Journal of Home Economics

Volume 25, Number (2), 2015

Journal of Home Economics

http://homeEcon.menofia.edu.eg **ISSN 1110-2578**

Egyptian Medicinal Plants and Foods: A Review on Phytoconstituents and Diuretic Activity

Yousif A. Elhassaneen*, Sherif S. Ragab and Khaled A. Saber

Department of Nutrition and Food Science, Faculty of Home Economics, Menoufia University, Shebin El-K**om, Egypt, *Corresponding Author: Yousif12@hotmail.com**

Abstract: In modern day to day practice diuretics can be used as a first line therapy in many diseases. Herbal medicines are in great demand in the developed as well as in the developing countries for primary health care because of their wide biological and medicinal activities, higher safety margins and lesser costs. The numerous diuretic plants and foods in Egypt with their active phytoconstituents have been explored. Such plants and foods include Khella (Ammi visnaga, L.**),** Licorice (Glycyrrhiza glabra)**,** Myrrh (Commiphora myrrha)**,** Barley (Hordeum vulgare), Halfa Bar (Cymbopogon proximus) and Gum Arabic (Acacia senegal). This work may prove a milestone in selection of medicinal plant/foods for carrying their work on the diuretics. Such evidence is needed to provide scientific credence to the folklore use of traditional medicines and even be helpful in the development of future medicines and treatments and treatment guidelines.

Keywords: Phytochemicals, Khella**,** Licorice**,** Myrrh**,** Barley, Halfa Bar, Gum Arabic.

Introduction

The modern pharmacological therapy is costly and associated with multiple side effects resulting in patient non-compliance. Thus there is a need to explore alternative therapies particularly from herbal sources as these are cost effective and possess minimal side effects. Plants produce an amazing amount of complex chemicals we can use as medicines to "curb and cure" disease. Many of authorities and academic centers of research pay more attention towards the area of cancer chemoprevention compounds. One of the most impressive findings in the field of chemoprevention is the very large number of compounds that have been demonstrated to prevent the occurrence of cancer. Many of these classes are lies in an enlarged group of compounds called phytochemicals **(*phyto* is Greek for plant)**. Phytochemicals are the bioactive compounds of plants that do not deliver energy and are not yet classified as essential nutrients but possess healthful properties beyond their use as macronutrients or micronutrients. Plants usually produce such low-molecular-weight ingredients for their protection against pests and diseases, for the regulation of their growth, or as pigments, essence, or odor**.** Scientists have identified thousands of phytochemicals, including flavonoids, glucosinolates (isothiocyanates and indoles), phenolic acids, phytates, and phytoestrogens (isoflavones and lignans), in vegetables, fruits, grains, legumes, and other plant sources. A vast variety of phytochemicals that are present in the daily human diet have been found to possess substantial antimutagenic and anticarcinogenic properties **(Surh, 2002)**. The chemopreventive effects of the majority of edible phytochemicals are often attributed to their antioxidative or anti-inflammatory activities. Besides the edible chemopreventives in vegetables, fruits, herbs, and spices, some phytochemicals in diverse plants also have other beneficial health effects such as anti-obesity, lipid-lowering antidiabetic and diuretics properties (Surh *et al.*, 2001). According to our knowledge, the studies regarding the potential effects of natural diet and plant parts as natural diuretics so limited. Therefore, the current review is intended to provide an overview of the current knowledge surrounding the use of plant parts and diets as natural diuretics.

Medicinal herbs are the significant source as Diuretics. Mono and poly-herbal preparations have been used as diuretics. According to one estimate, more than 650 mono and poly-herbal preparations in the form of decoction, tincture, tablets and capsules from more than 75 plants are in clinical use. There exist a large number of studies which supports the diuretic effects of traditional herbal medicines. This article reviews the various herbal plants used traditionally as diuretics and the identification of chemical constituent of the plant promoting diuresis. The present paper also involves various plant drugs and their pharmacological profile which focus on the dose administered, bioactive extract involved in dieresis mechanism. This work may mark an important milestone for the researchers in the selection of medicinal plant for carrying their work on diuretics.

Diuretics definition and mechanism of action

Diuretic are commonly defined as drugs that increase the amount of urine output by the kidneys. These agents augment the renal excretion of sodium and either chloride or bicarbonate primarily, and water excretion secondarily (Barrar , 2003). Diuretics are prescribed for people suffering from edema – accumulation of fluids in the body tissues. People suffering from high blood pressure or heart diseases may be prescribed diuretics. Women suffering from PMS symptoms such as bloating are often advised to take diuretics to rid the body of excess fluid retention. Often diuretics are taken in a bid to lose weight. If taken indiscriminately, diuretics can lead to serious consequences such as dehydration and potassium deficiency (Vivek and Vikrant, 2011). Also, diuretics play an important role in the management of oedema and hypertension. This function is mainly an increase in net negative water and solute balance. The proximal convoluted tubule reabsorbs about 50-66 % of fluid by both active and passive processes. The thin descending limb of Loop of Henle allows osmotic water abstraction as it is highly permeable to water and impermeable to solutes. The reduced water absorption from the descending limb of Loop of Henle has an important role in over-all enhanced condition of diuresis. The thin ascending limb of Loop of Henle is impermeable to water and highly permeable to chloride and sodium therefore diuretics show no effects on it (Kokko, 1984). Therefore, diuretic agents have very wide application in the treatment of various chronical diseases associated with edema. They are generally prescribed for the treatment of hypertension, congestive heart failure, glaucoma, diabetes insipidus and liver aliments (Koushik *et al.*, 2014).

Phytochemicals and diuretic property

Phytochemicals are bioactive non-nutrient chemical compounds found in plant foods such as fruits, vegetables, grains, and other plant foods. Phenolic compounds can be further divided into flavonoids (including flavonols, flavones, catechins, flavanones, anthocyanidins, and isoflavones), phenolic acids, stilbenes, coumarins, and tannins. Many phytochemicals are potent effectors of biologic processes and have the capacity to influence disease risk via several complementary and overlapping mechanisms (Steinmetz and Potter, 1991). On the other hand, WHO, IUCN and WWF, **(1993)** defined phytochemicals as non-nutritive plant chemicals that have protective or disease preventive properties. Plant produces these chemicals to protect itself but recent research demonstrates that many phytochemicals can protect humans against diseases. There are many phytochemicals in medicinal plant leaves and each works differently. Plant and plant products are being used as a source of medicine since long. According to World Health Organization (WHO) more than 80% of the world's population, mostly in developing countries depend on traditional plant based medicines for their primary healthcare needs.

