

Review

The State of the Art of Traditional Arab Herbal Medicine in the Eastern Region of the Mediterranean: A Review

Hassan Azaizeh¹, Bashar Saad^{1,2}, Khalid Khalil¹ and Omar Said¹

¹The Galilee Society R&D Center (Affiliated with Haifa University, Haifa, Israel), PO Box 437, Shefa Amr 20200, Israel and ²Faculty of Allied Medical Sciences, Arab American University, PO Box 240, Jenin, Palestine

Historical and current studies indicate that the Eastern region of the Mediterranean has been distinguished from other regions by a rich inventory of complementary alternative medicine (CAM), in particular herbal medicine. Data collected from several surveys and studies indicate that there is a flourishing and well-developed trade of herbs. These surveys also reveal that 200–250 herbs are used in treating human diseases and are sold or traded in market places in the Mediterranean region or internationally. In addition, some of these herbs are rare or even endangered species. In regard to the status of the know-how of herbalists, unfortunately, herbal medicine in our region is mostly prescribed by ethnopharmacologists symptomatically—based on signs and symptoms alone, rather than as a result of a full understanding of the underlying disease. In some cases, herbs used today may not even correspond to the plants described originally in the old literature, as the former are cultivated from herbs that went through different breeding procedures throughout several centuries. This article presents a systematic review of both the state of the art of traditional Arab herbal medicine and the status of the know-how of Arab herbalists.

Keywords: Arab herbal medicine – bioactive ingredients – ethnopharmacology – medicinal herbs

Historical Background

For many centuries after the fall of the Roman Empire, the Arabic world was the center of scientific and medical knowledge. Texts from Greece and Rome were translated into Arabic and studied by Islamic scholars. They developed and refined Hippocrate's theories and Islamic physicians began to use the regulation of diet, exercise and the prescription of medicinal herbs in the treatment of their patients. Arabs in the Baghdad region were the first in history to separate medicine from pharmacological science. The differentiation and separation of two scientific disciplines, medicine and pharmacy, began during the eighth century. It is very important to note the fact that the first models of professional pharmacy were found among the Arab population. The first drug stores in

the world were established in the Arab world (Baghdad, 754). The forms used in that period are still used in the therapy and some formulations of drugs can be found in pharmacopeas even today (1,2). Experts in the pharmaceutical sciences undertook the extraction and preparation of remedies. Physicians were now responsible only for diagnosis of the diseases and follow-up with the treatments given. This marked a turning point in pharmaceutical science and helped it to develop into a complex field. Pharmacologists and ethnopharmacologists started to search for different ingredients and extracts to be used as remedies, and studied the chemical properties of materials used in disease management. For the first time, chemists such as Jaber Bin Hayan investigated methods to extract and purify different compounds such as alcohol, nitric acids, sulfuric acids and Royal acid which were used to dissolve gold (3,4). Plant extracts were prepared and taken orally, applied externally, and administered by fumigation and vapor inhalation. The Egyptians were also credited with the early medicinal use of wine, castor oil, marijuana, opium, mints and beer made from barley and wheat (5).

For reprints and all correspondence: Dr. Hassan Azazieh, R&D center—GS, Industrial Zone, Shefa Amr 20200, Israel. Tel: +972-4-950-50-23/4; Fax: +972-4-950-50-25/4; E-mail: hazaizeh@yahoo.com/hazaizi@gal-soc.org

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Herbal Medicine in Bilad el-Sham

In this review we will focus on the development and current status of herbal medicine in the Middle Eastern region and in particular on a region covering significant parts of the present-day Syria, Palestine, Lebanon, Israel and Jordan, used to be called Bilad el-Sham by the Arab rulers and scholars of that time (1,2). Recent studies investigated the medical uses of natural substances in medieval and Ottoman al-Sham (the Levant) and revealed that there were 286 medicinal substances in use as traditional compounds (6–8). These studies involved meticulous surveying of a wide range of historical sources spanning ~1100 years, which include traditional literature, travelogues, archives, the Genizah, Ottoman Levant and other sources. The region under study served as the geographic origin of the majority of medical substances, only a minority of the materials was imported. In fact, the al-Sham region was an independent source of production and marketing of medicinal substances during the medieval and Ottoman period.

