Food Research International 78 (2015) 302–312

Contents lists available at ScienceDirect

Food Research International

journal homepage: www.elsevier.com/locate/foodres

Adaptability of some French red grape varieties cultivated at two different Portuguese *terroirs*: Comparative analysis with two Portuguese red grape varieties using physicochemical and phenolic parameters

Elisa Costa [a], João F. da Silva [b], Fernanda Cosme [b], António M. Jordão [a,*]

[a] Polytechnic Institute of Viseu (CI&DETS), Agrarian Higher School, Estrada de Nelas, Quinta da Alagoa,Ranhados,3500-606 Viseu,Portugal
[b] CQ-VR — Chemistry Research Centre, School of Life Science and Environment, University of Trás-os-Montes and Alto Douro,Edifício de Enologia,5001-801 Vila Real,Portugal

ARTICLE INFO

Article history:
Received 21 July 2015
Received in revised form 14 September 2015
Accepted 23 September 2015
Available online 26 September 2015

Keywords:
French grape varieties
Individual anthocyanins
Phenolic compounds
Wine regions

ABSTRACT

In the last year's, several French grape varieties have been introduced in different world wine regions, increasing their representation in the world. Consequently, it is important to analyze the adaptability of several red grape varieties from French origin to the other specific 'terroirs' and compare their characteristics with native grape varieties. Thus, the aim of this study was to evaluate the physicochemical and phenolic composition of five French red grape varieties and two Portuguese red grape varieties grown at two different Portuguese wine regions. In general, French (except 'Alicante Bouschet' grape variety) and Portuguese red grape varieties collected in the vineyard located in 'Dão' wine region had higher positive physicochemical characteristics, especially for estimated alcohol degree and titratable acidity. Regarding the phenolic composition, French grape varieties showed significantly higher values of total phenols and flavonoid compounds, especially for the grape samples collected in the vineyard located in 'Dão' region. Thus, for example 'Alicante Bouschet' grape variety showed the highest values for total phenolic (global average value from 0.636 to 0.894 mg g^{-1} of berry) and flavonoid compounds (global average value from 0.584 to 0.834 mg g^{-1} of berry). However, for total anthocyanins it was clear that the two Portuguese grape varieties studied ('Touriga Nacional' and 'Tinta Roriz') showed significantly highest values independently of the wine region considered (global average value ranged from 0.603 to 0.785 mg g^{-1} of berry). Similar tendency was also confirmed by significantly highest global average values for the sum of the glycosylated derivatives, where the values ranged from 0.389 to 0.539 mg g^{-1} of berry, for the two Portuguese grape varieties considered.

© 2015 Elsevier Ltd. All rights reserved.

1. Introduction

Turning to the global area under different grape varieties, the data reveal that the extent of varietal concentration in the world's vineyard has increased nontrivially over the decade to 2010. Half the world's plantings in 2000 were accounted for 21 grape varieties but, by 2010, that total had dropped to 15 grape varieties. At the same time, French grape varieties increased their share of Old World's vineyards, from 20% to 27% over that decade (Anderson & Aryal, 2013). Portugal is not an exception and over the past few years, several French grape varieties have been introduced in different Portuguese wine regions, increasing their representation in some regions, especially in the south of the country (Fig. 1). These observations are in accordance to the data that reveal the occurrence of varietal concentration in the world vineyards. Thus, for example, 'Cabernet Sauvignon' and 'Merlot' have more than doubled their shares to take 1st and 2nd places, and 'Chardonnay' have more than trebled to take 5th place, while 'Syrah' has the 6th place (Anderson & Aryal, 2013). As a result of this situation, for example 'Cabernet Sauvignon' has been widely studied by several authors because it is distributed world-wide (Santos-Buelga, Francia-Aricha, & Escribano-Bailón, 1995; Monagas, Gómez-Cordovés, Bartolomé, Laureano, & Ricardo-da-Silva, 2003; Peña-Neira et al., 2004; Rodríguez-Montealegre, Romero-Peces, Chacón-Vozmediano, Martínez-Gascueña, & García-Romero, 2006; Obreque-Slier, López-Solís, Castro-Ulloa, Romero-Díaz, & Peña-Neira, 2012).

