



Impact of geographical location on the phenolic profile of minority varieties grown in Spain. II: red grapevines.

M. Esperanza Valdés¹, Daniel Moreno¹, Anna Puig-Pujol², Gregorio Muñoz-Organero³ y Grupo MINORVIN⁴

¹CICYTEX-Instituto Tecnológico Agroalimentario. Avda Adolfo Suárez S/N. 06070. Badajoz

²INCAVI-IRTA. Polígon Industrial Domenys II, Plaça l'Àgora, 2-3, 08720 Vilafranca del Penedès, Barcelona

³Instituto Madrileño de Investigación y Desarrollo Rural, Agrario y Alimentario (IMIDRA). Finca El Encín. Autovía A2, Km. 38,2. Alcalá de Henares. 28805-Madrid

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esperanza.valdes@juntaex.es

Introduction

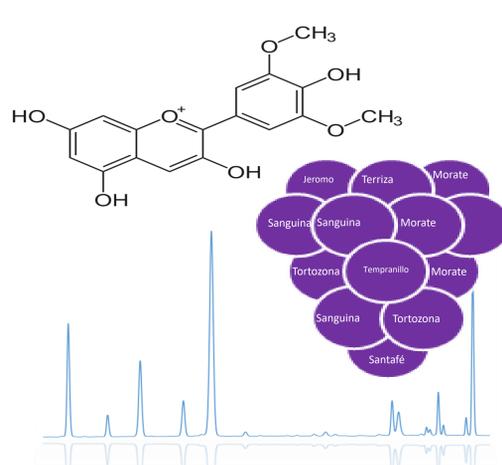
The recovery and selection of minority varieties represents an increase in the varietal heritage. In the case of red varieties, their polyphenolic characterization is a key factor in order to understand their oenological potential and to establish winemaking standards. This search work, included in MINORVIN project, studies the phenolic profile of 7 red cultivars, most of them considered minority varieties, in 8 wine growing Spanish areas harvested in 2020 harvest. Since terroir and cultivar are drivers of wine quality, is essential to investigate their effects on the polyphenolic profile before promoting the introduction of a red minority variety in a specific area.

Materials and Methods

Samples and locations



Analytical methods



Samples from different areas were picked at harvest, frozen and transported to Enology Lab. of CICYTEX-INTAEX

Extraction of phenolic material from grapes with methanol formic [1]

Identification and quantification by HPLC [2] of 36 phenolic compounds grouped in:

- Anthocyanins (15 compounds, An)
- Flavanols (6 compounds, Flava)
- Flavonols (6 compounds, Flavo)
- Hidroxicinnamic (7 compounds, AH) and Benzoic acids (1 compound, BA)
- Stilbenes (1 compound)

Antioxidant activity (AA, mmol Trolox/g fresh berry) was determined by DPPH method

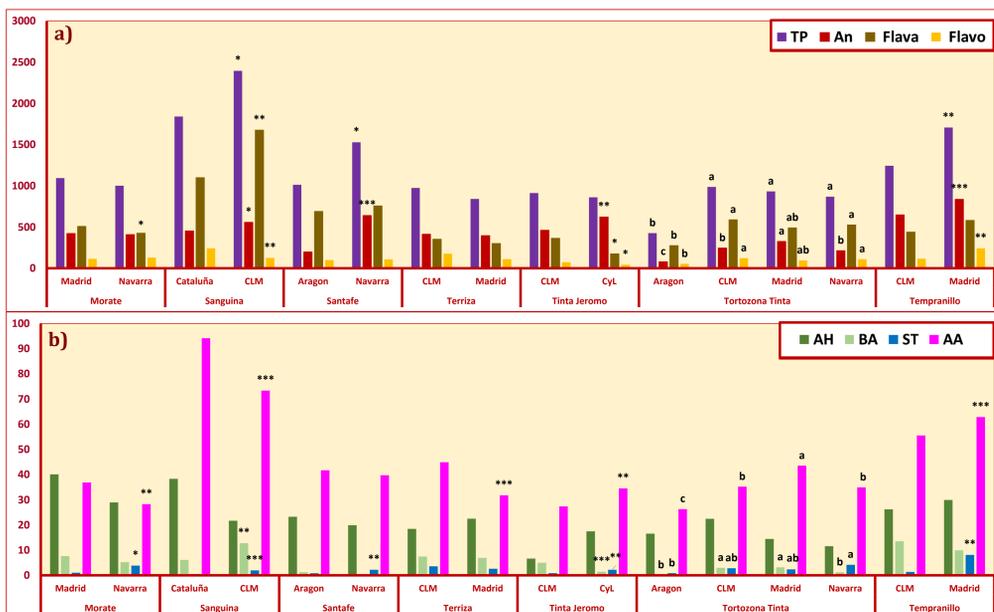
Statistical analysis

- MANOVA (cultivar, area, cultivar*area)
- Test de Tukey
- t de Student
- Hierarchical cluster

Results

Phenolic profiles

Figure 1a) and b) Values of total and polyphenolic groups (mg/Kg fresh berry) and antioxidant activity (mmol TE/g fresh berry) of minority red winegrape varieties from several spanish viticultural locations.



TP: Total Polyphenols, AN: Anthocyanins, FLAVA: Flavanols, FLAVO: Flavonols, AH y BA: Hydroxicinnamic and benzoic acids, ST stilbenes (ST) in mg substance/kg fresh berry. AA: Antioxidant activity in mmol Trolox/g fresh berry. CLM: Castilla la Mancha, CyL: Castilla León.

Values are expressed as the mean of 6 determinations (2 HPLC/extract x 3 extracts/sample).