Medicinal plants contain curative bioactive ingredients which have proven to be valuable as primary or supplemental therapies when carefully applied (9). Until last century most medicines were derived directly from plants or animals. Despite the increasing use of synthetic drugs, natural pharmaceuticals have persisted as the ‘treatment of choice’ for different diseases in societies throughout the world. Many local remedies used throughout the Middle East region have never been properly explored, researched, evaluated or exploited, compared to, for example, Chinese medicine, which is further away from Europe in theory (10), culture and practice. Medicinal herbs are great resources for various pharmaceutical compounds and urgent measures are required to protect these plant species from their natural destruction and disappearance. Indeed, there is a real danger of indigenous Arab medicinal practices and knowledge disappearing altogether, further weakening traditional Arab culture and creating more insecurity, as well as forsaking a resource of inestimable economic and health care importance.

The Uses of Medicinal Herbs and Extracting their Active Ingredients

Herbal remedies and alternative medicines are used throughout the world, and in the past herbs were the only original source of most drugs. Over 20 000 medicinal herbs were recently inventoried in by the World Health Organization (WHO), and ~250 species had been analyzed to identify their bioactive chemical components (11). The hills and mountains of the Middle Eastern region (mainly historical Palestine) are covered with >2600 plant species of which >700 are noted for their uses as medicinal herbs or as botanical pesticides (12,13). Ethnopharmacological research may represent a crucial step in the development of drugs from natural sources (14). A long history of trial and error has led to the correlation of a particular herb with the amelioration and/or complete curing of certain disease.

Criteria Used to Identify a Potential Medicinal Plant

The physical characteristics of the herb, including size, shape, color, texture and taste have traditionally served as important criteria in their selection for therapeutic purposes. Seeds with kidney shape are used for treating kidney stones: e.g. *Alhagi maurorum* (Medik.) and *Astragalus macrocarpus* (DC.). Roots' shape similar to human body or fruits that resemble human testis are used traditionally for stimulating sexual desire or treating sexual weakness: *Mandragora autumnalis* (Bertol.) and *A. macrocarpus* (DC.). The doctrine of signatures is reflected in some of the uses of certain herbs: e.g. the yellow decoction obtained from leaves of *Rhamnus alaternus* (L.) and the yellow juice from the fruits of *Ecbalium elaterium* (L.) are used for treating jaundice and liver diseases (15,16). For several herbs, the plant's common name in Arabic refers to its use. This is the case for *Glaucium oxylobum* (L.), *Hypericum lanuginosum*, *Marcurialis annua* (L.) and *Ceterrach officinarum* (Willd.). All four plants are called ‘The wounds’ herbs’, since they are used for treating external wounds. The exchange of people and culture between the Middle East, Europe and the Far East has brought with it exchange of information, so that a given herb is used similarly in all these areas: e.g. *Ammi visnaga* (Lam.) for kidney stones; *Matricaria aurea* (L.) for stomach aches; *Malva nicaensis* (All.) for wounds (15,16).

Preparation Techniques

Several techniques are used by traditional herbalists to obtain the beneficial phytochemical components from the selected species. The majority of botanically based remedies are consumed orally in the form of tea or other drink containing either diluted or concentrated chemical ingredients (12,13,15,17,18). The tea is generally produced from the various parts of the herbs through infusion or as decoctions (15). Heating a raw plant in a fluid medium not only aids the extraction and concentration of curative substances, it also acts to eliminate poisons and impurities prior to consumption (19,20). Since there is no sharp dividing line separating food and drugs, it is not surprising that various edible plant parts have been used as sources of both nutrition and medicine in different cultures (9,15). The seeds of *Nigella sativa* (L.), as an example, could be considered as either a meal for food consumption or as a preventive of high blood pressure and heart diseases (15). The oil as well as the fruits of *Olea europaea* (L.) is important food nutrition and an antioxidant or diabetes preventive in many societies. Some plant species are used for treating several types of pathological conditions: e.g. *Teucrium polium* (L.) is a perennial shrub commonly used in folk medicine as anti-diabetic, anti-inflammatory, anti-ulcer, hypotensive and liver diseases (15,21). Phytochemical investigations have shown that this herb contains various compounds such as flavonoids, iridoids and crisiol (22). *T. polium* (L.) crude extract significantly decreased (64%) the blood glucose concentration in treated animals and enhanced insulin secretion (135%) after a single dose of plant extract (23). Table 1 lists a number of plant species