Numerous studies have shown that the phenolic composition of grape varieties depends on several factors, including the intrinsic potential of each grape variety (Jordão, Ricardo-da-Silva, & Laureano, 1998a; Sun, Ricardo-da-Silva, & Spranger, 2001; Monagas et al., 2003; Kallithraka, Mohdaly, Makris, & Kefalas, 2005; Cosme, Ricardo-da-Silva, & Laureano, 2009; Obreque-Slier et al., 2010; Obreque-Slier et al., 2012; Costa, Cosme, Jordão, & Mendes-Faia, 2014), climatic factors, such as sunlight exposition and solar radiation (Jackson & Lombard, 1993; Bergqvist, Dokoozlian, & Ebisuda, 2001; Spayd, Tarara, Mee, & Ferguson, 2002; Downey, Dokoozlian, & Krstic, 2006; Cohen, Tarara, & Kennedy, 2008), soil and environmental characteristics (Mateus, Marques, Gonçalves, Machado, & De Freitas, 2001; Mateus, Machado, & De Freitas, 2002),

* Corresponding author.
E-mail address: antoniojordao@esav.ipv.pt (A.M. Jordão).

http://dx.doi.org/10.1016/j.foodres.2015.09.029
0963-9969/© 2015 Elsevier Ltd. All rights reserved.

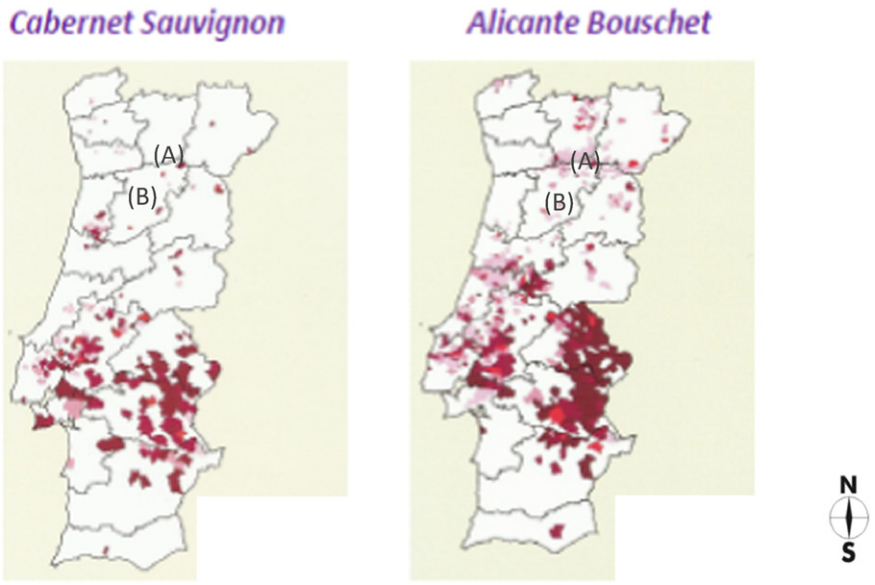

Fig. 1. Distribution of 'Cabernet Sauvignon' and 'Alicante Bouschet' grape varieties in the different Portuguese regions (from IVV, 2011). (A) — 'Douro' region; (B)—'Dão' region.

cultural practices (Jordão, Ricardo-da-Silva, & Laureano, 1998b; Ollé et al., 2011) and the degree of grape ripeness (Jordão, Ricardo-da-Silva, & Laureano, 2001; Ó-Marques, Reguinga, Laureano, & Ricardo-da-Silva, 2005; Obreque-Slier et al., 2010; Obreque-Slier et al., 2012).

