

## Diuretic Plant Ecology and Medicine in the Western Mediterranean Coastal Region of Egypt

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The objective of this investigation is to document ethnoecological knowledge through a survey on diuretic plant species used by the inhabitants of the North Western Mediterranean region of Egypt (from Burg El-Arab to Salum) for use in treatment of urinary system problems. The study revealed that the number of plant species used by the bedouins was low (35 species) and some species such as *Alhagi maurorum*, *Polygonum equisetiforme*, *Sylibum marianum* etc. recorded in the ancient Arabic medicine were not being used in the surveyed area. This may be due to the absence of the experiences and awareness of the inhabitants beside the rareness of these species which resulted from the extensive land use in the last decades. The herbal formula are simple and complex formula were rarely used. The herb may be decoct to be taken orally or applied locally in the form of fomentation. In the North part (coastal strip) of the surveyed area the kidney herbal remedies have decreased in importance and old knowledge begin to diminish, probably due to the shifting from folk to biomedical therapies. Wood cutting, overgrazing, intensive agriculture, obliteration of limestone ridges and building summer resorts are the main factors of habitat and species degradation.

**Key words:** Diuretic, ethnomedicine, diversity, sand dunes, degradation, North Western Coastal region of Egypt

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### Introduction

Now a days, the medicinal plants, as an endangered components of biodiversity, received special attention (Batanouny *et al.*, 1999). They are important health and economic components of the flora in developed as well as in the developing countries. The ethnomedical uses are documented for only about 28% of plants on the earth (Farnsworth and Soejarto, 1991). Moreover, fewer than 10% of the world's approximately 250,000 flowering plant species have been examined for their pharmaceutical properties (Stix, 1993). On the other hand 80% of the world's population is believed to rely, to some extent, on medicinal plants (Farnsworth, 1988).

The literature on quantitative ethnobotany, management and conservation has been increased in recent years (Gadgil *et al.*, 1993 and Rossato *et al.*, 1999). Diversity indices used by ecologists have been applied in quantitative ethnobotany (Begossi, 1996; Figueiredo *et al.*, 1993 and 1997). Two diversity indices are especially important in ecological studies: the Simpson, and the Shannon-Wiener indices.

The flora of the Western Mediterranean desert of Egypt includes almost 50% (1000 species) of the species recorded in Egypt (Täckholm, 1974). The rural people throughout the Western Mediterranean Coastal region of Egypt rely to some extent on medicinal plants due to its abundance in their surroundings, their effectiveness, lack of modern medical alternatives in some districts and cultural preferences (Batanouny *et al.*, 1999). It is noteworthy that the indigenous knowledge related to the medicinal uses of plant species and their environment of native populations in the region are threatened. Ayyad and Fakhry (1996) reported that some plant species became extinct and many others are threatened and partially deteriorated as affected by the various land use activities (e.g. wood cutting, overgrazing, pollution, overcultivation, irrigated agriculture, habitat destruction and fragmentation by building summer resorts and quarrying (cutting limestone blocks) initiated in the last few years.

Diuretics are chemicals that induce a net loss of fluid from the body by the urinary tract. They are used to eliminate excess liquid and toxic compounds from the tissues and the vascular system. Many plants in the North Western region of Egypt are known to exert diuretic effects. The objectives of this research are to document knowledge on locally occurring plant species with demonstrable diuretic activity, suitable for use in treatment of urinary system disorders, to measure and evaluate the abundance, distribution and the main operational factors of species degradation.

**Study area:** The current study was conducted along the Western Mediterranean Coastal region of Egypt. The area extends for a distance of about 450km from Burg-El-Arab to Salum and located at 25°00' to 29° 50' E longitude and 31°00' N latitude (Fig. 1). The soil is young and essentially alluvial and diagnostic horizons are absent (Harga, 1967). The climate can be qualified as "arid Mediterranean with mild winter" (UNESCO, 1977). Summer's warmest month has a mean temperature of less than 30°C, and winter's coldest month has a mean temperature above 10°C. Short rain storms occasionally occur in winter. The average annual rainfall is 100 to 180 mm (increasing from West to East and from South to North). The predominant ecosystems in the area are mainly desert ecosystems characterized by different plant communities. The distribution of such communities is controlled by: 1) the topographic location; 2) the origin and nature of parent material; and 3) the degree of degradation

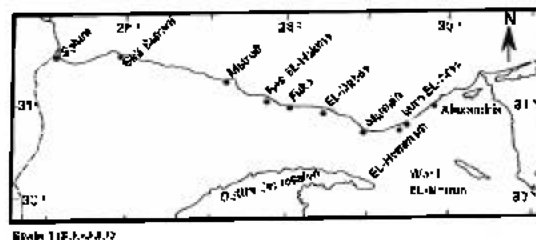


Fig. 1: Map of the Western Mediterranean Coastal region of Egypt

influenced by human pressure. Six main habitats may be recognized: 1) coastal calcareous dunes; 2) non-saline depressions; 3) saline and marshy depressions; 4) ridges and plateaus with skeletal shallow soils; 5) wadis; and 6) inland siliceous deposits (Kamal, 1988).