Biologically active plant chemicals other than traditional nutrients that have a beneficial effect on human health have been termed phytochemicals **(Hasler, 1998).** Phytochemicals are naturally occurring, biologically active chemical compounds in plants. In plants, phytochemicals act as a natural defense system for host plants and provide colour, aroma and flavour. Phytochemicals are protective and disease-preventing particularly for some forms of cancer and heart diseases. The most important action of these chemicals with respect to human beings is somewhat similar in that their function as antioxidants that react with the free oxygen molecules or free radicals in our bodies. Free radicals can damage the cells of our bodies and must be removed The thousands of phytochemicals that have been discovered are grouped based on function and sometimes source . These groupings include the widely studied, flavonoids, phyto-oestrogens, phytosterols and carotenoids. These classes and others can be further divided into subclasses such as described in Figure (1).

Wide ranges of phytoconstituents were responsible for diuretic activity includes alkaloids, glycosides, tannins, phenolics coumarins, triterpenoids etc. These phytoconstituents present in plant exert desired pharmacological effect on body and thus act as natural diuretic. These phytoconstituents present in plant exert desired pharmacological effect on body and thus act as natural diuretic. Phenolics (flavanoids and tannins) of Terminalia arjuna, Acacia suma, Camellia sinensis, Cuscuta reflexa, Mimusops elengi, Mimosa pudica Linn alkaloids of Aerva lanata, Erythrina indica, Cordia rothii, Azima tetracantha; coumarins of Daucus carota; triterpenes of Taraxacum officinale, Abutilon indicum; saponins of Asparagus racemosus, Tribulus terrestris; sesquiterpenes lactones of Taraxacum officinale; glycosides of Opuntia ficus indica, Moringa oleifera might be involved in the mechanism of diuretic activity **(Khare, 2007 Wright et al., 2007; Sangmai et al., 2010 and Vivek and Vikrant, 2011)**. Natural Diuretics acts by increasing the

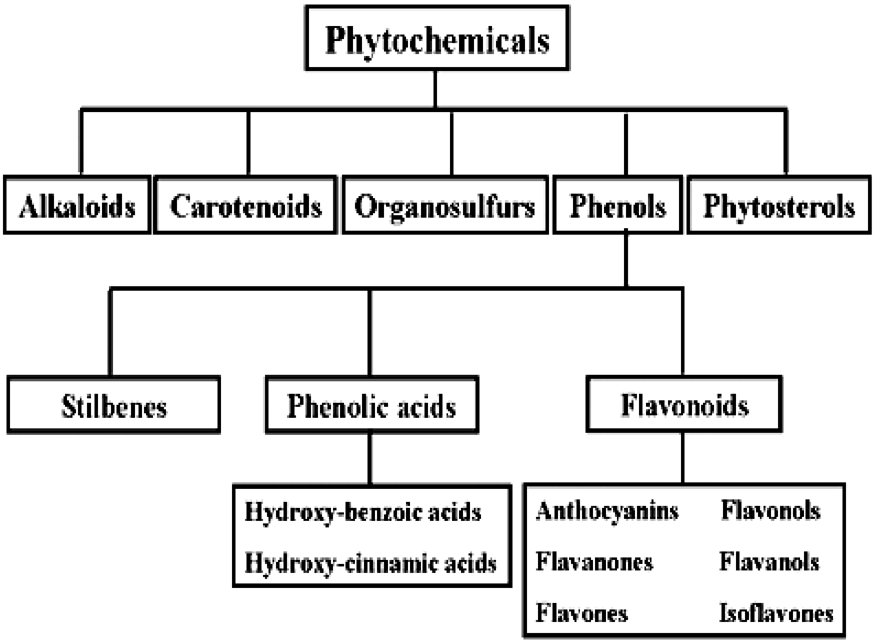

Figure 1. Classification of phytochemicals

urine output as well as urinary electrolyte concentration. *Lepidium sativum*, *Costus speciosus*, *Phyla nodiflora*, *Withania coagulans*, *Tylophora indica*, *Thespesia populnea*, *Phyllanthus fraternus*, *Mimosa pudica*, *Allium sativum* increases the sodium and potassium ion concentration in urine. *Spilanthes acmella*, *Tribulus alatus* acts as loop diuretics and *Rungia repens* might causes risk of hypokalemia due to increase in potassium level in urine **(Pantoja *et al.*, 2000; Nadkarni and Nadkarni, 2005 and Khare, 2007).**

Phytochemistry and pharmacological activities of diuretics Egyptian plant/food

Plant parts such medicinal herbs/spiced and diets are the significant source of diuretics. Mono and poly-herbal preparations have been used as diuretics. Such as mentioned by many authors, more than 700 mono and poly-herbal preparations in the form of decoction, tincture, tablets and capsules from more than 75 plants or more are in clinical use **(Nadkarni and Nadkarni, 2005; Khare, 2007 and Vivek and Vikrant, 2011)**. In Egypt, plant parts and diets used as a diuretic has been used for a long time and has been popularized world over by leading pharmaceuticals. Plant medicine was commonly used for traditional treatment of some renal diseases and a lot of plants have been reported to show significant diuretic activity **(Ammar, 2011; Monsef,2015 and Badr, 2015)**. In the next part we will reviewed here some Egyptian plant parts/diets and their phytochemical constituents as well as remarkable diuretic activity.

