

**DETERMINATION OF SOME MACRO-MINERALS OF
OLEA EUROPAEA L. GROWING IN PAKISTAN**

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Abstract

Eight olive cultivars, namely Dolece-agogia, Moriolo, Carotina, Leccino, Gemlik, Uslu, Arbequina and Frantio grown in Pakistan were investigated for macro-minerals. The highest levels of calcium (100 mg/kg), sodium (1930 mg/kg), potassium (94 mg/kg) and phosphorus (15.1 mg/kg) in Carotina, Arbequina, Moriolo and Gemlik, respectively were observed. The differences in macro-minerals composition among cultivars of olive may be due to environmental factors in different regions of Pakistan.

Olive (*Olea europaea* L.) belongs to Oleaceae family comprising 30 genera with 600 species (Muzzalupo *et al.* 2014). Olive is a small, ever green tree, averaging 20 feet or more in height. It has many thin branches with opposite branchlets and shortly-stalked, opposite, lanceolate leaves about 2 1/4 inches long, acute, entire and smooth, pale green above and silvery below. The bark is pale grey, flowers numerous, small and creamy white in color. The dark purple fruit is a drupe about 3/4 inch long, ovoid and often pointed, the fleshy part filled with oil. The thick, bony stone has a blunt keel down one side. It contains a single seed (Bacelar *et al.* 2004). Olive tree (*Olea europaea* L.) is the most important plant grown in Pakistan. It is traditionally grown in Mediterranean basin. It is used in various ailments such as wound infection and cardiovascular disorders. Olive oil contains fatty acids that are important in nutrition. In Mediterranean countries, *Olea europaea* L. has economic importance and is of superior quality used as table olive. It is abundantly found in coastal regions of Turkey. It is an important nutrient source with high calorie value. People consuming *Olea europaea* L. have less chance of cardiac disease. It is antioxidant, anti-inflammatory and cardio protective. It is used in gastric ulcer and heals ulcer quickly (Jan 2010). It is antioxidant and has high oleic contents (Lee and Lee 2010, Chu 2000, Koleva *et al.* 2002, Mantle *et al.* 2000, Oke and Hamburger 2002, Riley 2002, Micheli *et al.* 2007). Olive is wide spread in different parts of Pakistan. Growth of seeds and flowers is increased by use of phosphorus. Phosphorus present in seed increases soil fertility on decomposition of seeds (Umar *et al.* 2014). Plants need phosphorus for their proper growth and development. Phospholipids, ATP and nucleic acid also contain phosphorus. Potassium is involved in regulation of heart beat. It helps in contraction of muscles and maintains fluid balance.

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Cardiovascular diseases are prevented by adequate intake of potassium and calcium (McCarron and Reusser 2001). Thus, the presence of potassium and calcium in *Olea europaea* could increase the beneficial effects of other phytochemicals such as tocopherols and phenolic compounds on health. A study conducted in the Almaden mercury mining district for analysis of metallic trace elements uptake from soils for *Olea europaea* indicated that there is good correlations between olive contents for major elements (Ca, Mg, Al and Fe) and soil (Higueras *et al.* 2012). However, some element contents found in *Olea europaea* do not show any relation with the element contents found in soil (Zn, Pb, Nd, Hg, Cr and Ce). Lynch *et al.* (2012) studied the effects of internal and external factors on plant chemistry. In fact, plant root development and growth was affected by low molecular weight organic solutes, aeration, pH and nutrient availability. The aim of this study was to investigate the concentration of some macro-minerals in different varieties of *Olea europaea* grown in Pakistan

Fruits of Dolece-agogia, Moriolo and Carotina cultivars from Quetta (Arid Zone Agriculture Research Institute), Leccino, Uslu and Gemlik cultivar from Lorallia (Lorallia Agriculture Research Farm) and Arbequina and Frantio cultivar were collected from Zhob (Agriculture Research Station) in 2014. In each location, the selected cultivars were those predominating in the respective area. The samples were collected during the season when olives are usually harvested for oil production. For each sample (about 100 g) of olive fruits were manually collected from these plants.

Biochemical studies of *Olea europaea* were carried out at the laboratory of Plant Breeding and Molecular Genetics, Faculty of Agriculture, University of Poonch, Rawalakot, Azad Jammu and Kashmir, Pakistan.