### Materials and Methods

Data were collected in field trips from summer 1997 to spring 2000. Field work was divided into two phases: the first phase was considered with information gathering using "open-ended" interviews, based on a structured questionnaire where specific questions were asked to adults (45-65 years old). The basic question underlying the interviews was "Do you use any plants to treat or cure kidney problems or diseases?", which would promote the interviews to mention plants which afford symptomatic relief as well as those which actually cure it. Interviews were carried out separately for each individual. Usually the men were in the first category but in some cases women were also interviewed. Plant specimens were collected when available and nomenclature follows Täckholm (1974) and Boulos (1995, 1999 and 2000). Identity of the plants was confirmed by comparing plant material with live specimens and herbarium sheet from the herbarium of the Botany Department, Faculty of Science, Alexandria University. The aim of this phase was to document plant use and to compile a species list and knowledge on potentially useful species was also gleaned from a survey of the ethnobotanical literatures, detailed results of which will be represented elsewhere.

The second phase was focused on the establishment of random sample plots and line transects of varying size and lengths in six locally recognized sites: 1) Burg-El-Arab and Hammam; 2) El-Omayed; 3) El-Alamin and El-Dabaa; 4) Fuka and Ras-El-Hekma; 5) Mersa Matruh and 6) Salum. Local names, habitat type, growth form, cover rating and the effect of human activity of each locally used medicinal plant were recorded.

Data analysis included calculation of Shannon and Simpson indices for the different habitats based on the value of cover ratings.

### Results

A total of 143 adults, comprising 134 men and 9 women were interviewed in the six habitats. 21 sand dunes, 30 saline depression, 13 non-saline depressions, 19 rocky ridge, 37 inland plateau and cultivated fields 23 individuals. The number of species encountered in the present study was 35 plant species including 27 wild (W) and 8 cultivated (C), from 18 families all are used for diuresis and releasing kidney stones. All species recorded were ranked according to their life forms (Table 1). Generally, therophytes were the most

dominant life form followed by chamaephytes (among wild species the total number 11 and 8 species respectively). Table 2 illustrates the species cited for all the six habitats with their abundance, life forms and the main degradation factors. Families Apiaceae, Astraceae and Poaceae contain the large number of species as compared to the other families. It is obvious that some species such as *Echinops spinosissimus*, *Deverra tortuosa* and *Centaurea calcitrapa* were represented in almost or all habitats (presence percentage ranged from about 66 to 100%) while others (e.g. *Urginea maritima* and *Zygophyllum coccineum*) were recorded only in one or two habitats (presence percentages ranged from about 16 to 33%). The cover ratings for the different plant species varies greatly from one habitat to another. For example, *Centaurea calcitrapa* attained cover rating of value 4 in the habitat of non-saline depression, while the value was dropped to 1 in inland plateau habitat. Another example, *Cynodon dactylon* attained a value of 5 in the cultivated fields and 1 in the habitat of sand dunes. On the other hand, therophytes exhibit high cover values in the cultivated fields as compared to other habitats. Species richness and Shannon (H') and Simpson (D) indices in the different habitats and microhabitats are listed in Table 3. The data indicated that the cultivated fields and non-saline depression are substantially the most diverse habitats as estimated by Shannon index (3.2 and 2.03 respectively) and consequently they attained the lowest concentration of dominance (0.02 and 0.009 respectively). Sand dunes and saline depression habitats were characterized by low diversity (1.5 and 1.6 respectively).

Table 1: Absolute number and percentage for different life-forms of plant species

Life Form	Absolute Number	Percentage
<b>Cultivated Species(C)</b>		
Crops (Therophytes)	6	17.10
Trees (Phanerophytes)	2	5.71
<b>Wild Species (W)</b>		
Phanerophytes	1	2.85
Chamaephytes	8	22.30
Hemicyptophytes	2	5.71
Cryptophytes (Geophytes)	5	14.28
Therophytes	11	31.12
<b>Total</b>	<b>35</b>	<b>99.9</b>

**Some Diuretic Plant Species Used In The North Western Region Of Egypt :**

**Alliaceae**

**Allium cepa L.:** It is a biennial or perennial plant which is mostly cultivated in North Africa but also found wild in numerous areas. The value of the species in folk medicine has been attributed to their volatile substances (Schwimmer and Guadagni, 1968). The juice, decoction or extract is used most often as a diuretic (Kobasi, 1993). According to Potterton (1983), a tincture made by steeping an onion in alcohol is diuretic and used to expel sediment from the bladder and to treat dropsy. Leung (1984) stated that onion seeds are considered to invigorate kidney functions and brighten vision. They also used for treating impotence due to kidney deficiencies, hematuria (bloody urine), kidney stones, difficulty in urinating, dizziness, seminal emission, and white vaginal discharge. Their usual daily dose is 3 to 9g taken as a powder with water.

**Apiaceae**

**Ammi majus L.:** Glabrous annual winter weed growing mainly in the wheat, barley and broad bean fields. It is fairly common in the Delta and Nile Valley fields. It is naturalized or adventive in many temperate and warm regions (Boulos, 2000). However its cultivation is necessary in order to obtain an adequate yield for the pharmaceutical industry. Seeds (Boulos, 1983) and fruits (Batanouny *et al.*, 1999) are used in folk medicine as diuretic. On the other hand, Ageel *et al.* (1986) found that the fruits of *A. majus* are devoid of diuretic activity. Ahsan *et al.* (1989) reported that the fruits may be not valid for prevention of kidney stones. *A. majus* is completely free from Khellin which is responsible for the diuretic activity of the fruits. The fruits of *A. majus* were described in old literatures as a remedy for leukoderma (Rizk, 1986).

