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Nutritive Values of Some Iranian Manna

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A byproduct of the activity of insects on young host plant organs, Manna is a group of natural compounds with medicinal and nutritional benefits. The therapeutic characteristics of Manna are attributed to their sacchariferous contents. Since literature survey revealed that no studies have been carried out nutritionally on Iranian Manna, we prompted to determine the mineral and essential element contents including iron, zinc and copper in Taranjebin, Shir-Khesht, Bid-Khesht and Gaz-Alafi Manna which are the most vastly used in Iran. The samples were analyzed by Flame Emission Spectrophotometry method. Results showed high contents of zinc and iron in Gaz-Alafi and high copper content in Bid-Khesht. Based on the observed results, it could be concluded that these manna not only possess valuable medicinal properties but also could be considered as good sources of mineral essential elements and might be beneficial in the treatment of various deficiency disorders.

Key words: Iranian Manna, Nutritive Value, Iron, Zinc, Copper.

A by product of the activity of insects on young host plant organs, Manna is a group of natural compounds with medicinal and nutritional benefits. Manna called "Angabin" in Persian language and are also of commercial values in Iranian traditional medicine markets. Different kinds of manna have been used in Iranian folk medicine as laxatives, antipyretics and expectorant and to treat hyperbilirubinemia[1,2]. The therapeutic characteristics of manna are attributed to the sacchariferous compouds[3].

Taranjebin, Shir-Khesht, Bid-Khesht and Gaz-Alafi are the vastly used Iranian manna among others.

Taranjebin or Persian manna is a kind of manna which is the most economically important manna in Persian herbal markets. It is also known as Merniabin manna, Alhagi manna, Hedysarum manna and Caspian manna in English[4]. Taranjebin is a semi liquid resinous sweet natural product which appears on the leaves and branches of some camel's thorn shrubs including *Alhagi persarum* Boiss. & Bushe and *A. mannifera* Desf. (Fabaceae). Surprisingly, these species do not yield Taranjebin everywhere they grow. It seems to be related to the climate, temperature and soil conditions and especially to the presence of an insect belongs to

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the genus *Larinus* living on the shrubs[5]. However the latest studies revealed the strong relationship between Taranjebin production and a froghopper named *Poophilus nebulosus* Leth[6]. Camel's thorn shrubs yield manna only in certain regions including Khorasan, Tabriz, Tabas, Zarand, Tegerood (near Qom) and Booshehr in Iran only during summer[7].

Taranjebin possess a wide traditional application in Persian folk medicine for relive of fever, rubella, health maintenance, cough, pectoral aches, vomiting and thirsty[7]. Nowadays, it is mainly used as a mild laxative and for treatment of neonatal jaundice in Persian ethnomedicine. Studies have shown lowering bilirubin effect with no toxicity in mice[8,9]. Ethanol extract of herbal products containing this manna has been shown to have inhibitory effects on cell growth and synthesis of cellular proteins, DNA, and RNA[10].

Shir-Khesht is another important Iranian manna exuded from the branches of two endemic *Cotoneaster* species (Rosaceae), *C. nummularia* Fisch & Mey and *C. nummularioides* Pojark. Shrubs are attacked by the insect *Scolytus rugolosus* Mull (Scolytidae). Its larvae makes tunnel under the plant skin and destroy cambium. Manna exudes from these sites and become hard after few days. Shir-Khist occurs in small yellowish-white granules about the size of millet seed[11]. Shrubs not attacked by the insect and larva have no exudation.

Mannitol is the main component of Shir-Khesht while other ones include small amounts of hexose, fructose, glucose, saccharose, mucilage and resin[12]. It is claimed that Shir-Khesht protects the body against atomic radiations[5]. Also it has recently been introduced as an anticancer agent[13]. The most commonly use of this manna is for relief of jaundice in newborns[10].

Bid-Khesht is known as another valuable manna which is pharmacologically important in Iranian traditional medicine. This white, hard and amorphous sweet product is an insect honeydew which appears on willow twigs and branches. *Tuberolachnus salignus* Gmel. (Lachnidea) known as willow giant aphid is the most important aphid pest on willows, reported from 16 *Salix* species (Salicaceae) in Iran including *S. accmophylla* Boiss., *S. aegyptica* L., *S. alba* L., *S. excelsa* Gme. and *S. zygostemom* Boiss.

Bid-khesht sweetish is related to its saccharose, fructose and glucose contents[3]. It is used in Iranian traditional medicine to relieve fever, constipation and oral candidiasis[14]. It could be considered as a suitable substitute for Shir-Khesht which is so rare and expensive[3].

