SHORT COMMUNICATION

Antioxidant capacity, radical scavenger activity, lipid oxidation protection analysis and antimicrobial activity of red grape extracts from different varieties cultivated in Portugal

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The aim of this study was to investigate the antioxidant capacity, radical scavenger activity, lipid oxidation protection and antimicrobial activity of grape extracts from 12 different red grape varieties cultivated in Portugal. The mean values of total phenolic content quantified in grape extracts varied from 833.7 to 2005.6 mg/L gallic acid. Antioxidant capacity results showed different values for each grape variety ranging from 3.96 to 32.96 mm/L Fe(II). The scavenger activity values ranged from 15.99% to 54.82% for the superoxide radical and from 11.79% to 29.67% for the hydroxyl radical. The grape extracts with the highest antioxidant capacity had a positive effect on the lipid oxidation protection and induced low peroxide values in butter samples. Finally, concerning antimicrobial activity, grape extracts from Touriga Nacional and Tinta Roriz grape varieties had significant antimicrobial activity, especially notable for total mesophilic aerobics.

Keywords: antioxidant capacity; antimicrobial activity; grapes; lipid oxidation; scavenger activity

1. Introduction

Grape (Vitis vinifera L.) has been appreciated for its rich content of phenolic compounds such as gallic acid, catechin, anthocyanins and resveratrol, and a wide variety of procyanidins (Jordão et al. 2001; Vincenzi et al. 2013).

In recent years, several authors have reported the phenolic composition and antioxidant capacity of several red and white grapes from different fractions, varieties and countries (Breksa et al. 2010; Xu et al. 2010). However, the biological properties and the potential lipid oxidation protection of grapes have not been extensively studied, and a lack of information about the antioxidant activities of the different red grape varieties cultivated in Portugal has been detected.

Thus, the purpose of this work was to investigate the antimicrobial activity, antioxidant capacity and lipid oxidation protection analysis of grape extracts obtained from 12 different red grape varieties cultivated in Portugal.

2. Results and discussion

The data in Table 1 show the total phenols, antioxidant capacity and scavenger activity quantified in the red grape extracts studied. Total phenolic compounds, expressed as equivalent of gallic acid, ranged from 833.7 to 2005.6 mg/L with an average of 1341.0 mg/L. The highest
The concentration of total phenols was detected in Touriga Nacional (1957.0 mg/L) and Tinta Roriz (2005.6 mg/L) grape extracts, while Mourisco Tinto (833.7 mg/L) and Cabernet Sauvignon (890.9 mg/L) grape extracts showed the lowest values.

The antioxidant capacity (FRAP) ranged from 3.96 mmol/L Fe(II) in Cabernet Sauvignon extracts to 32.96 mmol/L Fe(II) in Touriga Franca extracts. Taking into account individual grape extracts analysed, Touriga Franca, Syrah, Touriga Fémea, Alicant Bouschet and Castelão showed higher antioxidant capacity (ranging from 12.81 to 32.96 mmol/L Fe(II)), while Cabernet Sauvignon, Mourisco Tinto, Pinot Noir, Baga, Touriga Nacional and Tinta Roriz showed lower antioxidant capacity (ranging from 3.96 to 7.73 mmol/L Fe(II)).

In relation to hydroxyl radical scavenger activity (HRSA) and superoxide radical scavenger activity (SRSA), data revealed that the scavenger activity tendencies were similar to those obtained for the total antioxidant activity values. Thus, extracts from Touriga Franca, Syrah, Tinta Roriz and Touriga Fémea samples had in general higher scavenger activity values than extracts from other grape varieties.

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Table 1. Total phenols, antioxidant capacity (FRAP method) and scavenger activity (HRSA and SRSA methods) quantified in different red grape extracts.

| Grape varieties extracts | Total phenols (mg/L)* | FRAP (mmol/L Fe(II)) | HRSA (%) | SRSA (%) |
|--------------------------|-----------------------|----------------------|----------|----------|
| Mourisco Tinto           | 833.7** ± 7.2         | 4.06 ± 0.21          | 22.72 ± 0.18 | 37.62 ± 0.28 |
| Touriga Franca           | 1167.3b ± 4.2         | 32.96 ± 0.32         | 29.67b ± 0.03 | 54.82b ± 0.52 |
| Touriga Nacional         | 1957.0f ± 14.4        | 6.58 ± 0.03          | 20.53 ± 0.17 | 48.44° ± 1.15 |
| Syrah                    | 1293.5d ± 2.6         | 24.87 ± 0.08         | 28.22b ± 0.01 | 51.80b ± 0.08 |
| Pinot Noir               | 1271.0d ± 3.6         | 5.03 ± 0.17          | 24.32b ± 0.13 | 43.95d ± 0.2  |
| Baga                     | 1518.7 ± 27.8         | 5.95a ± 0.02         | 12.66d ± 0.05 | 46.55c ± 0.25 |
| Tinta Roriz              | 2005.6b ± 10.4        | 7.73a ± 0.28         | 25.55b ± 0.32 | 44.59c ± 0.01 |
| Castelão                 | 1585.9b ± 15.3        | 12.81b ± 0.10        | 19.88c ± 0.34 | 47.15b ± 0.16 |
| Merlot                   | 1203.4b ± 0.3         | 5.46a ± 0.02         | 14.44b ± 0.19 | 24.23d ± 0.52 |
| Cabernet Sauvignon       | 890.9a ± 0.9          | 3.96a ± 0.07         | 11.79f ± 0.11 | 15.99° ± 0.13 |
| Touriga Fémea            | 1378.0d ± 4.5         | 23.98a ± 0.05        | 22.80a ± 0.16 | 43.11d ± 0.59 |
| Alicant Bouschet         | 987.2a ± 2.9          | 15.11d ± 0.28        | 20.60a ± 0.36 | 40.57d ± 0.95 |
| AV                       | 1341.0 ± 7.8          | 12.37 ± 0.13         | 21.0 ± 0.17   | 41.56 ± 0.40  |
| CV                       | 0.58                  | 1.09                 | 0.80       | 0.97       |
| R                        | 833.7–2005.6          | 3.96–32.96           | 11.79–29.67 | 15.99–54.82 |

Note: AV, average value; CV, coefficient of variation; R, range.
* Values expressed as gallic acid equivalents.
** Values are given as the mean ± SD of the two experiments; comparison of means was performed by the least significant difference (LSD) method; means followed by the same letter for each parameter in column are not significantly different (p < 0.05).
3. Conclusions

Our study demonstrates that grape extracts present important antioxidant, scavenging, antimicrobial and lipid oxidation protection activities, corroborating the notion of grapes as a healthy food and a potential source of antioxidant and antimicrobial drug substances.

Supplementary material

Experimental details relating to this article are available online.

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