**Ammi visnaga L.:** Stout tall, winter annual, with thick stem and pinnatisect leaves. Seeds and fruits are diuretics, release renal stones, have calcium antagonist activity, vasodilator, relieve congestion of prostate gland, gastric ulcers and generally for urinary disorders (Batanouny *et al.*, 1999). Decoction of umbels, prepared and consumed in increasing doses, was used for kidney stones (Chopra *et al.*, 1956). Khellin, sometimes known as visnamin, a selective coronary vasodilator and bronchodilator is used for the treatment of bronchial asthma and angina pectoris. Recently, Khellin has been applied as a photo chemotherapeutic agent for the treatment of vitiligo (Boulos, 2000). The umbel-rays are used as tooth picks.

**Apium graveolens L.:** Smallage (also called wild celery) is a glabrous annual of heavy aromatic smell. It is widely cultivated and also grows wild in salty soils of North and South America, Europe and Africa. Kobasi (1993) found that the roots, leaves and fruits are diuretics. The fruits are stimulant, affect on the kidneys and bladder, stimulate urine contractions and cause animal abortion. Tincture prepared from ripe seeds is used to treat urine retention and other renal disorders. Also Chiej (1984) confirmed that celery seeds and roots are diuretics. On the other hand, Lust (1974) reported that the juice of the fleshy petioles is the most effective form of medicine. It is a strong diuretic which is not to be used when acute kidney problems exist. The roots provoke the urine and are effectual where there is stoppage or for removing stone and gravel (Potterton, 1983). Kotb (1987) also cited that celery oil is sedative, general tonic and diuretic.

**Deverra tortuosa (Desf.) [= Pituranthos tortuosus (Desf.)]:** Zozaah is a xerophytic and salt intolerant plant which grows in almost all the phytogeographical regions of Egypt especially desert wadis and sandy and stony plains. The plant is widely distributed in Tunisia, Libya, Egypt, Palestine and Saudi Arabia (Boulos, 2000). Phytochemical investigation of the plant revealed the presence of coumarins and unsaturated sterols (Ahamed *et al.*, 1969). Boulos (1983) reported that the diuretic action of the plant may be due to its high mannitol content.

**Eryngium campestre L.:** A perennial, mostly spiny plant common in barley fields, roadsides and stony hillsides (Boulos, 2000). It has a highly effective diuretic action. Decoction of roots and the plant during the flowering stage is used for urinary disorders and to release kidney stones (Chiej, 1984). According to Kobasi (1993) taking the