Parsley

Parsley (Petroselinum crispum Family Apiaceae)

Garden Parsley is a bright green hairless biennial herbaceous plant.In the first year, it forms rosette of tripinnate leaves 10–25 cm long with numerous 1–3 cm leaflets, and a tap root used as a food store over the winter. In the second year it grows a flowering stem to 75 cm tall with sparser leaves and flat-topped 3–10 cm diameter umbels with numerous 2 mm diameter yellow to yellowish-green flowers. The seeds are ovoid, 2–3mm long, with prominent style remnants at the apex. The plant normally dies after seed maturation **(Huxley, 1992).** Parsley phytochemical composition include flavonoid apiin, essential oil apiole, coumarins, terpenes, phthalides (ligustilide, senkyunolide), mucilage, resin, starch, iron, calcium, phosphorus, manganese, inositol, sulfur, vitamins C and K, and beta-carotene **(Blumenthal *et al*., 2000**). Parsley diuretic effect was reported by **Ahsan *et al*., (1990)** who found that significant inhibitory effect of parsely on experimentally induced kidney stone and diuretic in laboratory animals. The use of parsley root and herb as a diuretic in disorders of the urinary tract and for the prevention and therapy of renal gravel is recommended **(Blumenthal, 1998).** Aquaretics herbs include dandelion (especially the leaf), asparagus root, parsley, juniper and horsetail have potential for the treatment of excessive weight, hypertension, congestive heart failure, diuretic, kidney stones and premenstrual syndrome **(Szentmihlyi *et al*., 1998).** The leaves, roots and seeds of parsley are diuretic, reduce the release of histamines and scavenge skin aging free radicals **(Richmond and Mackley, 2000)**. Parsley, due to its constituents apiole and myristicin, is believed to have a diuretic effect because diuretics would increase the flow of urine, this might help the body to wash out bacteria as well as stones **(Kreydiyyeh and Usta, 2002)**. Medical uses of parsley are spasmolytic, diuretic, emmenagogue, expectorant, antirheumatic and antimicrobial **properties (Barnes et al., 2002)**. The volatile oil of parsley shows a diuretic effect. A diuretic and spasmolytic activity is also postulated for the flavonoids **(Teuscher, 2003).** The diuretic effect of parsley leaf and root is due to its volatile oil components myristicin and apiole **(Bagnis et al., 2004).** Parsley has carminative, tonic and aperient action, but is chiefly used for its diuretic properties, a strong decoction of the root being of great service in gravel, stone, congestion of the kidneys, dropsy and jaundice **(Duke et al., 2009).**

Khella

Khella is an annual Mediterranean herb, which grows wild from Morocco to the Near East. Leaves are up to 20 centimeters long and generally oval to triangular in shape but dissected into many small linear to lance-shaped segments. The inflorescence is a compound umbel of white flowers similar to those of other Apiaceae species. The fruit is a compressed oval-shaped body less than 3 millimeters long **(Khan et al., 2001).**

Khella (*Ammi visnaga L.* family *Apiaceae*)

Khella phytochemical composition include fruranochromones (-py-ones): 2-4% comprising khellin (0.3-1.2%), **visnagin (0.05-0.3),** khellol and its glucoside, khellenin, khellinol, ammiol and its glucoside, visammiol, khellinone, visnaginone; pyranocoumarines (visnagans): 0.2-0.5% compising visnadin, samidin and dihydrosamidin, Furanocomarines: traces of xanthotoxin and ammoidin, flavonoids: 0.02-0.03% comprising qurcetin and isorhamnetin and their 3-sulphates as well as kaempferol, volatiles: camphor, carvone, (-terpineol, terpinen-4-ol, linalool, cis and trans linalool oxides), fixed oil: 12-18% **(Dan and Yves, 2001)**. Khella is used for colic and abdominal cramps, kidney stones, diuretic, menstrual pain, and premenstrual syndrome (PMS)**.** Khellin in *khella* is used in the treatment of coronary insufficiency, angina pectoris, diuretic, bronchial asthma, vitiligo and psoriasis, and for the removal of small bladder and kidney stones **(Batanouny et al., 1999).** *Khella* extract has prophylactic effect in oxalate stone formation, its diuretic effect in rats and on human volunteers, and also in vitro experiment, emphasizes its solubilizing properties on calcium oxalate **(Zulfqar et al., 2001).** Medicinal uses of *Ammi Visnaga* treat angina pectoris, kidney stones, asthma, diuretic ,allergies, and also dental hygiene **(Markvardsen et al., 2001).** Khella used for Kidney stones, Diuretic, Renal colic, Asthma, Carminative, Antispasmodic, Anti-psoriasis **(Nidal, 2005).**

Licorice

Licorice (*Glycyrrhiza glabra,* Family: *Fabaceae*)

The licorice shrub is grow in subtropical climates in rich soil to a height of four or five feet. It has oval leaflets, white to purplish flower clusters, and flat pods. Below ground, the licorice plant has an extensive root system with a main taproot and numerous runners. The main taproot, which is harvested for medicinal use, is soft, fibrous, and has a bright yellow **interior (Olukoga and Donaldson, 1998)**. A number of components have been isolated from licorice, including a water-soluble, biologically active complex that accounts for 40-50 percent of total dry material weight. This complex is composed of triterpene saponins, flavonoids, polysaccharides, pectins, simple sugars, amino acids, mineral salts, and various other substances Glycyrrhizin, a triterpenoid compound, accounts for the sweet taste of licorice root. This compound represents a mixture of potassium-calcium-magnesium salts of glycyrrhizic acid that varies within a 2-25 percent range. Among the natural saponins, glycyrrhizic acid is a molecule composed of a hydrophilic part, two molecules of glucuronic acid, and a hydrophobic fragment, glycyrrhetic acid **(Obolentseva et al., 1999)**.The yellow color of licorice is due to the flavonoid content of the plant, which includes liquiritin, isoliquiritin (a chalcone), and other compounds. The isoflavones glabridin and hispaglabridins A and B have significant antioxidant activity, **(Vaya et al., 1997)** and both glabridin and glabrene possess estrogen-like activity **(Tamir et al., 2001).** The dried root of licorice is taken orally as a diuretic, depurative and **emollient (Novaretti, *and* Lemordan, 1990). Also, Ross, (2001)** said that licorice use for Bladder and kidney pain, kidney stones, diuretic. *Glycyrrhiza glabra* are commonly used as a diuretic, sedative and refrigerant, and its fruits are considered to be an anti-scorbutic. Its calyces are commonly prepared as a drink and used as a mild diuretic, a colorectal, an intestinal anti-septic, a mild laxative, as an aid in heart and nerve conditions, to lower blood pressure and to treat calcified arteries **(Ajay et al., 2007).** Finally, licorice can increase the effects of potassium depleting diuretics wherease deglycyrrhizinated licorice (DGL) can be used safely with any diuretic **(Dorothea, 2008).**

