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A New Alternative for Edible Olive Oil

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Abstract: In the present study we report a new edible oil extracted from fruit of wild olive (*Olea cuspedata*). Samples of olive fruits were collected from hilly areas of Kotli Sattian, (District Rawalpindi) and were analyzed to evaluate quantity and quality of this newly extracted olive oil. Results indicates that concentration level of oil in the fruits of wild olive (34.11-36.69%), oleic acid (61.86-66.37%), Linoleic acid (20.19-21.6%), Linoenic acid (1.36-1.59%), Polyphenol (344.07-352.86 mg kg^{-1}), peroxides (7.66-8.32 meqO_2 kg^{-1}) and acidity (0.47-0.98 meq O_2 kg^{-1}) was found. The levels of these components were comparable with the level obtained from the fruits of cultivated olive and standard values reported for olive oil in the literature. Therefore it was observed that quality of new olive oil obtained from fruits of wild olive was comparable with olive oil (available in market) consumed by human population through out world. It is expected that this new oil will economically cheaper as compared to edible oils available in the market. This study will not only help to improve the nutritional values of existing oils but also provide a oil with lower coast.

Key words: Wild olive, essential oils, fruits, comparison, extraction

INTRODUCTION

The olive is a member of the family *Oleaceae*, which comprises of thirty species such as wild olive, jasmine, ash, lilac and privet etc. The well known specie is *Olea europaea*, which is cultivated for its plump, fleshy, oil containing fruits. There are 1000 varieties including *Olea cuspedata*, wild species found in forest of subcontinents and included in the World Catalogue of Olive (IOOC, 2004). In Pakistan *Olea cuspedata* is found in the hilly areas of Murree, Kotli sattian, Khutta, Mensara Hairpure and Azad Kashmir. It is also found in the similar area of sub contents an d other parts of world (Kafatos, 1995)

Pakistan spends over Rs. 45 billion every year to import edible oil. The per capital consumption of edible oil in Pakistan is the highest (approximately 13 kg per person) as compared to other countries of the world. Pakistan produces only 30% of edible oil and to fulfills its requirements import about 70% of edible from other countries (GOP, 2000). In the years 2004 the total availability of oil from all sources was up to 1.763 million tones (GOP, 2004). Normally sunflower, canola, soybean and olive oils are widely used as edible oil due to their high nutrients contents and easily digestibility in human body. Essential fatty acids like oleic acids and linoleic acids provides sufficient amount of energy to the human body after consumption. Scientists all over the world are looking for new resources for edible oils having not only good nutritional values that also provide economic benefits to public.

There are about 8.7 million ha (21.5 million acres) supporting a total of almost 750 million olive trees in 33 countries of the world. The Mediterranean Basin accounts for 97% of area planted and slightly more in terms of volume production. Spain's production of olive oil, at just over a half million tons followed by Tunisia and Turkey, both under 100,000 tons, While the three largest producers are also the largest consumers, The United States, with only two percent of production, is the world's largest importer, at 50,000 to 60,000 tons annually (Kafatos, 1995; IOOC, 1992). Although olive oil accounts only for 3% of the world market, however, it play major role in oil and fat supply to the people in the areas of production. The market share of extra virgin olive oil is 37% in Brazil and Australia, 50% in Japan, 54% in United States and 61% in Canada. The percentage of extra virgin olive oil in total oil sales is however, increasing year by year.

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Basically olive oil is a natural juice, which preserves the taste, aroma, vitamins and properties of the olive fruit. There are at least 4 types of olive oil (i) Extra virgin oil, considered to best least processed from olive fruits (ii) Virginal oil, obtained from the second pressing (iii) Pure oil, obtained from processing such as littering (iv) Extra light oil, under goes considerable processing. Olive oil is a complex compounds made of fatty acids, vitamins, volatile compounds, soluble components and microscopic bits of olive. However, it was reported elsewhere that olive oil contained oleic acid between 83% of all fatty acids. The free acidity values must be less than 0.8%, where as polyphenols (responsible for oil taste) concentration >200 and <500 mg kg^{-1}. The peroxides level must be 12 meqO_2 kg^{-1}, however, extra virgin olive oil must have high contents of polyphenols and oleic acids but peroxides concentration and free acidity level will be low.