**Table 2: Species cited in all habitats distributed along North-Western desert of Egypt (Burg El-Arab-Salum)**

Plant Species	Species Abundance in different h + B3 habitats (cover ratings)											Factor of degradation		
	Sand dunes	Saline depression	Non-Saline Depression	Rocky Ridges			Inland Plateau		Cultivated Pre-fields	Pre-sence%	Life-Form			
				Top	Slope	Foot	Rocky surface	Sand deposits						
Family Alliaceae														
<i>Allium cepa</i> (L.) Basal (c)									5	16.6	Geophyte	4 <sup>2</sup>		
Family Apiaceae														
<i>Ammi majus</i> (L.) <i>Khilla</i> (W)									3	16.6	Therophyte	4 <sup>2</sup> +5 <sup>2</sup>		
<i>Ammi visnaga</i> (L., Lam.) (W)									3	16.6	Therophyte	4 <sup>2</sup> +5 <sup>2</sup>		
<i>Apium graveolens</i> (L.) <i>Karafs</i> (C)											Hemicryptophyte			
<i>Deverra tortuosa</i> (Desf.) Qazzah (W)	1	1	2	4	3	2	3	1	1	100.0	Chamaephyte	2+3 <sup>1</sup> +3 <sup>2</sup> +4 <sup>2</sup> +5 <sup>2</sup> +6		
<i>Eryngium campestre</i> (L.) <i>Shagaqeel</i> (W)	2		3						2	50.0	Chamaephyte	2+3 <sup>2</sup> +4 <sup>2</sup> +5 <sup>2</sup> +6		
<i>Foeniculum vulgare</i> subsp <i>vulgare</i> (Mill.) <i>Shabaat</i> (C)									4	16.6	Therophyte	4 <sup>2</sup> +5 <sup>2</sup>		
Family Astraceae														
<i>Artemisia herba-alba</i> (Strip <i>El-Aragon</i> ) <i>Sheeh</i> (W)				4	3	2	3				66.6	Chamaephyte	3 <sup>2</sup> +3 <sup>3</sup>	
<i>Centaurea calcitrapa</i> (L.) <i>Shoak, Moraar</i> (W)			4			3			1	2	66.6	Chamaephyte	3 <sup>2</sup> +5 <sup>2</sup>	
<i>Cichorium endivia</i> (subsp <i>Pummlum</i> ) (L., Jacq., Ball.) <i>Shikoria</i> (W)										3	16.6	Therophyte	4 <sup>2</sup>	
<i>Conyza bonariensis</i> (L., Cronquist.) <i>Bellekikh</i> (W)			1							3	33.3	Therophyte	4 <sup>2</sup> +5 <sup>2</sup>	
<i>Echinops spinosissimus</i> (L.) <i>Kadaad</i> (W)	2	1	2	2	3	2	3	1	2	100.0	Chamaephyte	2+3 <sup>2</sup> +4 <sup>2</sup> +5 <sup>2</sup>		
Family Brassicaceae														
<i>Raphanus sativus</i> (L.) <i>Figl</i> (C)										5	16.6	Therophyte	4 <sup>2</sup>	
Family Caryophyllaceae														
<i>Citrullus colocynthis</i> (L., Schard) <i>Handal</i> (W)			1		2	2				2	66.6	Therophyte	3 <sup>1</sup> +3 <sup>2</sup> +4 <sup>2</sup>	
Family Chenopodiaceae														
<i>Chenopodium ambrosioides</i> (L.) <i>Habaq el-bahr</i> (W)										4	16.6	Therophyte	4 <sup>2</sup>	
Family Cucurbitaceae														
<i>Citrullus colocynthis</i> (L., Schard) <i>Handal</i> (W)			3							2	3	50.0	Hemicryptophyte	3 <sup>2</sup> +5 <sup>2</sup>
Family Cyperaceae														
<i>Cyperus rotundus</i> (L.) <i>Sa'd el-hammar</i> (W)						1				3	33.3	Geophyte	3 <sup>2</sup> +4 <sup>2</sup>	
Family Fabaceae														
<i>Vicia faba</i> <i>Dohrag</i> (C.)										5	16.6	Therophyte	4 <sup>2</sup>	
Family Fumaraceae														
<i>Fumaria officinalis</i> (L.) <i>Amiya</i> (W)										2	16.6	Therophyte	4 <sup>2</sup> +5 <sup>2</sup>	
<i>Fumaria parviflora</i> (Lam.) <i>Shaahatrag</i> (W)										2	16.6	Therophyte	4 <sup>2</sup> +5 <sup>2</sup>	
Family Liliaceae														
<i>Asparagus stipularis</i> (Forsk.) <i>Aqod gabal</i> (W)				2	2	1	2				66.6	Chamaephyte	3 <sup>1</sup> +3 <sup>2</sup>	
<i>Urginea maritima</i> (L., Baker) <i>Basal farson</i> (W)	2										16.6	Geophyte	2+6	
Family Moraceae														
<i>Ficus carica</i> sub-sp <i>rupestris</i> (Haukskn. Ex-Boiss) <i>Teen El-Baar</i> ®	2									5	33.3	Phanerophyte	5 <sup>1</sup> +5 <sup>2</sup> +6	
Family Oleaceae														
<i>Olea europaea</i> (L.) <i>Zaytoon</i> ®										5	16.6	Phanerophyte	5 <sup>1</sup> +5 <sup>2</sup>	
Family Plantaginaceae														
<i>Plantago major</i> subsp <i>intermedia</i> (Gilib, Lange) <i>Masaas</i> (W)										4	16.6	Chamaephyte	4 <sup>2</sup> +5 <sup>2</sup>	
Family Poaceae														
<i>Cynodon dactylon</i> (L., Pers) <i>Nigeel</i> (W)	1	2	4							5	66.6	Geophyte	2+3 <sup>1</sup> +4 <sup>2</sup> +5 <sup>2</sup>	
<i>Horidium vulgare</i> (L.) <i>Sheir</i> (C.)										5	16.6	Therophyte	4 <sup>2</sup>	
<i>Imperata cylindrica</i> (L., Rausch.) <i>Halfa</i> (W)										4	33.3	Geophyte	2+4 <sup>2</sup> +5 <sup>2</sup>	
<i>Phragmites australis</i> (Cav., Trin. Extend) <i>Ghaab hagna</i> (W)			2							3	33.3	Geophyte	2+4 <sup>2</sup> +5 <sup>2</sup>	
<i>Zea mays</i> (L.) <i>Zorah</i> (C.)										5	16.6	Therophyte	4 <sup>2</sup>	
Family Portulacaceae														
<i>Portulaca oleracea</i> (L.) <i>Rigla roomi</i> (W)										3	16.6	Therophyte	4 <sup>2</sup>	
Family Utriacaceae														
<i>Utrica urens</i> (L.) <i>Horrage</i> (W)										4	16.6	Therophyte	4 <sup>2</sup> +5 <sup>2</sup>	
Family Zygophyllaceae														
<i>Paganum harmala</i> (L.) <i>Hamal</i> (W)			2	1	1	2	1	1		50.0	Chamaephyte	3 <sup>1</sup> +3 <sup>2</sup>		
<i>Tribulus terrestris</i> (L.) <i>Shiqshiq</i> or <i>Dreiss</i> (W)			1			2		1	2	50.0	Therophyte	3 <sup>1</sup> +3 <sup>2</sup> +4 <sup>2</sup>		
<i>Zygophyllum coccheum</i> var. <i>berenicense</i> (Muschl) <i>Haramani</i> (W)						1	2	3		50.0	Phanerophyte	3 <sup>1</sup> +3 <sup>2</sup>		

Legend for Table 2 cover ratings and factor of degradation

Cover ratings	
Rating	(%)
1	1-3
2	3-5
3	5-15
4	15-25
5	> 25
Factor of degradation	
Land-use type	Degree of interference
<b>Rangelands</b>	
Light grazing	2
<b>Over grazing</b>	
Overgrazing with good vegetation and soil conditions	3
Over grazing with high degree of species and soil degradation	3 <sup>1</sup>
<b>Vegetation introduced by man (Mechanical Ploughing)</b>	
Crop cultivation	4 <sup>2</sup>
Arboriculture (Figs + Olives)	
Orchard well cultivated (regular ploughing, pruning, and manuring)	5 <sup>1</sup>
rainfed arboriculture combined with a rainfed annual intercalary crop	5 <sup>2</sup>
<b>Urbanization</b>	
Building of new touristic villages along the coast	6

decoction for 15 days, morning and night, helps the voiding of urine by drops, the stopping of urine and stones, and all defects of the reins and kidneys. On the other hand, warm decoction from the roots of species *E. creticum* was used for kidney stones and cold decoction every morning was used for gall bladder problems (Tzizik, 1952).