Myrrh

Myrrh (*Commiphora myrrha*, Family: *Burseraceae*)

Myrrh and the similar but lower quality opopanax are the hardened, resinous exudates obtained from trees of certain *Commiphora* species of the *Burseraceae* family. *Commiphora* species are small trees or shrubs with short, thorny branches **(Lumir et al., 2005).** Myrrh is oleo-gum resin exudates obtained from several species in the genus *Commiphora*. It contains Ca. 57–61% water-soluble gum, 7–17% volatile oils, and 25–40% alcohol-soluble resins and 3–4% impurities **(Massoud et al., 2001).** The alcohol-soluble resins of myrrh consist of commiphoric acids, commiphorinic acid, heeraboresene, heerabomyrrhols, and commiferin. Furthermore, the resins were found to contain α-, β-, and γ-commiphoric acids, commiphorinic acid, α- and β-herrabomyyhols, heerboresene, commiferin, kertosteroids, compesterol, β-sitosterol, cholestrerol, α-amyrone and 3-epi-α-amyrin **(Rao et al., 2001)**. The leaves and flowers of Myrrh were used by local Arab populations as analgesic, laxative and diuretic agents (Abdul-Ghani and Amin, 1997). Cinnamon ,ginger and myrrh used for antispasmodics, uterine cramps: diuretic **(Swami, 2007).**

Barley

Barley (*Hordeum Vulgare,* Family: *Poaceae*)

Barley belongs to the genus *Hordeum* in the tribe *Triticeae* of the grass family, *Poaceae*. The *Triticeae* tribe is a temperate plant group containg several economically important cereals and forages as well as bout 350 wild species. The genus *Hordeum* is unusual among the *Triticeae* as it contains both annual species, such as H. *Vulgare* and H. *marinum*, and perennial species, such as H. *bulbosum* **(Von *and* Bothmer, 1992)**. Barley is an excellent source of dietary fibre, protein, and complex carbohydrates, and is a good source of certain vitamins. Barley composition varies markedly in different environments and between varieties. The concentration of starch is inversely related to the content of total dietary fibre and protein. In malting barley, lower protein content (8-10.5% dry matter) and corresponding high starch content is preferred. In feed barley, grains with low fibre, higher protein (10-15%) and higher starch content are preferred carbohydrates, including starches, sugars and non-starch polysaccharides, comprise about 80% of the barley **grain (Newman *and* Newman, 1992).** Most of the carbohydrates is starch, which makes up 60% of the grain and provides energy for germination **(OECD, 2004**). Starch is the major source of readily available energy for food and feed. In most barleys, the predominant starch is amylopectin and the reminder is amylose **(Newman &Newman, 1992).** The non-starch polysaccharides are collectively called total dietary fibre and include β-glucans and arabinoxylans. The fibre content of barley is relatively high, and the benefits of dietary fibre on human health are well known **(McIntosh et**

al., 1991 and OECD 2004). Barley contains a number of other compounds, some of which may have a role in protection against diseases when ingested at high levels. These include simple phenolic acids, flavenoids and lignans, all of which have good antioxidant properties **(OECD, 2004).** Therapeutic uses of barley are Hypoglycemic, Diuretic and Renal calculi **(Nidal, 2005).** Also, **Swami, (2007)** said that Barley action : Diuretic, Antirheumatic and demulcent. Furthermore, reported that Talbina which is formed by adding milk and honey to the dried barley powder could be very nutritious, beneficial in coughs and inflammation of the stomach and to have the ability to expel toxins from the body and act agood diuretic.

Halfa Bar

Halfa Bar (*Cymbopogon proximus*), Family: *Poaceae*

Halfa Bar (*Cymbopogon proximus*), is a common weed with strong aromatic odour grows in southern Egypt and Northern parts of Sudan **(Boulos, 1999).** Main compounds in *cymbogon Proximus* are proximadiol, 5α-hydroxy-β-eudesmol, 1β-hydroxy-β-eudesmol and 1β-hydroxy-α-eudesmol, two new sesquiterpenes, 5α-hydroperoxy-β-eudesmol and 7α,11-dihydroxycadin- 10(14)-ene were isolated from the unsaponifiable fraction of the petroleum ether extract of *Cymbopogon proximus*. Isolation of compounds 2, 4 and 5 from the genus *Cymbopogon* is reported for the first time **(El-Askary et al., 2003).** In Egypt, Halfa Bar is widely grows in southern Egypt, the plant is widely used in the folk medicine as an effective renal antispasmodic and diuretic **(Batanouny et al., 1999).**

Sage

Sage (Salvia officinalis, L,* Family: *Lamiaceae)

age is a native of the northern Mediterranean coast but it is cultivated in many countries. The species shows a great deal of structural variation: narrow-leaved sage produces flowers but broad-leaved sage often does not flower. Sage is a low-growing shrub (up to 45 cm in height). It has lanceolate to ovate, long-stalked leaves, sometimes lobed at the base, up to 15 cm in length and either green and rather hairy, or greyish green when densely hairy. The surface is wrinkled and the margin crenulate. The pink or bluish-lilac flowers are borne in distant whorls on erectinflorescences. The corolla is two-lipped, the upper lip hood-like, the lower lobed. There are only two fertile **stamens (Vaughan and Geissler, 2009).** Phytochemical constituents of sage was atudied **by Paula et al., (2002)** who found that the identified compound from **(Salvia officinalis, L.)** extract can be grouped into three classes of phenolic compounds as follow: 1) phenolic acids: gallic acid, 3-O-caffeoylquinic acid, 5-O-caffeoylquinic acid, caffeic acid, and rosmarinic acid, 2) flavonoids: hesperetin, apigenin, hispidulin, cirsimaritin and genkwanin., and Phenolic diterpenes: carnosic acid, rosmadial, methyl carnosate, epirsorosmanol ethyl ether, epirosmanol methyl ether, carnosol and epirosmanol. Rosmarinic acid which was the major phenolic compound in two of the eight different Sage extracts was absent in other five ones. Sage the Romans, used as a diuretic, a local anesthetic for the skin, a styptic, and for other uses **(Kintzios, 2000).** Sage is also used usually for medicine to several aims such as carminative, diuretic, antihidrotic, antihistaminic, analgesic and expectorant **(Filiz and Nuran, 2002).** Investigations of the biological activities of the mono- and sesquiterpenes have proved so far the following effects: anesthetic, antihistaminic, antirheumatic, diuretic, expectorant, insecticidal, purgative (monoterpenes); analgetic, antiarhythmic, antiepileptic, spasmolitic, toxical (sesquiterpenes); anthelmintic, antibiotical, antiinflammatory, antitumorous, hypotensive, irritative and sedative (mono- and sesquiterpenes) **(Velickovic et al., 2002).** For hundreds of years, *Salvia* species have been used as traditional medicinal plants because of their sedative, antiseptic, antispasmodic, anti-inflammatory, and diuretic properties**(Ömer et al., 2006).**

