Antioxidant Activity of Pistachio Hulls

Sir:

Worldwide trends in the preservation of food and cosmetic products toward the use of natural additives and polyphenolics compounds found in plant materials have received considerable attention. Health benefit claims of plant phenolics have been widely discussed in scientific societies—the greater part of these claims being related to their antioxidant activity (1,2). The pistachio nut is one of the principal tree nuts of the Middle Eastern region and is a significant agricultural export of some of the countries in this area. For example, the amount of pistachio exported from Iran in the year 2001 was reported to be over 100,000 metric tons, of which the Kerman variety accounted for around 89% of the total (3). In spite of all efforts to find new sources of polyphenolics, to our knowledge there is no literature documenting the presence of pistachio hull phenolics and their antioxidant activity (4). Here we report pistachio hulls as a novel source of phenolics with antioxidant activity. Methanol, ethanol, and different aqueous solutions of these organic solvents were used to extract the phenolics. The Folin–Ciocalteau reagent was used to measure the total phenolic compounds of the hulls (5). The antioxidant activity of the solvent extract was determined by the thiocyanate method (6). Aqueous ethanol solution in an ethanol/water ratio of 75:25 (vol/vol) gave the highest yield of phenolic extract from Kerman hulls (19.8 mg/g dried hulls) (Table 1). This extract exhibited strong antioxidant activity, comparable with that of the synthetic antioxidant BHA (i.e., 98 vs. 99%) (Fig. 1). The extract from Damghan hulls obtained using the same aqueous ethanol solution showed results similar to those of the Kerman variety (see Table 1). HPLC analyses of the extracts showed that the major phenolic was gallic acid; the amount was estimated to be 79 and 82% for the Damghan and Kerman varieties, respectively. In comparison, the concentration of phenolic compounds in grapes, a major source of polyphenols among fruits and vegetables, is in the range of 260–920 mg/kg (7). Grape seed extract also has been found to contain several flavan-3-ols and gallic acid (8). Grape bagasse, a by-product of the grape juice and wine industries, has been found to have high concentrations of total phenolics (3). Agro-industrial residues (i.e., pistachio hulls) pose a considerable environmental threat; however, if they are a potentially good source of phenolics, then by extracting phenolics from this type of agro-residues, three goals may be achieved: (i) They can be introduced as a new source of natural antioxidants; (ii) since many antioxidant phenolics have antimicrobial properties, the agro-residues so obtained may become a suitable source of antimicrobial compounds; and (iii) by removing phenolics from the hulls, there would be less environmental impact, since the biodegradation of treated agro-residues would be enhanced significantly. This work therefore suggests that because the ethanolic extracts from the Kerman and Damghan varieties of pistachio hulls have a strong antioxidant activity, the hulls could become a good source of natural antioxidants.

TABLE 1
Yield of Phenolics from Pistachio Hulls Extracted with Ethanol, Methanol, and Different Aqueous Dilutions of These Solvents (mg per g dried hulls)[a]

	Pistachio variety	
Solvent	Kerman	Damghan
Ethanol	7.43	7.68
75:25 EtOH/H_2O	19.8	26.77
50:50 EtOH/H_2O	14.65	28.8
Methanol	8.76	23.4
75:25 MeOH/H_2O	15.65	22.93
50:50 MeOH/H_2O	15.51	23.87

[a]The extraction was carried out in four successive steps, and the extracts were pooled to obtain an estimation of the total extractable phenolics.

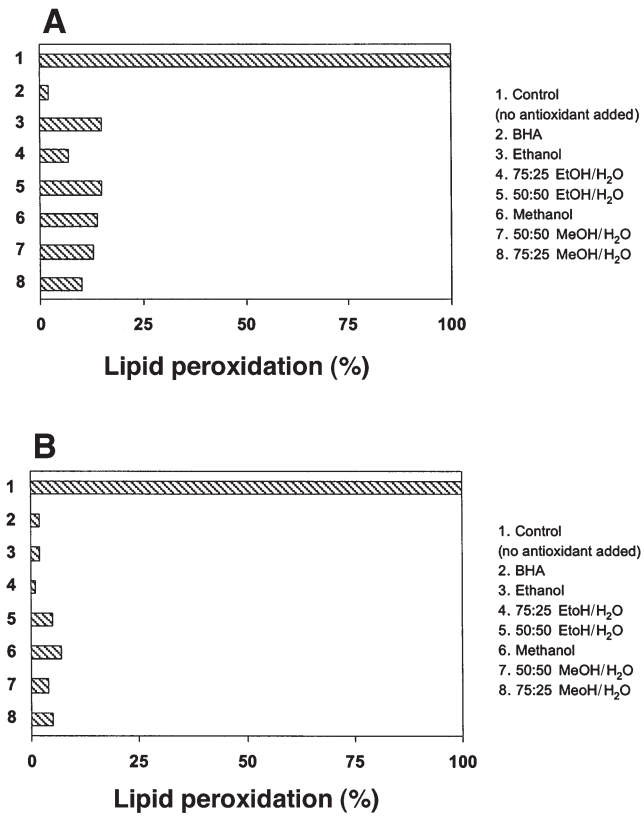

FIG. 1. Antioxidative activities, by the thiocyanate method, of different solvent extracts of Damghan (A) and Kerman (B) pistachio hull samples.

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