**Foeniculum vulgare Miller:** Fennel is a perennial, rarely annual, grows wild in fields, gardens and cultivated in many areas. Chiej (1984) cited the use of roots as diuretic. Fennel seeds and fruits are good to break wind, provoke urine, digest the food, ease the pains of the stone and help break it (Khan *et al.*, 1999). Fennel seed is said to warm the kidneys and to calm the stomach as well as to benefit the bladder. They are used also as a stimulant, carminative, stomachic, expectorant, and diuretic and are of value in treatment of coughs and asthma (Rizk, 1986). Other uses include the treatment of swollen testicles, painful menstrual periods, hernia of small intestine, cholera, and bed-wetting. It is one of the official drugs listed in the pharmacopoeia of the People's Republic of China, with a usual daily dose of 3 to 9g taken as a tea, decoction, or powdered (Leung, 1984).

#### Astraceae

**Artemisia herba-alba Asso. (Artemisia inculca Del.)** The genus Artemisia is one of the largest genera belonging to the family Astraceae consisting of more than 350 species. The species *herba-alba* is a perennial fragrant woolly-candescens undershrub which grows widely in the Arabian desert and has been reputed in folk medicine in dry powdered form as a diuretic (Batanouny *et al.*, 1999). In Arabic it is named 'Shih'. Many of the genus Artemisia have been used since ancient times as folk remedies for some treatment purposes (reducing phlegm, relieving cough, invigorating blood circulation, stopping pain, inducing sweat, diuresis, antihypertension, anthelmintic, antitoxic and anti-allergy) (Tan *et al.*, 1998). Moreover, Kobasi (1993) stated that the plant is commonly used in folk medicine for its high content of a considerable number of very effective volatile oils.

Table 3: Diversity indices based on cover ratings (Braun-Blanquet) in different habitat and microhabitat types distributed along the North Western desert of Egypt (Burg El-Arab-Salum)

Habitat and Microhabitat Types	Richness	Shannon Wiener (H)	Simpson (D)
Sand Dunes	2.1	1.5	0.09
Saline depression	2.2	1.6	0.06
Non-Saline depression	2.8	2.03	0.009
Rocky Ridge			
Top	1.7	1.5	0.15
Slope	2.6	2	0.008
Foot	2.3	1.9	0.008
Inland Plateau			
Rocky Surface	1.9	1.7	0.13
Sandy Deposits	2.1	1.5	0.1
Cultivated Fields	5.9	3.2	0.02
<b>Total</b>	<b>1.8</b>	<b>1.9</b>	<b>0.17</b>

**Centaurea calcitrapa L.:** Tall richly branched biennial weed. It grows along roads and canal banks especially in the Nile region. It grows also in the Mediterranean region and the Oases. Seeds are used as vulnerary, febrifuge, and commonly used for renal stones and pains (Batanouny *et al.*, 1999). The use of several *Centaurea* spp., by local natives of some countries as diuretic, emetic, antimalarial, antifebrile as well as poisoning of the livestock by some species have been reported (Kingsbury, 1964).

**Cichorium intybus L.:** Also known as chicory, of which there are a number of garden varieties. Kobasi (1993) reported that the leaves and roots of this plant are diuretic. Number of coumarins was isolated from the flowers of this species. The species *pumilum* is a weed which grows in alfalfa fields. In Egypt the leaves are eaten by villagers as a green salad (the roots were found to contain) as blood purifiers and for liver diseases (Kobasi, 1993).

**Conyza bonariensis L.:** Boulos (1983) reported the use of the flowering branches of this plant as diuretic. Rizk (1986) cited the use of this species in Egypt in folk medicine as antispasmodic drug.

**Echinops spinosus L.:** A perennial plant commonly distributed in the area from Egypt to Morocco. Stems, leaves and roots are used as diuretic (Boulos, 1983).

#### Brassicaceae

**Raphanus sativus L.:** It is an annual or biennial herb that is widely cultivated as a salad vegetable and often found naturalized in North Africa. Boulos (1983) cited that fresh roots are used as diuretic. It provokes urine and is good for kidney stone and gravel. The juice pressed from grated fresh radish is an old European home remedy for gall-bladder problems (Lust, 1974). On the other hand, Potterton (1983) reported that radish juice is not suitable for inflammatory conditions where there is a kidney disease.

#### Caryophyllaceae

**Paronychia argentea Lam.:** It is a small prostrate annual or short-lived perennial herb with entirely silvery-scarious bracts and stipules. The plant grown widely in sandy and rocky ground and commonly distributed in Mediterranean region, coastal strip (Salum - Port Said), Gebel Elba, and Sinai. Infusion of the above ground parts is diuretic and commonly used for urinary stones (Batanouny *et al.*, 1999). The green leaves are boiled in water until liquid becomes red and then taken from 2-4 glasses a day to treat kidney stones and edema (Abou-Charr and Ades, 1961).