Gum arabic (GA)

Gum arabic (GA, *Acacia senegal*)

Gum Arabic (GA) or Acacia gum is an edible biopolymer obtained as exudates of mature trees of *Acacia senegal* and *Acacia seyal* which grow principally in the African region of Sahe in Sudan. The exudate is a non-viscous liquid, rich in soluble fibers, and its emanation from the stems and branches usually occurs under stress conditions such as drought, poor soil fertility, and injury **(Williams and Phillips, 2000).** Such as reported by **MSN (2008)** there are close to 900 *Acacia* species capable of producing gum. These are primarily located in tropical climates, with about 130 of them located specifically on the African continent. Africa, therefore, quickly became the major site of the production of gum; this is the reason why it is also referred to as 'Senegal Gum'. Gum is essentially the secretion of several acacia (leguminous) trees. Acacia Gum species, of which there are up to seventeen, produce acacia gum of varying quality and quantity. Interestingly, close to 80% of Gum Arabic is produced by the *Acacia senegal* (in Sudan). The remainder is produced either by the *Acacia laeta* or the *Acacia seyal*, with each species contributing 10% to the total supply of gum. The gum produced by the *Acacia senegal* is commonly referred to as "hard gum" and the gum from *Acacia seyal*, as "flaky gum". Europe and U.S. are the most important GA markets importing 40 kTn/year, on average, while Japan, the largest Asian consumer, imports about 2 kTn/year. Structurally, GA is a neutral or slightly acidic salt of a complex polysaccharide composed of galactose, arabinose, rhamnose, glucuronic acid, 4-*O*-methylglucuronic acid, calcium, magnesium, and potassium. The molecular weight has been reported to be 600,000 **(Anderson and Dea, 1971)**. Gum arabic is distinguished from other gums by its high solubility in water; 50% solutions can be prepared, compared with maximum concentrations of 5% or less for most other gums **(Furia, 1972)**. In the last two decades, several investigations have been conducted in order to reveal the molecular structure of GA and relate it to its exceptional emulsifying and rheological properties. The chemical composition of GA is complex and consists of a group of macromolecules characterized by a high proportion of carbohydrates (~ 97%), which are predominantly composed of *D*-galactose and *L*-arabinose units and a low proportion of proteins (<3%) (**Islam *et al.*, 1997 and Mohamed, 2013**). The chemical composition of GA may vary slightly depending on its origin, climate, harvest season, tree age and processing conditions, such as spray **dying (Al-Assaf et al., 2005 (a,b); Flindt et al., 2005; Hassan et al., 2005 and Siddig et al., 2005**). Gum Arabic (GA) or Acacia gum is an edible biopolymer obtained as exudates of mature trees of *Acacia senegal* and *Acacia seyal* which grow principally in the African region of Sahe in Sudan. The effective biological role of GA has confirmed in the last twenty years including reduction in plasma cholesterol level in animals and humans **(Sharma, 1985 and Tiss et al., 2001),** anticarcinogenic effect **(Nasir et al., 2010)** and antioxidant effect **(Ali et al., 2003; Trommer and Neubert, 2005 and Ali and AlMoundhri, 2006)** with a protective role against hepatic and cardiac toxicities. In addition to that, it has been claimed that GA alleviates effects of chronic renal failure in humans **(Matsumoto et al.,**

2006; Ali, 2004; Ali et al., 2008; Glover et al., 2009 and Ali et al., 2010).

Conclusion

The current review projected to provide an overview of knowledge adjoining the herbal medicines used as diuretics in Egypt. By this review, it can be concluded that in the core of the nature there are so many plants and diets which possess potent diuretic activity. Herbal medications and natural foods are free from side effects and toxicity unlike the allopathic medicines. Further studied are needed to investigate which components are responsible for the diuretic effects exhibited by the Egyptian plants and foods. Explanation of their mode/mechanism of actions is also needed.

References

Abdul-Ghani, A.S. and Amin, R. (1997). Effect of aqueous extract of Commiphora opobalsamum on blood pressure and heart rate in rats. J. Ethnopharmacol. 57: 219-222.

Ajay, M.; Chai, H. J.; Mustafa, A. M.; Gilani, A. H. and Mustafa, M. R. (2007): Mechanisms of the anti-hypertensive effect of (Hibiscus sabdariffa L) calyces, J. Ethnopharmacol , 109(3): 388-393.

Al-Assaf, S.; Phillips, G.O. and. Williams, P.A. (2005 a). Studies on acacia exudate gums. Part I: the molecular weight of Acacia senegal gum exudate. Food Hydrocolloids, Vol.19, No.4, (July 2005), pp. 647-660, ISSN: 0268-005X.

Ali BH, Al-Qarawi AA, Haroun EM, Mousa HM (2003): The effect of treatment with Gum Arabic on gentamicin nephrotoxicity in rats: a preliminary study. *Ren Fail*, 25(1):15-20.

Ali BH, Al-Salam S, and Al-Husseni I, (2010). Effects of Gum Arabic in rats with adenine-induced chronic renal failure. *Exp Biol Med (Maywood)*, 235(3):373-382.

Ali, A. E. H. (2008). Technological, Chemical And Nutritional Studies On By-Products Frozen Food Companies. "M. Sc. Thesis in Nutrition and Food Science, Faculty of Home Economics, Minufiya University, Egypt.

Ali, B.H. (2004). Does gum Arabic have an antioxidant action in rat kidney? Ren. Fail., 26(1):1-3.

Ali, B.H. (2004). Does GA have an antioxidant action in rat kidney? Renal Failure, Vol.26,No.1, (January 2004), pp. 1-3, ISSN: 0886-022X.

