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AMINO ACIDS AND MINERAL COMPOSITION ANALYSIS OF *Moringa peregrina* FORSSK (FIORI) IN JORDAN

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ABSTRACT

Amino acids, mineral composition and protein analysis of *Moringa peregrine* Forssk. (Fiori) seeds and leaves were investigated at Jordan. The results showed that the fresh leaves have high percentage of protein (14.5%) compared to dried leaves (6.45%). The mineral analysis of fruit and leaves were investigated, fruits showed high content of Mg 85.67 ppm, Zn 21.55ppm and Cu 2.14ppm. Leaves recorded high content of Fe 62.26ppm and 10.48 ppm Pb. Amino acid analysis showed that Glutamic acid was the highest percentage registered 2.77% followed by Leucine 1.95%, while Cystine (0.25%) was the lowest percentage recorded. The results emphasized that leaves and fruits of *Moringa peregrina* Forssk. (Fiori) have great potential as a source of food and feed.

Keywords: *Moringa peregrine* Forssk. (Fiori), amino acids, Jordan, *moringa*, protein, seeds.

INTRODUCTION

Moringa peregrina, species belong to family Moringaceae, native to Jordan, have over the time occupy areas of severe drought and edaphic conditions of Southern parts of Jordan, particularly Wadi Araba. It is considered as an important food source in most countries, as well it has a medicinal value mainly in folk medicine also their flowers considered as good source for beekeepers as they provide nectar. Although it is a rare species, *M. peregrina* has a wide geographic range, growing from the Dead Sea area sporadically along the Red Sea to northern Somalia and around the Arabian Peninsula to the mouth of the Arabian (Persian) Gulf (Zaghloul *et al*., 2010). Moringa trees have helped to combat malnutrition especially among infants and nursing mothers (Okereke and Akaninwor, 2013). Zaghloul et al., (2010) stressed that *M. peregrina* together with *Acacia* trees and various shrub species provide an essential food source for desert wildlife. Salaheldeen *et al*., (2014) found that high fraction of unsaturated fatty acids was observed in *M. peregrina* seed oil (81.24%) while 76.92% of *M. peregrina* seed oil was contributed by monounsaturated fatty acids with oleic acid as the major component (72.19%). Al-Dabbas *et al*., (2010) stressed that *Moringa peregrina* protein was rich in arginine (15.3%), leucine (9%), glycine (8.4%) and proline (8.2%), while essential amino acids comprised approximately 56% of the *Moringa* protein which was higher than the reference value (40%) recommended by FAO/WHO. Fatty acid composition was studied by AlRawashdeh *et al*., (2013), and reported that study was demonstrated that olive oil and *M. peregrina* are an area of real promise for inhibiting the lipid peroxidation and enhancing mechanisms for cancer resistance. *M. peregrina* is a good source of natural antioxidants such as the phenolic compounds (El-Lamey, 2015). The *Moringa peregrina* oil showed high growth inhibition against three human cancer cell lines, breast adenocarcinoma (MCF-7), hepatocellular carcinoma (Hep-G2), and colon carcinoma (HCT-116), with IC50 values of 2.92, 9.40 and 9.48 µg/ml, respectively (Abd El Baky and El-Baroty, 2013). The oil recovered from *Moringa oleifera* can be used for human consumption and other purposes such as illumination and lubrication (Foidl *et al*., 2001). The results revealed that both culms and dry leaves are good sources of protein and essential minerals comparable to those recorded for *Moringa oliefera* (Osman and Abo Hassan, 2012). *Moringa* is known to contain elements that are essential to life they have roles in enzyme activation, nerve impulse conduction, oxygen transport, immune functions (Gyamfi *et al*., 2011). Salehi *et al*., (2012) reported that it can be guessed that calcium has an important role in plant preservation from salinity. *Moringa* leaves showed an excellent source of protein, they are also rich in many minerals, exceptionally high in Zinc and iron mainly (AlRawashdeh *et al*., 2013). Mg plays some roles in human health, namely, production and energy transport, contraction and relaxation of muscles, synthesis of protein and function of enzymes (Fakankun *et al*., 2013). They found high Fe content was registered for leaves and lowest in fruits of *Moringa oliefera*. *Moringa* plant possesses many valuable properties which make it of great scientific interest. These include the high protein content of the leaves twigs and stems, the high protein and oil contents of the seeds. Therefore, this study was carried out to analysis amino acids and mineral content in the leaves and fruits of *Moringa peregrina* at their natural habitats in Jordan.