Gaz-Alafi also called "Gazu" or "Kurdish Gaz" is another valuable manna which is considered as a byproduct of oak forests in west of Iran. It is a hard, brilliant resinous sweet natural product which appears on the leaves of some *Quercus* species including *Q. brantii* Lindi. and *Q. infectoria* Oliv. (Fagaceae). This manna is the excretion of two insects known as *Thelaxes suberi* Del. and *Tuberculoides annulatus* Hart. (Calaphidae) [3]. Gaz-Alafi contains glucose, fructose and saccharose and other polysaccharides. It is used in Iranian traditional medicine as a demulcent, febrifuge, analgesic and for treatment of chickenpox, rubella and related itching[3].

Literature survey revealed that no studies have been carried out nutritionally so far on mineral content and nutritive value of mentioned Iranian Manna (Taranjebin, Shir-Khesht, Bid-Khesht and Gaz-Alafi). This prompted us to carry out a determination of minerals and essential elements including iron, zinc and copper in Taranjebin, Shir-Khesht, Bid-Khesht and Gaz-Alafi manna which are vastly used in Iran.

MATERIALS AND METHODS

Plant material

100 different samples of each four popular manna (Taranjebin, Shir-Khesht, Bid-Khesht and Gaz-Alafi) were purchased from 20 herbal Markets in Tehran in July 2012.

Analytical method

For metal analysis, each sample oven-dried at 60^0C to a constant weight. Each oven-dried sample was ground in a mortar until it could pass through a 60 mesh sieve. The samples were stored in clean, dry, high density polyethylene bottles of 100 ml capacity with screw caps. All glassware and plastic containers used were washed with liquid soap, rinsed with water, soaked in 10% HNO_3 v/v for 24h, cleaned thoroughly with distilled water and dried in such a manner to ensure that any contamination does not occur.

1 g of each powdered sample was

separately put in a 100 ml digestion flask and 5 ml of digestion mixture was added to each and heated on a hot plate in the fuming chamber in order to be wet digested. A digestion mixture comprises of concentrated HNO_3 and HCl in the ratio of 6:1. The flasks were firstly heated slowly and then vigorously till a white residue is obtained. The residue was dissolved and made up to 10 ml with 0.1 N HNO_3 and NH_4I solution in a volumetric flask. Blanks and samples were also processed and analyzed in duplicate simultaneously. All the chemicals used were of analytical grade (AR). All necessary precautions were taken to avoid any possible contamination of the sample as per the AOAC guidelines. The concentration levels of trace elements and heavy metals on the samples were determined as means ± SD of three replicates in each test and determined based on sample dry weight (DW).

The samples were analyzed by a Flame Emission Spectrophotometer Model AA-6200 (Shimadzu, Japan) using an air-acetylene flame for Zinc, Iron and Copper using at least five standard solutions for each metal. Coefficient of variations (%CV) in the determination of the heavy metals in all samples was less than 2.5%. All necessary precautions were taken to avoid any possible contamination of the sample as per the AOAC guidelines (AOAC, 1998).

RESULTS AND DISCUSSION

Copper

Copper is involved in the activity of many enzymes and metabolic functions. It is necessary for the growth and maintenance of bones and is involved in the production of red blood cells, connective tissue and in metabolism of fats[16]. As the data (Fig. 1), Copper concentration ranged from 23.3075± 1.55 mg/kg in Taranjebin to the highest levels in Bid-Khesht by 33.9141 ± 2.67 mg/kg. There is no permissible limit prescribed in local food law or by WHO, but WHO (1996) has recommended the lower limit of the acceptable range of Cu as 20 mg/kg body weight per day[17,18].

Zinc

Zinc is an essential trace element and plays an important role in various cell processes including normal growth, brain development, behavioral response, bone formation and wound

Table 1. Botanical, local and English name and growing location of studied Manna

Plant source scientific name	Family	Common name	Local name	Growing location
Alhagi persarum Boiss. & Bushe *A. mannifera* Desf *Cotoneaster nummularia* Fisch & Mey	Fabaceae	Camel's Thorn Manna	Taranjebin	Khorasan, Tabriz, Tabas, Zarand, Tegerood, Booshehr
C. nummularioides Pojark	Rosaceae	Pocks pray manna	Shir-Khesht	Balochestan, Azarbayjan, Alborz region, Khorasan, Lorestan
S. accmophylla Boiss.*S. aegyptica* L.*S. alba* L.*S. excelsa* Gme.*S. zygostemom* Boiss.	Salicaceae	Willow Manna	Bid-Khesht	Khorasan, Azarnayjan, Alborz region, Shiraz
Q. brantii Lindi. *Q. infectoria* Oliv.	Fagaceae	Oak Manna	Gaze Alafi	Kordestan, Lorestan

healing. Zinc deficient diabetics fail to improve their power of sensitivity and it cause loss of sense of touch and smell[18,19,20]. Zinc deficiency is common in people suffering from Chrohn's disease, hypothyroidism and gum disease, and probably plays a part in susceptibility to viral infections and diabetes mellitus. It can be beneficial in the treatment of viral infections, including those of AIDS, prostate gland enlargement, rheumatoid arthritis, healing of wounds, acne, eczema and stress[16]. Results showed that zinc concentration is high in all manna studied. The highest concentration of zinc was found in Gaz-Alafi 20.6221±1.2435 mg/kg, following by Shir-Khesht 19.8747± 2.1183, Taranjebin 18.6580±1.3323 and Bid-Khesht 14.1661 mg/kg (Fig. 2).