Table 1. Medicinal herbs used to treat diabetes in the Eastern Mediterranean region*

Plant species	Preparation	Additional uses
<i>Astragalus macrocarpus</i> DC.	Leaf decoction	Heart diseases
<i>Ceratonia siliqua</i> L.	Leaf decoction	Herpes and lip sores
<i>Cichorium pumilum</i> Jacq.	Foliage decoction	Bacterial infection, poisoning and rheumatism
<i>Cupressus sempervirens</i> L.	Fruit decoction	Antiseptic and nervous system
<i>Eryngium creticum</i> Lam.	Foliage decoction	Liver diseases, poisoning, anemia and infertility problems
<i>Juglans regia</i> L.	Leaf and flower decoction	Asthma and sexual weakness
<i>Lupinus varius</i> Gaertn	Soaked seeds	Kidney stones
<i>Mercurialis annua</i> L.	Leaf decoction	Cancer and skin diseases
<i>Morus nigra</i> L.	Leaf, stem and fruit decoction	Teeth and gum inflammation and cholesterol
<i>Paronychia argentea</i> Lam.	Leaf and flower decoction	Stones in kidney and heart diseases
<i>Pinus halepensis</i> Mill.	Leaf and seed decoction	Sexual weakness
<i>Prosopis farcta</i> Sol. Ex Russell	Foliage decoction	Menstrual cramps and kidney stones
<i>Quercus calliprinos</i> Decne	Fruit and bark decoction	Cancer, bed wetting and ulcer
<i>Salvia fruticosa</i> Mill.	Foliage infusion	Stomach ache, intestinal gas and inflammation
<i>Sarcopoterium spinosum</i> L.	Leaf, seed and root decoction	Intestine pain, kidney diseases and ulcer
<i>Smilax aspera</i> L.	Fruit and root decoction	Poisoning
<i>Teucrium polium</i> L.	Foliage decoction	Kidney stones, liver diseases, stomach and intestine inflammation
<i>Trigonella foenum-graecum</i> L.	Seed decoction	Sexual weakness, stomach and intestinal pain

*Data from Said *et al.* (15) and Dafni *et al.* (16).

that have been used traditionally to treat diabetes in Arab communities.

Other methods include the inhalation of aerosols (e.g. *Pimpinella anisum* L.), essential oils (e.g. *Jasminum fruticans* L.) and vaporized plant juices or teas, as well as absorption to the skin (e.g. *Portulaca oleracea* L.) (12,13,15,18). In making a poultice, for example, plant parts are ground or crushed and combined with hot water or other liquids to create a medicinal paste or plaster. The resulting mixture is placed directly on wounds, bruises, aritric joints, burns, insect and animal bites, rashes, swellings, wrinkles or dermatological irritations (e.g. *C. officinarum* Willd., *Citrullus colocynthis* L., *Eryngium creticum* Lam.) (12,13,15,18). Table 2 summarizes a partial list of plants prescribed by ethnopharmacologists for treating skin disorders.

Herbal-derived Active Compounds

Plants have an almost limitless ability to synthesize aromatic substances that have been evaluated for their therapeutic potential. These include alkaloids, coumarins, saponins and flavonoids (24,25). Flavonoids are probably the best known of these substances due to their antioxidant properties (26). The therapeutic benefit of several plant species used by traditional herbalists, at least in part, was attributed to their effective inhibition of oxidative processes (27–29). Several of these herbs are used traditionally in treating liver diseases, where *Pistacia lentiscus* (L.) was found effective in suppressing iron-induced lipid peroxidation in rat homogenates as Trolox, the water soluble analog of vitamin E, and did not adversely affect cell membrane integrity or suppress mitochondrial

respiration in cultured HepG2 and PC12 cells (29). A single dose of the aqueous boiled and non-boiled decoctions prepared from the leaves of *P. lentiscus* (L.) blunted the effects of single intoxicating dose of the known hepatotoxin, carbon tetrachloride (30). *Silybum marianum* (L.) (milk thistle) is currently the most well researched plant used traditionally by Arab herbalists in the treatment of liver diseases (15). The active constituents of milk thistle are flavonolignans including silybin, silydianin and silychristine, collectively known as silymarin (31,32). Silymarin is not water soluble and so cannot be taken as a tea but as an encapsulated standardized extract.