MATERIALS AND METHODS

Habitat and distribution

Distribution

Palestine region considered as a center of origin for the *Moringa peregrina*. Jordan and the semi Arab island mainly Yamen and Oman and extended to India now found in most tropical areas of south Asia to west north Africa, Egypt and Sudan. In Jordan, naturally found in warm valleys particularly in Jordan valley and in Fifa

Ghor, Safi Ghor, Hamamat Afra in Tafila area Alhasa valley, Wadi Alyarmok and Alhameh /Irbid (Tellawi, 2006). This species was produced by the nurseries of forestry about 1000 transplant /year and the number of trees in Jordan estimated about 50000 trees consider extent as a result of land degradation, land use change and climate change the *Moringa* tree tolerate drought condition and very sensitive to moisture and their distribution on wadi finan is far from the Wadi flow (Figure-1).

Natural habitats

Site: Wadi Fenan (Figure-1), hill side, scattered massive trees thriving very harsh conditions of extreme desert/ Tafila Province.

Status: Plants highly endangered by overgrazing and human use.

Seed collection

Dried seeds were collected from Wadi Araba in the southern part of Jordan. The seeds were cleaned from impurities then stored an NACRE Gene bank until analysis.

Oil extraction

Moringa peregrina oil was extracted followed the traditional method used by the local Bedouins; the past of ground seeds placed on boiling water (100°C) and then the floating oil layer separated from the surface and collected with plastic tubes (AlRawashdeh et al., 2013).

Amino acids analysis

Total amino acids content were estimated using HPLC at Veterinary lab at Agriculture ministry.

Minerals analysis

The trace elements were analyzed using Atomic absorbance while the phosphorus was analysed using spectrophotometer.

RESULTS

Protein contents, crude fat and crude fiber of *Moringa peregrina* are shown in Table-1. High protein percentage was recorded by fresh leaves (14.5%) compared to dried leaves (6.45%). Crude fiber, NDF, ADF and crude fat were registered high percentage for dried leaves, 35%, 43%, 36% and 11.46%, respectively (Table-1).

Table-1. Protein content, crude fiber and crude fat vegetation of two- years-old of *Moringa peregrina*.

Plant source	Protein %	Crude Fiber %	NDF %	ADF %	Crude fat %
Fresh leaves	14.50	25	33.32	25.6	3.0
Dried leaves	6.45	35	43.0	36.0	11.46

Amino acids of *Moringa peregrina* was shown at Table-2. Glutamic acid recorded the highest percentage (2.77%) compared to the rest of amino acids. Leucine, arginine, alanine and valine amino acids showed 1.95%, 1.51% and 1.33%, respectively (Table-2).

The lowest percentages of amino acids were registered by cystine 0.25% and methionine 0.40%.

Table-2. Amino acids profile of *Moringa peregrina* fresh leaves collected from four-months-old were grown at forage lab of Ministry of Agriculture.

Amino acid	Percentage %	Amino acid	Percentage %
Alanine	1.33	Lysine	0.82
Arginine	1.51	Methionine	0.40
Cystine	0.25	Phenylalanine	1.17
Isoleucine	0.96	Serine	0.93
Glutamic acid	2.77	Thrionine	1.03
Leucine	1.95	Valine	1.27
Glycine	1.20		

In the Table-3, the soil type and the chemical analysis were demonstrated. *Moringa peregrina* was grown within PH 7.4 and 7.8 and favourite sandy loam. Mineral composition analysis of fruits and leaves of *Moringa peregrina* illustrated at Figure-2. *Moringa peregrina* fruits showed high content of Mg 85.67 ppm followed by Fe 22.35 ppm, Zn 21.55ppm. Leaves recorded 57.68 pmm of Mg, 62.26ppm Fe, 18.61 Zn and 0.48ppm of Pb.

Table-3. Location and soil type of *M. peregrina* habitat at Jordan.