#### Chenopodiaceae

***Chenopodium ambrosioides* L.:** Several of the more than 20 species of the genus *Chenopodium*, mostly annual weeds, have been considered toxic or potentially toxic (Kingsbury, 1964). The species is a common weed along canals in Nile, Mediterranean and Oases regions. The plant is a yellow green with rich inflorescence. Leaves, young shoots and fruits are diuretic (Batanouny *et al.*, 1999). According to Boulos (1983) the plant was recorded in the region from Egypt to Morocco and naturalized from tropical America. He also cited that a decoction of the flowers and fruits is used as diuretic. The plant is efficiently used to promote the secretion of the kidneys (Lust, 1974).

#### Cucurbitaceae

***Citrullus colocynthis* L.:** The plant is very toxic, common and grows in deep sandy habitats in all the phytogeographical regions of Egypt. It appears as a groups in depressions receiving runoff water. However, cultivation of the plant for medical purposes is recommended. The leaves are diuretic and also used in treatment of jaundice and asthma (Batanouny *et al.*, 1999). The fruit pulp is diuretic and used for urinary discharge. Nadkarni (1954) also cited that the plant in moderate doses is diuretic and roots is useful in urinary diseases. The peels of this species, grown in Egypt, yielded a volatile oil by 5.53% (Ali, 1979). It is noteworthy that colocynth (the dried peeled fruit of *C. colocynthis*) has been used as a cathartic because of the increasing problem of synthetic laxative habituation and also because it is not toxic (Ickert, 1979).

#### Cyperaceae

***Cyperus rotundus* L.:** A perennial herb with creeping rhizome; which produces rows of small leaf rosettes along the ground. The rhizomes (in the form of ellipsoid tubers) are diuretic and commonly used to remove renal calculi (Batanouny *et al.*, 1999).

#### Fabaceae

***Vicia faba* L.:** For centuries the broad bean have formed a staple part of the daily diet of people in countries of Europe, Asia and Africa (Rizk, 1986). According to Chiej (1984), flowers of this species are diuretic. Also the water, distilled from the green husks is held to be effectual against the stone and to provoke urine (Kobasi, 1993). Vered *et al.* (1997) showed that the consumption of *V. faba* seedlings results in an increase of urinary dopamine "DA" (acts as a natriuretic and vasodilatory hormone) excretion and in subsequent increase in sodium excretion. The clinical implications would be the beneficial effects of enhancing natriuresis and diuresis in various kidney disease. The distilled water from the flowers is good to clean the face and skin from spots and wrinkles (Potterton, 1983).

#### Fumariaceae

***Fumaria officinalis* L.:** An annual plant where the flowering branches are used as diuretic (Boulos, 1983; Lust 1974). Potterton (1983) reported that the dried herb is used in infusion as a diuretic. It eradicates the yellow jaundice through the urine which it produces in abundance (Kobasi, 1993).

***Fumaria parviflora* Lam.:** Annual plant commonly distributed in the region from Egypt to Morocco. According to Boulos (1983) and Nadkarni (1954), an infusion of the entire plant is used as diuretic.

#### Liliaceae

***Asparagus stipularis* Forssk.:** Asparagus is a perennial plant

that is common from Egypt to Morocco. An infusion of the tuberous roots is used to remove renal stones, also the young tender shoots are diuretic (Boulos, 1983).

#### *Urginea maritima* (L.) Baker

Squill is a perennial plant with an onion-like bulb, full of thick juice. The two types (white and red) are common from Egypt to Morocco and are of rare occurrence in the Mediterranean coastal region and the Ithmic desert. Their value in folk medicine has been attributed to their content of cardiac glycosides. Batanouny *et al.* (1999) reported that the bufadienolides of squill increase diuresis due to dilatation of the capillaries of the kidneys as well as through increased volume of blood passing through kidneys. Kotb (1987) also cited the use of white squill for diuresis. In addition, the scales are dried and eaten for edema (Al-Rawi and Chakravarty, 1964)

#### Moraceae

***Ficus carica* L.:** Deciduous trees or shrubs with big palmately-lobed leaves commonly cultivated and often naturalized in North Africa. It is one of the most important cash crop fruit trees densely cultivated in the habitat of the sand dunes along the North Western Coastal strip of Egypt (El-Darier, 1988). Large numbers of fig trees were removed and substituted by modern constructions; thereby, the fig area is now shrinking (Batanouny, 1999). Watt and Breyer-Brandwijk (1962) reported that the fruits are diuretic, remove kidney and bladder stones. On the other hand, the plant latex is used also as diuretic (Rizk and El-Ghazaly, 1995).

#### Oleaceae

***Olea europaea* L.:** Evergreen trees or shrub 2-8m height, with stiff branches. Several olive cultivars are grown in Egypt for oil and fruit pickling. The drought resistant cultivar "Chemlali" is widely cultivated in the Mediterranean coastal region. Extraction or decoction of leaves are used as a diuretic to increase the renal secretion; it has vasodilatory activity (Kobasi, 1993).

#### Plantaginaceae

***Plantago major* L.:** Plantain is a perennial plant its seeds are known to be an excellent source of acid polysaccharides. A cold infusion is demulcent and given also in urinary disorders and dysentery. Also the whole plant (Kobasi, 1993) and seeds (Boulos, 1983) are considered to be diuretics.

#### Poaceae

***Cynodon dactylon* L.:** Bermuda grass is a perennial herb and The use of this plant in folk medicine has been reported (Rizk and El-Ghazaly, 1995). A decoction of rhizomes (collected during spring or autumn) are efficiently used for urinary troubles and inflammation of the urinary bladder (Kobasi, 1993). They are diuretic and would be used for suppression of urine and vesicle calculus (Boulos, 1983). In Iraq, a decoction of the plant is reported as diuretic, useful in dropsy and anasarca; expressed juice as astringent stops bleeding of cuts and wounds and rhizomes in genito-urinary disorders (Al-Rawi and Chakravarty, 1964).