The State of the Art of Traditional Arab Herbal Medicine

The Eastern region of the Mediterranean has been distinguished throughout generations with a rich inventory of natural medicinal herbs used by local herbalists (1–4,7,8,12,13,15,33–36). In contrast to the historical importance of Arab medicine, current research into the different modalities of complementary alternative medicine (CAM) in our region and the know-how of modern Arab herbalists are limited. The number and species of medicinal plants that are currently used by herbalists and practitioners were described in a comprehensive survey that was conducted on practitioners and herbalists using medicinal plants in an area that included Israel, the West Bank and the Golan Heights (15,37). Results obtained in this extensive survey indicate that (i) ~129 plant species are still in use in the treatment of various human diseases including liver, skin, respiratory, digestive, cancer and other diseases; (ii) the number of species of plants being

Table 2. Medicinal herbs used to treat skin diseases in the Eastern Mediterranean region*

Plant species	Preparation	Additional uses
<i>Alcea setosa</i> Boiss.	Leaf, flower and root decoction	Stomach and intestine pain, inflammation and asthma
<i>Ammi visnaga</i> L.	Flower and seed decoction	Kidney inflammation and respiratory system (asthma)
<i>Asphodelus microcarpus</i> Salzm. and Viv.	Bulb and root juice	Ectoderm parasites and jaundice
<i>Cyclamen persicum</i> Mill.	Leaf and bulb decoction	Ear infections
<i>Eruca sativa</i> Miller	Seed oil	Sexual weakness and hair loss
<i>Ficus sycomorus</i> L.	Stem milky sap	Coughing, digestive system and anemia
<i>Glaucium corniculatum</i> L.	Poultice of macerated roots	Cholesterol and acne
<i>Inula viscosa</i> L. Ait. <i>Inula</i>	Foliage macerated in oil	Muscle relaxation and infertility
<i>Lavandula officinalis</i> Chaix and Kitt	Leaf, flower and seed infusion	Urinary system, asthma and nerve system
<i>Lycium europaeum</i> L.	Root decoction	High blood pressure and diabetes
<i>Malva nicaensis</i> All.	Whole plant decoction	Coughing and wounds
<i>Myrtus communis</i> L.	Leaf infusion	Stomach, intestine pain and inflammation
<i>Paronychia harmala</i> L.	Seed infusion in olive oil	Wounds and lice
<i>Sanguisorba minor</i> Scop.	Whole plant decoction	Ulcer, burns and wounds
<i>Saponaria mesogitana</i> Boiss.	Root decoction	Liver diseases, stones in kidney and joint inflammation
<i>Scolymus maculatus</i> L.	Stem decoction	Intestine and kidney inflammation
<i>Solanum nigrum</i> L.	Foliage decoction	Wounds and sun burn
<i>Thymelaea hirsuta</i> L. Endl.	Foliage paste	Coughing and respiratory system
<i>Viola odorata</i> L.	Foliage decoction	Respiratory system, stomach and intestine inflammation
<i>Tamarix aphylla</i> L. H. Karst.	Leaf decoction	Eye inflammation and fever

*Data from Said *et al.* (15) and Dafni *et al.* (16).

used by practitioners was nearly twice as many as previously thought; and (iii) some plants were discovered as having medicinal properties for the first time (15). Similar conclusions were drawn from another recently published ethnopharmacological survey conducted in Jordan where >100 herbalists interviewed in this survey revealed that there are ~150 plant herbs still in use as traditional source of natural substances (18). Currently, <200–250 plant species are still in use in Arab traditional medicine for the treatment of various diseases (7,8,15). The number of herbal-derived substances that are in use as traditional compounds is ~286 (8).