In general, the average concentration of total phenolic compounds is around 2178.8 mg g^{-1} of gallic acid equivalent in seeds, 374.6 mg g^{-1} of gallic acid equivalent in skins, and 23.8 mg g^{-1} of gallic acid equivalent in pulps (Pastrana-Bonilla, Akoh, Sellappan, & Krewer, 2003). Phenolic composition of red grape varieties (anthocyanins, flavonols, catechins, and other flavonoids) is an increasingly important parameter in wine quality assessment, since they are responsible of most wine sensory characteristics, namely color and astringency, it is important to know the behavior of each grape variety on a specific 'terroir'. Thus, several authors reported the phenolic composition of different red grape varieties cultivated in different countries. For example, Yang, Martinson, and Liu (2009) analyzed the total phenolic content of 14 different wine grapes (including two French grape varieties) and reported values that ranged between 201.1 and 424.6 mg of gallic acid equivalents 100 g^{-1} of grapes, while Núñez, Monagas, Gomez-Cordovés, and Bartolomé (2004) reported for 'Graciano', 'Tempranillo' and 'Cabernet Sauvignon' grape varieties values of total phenols that ranged from 16.5 to 29.9, from 18.2 to 29.1 and from 11.4 to 21.2 g gallic acid kg^{-1} of skin, respectively.

Several studies have been made in some Portuguese wine regions on the phenolic composition of diverse grape varieties (Jordão et al., 1998a; Mateus et al., 2002; Dopico-García et al., 2008; Cosme et al., 2009). However, comparative information on the phenolic composition of Portuguese and French red grape varieties produced simultaneously in two Portuguese wine regions ('Douro' and 'Dão') are scarce in the literature.

Thus, in order to deepen the knowledge of the phenolic potential of Portuguese and French red grape varieties, the present study aimed to evaluate the physiochemical and phenolic composition of seven red grape varieties (five French and two Portuguese) grown at two experimental vineyards, one located in 'Douro' region and the other located in the 'Dão' region. This research will contribute to increase the knowledge of the adaptability of several 'international' red grape varieties (from French origin) in the specific Portuguese *terroir* and compare their characteristics with two important traditional Portuguese red grape varieties ('Touriga Nacional' and 'Tinta Roriz'). In addition, the present work expands the knowledge of the red grape varieties analyzed, giving more information for a correct planning and management of the winemaking operations.

2. Experimental

2.1. Grape samples

Five French and two Portuguese red grape varieties (*Vitis vinifera* L.), were harvested at technological maturity with good sanitary conditions in two vintages (2010 and 2011), from 6-year-old grapevines in two experimental vineyards at northeast of Portugal, one located in 'Douro' region and other in 'Dão' region. Grape samples (samples of 200 berries in triplicate) were picked randomly in duplicate from twenty different plants of each grape variety studied. Each grape variety sample was collected from all possible locations with difference in height and exposure to sunlight. All grape samples were kept frozen at −20 °C until processing. The French red grape varieties studied were: 'Alicante Bouschet', 'Cabernet Sauvignon', 'Merlot', 'Pinot Noir' and 'Syrah' while the Portuguese red grape varieties evaluated were: 'Tinta Roriz' and 'Touriga Nacional'.

2.2. Agronomical characteristics of grape varieties

According to IVV (2011), the general agronomical characteristics of the different red grape varieties studied are the following:

'Touriga Nacional' is a very vigorous vine and it is usually trained on the Guyot systems, and needs severe pruning to keep it under control. This grape variety shows a good adaptation to the great diversity of soils and is not particularly sensitive to all the most common diseases and pests. 'Tinta Roriz' is an early variety and the vines are very vigorous and productive and adapt well to different climates and soils, although it prefers hot, dry climates on sandy or clay-limestone soils. 'Alicante Bouschet' is an early-average grape variety and the vine prefers medium density cultivation systems with medium or short pruning. In addition, this grape variety shows a good tolerance to downy and powdery mildew. 'Cabernet Sauvignon' vines show a high vigor and adapts well to almost all vine-growing soils. This grape variety also shows a considerable resistance to downy mildew, *botrytis* and acid rot. 'Merlot' vine shows an average vigor and it's a very versatile vine that adapts to almost all soils. The grape clusters are sensitive to downy mildew, *botrytis* and acid rot but resistant to powdery mildew. 'Pinot Noir' vines show a low vigor and prefer hilly and fresh soils with average or poor fertility. This grape variety also shows resistance to diseases and adversities and high susceptibility to *botrytis* and acid rot. 'Syrah' vine, although it is a rather early vine, it prefers warm and dry climates to optimize

Download English Version:

https://daneshyari.com/en/article/4561322

Download Persian Version:

https://daneshyari.com/article/4561322

Daneshyari.com