolic content (de Palma *et al*. 2010), they were chosen to produce an "orange wine" applying a cold pre-fermentative skin maceration (at 10 °C for 24 hr); also in this case, the winemaking was based on a protocol described by Savino and coll. (2007).

At wine bottling, chemical and physical parameters were assessed according to the EC 2676/90 regulation. Moreover, a wine sensory evaluation was done by a panel of 12 people including researchers (University of Foggia, University of Turin, CRA-Council of Research for the Agriculture), enologists, experts of Società Cooperativa Agricola Fortore. Falanghina wine was "masked" to avoid the "fame effect". Using a destructured scale, the following descriptors were evaluated: visual aspect (color tonality, color intensity), aroma (purity, wine aroma, fruity, herbaceous) taste (purity, acidity, astringency, bodiness, harmony, whole judgment). Finally, wines were analyzed by gas-chromatography in order to point out their aromatic traits. In particular the neutral lipophylic compounds were analyzed according to Gianotti and Di Stefano (1991).

Since a very small amount of wine was realized per each individual winemaking, replications were not included in this trial.

RESULTS AND DISCUSSION

Must composition. Must T.S.S. ranged from 18 to 20 °Brix (tab. 1); the highest concentrations were found in the reference cultivar Falanghina and in Malvasia Bastarda, although this latter had a very high productivity. Previous studies pointed out this genotype as characterized by a higher photosynthetic rate respect to the other old varieties studied in this trial (de Palma *et al*., 2010). The must T.S.S. concentration of the blended grapes was influenced by the low refractometric degree reached by Palumma and Uvarilla (about 15 and 17 °Brix respectively) at the time when the other varieties were harvested.

Must titratable acidity ranged from 4.3 to 6.6 g L^{-1}, thus it was quite low as it often occurs in warm climates, where malic acid is rapidly respired due to the high air temperature. A considerable higher titratable acidity was found in Squaccianosa and in the reference cv. Falanghina respect to Tuccanese Moscio (+25÷38 %) and to the grape blend (+40÷53 %). As a consequence of the low acidity, juice pH often reaches quite high values; in this trial it ranged between 3.4 and 3.9.

Table1. Main parameters of must composition.

Grape variety	T.S.S. (°Brix)	A.T. (g L^{-1})	pH
Malvasia Bastarda	20.3	5.5	3.7
Selvaggio	18.3	5.7	3.9
Squaccianosa	18.6	6.6	3.5
Tuccanese Moscio	18.5	4.8	3.7
Grape blend	18.0	4.3	3.9
Falanghina (reference)	19.6	6.0	3.6

Wine physical and chemical parameters. All the values of physical and chemical parameters were found in a normal range for white wines fermented at a small scale (tab. 2).

Table 2. Wine physical and chemical parameters.

Parameters	Grape variety					
	Malvasia B.	Selvaggio	Squaccianosa	Tuccanese M.	Grape blend	Falanghina (ref.)
Wine density (20°C/20°C)	0.994	1.000	0.997	0.994	0.994	0.997
Alcohol density (20°C/20°C)	0.984	0.987	0.986	0.985	0.985	0.985
Alcohol (% vol)	12.10	9.42	10.80	11.37	11.62	11.05
Reducing sugars (g L^{-1} as saccharose)	1.8	2.5	2.0	2.0	1.8	1.8
Total dry extract (g L^{-1})	26.6	40.0	29.2	23.5	23.5	31.0
Sugarfree extract (g L^{-1})	25.8	38.5	28.2	22.5	22.7	30.0
pH	3.72	3.83	3.34	3.52	3.85	3.63
Titratable acidity (g L^{-1} as tartaric ac.)	5.30	5.57	5.93	5.37	4.74	6.34
Volatile acidity (g L^{-1} as acetic ac.)	0.50	0.27	0.31	0.34	0.21	0.19
Total SO_2 (mg L^{-1})	70	74	89	76	90	65

Wine of Malvasia Bastarda, which must had the highest T.S.S. content, showed a tendency to be more alcoholic (about 0.8 degrees). Same tendency was showed

by the blended wine, although its must had the lowest T.S.S. concentration; Selvaggio wine performed at the opposite. Possibly, the grape blend favoured the yeast activity by supplying a richer and more diversified *pabulum*.