Nutritionally olive oil contained healthful fats that may provide 120 calories per tablespoon (nine calories per gram) to the human body after digestion. However, it was suggested that fats should not constitute more than 30% of daily caloric intake. Furthermore it was reported by some scientist that olive oil is free of cholesterol and do not have adverse effects on human body. Therefore, in order to increase the number of edible oil and reduce the prices of oils in the markets. It is essential that new raw material should be identified. Some of wild material has potential to increase oil production, so need is to develop new and improved olive cultivars based on selection and oil analysis (Sedgley, 2000). The wild materials found in the surrounding areas of Rawalpindi/Islamabad is not present being used for any purposes. While million and million tones of the fruit of wild olive (*Olive cuspedata*) is going to waste every years. Wood of this plant is being used for domestic purposes, which are not affected, by insect or termites up to 100 years.

Keeping in the view the facts given above present study was undertaken with following aim and objectives.

- To evaluate the quality of edible oil in fruit of wild olive (*Olea cuspedata*)
- To compare the levels of these essential components in edible oils (both cultivated and wild olives)
- Last but not least to assess the economical values of new edible oil

MATERIALS AND METHODS

In order to explore new sources of edible oil, the present study was conducted to evaluate the quantity and quality of oil in fruit of wild olive and its comparison with cultivated olive oil consume by public as edible oil. Samples of the ripe fruits of wild olive (*Olea cuspedata,* locally known as Kaho) were collected from hilly areas of Kotli Sattian, District, Rawalpindi. Where as fruit of cultivated olive were purchased from markets of Rawalpindi and Islamabad. The chemical analysis were carried out in the Biochemistry laboratory of University of Arid Agriculture, Rawalpindi. This study was conducted during August 2004 to June 2005.

Collection of samples: Seventy-five samples of wild olive seeds were collected from 75 wild olive plants (*Olea cuspedata*) from 5 different locations of uniform type of hilly areas. Total 50 g of fresh fruits (per tree) were collected in the fine plastic bags dully labeled with sample numbers, date and code of locations. Similarly, 15 samples of cultivated olive fruit were purchased from markets of Rawalpindi and Islamabad. The samples soon after collections were transported to laboratory for further process.

Preparation of samples: Fruit samples of wild olive and olive were subjected to sun dried for a week followed by oven drying at 105°C for 24 h. The dried fruits were grounded in to powder form. Total 2 g of fruit sample and added 100 mL of petroleum ether were boiled for 4 h in soxhlet apparatus for collection of ether extract of this materials (Harwood, 1999; Guinda *et al*., 2003). After evaporation of solvent crude oil was obtained and percentage of oil in fruit of wild olive and cultivated olive was calculated separately.

Calibration curve: Suitable amounts of oil samples were dissolved in Tetrahydrofuran (THF) to give a final concentration of 5 mg mL^{-1} and 20 μL of solution was injected in the gas chromatography system. The calibration curve of the standards was obtained by dissolving a suitable amount of polystyrene mixture in 1 mL THF to obtain the concentration of 0.15%. The solution was injected to the Gc system. Three different standards of polystyrene mixtures of varying molecular weight were used.

Chromatography analysis: The elution protocol was design to achieve adequate separation of fatty acids like oleic linoleic, linolenic acids within a reasonable length of time. THF was used as the fluent at a flow rate of 1 mL min^{-1}. Compounds were detected using the UV and RI detectors. Identification based on spectral characteristic of compounds. Percentage composition of

essential fatty acids (oleic, linoleic and linoleic acids) were determined by using gas chromatographic analysis as explained by Satyabrata *et al*. (1988) and Sedgley (2000). Furthermore for fatty acids methyl esters was prepared and analyzed by capillary column gas chromatography was carried out.

Identification of peaks: The order in which the fatty acid methyl esters appear on the chromatogram was taken as direct function of carbon atoms. The unsaturated esters were eluted after the corresponding esters and their elution was direct function of the number of double bonds. Mostly trans fatty acids esters are eluted before the corresponding cis isomer. Therefore individual methyl esters were then identified by their retentions times and comparing the peaks with the peaks obtained for standards.

Quantitative analysis: The percentage of each fatty acid was calculated from the ratio of the area under the corresponding peak to the sum of the areas.

Further more the level of polyphenol in the fruits of wild olive and olive was determined by using the method of Singleton *et al*. (1999). Where as free acidity level and peroxides concentration was determined by using the method reported by EC Regulation (1991).