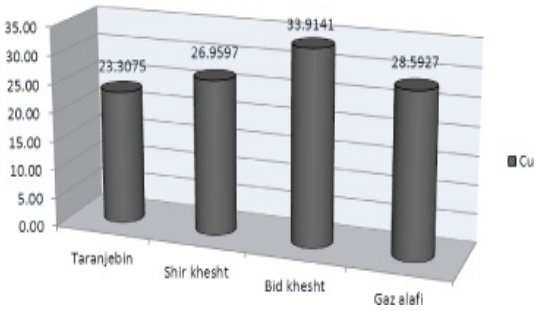

Fig. 1. The mean level of Copper contents in manna purchased from herbal markets in Iran

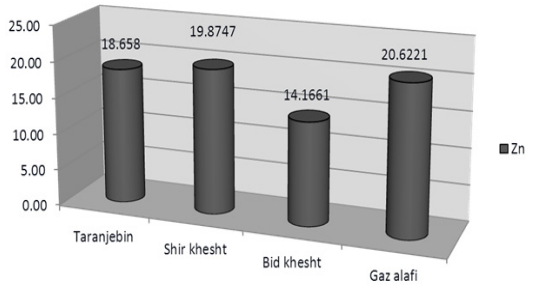

Fig. 2. The mean level of Zinc contents in manna purchased from herbal markets in Iran

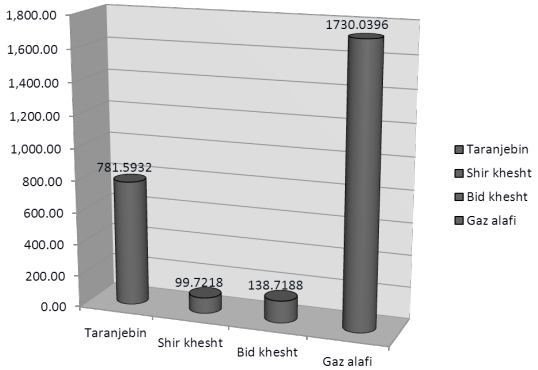

Fig. 3. The mean level of Iron contents in manna purchased from herbal markets in Iran

Iron

The results revealed that highest concentration of iron in the Manna studied was found in Gaz-Alafi (Oak manna) 1730.0396 ±11.6532 mg/kg, followed by Taranjebin (camel's thorn Manna) 781.5932 ± 25.1118 mg/kg, Bid-Khesht (willow Manna) 138.7188 ± 5.8872 and Shir-Khesht (pocks pray Manna) 99.7218± 1.3320 mg/kg. It was observed that Gaz-Alafi has comparatively the highest concentration of Iron (Fig. 3). Iron is an essential element for human beings and animals and is an essential reported by component of hemoglobin. It facilitates carbohydrates, protein and fat to control body weight, which is very important factor in diabetes[21]. Iron is necessary for the formation of hemoglobin and also plays an important role in oxygen transfer in human body and low iron content causes gastrointestinal infection, nose bleeding myocardial infection[20,21].

CONCLUSIONS

The trace elements iron, copper and zinc merit special attention when evaluating the nutritional adequacy of vegetarian diets. Although plant foods tend to be rich sources of trace elements, animal products provide most of the iron and zinc in the most people diet and meat, poultry, and fish provide some iron in the highly bioavailable heme form. To maximize performance of life, recovery, endurance and resistance to illness, enhanced intake of manna in addition of some foods like beans, greens, seeds, nuts, whole grains, and other colorful plant products are recommended. These same suggestions also are important for pregnant women, infants and vegetarians who may be at risk of mineral deficiency especially iron deficiency. The manna not only has medicinal property but also can be considered as good sources of mineral essential elements and can be beneficial in the treatment of various efficiency disorders. Gaz-Alafi is recommended for people suffering from leukemia, ulcerative colitis, in bleeding disorders,

in immune system disruption or in those suffered blood loss. Taking manna in diet especially Bid-Khesht could be beneficial for situation that reduced number of white blood cells has been observed or in lowered immunity conditions.

As the human body requires food to provide energy for growth and all processing in life, taking natural manna in a common daily diet could be recommended. In the other hand as the effectiveness of trace element supplementation of manna has not been demonstrated, and any recommendations for supplementation should consider potential adverse effects, including possible competitive interactions between minerals, further researches to the functional consequences of daily intake of the manna is suggested.

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