Selvaggio wine, obtained by cold pre-fermentative skin maceration, reached the highest total dry extract, followed by the Falanghina and Squaccianosa wines; Tuccanese Moscio performed at the opposite. The volatile acidity reflected the sanitary state of grapes at harvest, hence, it was very low in Falanghina and reached the threshold 0.6 g L^{-1} in Malvasia Bastarda.

Wine sensory evaluation. Selvaggio wine showed the most marked color intensity and tonality, as expected, due to its winemaking style (fig. 1); its color was darker and, during the must contact with the grape skins and their pigments, was enriched by a light orange tinge. This wine style, which was quite common in Italy in the 1950s and 1960s, recently has been set out again mainly by Friuli Venezia Giulia and Slovenian winemakers.

As concerns the other wines, the color intensity resulted to have been slightly exalted by the grape blending, while the color tonality differed very little.

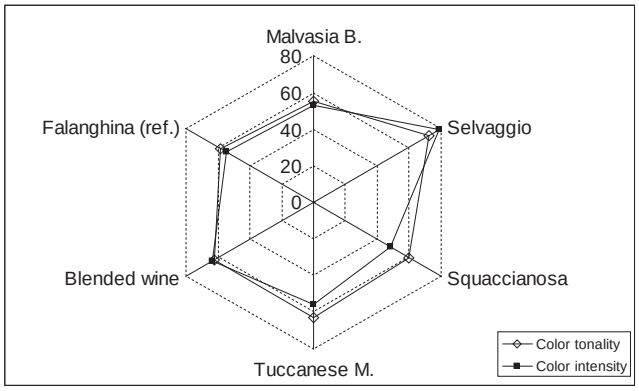

Figure 1. Wine sensory evaluation: visual aspects.

At the smell sense, the blended wine received the best score for purity of aroma as well as for fruity ad floral aroma. The latter two types of aromas were more marked in all the wines obtained from the old genotypes than in the Falanghina reference wine (fig. 2).

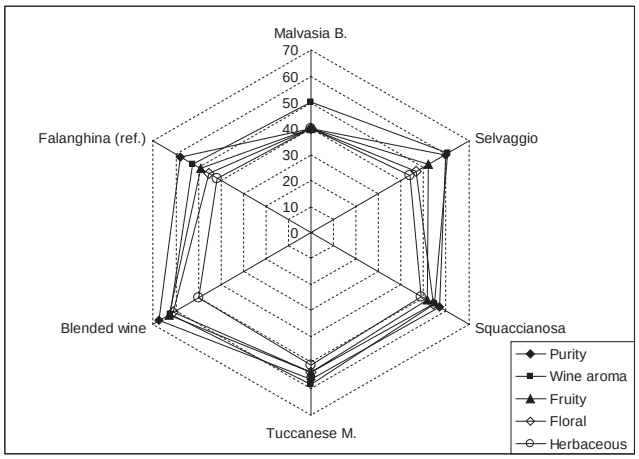

Figure2. Wine sensory evaluation: smell sense aspects.

At the taste, the blended and the Selvaggio wines had the most marked bodiness; Selvaggio and Squaccianosa were the most astringent; the blended and the Squaccianosa wines reached the best harmony (fig. 3). In Squaccianosa, moreover, aromas of almond, white peach and white flowers were noticed.

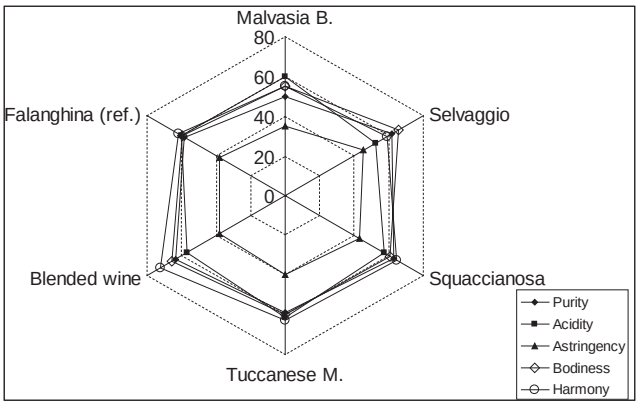

Figure 3. Wine sensory evaluation: tasting aspects.

Surprisingly, Falanghina wine, obtained by grape produced and processed by using the same protocol used for the other varieties, was not preferred at the sensory evaluation. As total judgement, the blended wine was preferred among all those tested, followed by Squaccianosa and, thereafter, by Tuccanese Moscio. This latter did not achieve the higher score for any descriptor, but was rated quite good for most of them (fig. 4).