RESULTS AND DISCUSSION

During present study the level of essential oil (composition of fatty acids) oleic linoleic and linolenic acids in the fruits of olive and wild olive was determined and the results are presented in Fig. 1-4. Results indicates that levels of total oil, oleic linoleic and linolenic acids, polyphenol, free acidity and peroxides in wild olive oil fruits are comparable to the levels of these parameters obtained from cultivated olive fruits.

Olive oil: It was observed that level of total oil in different samples wild olive (34.11-36.69%) as compared to (35.1-65.1%) found in olive (Fig. 1 and 4). The result of oil obtained in present study was comparable with results of oil reported by Sedgley (2000). Therefore it was assumed that this variety of olive can supply sufficient amount of edible if use for consumption and maximum oil content can be obtained to improve the deficiencies of edible oil in future (Frank *et al*., 1986). By comparing percentage of oil in wild and cultivated olive it was cleared that both varieties are closed to each other as long as total oil contents is concerned (Fig. 4). Olive oil is well know edible oil and consumes by public to get sufficient energy for metabolic reactions.

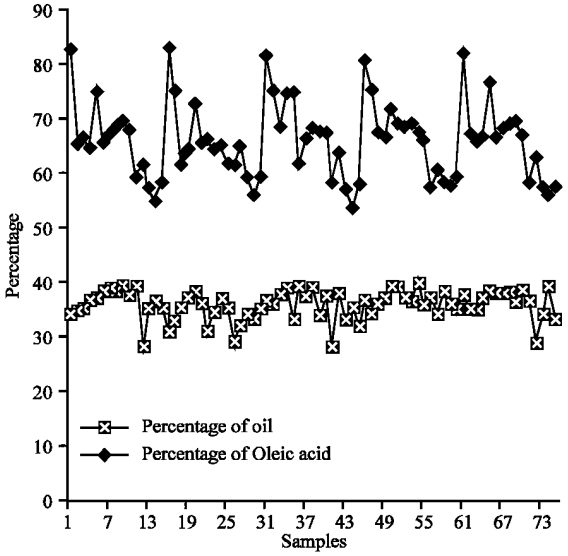

Fig. 1: Percentage of oleic acids and oil in wild olive's fruits

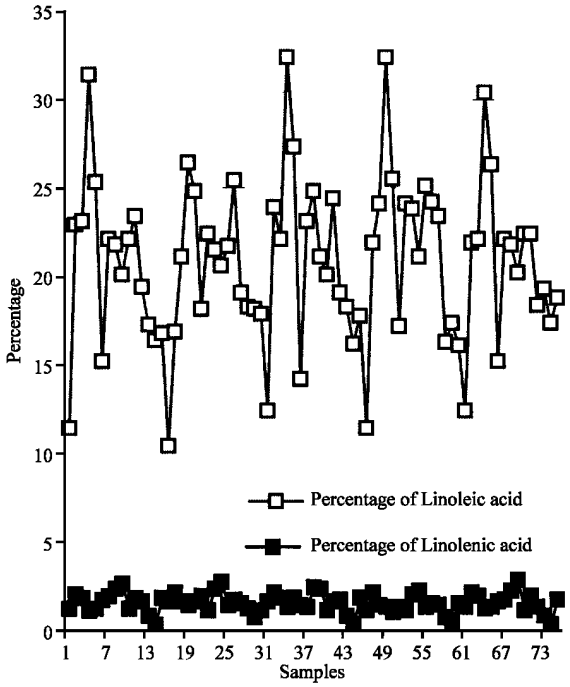

Fig. 2: Percentage of linoleic and linolenic acids in wild olive's fruits

Oleic acids: The concentration level of oleic acids found in the fruits of wild olive (61.86-66.37%) and cultivated olive (57.1-97.3%) respectively (Fig. 1 and 4). The values of oleic acid obtained in the present study from both varieties of olives are comparable to the standard values of oleic acids report for olive oil in the literature