*,** and *** within the same parameter indicate significant differences at $p < 0.05$, $p < 0.01$ and $p < 0.001$ (Student test) for a given variety in different locations.

Different letters within the same parameter indicate significant differences (Tukey HSD test; $p < 0.05$) in Tortozona Tinta variety.

Effects of variation

Table 1. Effect of the variety, location and their interactions on values of polyphenolic group and AA in minority red winegrape varieties.

Parameter	TP	An	Flava	Flavo	AH	BA	ST	AA
Variety	32.7%**	42.31%***	66.31%***	17.06%***	44.20%***	31.95%***	20.66%***	7.43%***
Location	58.3%**	51.12%***	25.13%***	51.82%***	27.35%***	48.25%***	31.52%***	86.41%***
Variety*Location	2.5%*	5.60%***	n.s.	19.42%***	n.s.	n.s.	32.39%	3.25%***

MANOVA test significance level. n.s. = not significant; * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$

TP: Total Polyphenols, AN: Anthocyanins, FLAVA: Flavanols, FLAVO: Flavonols, AH y BA: Hydroxicinnamic and Benzoic acids, ST stilbenes, AA: Antioxidant activity

FIGURE 1a

Since *Sanguina* from Castilla la Mancha (CLM) and Cataluña reached the highest values in Flava, they showed the highest values of Total Polyphenols.

Among all varieties under study, *Tempranillo* (control variety) from Madrid presented the highest in An.

Tortozona phenolic profile presented similar values in CLM, Madrid and Navarra being Flava the most abundant phenolic compounds found in this variety.

FIGURE 1b

Independently of their location, the highest values of AA were found in *Sanguina* samples.

TABLE 1

The variety and location effects were significant for all polyphenolic families studied, including their AA.

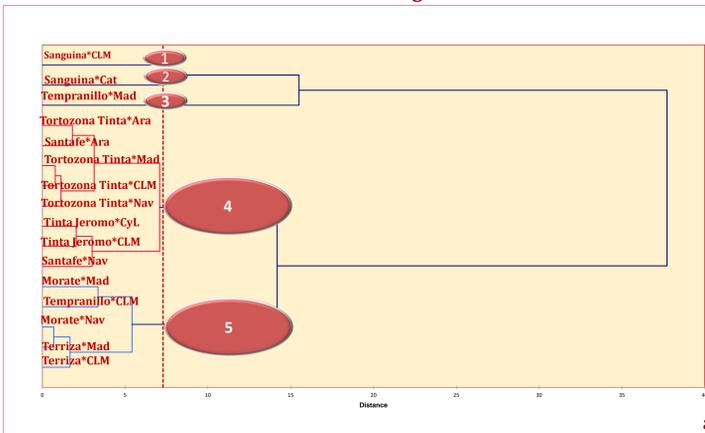
Flava presented the highest variability due to variety and AA the lowest.

AA, Flavo and An presented the highest values of variability due to the growing area

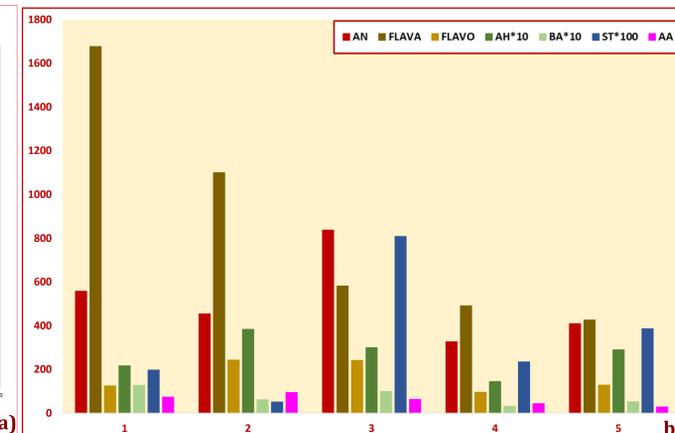
The interaction variety*location was significant for ST>Flavo>An>AA>TP.

Phenolic classification

Figure 2a) Dendrogram of the cluster yielded by the hierarchical cluster analysis using phenolic and AA values. Figure 2b) Phenolic profile characteristic of the different classes catalogued in the cluster.



Ara: Aragón, Cat: Cataluña, Mad: Madrid, CLM: Castilla la Mancha, CyL: Castilla León, Nav: Navarra.



TP: Total Polyphenols, AN: Anthocyanins, FLAVA: Flavanols, FLAVO: Flavonols, AH y BA: Hydroxicinnamic and Benzoic acids, ST stilbenes in mg substance/kg fresh berry. AA: Antioxidant activity in mmol Trolox/g fresh berry.

FIGURE 2a

Dendograms presented 5 groups. Groups 1 and 2 included *Sanguina* from CLM and Cat respectively.

Tortozona, *Santa Fé* and *Tinto Jeromo* are included in group 4 independently of their location.

Morate and *Terriza* from different growing areas belongs group 5.

The location effect had more influence on the phenolic values in *Sanguina* and *Tempranillo* samples than in *Morate*, *Terriza*, *Tinto Jeromo*, *Tortozona* and *Santa Fé*.

FIGURE 2b

Samples from groups 1, 2 and 3 had higher amounts of polyphenols than groups 4 and 5.

Flava were predominant polyphenols in *Sanguina* samples from groups 1 and 2. The amounts of the each phenolic family in the grapes of these groups depended on the location. However, it is noteworthy that the relative amounts of each of them with respect to the total polyphenols is similar.

Ant and St were abundant in grapes from groups 3 and 5.