***Imperata cylindrica* L.:** The analysis of the mineral elements, amino acids, proteins and gross energy value of the different parts of this plant showed that the stems and leaves contain

the highest percentage of minerals and the inflorescence contain the highest crude protein (Rizk, 1986). Rhizomes and young shoots are used as diuretic (Boulos, 1983).

***Phragmites australis* Cav. (syn. *P. communis* Trin.):** The plant is a perennial and of common occurrence in many different habitats and conditions in Egypt. Rhizomes are frequently used as diuretic (Boulos, 1983). The powdered seed is used as an ingredient in a burn ointment and the root-stock has been used as a diuretic and diaphoretic (Watt and Breyer-Brandwijk, 1962).

***Hordeum vulgare* L.:** It is an annual plant widely cultivated as a cereal crop through the world. The grain (caryopsis) is the main part to be used in the form of decoction and fluid extract to treat the inflammation of the urinary bladder (Kobasi, 1993). Also the mucilaginous substances obtained after cooking barley grains may be suitable for stomach problems. Barley water is used widely for diuresis (Lust, 1974).

***Zea mays* L.:** An annual plant commonly cultivated in North Africa and originated in South America. A decoction of corn silk (style and stigma of the female inflorescence) is very diuretic and calmative, frequently prescribed for urinary system diseases, particularly cystitis (Kobasi, 1993). Infusion of corn silks mixed with barley grains and dried flowers of *Opuntia ficus-indica* is taken for cases of retention of urine (Boulos, 1983). Leung (1984) reported that the corn silks make a good diuretic preparation, which is sometimes helpful in such urinary problems as cystitis, pyelitis, and oliguria and also in edemous conditions. Moreover, Newval *et al.* (1996) has listed the herbal use of aqueous extract of corn silks for treatment of cystitis, urethritis, nocturnal enuresis, prostatitis, and especially for acute or chronic inflammation of the urinary system. It was also demonstrated that the ethanolic extract (C<sub>2</sub>H<sub>5</sub>OH) of corn silk has a wide range of therapeutic action as anti-inflammatory agents (Habtariam, 1998). Corn silk is an ingredient in some diuretic preparations sold over the counter in America and Europe. It contains bitter glycosides, saponins, volatile oil, fats, resin, tannin (1, 3, 0.1 to 0.2, 2.5, 2.7, and 1% respectively), vitamins C and K, steroids, alkaloids and others (Leung, 1984). Moreover, corn silk is listed as an official drug in the pharmacopoeia of the People's Republic of China and is used as a diuretic and hypotensive in the treatment of edema, nephritis (kidney inflammation), urinary difficulties, jaundice, and hypertension. Traditionally, it is also used for diabetes, hepatitis, kidney stones, gallstones, cholecystitis (gallbladder inflammation), beriberi, chylous hematuria (milky and bloody urine), and hematemesis (vomiting blood). The usual internal daily dose is 15 to 30g, but at times up to 60g and is normally taken as a decoction (Leung, 1984).

#### Portulacaceae

***Portulaca oleracea* L.:** Annual, glabrous, densely branched succulent herb commonly found in the area from Egypt to Morocco. The plant is stated to be rich in calcium, iron and when collected prior to flowering, contains vitamin A and C. In addition, it also contains potassium nitrate, potassium chloride, potassium sulphate and other potassium salts (Rizk, 1986). It is assumed that the diuretic action of the plant is due chiefly to these salts (Rizk, 1986). Chiej (1983) also cited the use of the whole plant as diuretic. On the other hand, Kobasi (1993) confessed the use of leaves as a diuretic and for kidney diseases. In addition, Dastur (1977) indicated the use of seeds in the urinary discharge and found the herb is regarded as a cooling diuretic.

#### Urticaceae

***Urtica urens* L.:** Nettle is an annual small herb, branching from the base. The plant is common from Egypt to Morocco and used for kidney ailments (Batanouny *et al.*, 1999). The park is taken for bladder pains (Watt and Breyer-Brandwijk, 1962), and infusion and decoction of leaves are diuretic (Kobasi, 1993). Lichius and Muth (1996) cited that tea made from the dried roots of *Urtica dioica* had some positive effects in the treatment of Benign Prostatic Hyperplasia (BPH) in mouse. The 20% methanolic extract (CH<sub>3</sub>OH) was the most effective with a 51.4% inhibition of induced growth.

#### Zygophyllaceae:

***Peganum harmala* L.:** A glabrous perennial plant common in the area from Egypt to Morocco. The alkaloids of *Peganum harmala*, because of their pharmacological activities, are perhaps the most important alkaloids of this family (Rizk, 1986). Boulos (1983) reported that the plant is diuretic. The seeds are powdered, decocted and taken orally with water for removing kidney stones (Batanouny *et al.*, 1999).

***Tribulus terrestris* L.:** It is a wild annual prostrate hairy herb grows in many areas of the Arabian desert, and common in Egypt (Täckholm 1974). It is a natural grazing animal fodder whose nutritive value has been investigated by various workers. Roots are diuretic and useful in urinary discharge (Kirtikar and Basu, 1984). Duke and Ayensu (1985) reviewed that decoction or infusion of seeds and spiny fruits are used for relief of bladder pains, gravels and as diuretic in gout.