Ali, B.H. and Al Moundhri, M.S. (2006). Agents ameliorating or augmenting the nephrotoxicity of cisplatin and other platinum compounds: a review of some recent research. Food and Chemical Toxicology, Vol. 44, No.8, (August 2006), pp. 1173–1183, ISSN: 0278-6915.

Al-Majed, A.A.; Mostafa, A.M.; Al-Rikabi, A.C. and Al-Shabanah, O.A. (2002). Protective effects of oral arabic gum administration on gentamicin-induced nephrotoxicity in rats. *Pharmacological Research*, Vol.46, No.5, (November 2002), pp. 445–451, ISSN: 1043-6618.

Ammar, N. (2011). Effect of low protein, phosphorus, potasium diets and high gum arabic content on rats suffering from chronic renal failure" Ph.D. Thesis in Nutrition and Food Science, Faculty of Home Economics, AlAzhar University, Nawag, Tanta, Egypt.

Ammar, N. (2011). Effect of low protein, phosphorus, potasium diets and high gum arabic content on rats suffering from chronic renal failure" Ph.D. Thesis in Nutrition and Food Science, Faculty of Home Economics, AlAzhar University, Nawag, Tanta, Egypt.

Anderson, D. and Dea, I., (1971). Recent advances in the chemistry of Acacia gums. J. Soc. Cosmet. Chem. 2:61-73.

Art, I.C., and P.C. Hollman. 2005. Polyphenols and disease risk in epidemiologic studies . Am J Clin Nutr 81 (Supp) : S317-S325 .

Badr, W. (2015). The protective effect of black mulberry and plum in rats with induced renal dysfunction". Ph.D. Thesis in Home Ecnomics (Nutrition and Food Science), Faculty of Home Economics, Al-Azhar University, Nawag, Tanta, Egypt.

Badr, W. (2015). The protective effect of black mulberry and plum in rats with induced renal dysfunction". Ph.D. Thesis in Home Ecnomics (Nutrition and Food Science), Faculty of Home Economics, Al-Azhar University, Nawag, Tanta, Egypt.

Bagnis, C. I.; Derav, G.; Baumelou, A.; Le Quintrec, M. and Vanherweghem, J.L. (2004): Herbs and the kidney. AJKD, 44(1): 1-11.

Barnes, J.; Anderson, L. A. and Philipson D. J. (2002): Herbal Medicines. A guide for healthcare professionals. Second edition, Pharmaceutical Press, London, pp. 365-368.

Barrar FSK. (2003). Text book of pharmacology. New Delhi: S. Chand; p298.

Barrar FSK. (2003). Text book of pharmacology. New Delhi: S. Chand; p298.

Batanouny, K. H.; Aboutabl, E.; Shabana, M. and Soliman, F. (1999). Wild Medicinal Plants in Egypt. With support of the Swiss Development Co-operation (SDC). Academy of Scientific Research and Technology, Egypt. The World Conservation Union (IUCN), Switzerland. pp. 37-41.

Blumenthal, M. (1998). The Complete German Commission E Monographs. Therapeutic Guide to Herbal Medicines. Boston, MA: Integrative Medicine Communications, 179.

Blumenthal, M.; Goldberg, A. and Brinckmann, J. (2000): Herbal Medicine: Expanded Commission E Monographs. Austin, TX: integrative Medicine Communications.

Boulos, L., (1999). Flora of Egypt. Al Hadara Publishing, cairo, Egypt, 1: 291-301.

Dan, K. and Yves, R. (2001). Botanical Medicine, A European Professional Perspective. Paradigm Publications 44, Linden Street, Brookline, Massachusetts, pp. 196,

Dorothea, D. (2008). Drug herb interactions Carpin 3rd scientific conference.

Duke, J. A.; Godwin, M. J. B. and Ottesen, A. R. (2009): Medicinal Plants of Latin America. Taylor & Francis Group, LLC.

El-Askary, H.I.; Meselhy, M.R. and Galal, A.M. (2003). Sesquiterpenes from Cymbopogon proximus. Molecules, 8: 670-677.

Fila, M.; Brideau, G.; Morla, L.; Cheval. L.; Deschênes, G. and Doucet, A.(2011):

Flindt, C.; Al-Assaf, S.; Phillips, G.O. and Williams, P.A. (2005). Studies on acacia exudates gums. Part V. Structural features of Acacia seyal. *Food Hydrocolloids*, Vol.19, No.4, (July 2005), pp. 687-701, ISSN: 0268-005X.

Furia, T., (1972) ed., CRC Handbook of Food Additives, CRC Press, Cleveland, Ohio, pp. 295-359.

Glover, D.A.; Ushida, K.; Phillips, A. O. and Riley. S. G. (2009) Acacia (sen) SUPERGUMTM (Gum arabic): An evaluation of potential health benefits in human subjects. Food Hydrocolloids, Vol. 23, No. 8, (December 2009), pp. 2410–2415, ISSN: 0268-005X.

Hasler, C.M. 1998. Functional foods: Their role in disease prevention and health promotion and health promotion. Food Tech, 52(11): 63-70.

Hassan, E. A.; Al Assaf, S.; Phillips, G.O. and Williams, P.A. (2005). Studies on Acacia gums: Part III molecular weight characteristics of Acacia seyal var. seyal and Acacia seyal var fistula. *Food Hydrocolloids*, Vol. 19, No. 4, (July 2005), pp. 669-677, ISSN: 0268-005X.

Huxley, A. (1992): New RHS Dictionary of Gardening, 3: 532.

Influence of green tea polyphenol in rats with arginine-induced renal failure. J. Agric. Food Chem.; 51:2421-2425.

Islam, A. M.; Phillips, G. O.; Sljivo, A.; Snowden, M. J. and Williams, P. A. (1997). A review of recent developments on the regulatory, structural and functional aspects of gum arabic. *Food Hydrocolloids*, 11 (4): 493-505.

Khan, Z. A. *et al*. (2001). Inhibition of oxalate nephrolithiasis with Ammi visnaga (AI-Khillah). International Urology and Nephrology 33:(4) 605-8.

Khare CP (2007). Indian Medicinal Plants. 1st Edn., Berlin/Heidlburg, Springer verlang.

