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Physical, compositional and sensory differences in nuts among pistachio (*Pistachia vera* L.) varieties

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ABSTRACT

Differences in some physical, compositional and sensory characteristics among eight varieties of pistachio nuts (Aegina, Pontikis, Bronte, Cerasola, Joley, Kerman, Mumtaz and Sirora) from different origins were studied. The evaluated varieties were cultivated under the same field conditions and the dried nuts were utilised. The percentage of split nuts ranged from 93.8% (Sirora) to 80.2% (Aegina), the 10-nut weight from 15.23 g (Kerman) to 9.7 g (Cerasola), the kernel/nut percentage from 57.24% (w/w) (Pontikis) to 47.08% (w/w) (Kerman) and the ratio of length/width of nut from 1.81 (Aegina and Joley) to 1.56 (Mumtaz). Colour measurements showed the highest shell L^* (80.26) for Kerman, the lowest shell h° (81.19) for Mumtaz, the lowest kernel membrane h° (24.43) for Cerasola, and the highest h° (107.23) on the inner kernel of Aegina. Crude protein content varied between 21.87 (Cerasola) and 18.99% d.w. (Joley), and the fat between 57.62 (Joley) and 49.79% d.w. (Cerasola). Among the major fatty acids in kernel oil, oleic ranged from 67.86% in Cerasola to 51.6% in Kerman, linoleic from 27.03% in Kerman to 11.56% in Pontikis and palmitic from 10.24% in Kerman to 8.54% in Cerasola. Linolenic acid was highest in Kerman (0.5%). Myristic, palmitoleic, stearic, vaccenic, arachidic and gondoic acids were also found in all samples. Negative and significant linear correlations were found between oleic and linoleic, and between mono- and poly-unsaturated fatty acids. Most of the physical and compositional characteristics measured were affected significantly by variety. Panelists preferred nuts of big size with a naturally yellowish shell colour. Visual differences in kernels were not significant, whereas Kerman, Sirora and Cerasola gained the panelists' overall flavour preference among the varieties evaluated.

1. Introduction

Pistachio (*Pistachia vera* L.) is one of the most important tree nuts. It can be cultivated in dry and hot areas and under saline conditions (Metheney et al., 1998). Iran, the USA, Turkey, Syria, Italy and Greece are the main producers of pistachio nut, and the global production increases steadily (FAOSTAT, 2008). A tendency for increasing nut consumption is attributed to their nutritional components, including sterols, vitamins, minerals, fatty acids and phenolic compounds (Brufau et al., 2006; Ryan et al., 2006; Venkatachalam and Sathe, 2006; Miraliakbari and Shahidi, 2008) and their antioxidant and antiproliferative properties (Yang et al., 2009).

Pistachio nuts are sold shelled or in-shell, mainly dried or roasted with salt, while the kernels can also be used in confectionery and cookery for their flavour, colour (green or yellow) and for pistachio nut paste (Gamli and Hayaoglu, 2007). In consequence, the physical quality characteristics of fresh de-hulled nuts and kernels include their dimensions and weight, percentage of split nuts, and ratio of kernel/nut (w/w) (Kallsen et al., 2009; Seferoglu et al., 2006). Both variety and drying conditions influence the moisture content, nut and kernel dimensions (Hsu et al., 1991; Razavi et al., 2007), shell appearance, split percentage and compositional changes (Kashani Nejad et al., 2003). Kernel colour is also a characteristic of quality and reflects compositional differences, but reports on colour are relatively limited (Bellomo and Fallico, 2007; Kunter et al., 1995; Seferoglu et al., 2006; Zakynthinos and Rouskas, 1994).

Most studies of pistachio were carried out on fresh kernels (Kucukoner and Yurt, 2003; Satil et al., 2003; Seferoglu et al., 2006) or kernels dried under unknown conditions (Agar et al., 1998b; Kamangar and Farsam, 1977). There are only a few cases where the drying conditions have been reported (Kader et al., 1982; Okay, 2002). It was shown that the particular conditions of either drying (Gazor and Minaei, 2005; Kashani Nejad et al., 2003) and/or storage of the dried product (Maskan and Karatas, 1999) had an impact on compositional changes in the kernels. However, drying can be

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