Two gm of olive fruit per sample were taken. Analysis of olive was done for Ca, Na, K, and P according to Association of official Analytical Chemistry 1990 procedure (Idoui and Boucheфра 2014).

Two gm finely ground sample was taken in a clean and dry porcelain crucible, shed in muffle furnace at 650°C, the ash dissolved in 3% HCl, gently boiled, cooled, then added a few drops of concentrated HNO₃, heated, cooled, diluted with 30 ml distilled water, heated again cooled, filtered in 100 ml volumetric flask and made the volume up to mark with distilled water. These digested samples were analyzed for Ca, Na, K by using flame photometer (AFP100) and P by using spectrophotometer (Spectronic-21UVD by Burch and Lamb).

Means of triplicate measurements and standard errors were determined for each sample using standard procedures.

The macro-minerals contents (Ca, Na, K and P) of different cultivars of olive were determined. Table 1 shows that all olive cultivars were found to be rich in Ca, Na, K and P. The mineral compositions of olive cultivars, namely Dolece-agogia, Moriolo, Carotina, Leccino, Gemlik, Uslu, Arbequina and Frantio are shown in Table 1. The decreasing order of calcium (mg/kg) was Carotina (100) > Gemlik (93) > Leccino (90) > Moriolo (82) > Arbequina (65) > Frantio and Dolece-agogia (62) > Uslu (61); and the decreasing order of Na (mg/kg) was Arbequina (1930) > Moriolo (1839) > Carotina (1830), Uslu (1820), Dolece-agogia (1739), Frantio (1643), Gemlik (1393), Leccino (1343); and the decreasing order of K (mg/kg) was Moriolo (94) > Leccino (90) > Dolece-agogia (89) > Carotina (84) > Gemlik (59) > Uslu (49) > Arbequina (48) > Frantio (43); and that of P (mg/kg) was Gemlik (15.1) > Leccino (15.0) > Dolece-agogia (9.3) > Carotina (7.3) > Moriolo (6.6) > Uslu (6.0) > Frantio (4.12) > Arbequina (4.0). It was revealed from Table 1 that the highest levels of calcium (100 mg/kg), sodium (1930 mg/kg), potassium (94 mg/kg) and phosphorus (15.1 mg/kg) were obtained in Carotina, Arbequina, Moriolo and Gemlik, respectively. The mineral composition of olive showed that

calcium contents of Carotina growing in Quetta are higher than those of other cultivars. Potassium contents of Moriolo are higher (90 mg/kg) than those of other cultivars. The potassium contents of Moriolo were significantly ($p < 0.05$) different from other cultivars grown in Pakistan. The values of calcium (61 to 100 mg/kg) in olive in the present study are found different from values (9.29 mg/g) as reported by Lee *et al.* (2005). These values are also different from values of calcium (4.47 to 9.14 mg/g) in olive grown in Tunisia reported by Bahloula *et al.* (2014). Kenan *et al.* (2007) reported concentration of phosphorus, potassium and calcium in olive fruit that ranged between 605 and 1187, 4724 and 11442 mg/kg and 481 and 1176 mg/kg, respectively. Parisa and Samaneh (2014) reported concentration of K (1123 ± 273 mg/kg), Ca (1899 ± 99 mg/kg), Na (9745 ± 49 mg/kg) in *Olea europaea* L. cultivated in Iran. In present study, the value (1930 mg/kg) of sodium in Arbequina is higher than those of other cultivars in Pakistan. The value (15.1 mg/kg) of phosphorus in Gemlik was found higher than those of other cultivars. This study showed that there is significant difference in composition of macro-mineral concentrations between different cultivars of *Olea europaea* L. grown in Pakistan.

Table 1. Concentration of macro-minerals in different varieties of *Olea europaea*.

Varieties	Ca (mg/kg)	Na (mg/kg)	K (mg/kg)	P (mg/kg)
Dolece-agogia	62	1739	89	9.3
Moriolo	82	1839	94	6.6
Carotina	100	1830	84	7.3
Leccino	90	1343	90	15
Gemlik	93	1393	59	15.1
Uslu	61	1820	49	6
Arbequina	65	1930	48	4
Frantio	62	1643	43	4.12

In this study, authors found Carotina with high calcium content, Arbequina with high sodium content, Moriolo with high potassium content and Gemlik with high phosphorus content. It was concluded that the highest concentration of calcium, sodium, potassium and phosphorus was obtained in Carotina, Arbequina, Moriolo and Gemlik, respectively.

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