Khare CP (2007). Indian Medicinal Plants. 1st Edn., Berlin/Heidlburg, Springer verlang.

Kintzios, S. E. (2000). Sage: The Genus Salvia. CRC Press. pp. 10-11.

Kokko P J. (1984). Site and mechanism of action of diuretics. American Journal of Medicine, 77: 11-17.

Kokko P J. (1984). Site and mechanism of action of diuretics. American Journal of Medicine, 77: 11-17.

Koushik N., Purbajit C., Sunita L. and Sumit D. (2014). Herbal Plants Used as Diuretics: A comprehensive Review. Journal of Pharmaceutical , Chemical and Biological Sciences, 2(1):27-32.

Koushik N., Purbajit C., Sunita L. and Sumit D. (2014). Herbal Plants Used as Diuretics: A comprehensive Review. Journal of Pharmaceutical , Chemical and Biological Sciences, 2(1):27-32.

Kreydiyyeh, S.I. and Usta, J. (2002). Diuretic effect and mechanism of action of parsley. J. Ethnopharmacol, 79: 353-357.

Lumir, O.H.; Tomaš Ř.; Valery, M.; Dembitskya, and Arieh, M. (2005). Myrrh–commiphora chemistry. biomed. Papers 149(1), 3–28.;

Markvardsen, A. J.; David, W. I. F.; Johnson, J. C. and Shankland, K. (2001). Structural model of khellol glucoside from high-resolution powder pattern: hydrogen bonding scheme.J. Acta Cryst, A57: 47-54.

Massoud, A.; Sisi, S.E.; Salama, O. and Massoud, A. (2001). Preliminary study of therapeutic efficacy of a new fasciolicidal drug derived from Commiphora molmol (Myrrh). Am. J. Trop. Med.Hyg. 65(2): 96-99.

McIntosh, G.H.; Whyte, J.; McArthur, R. and Nestel, P.J. (1991). Barley and wheat foods:in fluence on plasma cholesterol concentrations in hypercholesterolemic men. American J. Clinical Nutrition, 53: 1205-1209.

Mohamed, F. and Jörg-Thomas, M. (2003).Recovered lipids from prickly pear [*Opuntia ficus-indica (L.) Mill*] peel: a good source of polyunsaturated fatty acids, natural antioxidant vitamins and sterols. Food Chemistry, 83(3): 447–456.

Monsef, W (2015). Breast cancer in relationship with diatery fat and antioxidant: Possible nutritional and biochemical mechanism of action, Ph.D. Thesis in Nutrition and Food Science, Faculty of Home Economics, Minoufiya University, Egypt.

Monsef, W (2015). Breast cancer in relationship with diatery fat and antioxidant: Possible nutritional and biochemical mechanism of action, Ph.D. Thesis in Nutrition and Food Science, Faculty of Home Economics, Minoufiya University, Egypt.

Monsef, W. (2011).Toxicological studies of some plant extracts rich with phenolic compounds *in vitro* " M.Sc. Thesis in Nutrition and Food Science, Faculty of Home Economics, Minoufiya University, Egypt.

Nadkarni KM and Nadkarni AK. (2005). Indian Materia Medica 3rd Ed., Popular Prakashan Mumbai.

Nadkarni KM and Nadkarni AK. (2005). Indian Materia Medica 3rd Ed., Popular Prakashan Mumbai.

Nasir O, Wang K, Föller M, (2010). Downregulation of angiogenin transcript levels and inhibition of colonic carcinoma by Gum Arabic (Acacia senegal). *Nutr Cancer,* 62(6): 802-810.

Newman, C.W. and Newman, R.K. (1992). Nutritional aspects of barley seed structure and composition. Chapter 17.in: PR shewry, ed. Barley: Genetics, Biochemistry, molecular biology and Biotechnology. C.A.B International, Wallingford, oxan. pp. 351-368.

Novaretti, R. and Lemordant, D. (1990). Plants in the traditional medicine of the Ubaye Valley. J. Ethanopharmacol, 30(1): 1-34.

Obolentseva, G. V.; Litvinenko, V. I.; Ammosov, A. S. and et al. (1999): Pharmacological and therapeutic properties of licorice preparations (a review). *Pharm. Chem. J.,* 33:24-31.

OECD, (2004). Consensus Document on compositional consideractions for new varieties of barley (Hordeum vulgare L.): key food and feed nutrients and anti-nutrients. Report No. 12, Environbent Directorate, OECD, Paris.

Olukoga, A. and Donaldson, D. (1998). Historical perspectives on health. The history of liquorice: the plant, its extract, cultivation, and commercialisation and etymology. J.R Soc Health;118: 300-304.

Ömer, Ç.; Ali, K.; Ayan, and Cüneyt, Ç. (2006). Seedling quality of common sage (Salvia officinalis L.) as affected by seedling production methods. International, J. Agriculture and Biology. 1(2): 106-110.

Pantoja C V *et al.* (2000). Purification and bioassays of a Diuretic and natriuretic fraction from garlic (Allium sativum). Journal of Ethnopharmacology, 70: 35-40.
Pantoja C V *et al.* (2000). Purification and bioassays of a Diuretic and natriuretic fraction from garlic (Allium sativum). Journal of Ethnopharmacology, 70: 35-40.
Paula, C.S.; Rosa, M.S. and Manuel, F. F.(2002). Phenolic antioxidant compounds produced by in vitro shoots of sage (Salvia officinalis L.).Plant Science, 162(6): 981-987.

Rao, R.M.; Khan, Z.A. and Shah, A.H. (2001). Toxicity studies in mice of Commiphora molmol oleo-gum resin. J. Ethnopharamaco. 76: 151-154.

Ross, I.A. (2001). Glycyrrhiza glabra. Medicinal Plants of the World. Chemical Constituents, Traditional and Modern Medicinal Uses, vol.2. Humana Press, Totowa, NJ, pp. 191–240.

Salt mixture . J. Biol . Chem . , 138 – 459.

Sangmai T K et al. (2010). Diuretic property of aqueous extract of leaves of Mimosa pudica Linn on experimental albino rats. Journal of Natural Product 2010; 3:173-178.
Sangmai T K et al. (2010). Diuretic property of aqueous extract of leaves of Mimosa pudica Linn on experimental albino rats. Journal of Natural Product 2010; 3:173-178.
Shalaby, H. (2015).The effect of some food products mixed with plant parts on blood sugar levels of rats. Ph.D. Thesis in Nutrition and Food Science, Faculty of Home Economics, Minoufiya University, Egypt.