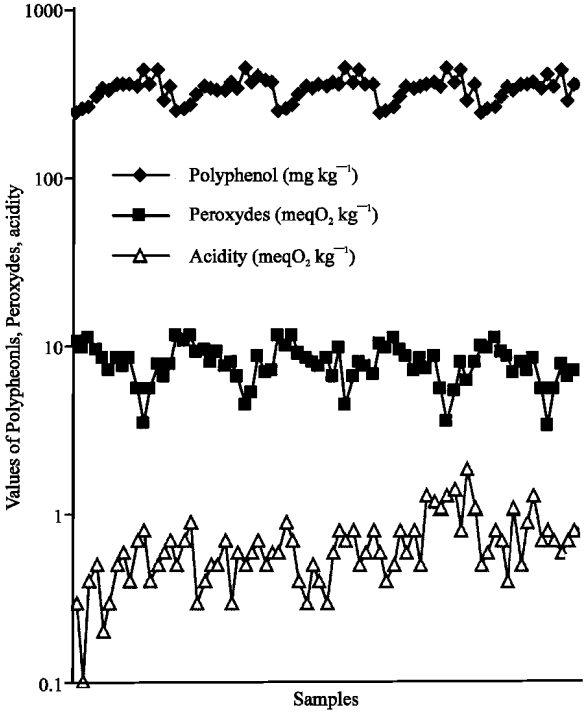

Fig. 3: Polyphenols, peroxides and acidity in fruit of wild olives

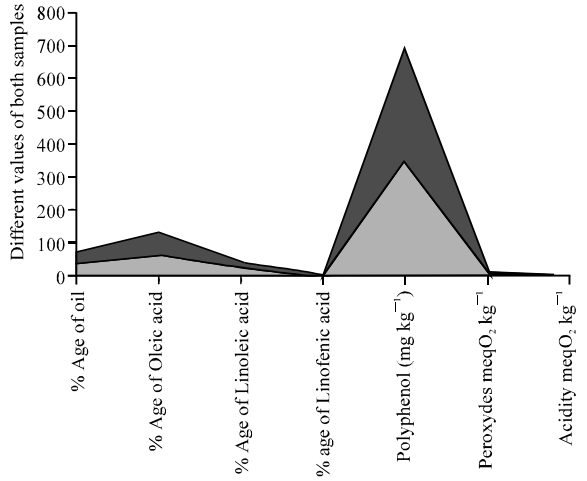

Fig. 4: Comparison of mean values of different samples of *Olea europea* and *Olea cuspedata* (top to bottom)

(IOOC, 1992). Furthermore values of oleic acid obtained from fruits of wild olive (*Olea cuspedata*) shows that this fruit have potential to supply essential fatty acids if refined properly.

The results of oleic acid found in present study was closed to those reported by Guinda *et al.* (2003). Furthermore, the comparison of oleic acid in wild olive and olive indicates that wild olive fruits can be good source of essential fatty acids like oleic which is required for health of human population (Eromocele, 2002).

Linoleic and linolenic acids: The results of linoleic and linolenic are given in Fig. 2. Linoleic and linolenic acid are unsaturated fatty acids present in various oils in different percentages. In present study concentration of linoleic acid is found in wild olive (20.19-21.6%) and in olive (10.4-46.1%) where as the level of linolenic acid in wild olive found was (1.36-1.59%) and olive (1.2-2.7%). Both fatty acids are essential for good quality of oils (IOOC, 2004). The result of linoleic acid found in present study was closed to the results reported by Sedgley (2000).

Polyphenol, peroxides and acidity: Polyphenol is required for taste of edible oils where as peroxides required for oxidations of fats (oils). While free acidity (produce by breakdown of triglycerides) is also consider as essential components of edible oil of olives (Tous and Ferguson, 1996). The results regarding polyphenol, peroxides and acidity is given in the Fig. 3, which indicates that both oils have sufficient amounts of these ingredients.

Wild olive oil vs olive oil: By comparing the results of Total oil, essential fatty acids (oleic, linoleic, linolenic acids), polyphenol, peroxides and acidity in wild olive (Fig. 1-4) with the similar parameters analyzed from cultivated oil fruits (Fig. 4). It was observed that quality of both of these oils are comparable with each other and very less difference in the percentage composition of these parameters are presents in both oils. Therefore it was concluded that regardless of minor difference in percentage composition of these parameters in both oils, fruits of wild olive are easily available from hilly areas in the north of Pakistan. This fruit can be used for extraction of edible in large scales, that should be a cheap source of edible oil. Presently this fruit is not being use for any purposes in any party of this country and huge amount of this fruit is going to be wasted every year. Therefore it is require to use this fruit for extraction of edible oil. This new edible oil will not only help to improve the quality but also help to reduce the prices of existing oils in the market.

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