***Zygophyllum coccineum* L.:** Is the most widespread *Zygophyllum* species in Egypt and grows in diverse habitats and different soil types (Boulos, 2000). It is a succulent low shrub, or perennial herb very common in arid zones of Egypt (Eastern and Western Desert and Sinai Peninsula). Infusion of fruits is diuretic (Batanouny *et al.*, 1999).

#### Discussion

The study area represents one of the most ideal examples of desert communities in which the inhabitants not or less receive the proper medical health care. Instead and to fill this gap, they have to use folk medicine formulae based on crude materials from their local environment. Infusions, decoction, powders, teas, juices and others constitute the major of their medical activities and practices (Boulos, 1983).

The ecology and existing traditions of diuretic herbal medicine among the ethnic groups, in the rural area of the North Western region of Egypt have been estimated, collected and described in this research. The herbal medicines recommended by the bedouins were mainly for diuresis and repelling the kidney stones. While often most of the inhabitants avoided the use of narcotic and poisonous plants due to their toxicity, some others use narcotic plants such as *Peganum harmala*, but special care is used in preparation, dosage and administration.

Surprising, some plants common and recorded to herbal practice in early Arabic medicine, Chinese, Indian and in Europe for long time were not being used in the surveyed area. We are unable to explain this phenomenon, one may suggest that this may be due to unawareness of the inhabitants by the medicinal values of these species or it may be ascribed to unexperienced trials in ailment treatments.

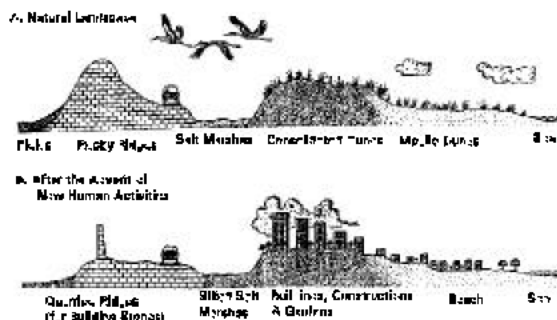


Fig. 2: Schematic diagram showing a section extending from the sea southwards. This shows the various habitats before and after the advent of new human activities (after Batanouny, 1999).

Among such plants are *Morus alba* (the decoction of its leaves is used as diuretic and vermifuge while the root bark is used as an antiplostatic, diuretic, in the oriental medicine; Al-Kofahi and Al-Khalil, 1996), *Alhagi maurorum* (the rhizome boiled until water becomes yellow (overnight) and consumed 2 to 3 times a day for kidney stones; Fahmy, 1956), *Polygonum equisetiforme* (decoction prepared from the whole herb for 10 minutes and then consumed in the morning for 3-4 days for edema and kidney diseases; Miller and Greenblatt, 1978), *Thymus capitatus* (naturally used as a sedative and calmative for the pain rises from the bladder stone movement; Korb, 1987) and *Sylbium marianum* (infusion of the whole plant used for diuresis Kobasi, 1993). Mostly all the surveyed medicinal uses involve using only one plant species and mixtures were rarely used and mainly for breaking or repelling kidney stones. The herbal remedies are simple and include in most cases a decoction of the plant parts to be taken orally. In a few cases, local remedies by hot suspension of mashed plant parts were applied. The resulting mash was wrapped in gauze and fixed to the kidneys. Also local remedies were applied through fomentation. Soak a cloth or towel in an infusion or decoction, wring out the excess, and apply as hot as possible to the area of kidneys. A fomentation has about the same application as a poultice but is generally less effective. Examples of such plants, in the study area, are *Artemisia herba-alba*, *Hordeum vulgare*, *Zea mays* (corn silks) and *Deverra tortuosa*.

The results showed that there is a low diversity of diuretic plants in all six habitats indicating a low dependency on folk diuretic medicine specially in the north part. The habitats of sand dunes (new land uses) and saline depressions (moisture stress and monotonous relief) were characterized by very low diversity (1.5 and 1.8 respectively). Such results may be useful for local management. The primary cause of the decay of biodiversity is not a direct human exploitation, but the habitat destruction that inevitably results from the expansion of human population and human activity (Wilson, 1988). The continued uncontrolled wood cutting, over grazing and rain-fed farming for cultivation of annual crops in addition to other recent land uses such as intensive agriculture, obliteration of limestone ridges for brick making is endangering many plant and animal species (Ayyad and Fakhry, 1996). In the habitat of sand dunes we face many specific problems related to different land uses and human activities. Batanouny (1999) gave a representative schematic diagram (Fig. 2) showing the severe degradation of major

habitats resulting from poorly planned or unplanned coastal development. He stated that, the crowding of coastal villages, villas, chalets, lawns, gardens, etc. has resulted in the disappearance of some important species such as, the sand-fixing *Ammophila arenaria*, potentially medicinal species such as *Panoratiun maritimum* and *Centaurea pumilio*, and the endemic *Helianthemum sphaerocalyx*. The same trend was noticed by Rossato *et al.* (1999) at Atlantic forests. The loss of these natural sites is a national disaster which definitely affects the abundance, distribution and availability of medicinal plants in the western coastal region of Egypt. The conservation of these sites will be crucial to the continued availability of traditional medicinal plants. Such conservation will require a new policy in economy, socio-economy, agriculture and constructions to relieve and minimize the risk upon these areas.

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