Siddig, N.E.; Osman, M.E.; Al-Assaf, S.; Phillips, G.O. and Williams, P.A. (2005). Studies on acacia exudate gums, part IV. Distribution of molecular components in *Acacia seyal* in relation to Acacia senegal. *Food Hydrocolloids*, 19 (4): 679-686.

Sotelo, A. and Alvarez, R.G. (1991). Chemical composition of wild Theobroma species and their comparison to the cacao bean. J. Agric. Food Chem.; 39: 1940-1943.
Sotelo, A. and Alvarez, R.G. (1991). Chemical composition of wild Theobroma species and their comparison to the cacao bean. J. Agric. Food Chem.; 39: 1940-1943.
Steinmetz, K. A. and Potter, J. D. (1991). Vegetables, fruit, and cancer. II. Mechanisms. Cancer Causes Control 2: 427-443.

Swami, S. S. T. (2007). The ayurveda Encyclopedia: Natural secretsto Healing, preventiong & longevity.Ayurveda Holistic Center Press. p.o.Box 94. an eco-positive publisher. 2nd edition.

Szentmihlyi, K.; KEry, A.; Then, M.; Lakatos, B.; Sándor, Z. and Vinkler, P. (1998): Potassiumsodium ratio for the characterisation of medicinal plant extracts with diuretic activity. Phytotherapy Research, 12: 163-166.

Tamir S, Eizenberg M, Somjen D, et al.(2001): Estrogenlike activity of glabrene and other constituents isolated from licorice root. *J Steroid Biochem. Mol. Biol.,*78:291-29.

Teuscher, E. (2003). Gewürzdorgen. Ein Handbuch der Gewürze, Gewürzkräuter, Gewürzmischungen und ihrer ätherischen ÖleWissenschaftliche Verlagsges. M.B.H. Stuttgart, pp.275-280.

Trommer, H. and Neubert, R.H. (2005). The examination of polysaccharides as potential antioxidative compounds for topical administration using a lipid model system. *International Journal of Pharmaceutics*, Vol. 298, No. 1, (July 2005), pp.153–163, ISSN: 0378-5173.

Vaughan, J. G. and Geissler, C. A.(2009). The new Oxford book of Food plants. SPI Publisher Services, Pondicherry, India.

Vaya, J.; Belinky, P. A. and Aviram, M.(1997): Antioxidant constituents from licorice roots: isolation, structure elucidation and antioxidative capacity toward LDL oxidation. *Free Radic Biol. Med.,* 23:302-313.

Velickovic, D.; Randjelovic.N.; Ristic, M.; Smelcerovic, A. and Velickovic, A. (2002). The possibilities of the application of some species of sage (Salvia L.) as auxiliaries in the treatment of some diseases J. Serb. Chem. Soc. 67.639

Vivek K. and Vikrant A. *(2011).* A review on potential diuretics of Indian medicinal plants, *J. Chem. Pharm. Res., 3(1):613-620*

Von, B. and Bothmer, R. (1992).The wild species of Hordeum: Relationships and improvement of cultivated barley. Chapter 1. In: PR shewry, ed. Barley: Genetics, Biochemistry, Molecular Biology and Biotechnology. C.A.B International, Wallingford, Oxan. pp 3-18.

WHO IUCN/WWF (1993).Guidelines on the conservation of medicinal plants. World Health Organization, Geneva. [http://www.wwf.org.uk/filelibrary/ pdf/ guidesonmedplants.pdf]

Williams, P. A. and Phillips, G. O. (2000). In Handbook of Hydrocolloids; Williams, P. A., Phillips, G. O., Eds.; CRC Press: Cambridge, p 155-168.

Wright C J *et al.* (2007). Herbal medicines as diuretics, a review of the scientific evidence. Journal of Ethnopharmacology, 114(1):1-31.

Wright, C.I.; Van-Buren, L.; Kroner, C.I. and Koning, M.G. (2007). Herbal medicines as diuretics: A review of the scientific evidence, J. Ethnopharmacology, 114: 1-31.

Zulfqar, A.; Khan, A.M.; Assiri, H.; Al-Afghani, M.A.; Turki M.A. Maghrabi, (2001). Inhibition of oxalate nephrolithiasis with *Ammi Visnaga* (Al-Khillah). International Urology and Nephrology. Kluwer Academic Publishers. 33: 605-608.

Journal of Home Economics, Volume 25, Number (2), 2015

النباتات الطبية والأغذية المصرية: دراسة مرجعية على المكونات النباتية والنشاط المخرج للماء من الجسم

يوسف عبد العزيز الحسانين , شريف صبرى رجب ، خالد الحاج صابر
قسم التغذية وعلوم الأطعمة - كلية الاقتصاد المنزلي- جامعة المنوفية- شبين الكوم - مصر

الملخص العربى:

فى الأيام الحالية تمثل المواد اذات القدرة على إخراج الماء من الجسم الخط الأول فى علاج العديد من الأمراض. كما لآقت النباتات الطبية فى البلاد النامية وغير النامية إهتماما خاصا لما تتصف به من أنشطة بيولوجية وطبية وأوجة الأمان فى الإستخدام وإنخفاض ثمنها. وعلى وجه الخصوص لآقت النباتات والأغذية التى تتصف بقدرتها على إخراج الماء من الجسم فى مصر إهتماما كبيرا ومنها الخلة، العرق سوس، المر ، الحلفا بار ، الشعير ، الصمغ العربى وغيرها. ونظرا لنقص المعلومات المتعلقة بهذا الجانب فإن الدراسة الحالية تهدف الى توضيح تأثير بعض المكونات النباتية الطبيعية الموجودة بتلك النباتات وإستيضاح بعض الأليات المتعلقة بهذا الخصوص لتكون حجر الزاوية لتوسيع قاعدة الإستفادة من تلك النباتات ولتكون عوضا عن البدائل الكيمائية ذات الآثار الجانبية العديدة.

الكلمات المفتاحية: الكيماويات النباتية ، الخلة، العرق سوس، المر ، الحلفا بار ، الشعير ، الصمغ العربى