Research into the traditional medicinal herbs has also been conducted in many Arab countries such as Syria, Morocco, Yemen, Egypt and others (38–41). The most recent survey conducted on the potential uses of plant species of the coastal Mediterranean region in Egypt (41) recorded 230 species belonging to eight families. Only 89% of these species have medicinal values and are used for treating diseases. Among these species, 62% are common species, 12.7% are occasional, while 13% are rare. According to these authors, all rare species, most of the occasional species and even some of the common ones are going to disappear as a result of overuse. Our heritage of plant herbs that flourished a few centuries ago is now in rapid decline. A report by the Arab Union for Agriculture and Development (2000) has indicated that out of 814 plant species used in traditional Arab medicine only 23 herbs are still in use in pharmaceutical industry, 55 are used in perfume and cosmetics, 34 are involved in food industry and 10 species are used as botanical pesticides. The

Middle Eastern region was covered with >2600 plant species of which >700 were noted for their use as medicinal herbs or as botanical pesticides. Unfortunately, recent ethnopharmacological surveys revealed that <200–250 plant species are still in use in Arab traditional medicine for the treatment of various diseases (15,17,18,42). Moreover, many plant herbs used in traditional medicine are now rare or endangered species. Table 3 lists some of the important rare and endangered plant species used traditionally for treating human diseases or as botanical pesticides. There are several factors endangering plant diversity or even causing eradication of these herbs which include habitat loss, habitat degradation and overharvesting (43).

The Status of the Know-How of Arab Herbalists of the Region

In the middle ages, in the periods of Muslim and Christian rule in the Near East, herbalists and owners of stands for preparing and selling medicines were recognized as a body under professional supervision by the authorities (44). In contrast, recent surveys (18,37) have revealed that most of the practitioners do not have any formal education in the field of medicine and pharmacy. They are also wary of joining local unions or cooperating with local physicians for fear of losing their professional niche. The competition amongst healers is quite high, perhaps because of the general insecurity surrounding this fringe activity. The same phenomenon is noticed in many Caribbean societies, where traditional healers

Table 3. Selected list of important rare and endangered plant species used traditionally for treating human diseases or as botanical pesticides

Plant species*	Applications	Red plant number**
<i>Anchus negevensis</i>	Anti-parasites, skin wounds and anti-coagulation	12
<i>Anchus ovata</i>	Anti-parasites, skin wounds and anti-coagulation	6
<i>Eryngium barrelieri</i>	Liver diseases and anti-toxins	7
<i>Eryngium maritimum</i>	Liver diseases and anti-toxins	6
<i>Euphorbia dendroides</i>	Botanical pesticides	9
<i>Euphorbia hirsuta</i>	Anti-parasite	7
<i>Ophioglossum lusitanicum</i>	Anti-parasite, skin wounds and anti-coagulation	8
<i>Ophioglossum polyphyllum</i>	Anti-parasite, skin wounds and anti-coagulation	6
<i>Teucrium procerum</i>	Diabetics, liver diseases and wounds	12
<i>Teucrium scordium</i>	Chronic skin disease, dyspepsia and hemorrhoids	7
<i>Ziziphus nummularia</i>	Diarrhea, lung inflammation and anti-congestion	8

*Rotem (Israel Plants information center), University botanical garden Jerusalem, 2005 online, <http://www.botanic.co.il/english/research/rare.htm>, cited April 20, 2006.

**The Red number is an additive index, summarizing values of four parameters: rarity, declining rate and habitat vulnerability, risk through attractivity and distribution type. The higher the number is the more the plant is at risk.

acquire their positions through inheritance ('transmission'). It is believed that these skills and abilities are passed down through family lines and visions, rather than also by training and apprenticeship (45). A recent survey (37) reported that only 31 professional Arab practitioners in Israel, Palestine and the Golan Heights are still practicing. The total number of practitioners interviewed was >60, but many of them were excluded from the survey because their know-how was very limited. This number is significantly less in comparison with that in previous surveys (12,16).

Each interviewed practitioner has his own methods of preparation, following the tradition of his parents or teachers. The process of transmitting knowledge from one generation to the next is complex one, and the end result is not always identical. A recent ethnopharmacological survey conducted in Jordan, where >100 herbalists were interviewed, found that most of the herbalists were not educated or trained in the field of herbal medicine beyond the knowledge passed down from their predecessors (18). It was also found that the traditional herbalists were not licensed for this particular purpose. This survey concluded that there is a necessity for proper handling and licensing of herbal medicines. A similar conclusion was also drawn by a comparable survey conducted by our group (37). The scope of experience of those surveyed practitioners varied greatly, depending upon their location, i.e. in the Golan Heights, there is only one practitioner who works part-time, in comparison to the West Bank and Galilee region, in which more practitioners were found to depend on their practice as a sole source of income (37). This indicates that this practice may disappear in some regions of the Middle East. The status of the Arab herbalists according to our recent survey is summarized below:

- Most practitioners have very limited knowledge in the identification of species and procedures for preparing medicinal remedies. They buy readymade or partially

prepared remedies from 'Attarah' shops, where plant materials are sold, and do not collect plants from natural sources.

