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Rosemary Aromatization of Extra Virgin Olive Oil and Process Optimization Including Antioxidant Potential and Yield

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ABSTRACT

Aromatization of olive oil especially by spices and herbs has been widely used technique throughout the ages in Mediterranean diets. The present study was focused on aromatization of olive oil by rosemary (*Rosmarinus officinalis* L.). Aromatization process was optimized by response surface methodology as a function of malaxation's conditions (temperature and time). According to authors' best knowledge it was first time for examination of oil yield performance with antioxidant potential and pigments under effect of aromatization parameters. For all oil samples, values of the free acidity, peroxide, K_{232} and K_{270} as quality parameters fell within the ranges established for the highest quality category "extra virgin oil". Oil yield (mL oil/kg olive paste) changed from 158 to 208 with respect to design parameters. Total phenolic content and free radical scavenging activity as antioxidant potential of olive oil samples were varied in the range of 182.44 – 348.65 mg gallic acid equivalent/kg oil and 28.91 – 88.75 % inhibition of 2,2-Diphenyl-1-picrylhydrazyl-(DPPH•), respectively. Total contents of carotenoid, chlorophyll and pheophytin a as pigments in oil samples were found to be in between 0.09 – 0.48 mg carotenoid/kg oil, 0.11 – 0.96 mg chlorophyll/kg oil, 0.15 – 4.44 mg pheo α/kg oil, respectively. The proposed models for yield, pigments and antioxidant potential responses were found to be good enough for successful prediction of experimental results. Total phenolics, carotenoids and free radical scavenging activity of aromatized olive oil and oil yield were maximized to gather and optimal conditions were determined as 25°C, 84 min, and 2 % (Rosemary/olive paste; w/w).

Introduction

Virgin olive oil is a popular product widely used throughout the ages in the Mediterranean cuisine and is appreciated for its delicious taste and aroma, as well as for its nutritional benefits (Moldão-Martins et al., 2004; Morales et al., 2000; Stark and Madar, 2002) primarily related to its balanced fatty acid composition and the presence of considerable amounts of natural antioxidants (Moldão-Martins et al., 2004). Its preventive and healing actions on cardiovascular diseases, certain types of cancer, and other chronic diseases have been associated with antioxidant potential of olive oil (Boskou et al., 2006; Jacotot, 1994).

In recent years, consumers have focused on new foods including different spices and herbs because of new trends in local and traditional markets. Especially virgin olive oils flavored with spices or herbs have been taken increasing interest because of their health promoting effect with antioxidant potential against oxidation reactions beside of flavoring properties (Boskou et al., 2006). In order to produce flavored olive oil (generally virgin olive oil), fresh or dried vegetables, herbs, spices or other fruits and/or their aroma, essential oils and extracts can be added in olive oil in order to improve the nutritional value, enrich the sensory characteristics and increase antioxidant potential or shelf-life (Lagouri and Boskou, 1996; Nouhad and Tsimidou, 1998; Tsimidou, 1998).

Rosemary (*Rosmarinus officinalis* L.) belonging to the family of Lamiaceae, is one of the common herb for olive oil aromatization, especially in the Mediterranean region. High popularity of rosemary is implicated in health beneficial effect, nutritional potential with high antioxidant activity (Chipault et al., 1952), thus researchers and consumers' interests have been increasing and it is focused on in different studies. Damechki et al. (2001) investigated the phenolic compound potential of aromatized olive oil and found that oil aromatized by rosemary had higher phenolic content than the non-aromatized ones. Moreover, the oxidative stability of oil products was studied and results indicated that aromatized olive oil displayed better stability compared to oil processed without aromatic plant (Rached et al., 2014; Tsimidou, 1998).

Flavored or aromatized olive oils have been generally produced as boutique and carried out through different techniques. Infusion of plant material, mixing of essential oil and aromatic plant extract with oil are available common techniques used in flavored olive oil industry. These techniques include some disadvantages like turbidity, over dosage (Gambacorta et al., 2007), co-