LEAF VINE CONTENT IN NUTRIENTES AND TRACE ELEMENTS IN LA MANCHA (SPAIN) SOILS: INFLUENCE OF THE ROOTSTOCK

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Figure 1. Area of study and vineyard in Castilla-La Mancha

ABSTRACT

Castilla-La Mancha is an important wine-growing region in Spain and the largest in the world, with an area of more than 500,000 ha (Figure 1). The predominant ecological conditions of the region do not allow, in general, the achievement of large productions. However, high insolation, low relative humidity, the width of the plantation rows and the low incidence of pests and diseases are positive factors for obtaining quality products. For this reason, it is interesting to establish if different rootstock modifies nutrient composition as well as trace elements content that could be important for determining the traceability of the vine products. From the data presented in this work it can be drafted that the provenance of vine tissues from different soils is not affected by the rootstock, from a geochemical point of view.

MATERIAL AND METHODS

Four classic rootstocks (110-Richter, SO4, FERCAL and 1103-Paulsen) and four new ones (M1, M2, M3 and M4) provided by Agromillora Iberia. S.L.U., grafted with the Tempranillo variety, were studied during 2019. The survey was carried out in pots of 500 cc (Figure 2). Three soils with very different characteristics from Campo de Calatrava, (Castilla-La Mancha, Spain) were used. In the month of July, the leaves were collected and dried in a forced air oven for seven days at 40ºC. Ten major elements (Na, Mg, Al, Si, P, S, K, Ca, Fe and Mn in $g \cdot kg^{-1}$) and fifteen trace elements (Sc, V, Cr, Co, Cu, Zn, Sr, Y, Nb, Ba, La, Ce, Hf, Pb and Nd in $mg \cdot kg^{-1}$) were analysed by X-Ray fluorescence spectrometry. A Principal Component Analysis (PCA) and Discriminant Analysis (DA) were performed by SPSS program under license by University of Castilla-La Mancha.

Figure 2

Grafted plant prepared for plantation.

	Si	Fe	Sr	Pb
1 (black)	210.2	81.2	252.0	14.8
2 (red)	373.0	22.8	80.2	20.7
3 (white)	134.5	15.3	1339.8	17.7

Content in each soil in Si, Fe ($g \cdot kg^{-1}$) and Sr, Pb ($mg \cdot kg^{-1}$).

Appearance of the plant in July 2019

RESULTS

It can be seen in Table 1, the content of four minerals elements (Si, Fe, Pb and Sr) in leave, separated by soil type. Strontium is a key element in the traceability of soil-plant-product system, as it was reported in previous publications from our research group (2009 – 2017). The DA shows a correct separation of 100% of the individuals around the centroids of the groups by type soil (Figure 3). In this separation, Sr affects the horizontal axis well above than other elements (1.67 standardized coefficient of the canonical discriminant function), and in the vertical axis the Fe and the Si (1.38 and -1.09 standardized coefficient of the canonical discriminant function, respectively) are the most relevant elements.

Soil		Si	Fe	Sr	Pb
1 (black)	N	17	17	17	17
	Av.C.	2.8	0.2	60.1	2.2
	SD.	0,8	0,1	29.2	0,7
2 (red)	N	18	18	18	18
	Av.C.	4.7	0.1	93.9	3.1
	S.D.	1.1	0.1	25.3	0.9
3 (white)	N	19	19	19	19
	Av.C.	3.0	0.1	190.3	2.1
	S.D.	1.1	0.03	66.9	0.5
Total	N	54	54	54	54
	Av.C.	3.5	0.1	117.2	2.5
	S.D.	1.3	0.05	71.6	0.8

Table 1. Average content (Av.C.) by type of soil in Si, Fe ($g \cdot kg^{-1}$) and Sr, Pb ($mg \cdot kg^{-1}$). N: number of plants analysed. S.D.: Standard deviation

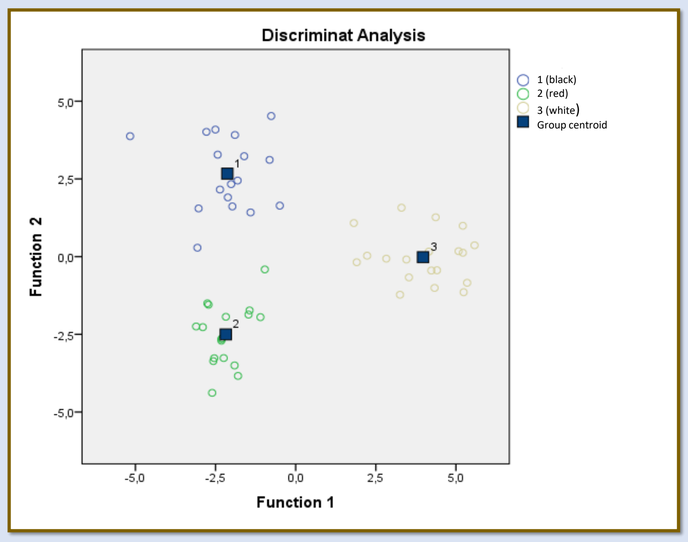

Figure 3. Representation of discriminate analysis

CONCLUSIONS

The geochemical footprint of the soil is not affected by the rootstock regarding the vine leaf composition. The influence of the soil can be discriminated according to the content of a few elements such as Fe, Pb, Si and, especially, Sr. The relevant role of Sr and specially his isotopic ratio ($^{86}Sr/\ ^{87}Sr$) could be the key issue for the traceability of agriculture products.