Antioxidant properties of the phenolic fraction of Sardinian wines

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Abstract

The aim of this study was to compare the antioxidant capacities of the phenolic fraction of wines from Vitis vinifera grapes cultivated in Sardinia (three native: Cannonau, Malvasia, Vermentino and three non-native types: Cabernet-sauvignon, Chardonnay and Sauvignon), in simple in vitro systems. All the extracts showed a significant antioxidant activity, being the native wine extracts the most active in inhibiting the lipid peroxidation process.

Introduction

The antioxidant potential of wine, one of the key elements of the Mediterranean diet, is very high, due to the presence of phenolic compounds, whose many biochemical and pharmacological activities are related to their antioxidant properties [1]. Experimental evidence suggests that ingestion of antioxidant compounds inhibits oxidative stress associated diseases [2]. We evaluated the antioxidant effect against the lipid peroxidation process of the phenolic fraction of wines from grapes cultivated in Sardinia during linoleic acid and cholesterol autooxidation and in TBH treated intestinal Caco-2 cells.

Materials and methods

The wine extracts were prepared as methanolic extracts and analysed as previously described [3]. The main phenolic compounds quantified are shown in Tab. 1. Linoleic acid (LN) autooxidation was conducted in dry state, at 37°C for 32 h, as previously described [4]. Cholesterol oxidation was conducted in dry state, at 140°C for 90 min, as previously described [5]. Analyses of pure lipids and major oxidation products were carried out with a HPLC-DAD [4,5]. For experimental studies differentiated Caco-2 cells (from ECACC, Salisbury,Wiltshire UK), with enterocytic features,
at passage 45-60, were plated at a density of about 1x10^5/ml. Caco-2 cells were pretreated with the different concentrations of wine extracts (25-100μg/ml; 30min) and treated with TBH (2.5mM; 2h). The extent of oxidation was evaluated as malondialdehyde (MDA) formation, measured with the TBARS method [5]. Statistical significance was assessed by analysis of variance ANOVA, using the software Graph Pad INSTAT (n=9).

Results

During the autoxidation of LN (Fig.1) wine extracts showed a significant inhibition of the oxidation process from the concentration of 5μg.

The extracts of native cultivars (Cannonau, Malvasia, Vermentino) exerted total protection from 10μg; the others from 25μg. The extracts of native cultivars were more effective also in preserving cholesterol from oxidative degradation, exerting a significant protection from 5μg (Fig.2A). All the extracts showed total protection from the concentration of 10μg and prevented the total formation of 7-ketooxysterol (7-keto) from a concentration of 10μg (Fig.2B). Caco-2 cells (Fig.3) pretreated with the extracts of native cultivars showed a significant reduction of MDA production from the concentration of 25μg/ml.

Discussion

All the tested extracts exerted a significant antioxidant action, inhibiting the lipid peroxidation process both in chemical systems and in intestinal cells. The extracts from native cultivars, showed higher efficacy. The activity of the phenolic extracts seems to be proportional to the total phenolic content but also to the relative proportions between the different classes of compounds and it is the result of an action of synergy between the various constituents.

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References