Location	PH	Electrical conductivity (EC mS/cm)	P ppm	K ppm	N ppm	O.C	Clay	Silt	Sand	Texture	Status
Ghor Alsafi	7.4	31.8	14.8	647.2	0.09	1.09	6.8	29	64.2	Sandy loam	Cultivated area/ research station
Wadi Finan (Site1)	7.8	4.12	8.8	405.5	0.04	0.4	2.7	8.7	88.6	Sand	Wild habitat
Wadi Finan (Site 2)	7.8	2.35	9.1	591.5	0.03	0.28	4.7	14.8	80.5	Loamy sand	Wild habitat

Figure-1. *Moringa peregrina* photo at natural habitat in Jordan.

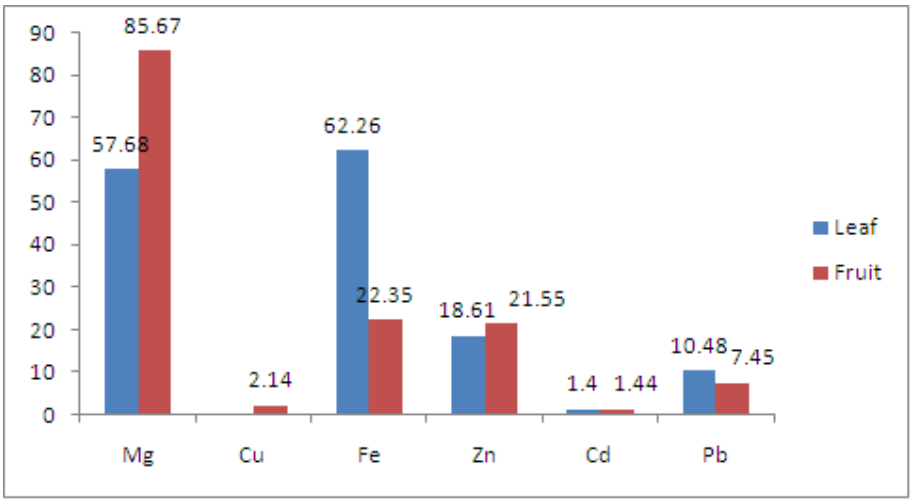

Figure-2. Mineral composition analysis of *Moringa peregrina* leaves and fruits.

DISCUSSIONS

M. peregrina seeds have a great potential as a food or feed due to its high content of oil, protein, amino acids, sterols and polyunsaturated fatty acids (Adabbas *et al*., 2010). On the other hand, El-Lamey, (2015) reported that *M. peregrina* can be tolerated the harsh condition and it considered as a donor to transfer stress tolerance gene to other economical plants to increase their drought tolerance. The protein content obtained during this study ranged 14.5%, this result in agreement with results found by (Osman and AboHassan, 2012). Abundant presence of amino acids as precursor for alkaloids synthesis tha t have a great role in plant defense against parasites and environmental stress. The most abundant essential amino acid is arginine, its highest concentration (7.28g %) was detected in the seeds of *M. peregrina* at Wadi Abu Halfaya (El-Lamey, 2015). In our study, Glutamic Acid was the most abundant amino acid, it could be related to activation of its biosynthesis from glutamate also availability of chemical composition in the soils has a key factor for amino acids synthesis. High percentages of amino acids and non-amino acid compounds indicated that those have a great role in tolerance of *M. peregrina* under stress conditions and its stability in the arid and smi-arid areas. High mineral content mainly Mg element was observed in the leaves this is very essential element as the main component of chlorophyll compound and has a significant role in photosynthesis. In this study, Cu element was not detected in the leaves of *M. peregrina*, but found in the fruits. The dried *Moringa oleifera* leaves contained Cu, which is considered to have strong effects on the immune system, the Cu content found in the sample was 1.01mg (Offor *et al*., 2014). Also they found that Ca and Cd were not detected in the leaf sample of *M. oleifera*. Availability essential elements either in leaves or fruit were necessary for human metabolism mechanisms, muscle development, reproductions cells and macromolecules synthesis. For this reason *Moringa* tree called as a miracle plant it cures form all diseases except the death. However, *M. peregrina* has a potential for agricultural and industrial and a source of protein for animals in summer when other plant disappeared from their natural habitats. In conclusion, current threats and the prevailing harsh habitat conditions are the main causes for the need of the species conservation and development of a plan for its sustainable management in the Jordan. Direct protection is urgently needed to stop further deterioration of *M. peregrina* populations and to improve their ability to maintain or improve population numbers (Zaghloul *et al*., 2010).

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