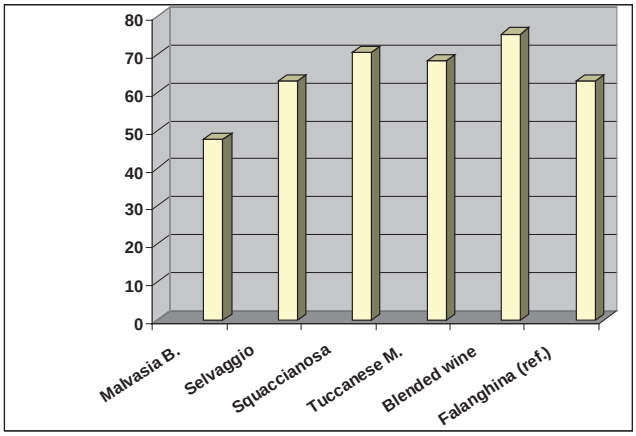

Figure 4. Wine sensory evaluation: total judgement.

On the whole, the blended wine was the most appreciated for aroma purity and intensity and, together with Selvaggio, was rated higher for bodiness. The blended wine was also found the most harmonic, followed by Squaccianosa; these latter seemed also provided by a rich aromatic frame. The judgment on Malvasia Bastarda wine was likely penalized by the not good grape sanitary state.

Wine volatile compounds. Within benzenoid compounds that gives floral and rose aromas and are mainly detectable after wine wood refinement (Limosani *et al.*, 2008), Benzyl alcohol and Homovanillic alcohol were detected (fig. 5). In particular, Benzyl alcohol reached the highest value in Tuccanese Moscio, showed a lower level in Squaccianosa and Falanghina, and was absent in the other wines; homovanillic alcohol reached the highest level in the blended wine, was absent in Malvasia Bastarda and Tuccanese Moscio, and showed a medium level in the other wines.

The well-expressed floral aroma noticed in Squaccianosa wine at the sensory evaluation was likely exalted by the presence of the monoterpen Linalool, characteristic of muscat aroma that was not detected in the other wines. Falanghina showed the highest content of Ethyl butyrate and Isoamyl acetate, responsible for fermentative aromas of banana, pineapple and caramel, although these aromas were not noticed at the sensory evaluation. In all wines, the coexistence of these two classes of compounds is known to give a particular elegance to the wine (Savino *et al*., 2007).

Figure 5. Wine neutral lipophylic volatile compounds.

Compounds (ug L^{-1})	*Malvasia Bastarda*	*Selvaggio*	*Squaccianosa*	*Tuccanese Moscio*	*Blended wine*	*Falanghina*
Ethil butyrate	55	40	42	73	62	88
Isoamyl acetate	266	172	106	139	420	828
Isoamyl alcohol	9594	9762	8053	14400	11078	12010
Ethyl hexanoate	145	70	81	136	175	241
Hexyl acetate	nd	nd	nd	nd	29	39
Hexanol	446	824	322	477	461	130
Linalool	nd	nd	24	nd	nd	nd
Benzyl alcohol	nd	nd	16	80	nd	22
2-Phenyl ethanol	9600	nd	10693	16364	16833	13952
Benzo thiazole	1111	182	300	303	880	634
4-Vinyl guaiacol	32	13	139	25	36	19
4-Vinyl phenol	nd	53	16	29	168	120
3-OH β-damascone	nd	nd	30	53	450	344
Homovanillic alcohol	nd	329	301	nd	1235	903
Tyrosol	2966	1567	2000	2745	8370	2024
Geranial	nd	nd	nd	nd	nd	nd

The compound 2-Phenylethanol, that is also responsible for rose aroma, was not detected in Selvaggio, while its concentration was quite similar among all the other wines; nevertheless its content did not overcome the perception threshold, thus this compound did not contribute to the sensory information.

In conclusion, the results of this trial encourage to pursue the obtaining of new enological products from the "new-old" genotypes individuated in the Alto Tavoliere of the Foggia province, either as blend or as mono-variety wines. Grapes obtained by the genotypes Malvasia Bastarda, Selvaggio, Squaccianosa and Tuccanese Moscio showed some interesting enological attitude, especially when mixed together and with grapes of the genotypes Palumma and Uvarilla; the grape blending resulted in the most harmonic wine, as it often occurs. Nevertheless Squaccianosa grapes, due to their well-expressed floral aromas, seem particularly suitable to produce a mono-variety white wine.

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