- Younger practitioners were even less experienced than their older counterparts, indicating that traditional knowledge is being partially lost with new generations.
- Many practitioners are turning to 'mystical' or 'magical' methods of healing, indicating a loss of the rich knowledge of practical plant medicine.
- The level of education of practitioners is in decline, where many practitioners often rely on shepherds for knowledge, identification and collection of plant materials for their practice.
- Plant mixtures are of poorer quality and less variety in comparison to the past. Moreover, plants used in certain regions are not used in others. For example, local practitioners from the Negev region of Israel use only plant species found in the desert.
- A very limited exchange of information takes place between the healers in the same area. The occupation of traditional healer is a family matter and passed on by inheritance; therefore, when the present generation of healers dies, the know-how may die with it because children of the practitioners have no interest in the subject.

The Need for Regulations

These surveys also conclude that there is a necessity for proper handling and licensing of herbal medicines. The increasing popularity of over-the-counter health food, nutraceuticals and medicinal products from herbs or other natural sources in developed countries (46) indicates that the public is not satisfied with 'orthodox' allopathic medical treatment. However, over the past decade several episodes in developed

communities indicated adverse effects, sometimes life-threatening, allegedly arising consequential to taking of herbal products or traditional medicines from various ethnic groups (46,47). In some cases, adulteration, inappropriate formulation, or lack of understanding of plant and drug interactions or uses led to adverse reactions (18,48,49). In view of the progress of Western medicine, not only new synthetic drugs but also herbal remedies have to fulfill international requirements on quality, safety and efficacy (47,50).

Recent ethnopharmacological surveys conducted by different groups in the Middle East support the necessity of proper handling of herbal medicine which requires suitable regulation and licensing in order to ensure supply of suitable and safe products (18,42,51). Fortunately, today there is a counter-trend underway to preserve natural botanical resources through and increasing emphasis on conservation by way of botanical gardens, greenhouses, herbariums, tissue cultures, propagation and seed banks (52,53). The WHO regulations (54,55) can be considered as a good basis for such regulations. In addition a uniform database should be established on the characteristics of these herbs, the methods used for the preparation of these remedies, their application as well as efficacy and toxicity tests in order to avoid negative impacts on the patients.

Concluding Remarks

Medicinal plants in the Middle Eastern region and worldwide are becoming increasingly rare due to the ongoing destruction of their natural habitat, overharvesting of wild species, and detrimental climatic and environmental changes. As a result, it is predicted that in semi-arid regions such as the Middle East, a number of species will disappear within the next 10 years, particularly in desert or dry areas where almost a third of native plants are found. This gives an added sense of urgency to the task of recording their identity and uses, and initiating programs of preservation of the genetic resource of medicinal plants of the region. This is paradoxical at a time when there is an increasing interest worldwide in herbal medicines accompanied by increased laboratory investigation into the pharmacological properties of the bioactive ingredients used to treat various diseases.

The picture today within the region is a general availability of modern medicine, widespread non-professional use of folk and natural remedies, and a small and declining professional tradition of Arab medicine. Recent surveys have found that ethnopharmacologists in the Middle East are increasingly distanced from the knowledge of their predecessors. This is largely because such knowledge is not written, and also because ethnopharmacologists do not directly collect the herbs from nature. These surveys also reveal a lack of information exchange amongst practitioners, and between practitioner and researcher. Additional research emphasis in the field of medicinal plants is required in the future on issues of safety, toxicity, proper dosages, contamination and potential interactions with synthetic and other natural drugs. In order to further reduce the possibility of human poisoning, new methods

might also be introduced to detoxify phytotoxins. In order to revive this cultural heritage, botanical gardens and education centers in the Middle East should exchange knowledge and develop a regulatory framework on a regional scale.

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