

Chapter Two

Pharmacopoeial Wild Medicinal Plants in Egypt

The pharmacopoeial plants have been used since a long time in folk medicine. Some of them have been reported in the Ebers Papyrus. Almost all these plants have been mentioned in numerous books and treatises written by many scholars since the Greek writings of Dioscorides and all over the last fifteen centuries during the Islamic Era. Recent and modern studies on these plants proved the occurrence of active principles in the different organs of them. Their pharmacological activity has been investigated. In view of their importance as a source of extracts and active constituents used in medicine, they were embodied in different pharmacopoeias, either in Egypt and/or abroad.

The collection of these plants from their natural habitats threatens them to a great measure. No means have been taken up till now to conserve these wild plants. In view of the rising demands for these plants and the limited amount of the wild supply, it is indispensable to undertake measures for their conservation for the sake of sustainable use. However, it seems difficult to think of conservation without good knowledge of these plants. The present work is an attempt to give a multidisciplinary study on these plants covering their taxonomy, ecology, phytochemistry, pharmacology...etc. The wild pharmacopoeial plant species include: *Ammi majus*, *A. visnaga*, *Citrullus colocynthis*, *Datura stramonium*, *Glycyrrhiza glabra*, *Hyoscyamus muticus*, *Plantago afra*, *P. lanceolata*, *P. ovata*, *Senna alexandrina*, *Senna italica*, *Silybum marianum*, and *Urginea maritima*.

The above-mentioned plant species are used also in the folk medicine. Prescriptions from the *attar*, incorporating parts of these plants (seeds, fruits, leaves, stems, rhizomes or roots) are usually available in the local market in Egypt and many other countries.

Due to the lack of adequate information about the potentiality of cultivating some of these plants, the pharmaceutical companies import some of these drugs. For instance, *Ammi visnaga* and *A. majus* could be easily grown in Egypt. However, the Egyptian companies import their fruits, may be from Morocco. This shows that the issue of the wild medicinal plants in Egypt should be clarified and to be well-

investigated from different aspects, e.g. from the agricultural, commercial and marketing point of views. Such studies are indispensable. They will open the door for investigating other plant species, which would be of pharmaceutical importance to the country in the future.

Criteria studied for the wild pharmacopoeial medicinal plants

Names :

The legitimate Latin binomial, and its synonyms

Mention of the synonyms facilitates the search for the plant in the literature and abstracts under different names given to the plant.

Names in different languages whenever possible:

Arabic, Berber, English, French, German, Italian, and Turkish

Morphological Description

Ecology :

Habitat conditions

Distribution : Local - Regional - Global

Regional distribution : means the occurrence in North African countries, Egypt, Libya, Tunisia, Algeria and Morocco.

Status : To show if the plant is endangered, vulnerable or does not need conservation

Parts used : Names - Description

Constituents

Folk Medical Uses

Pharmacological Actions and Indications

Adulterants and Substitutes

Authentication - Tests for Purity

Pharmacopoeias

Phytopharmaceuticals in the Egyptian Market

Economic Potential, whenever data available

Cultivation, whenever data available.

References

Illustrations and/or photos

Part Used:

The fruit known as *Ammi majus* fruit.

Description:

Odour, slightly aromatic, terbenzinate; taste, strongly pungent and slightly bitter.

Macroscopical: Fruit, **cremocarp**, nearly cylindrical, usually separated into its 2 mericarps, rarely entire, with a part of the pedicel attached. **Mericaarp**, small, slightly concave on the commissural side. It is slightly tapering towards the apex; about 2 to 2.5 mm long and about 0.75 mm broad; crowned with a nectary disc-like stylopod; reddish-brown to greenish-brown; externally, glabrous, rough, marked with 5 broad, distinct, yellowish-brown primary ridges, alternating with 4 equally prominent dark brown secondary ridges; internally the mericaarp shows a pericaarp with 6 vittae, 4 in the dorsal and 2 in commissural side, a large orthospermous endosperm in which is embedded a small apical embryo. **Carpophore**, forked, each branch of which enters at the apex of the mericaarp and unites with the raphe.

Microscopical: **Epidermis** of pericaarp consists of polygonal cells, with straight anticlinal walls and short papillae, containing clusters or prismatic crystals of calcium oxalate, and covered with thick strongly striated cuticle; stomata, occasional, of cruciferous type, but no hairs. **Mesocarp**, formed of somewhat brownish parenchyma; traversed longitudinally by 6 large schizogenous vittae, 4 in the dorsal and 2 in the commissural side, appearing elliptical in transverse section, and each surrounded by large, radiating cells; and traversed in the primary ridges by vascular bundles, appearing oval, ovoid or rounded in transverse section, not accompanied by vittae (Distinction from *khella*, *Ammi visnaga* Lam.), each bundle, with a xylem strand and 2 lateral phloem strands and accompanied by strongly lignified fibres and reticulate, lignified cells; innermost layer of mesocarp, with large, polygonal, brown-walled equally thickened nonporous cells (Distinction from *Khella*, *Ammi visnaga*). **Endocarp**, of narrow, tangentially elongated cells, many of which being regularly arranged in groups, variously oriented, and adhering to the brown testa which is formed of similar, but wider, and somewhat shorter cells. **Endosperm**, of polygonal, somewhat thick-walled, cellulosic parenchyma with much fixed oil and several aleurone grains, about 4 to 12 microns in diameter, each with one or 2 rounded globoids and 1 or rarely 2 micro-rosette crystals of calcium oxalate, 2 to 4 microns in diameter. **Carpophore**, each branch traversed by a vascular strand of fibres and spiral vessels.

Constituents:

Coumarins and coumarin glycosides. The fruit yields not less than 0.5% of ammoidin (xanthotoxin), 0.3 % of ammidin (imperatorin), and 0.01 % of majudin (bergapten). Furanocoumarins have also been produced by cell suspension cultures of *A.majus*.

Tests for Identity :

A. Boil about 0.05 g of *Ammi majus* fruit with 5 ml of water for 1 minute and strain; add 1 or 2 drops of this decoction to 1 ml of a solution (1 in 1) of sodium hydroxide *R*; no rose -red colour is produced (Distinction from *khella*, *Ammi visnaga*).

B. The alcoholic extract of *Ammi majus* fruit (1 in 10) gives blue fluorescence when examined in the filtered ultraviolet light.

Tests for Purity :

Cereals and Starchy Material: Powdered *Ammi majus* fruit contains no starch granules.

Alcohol (90 %) Extractive: Not less than 33.86 %

Moisture: Not more than 12.0 % determined by the toluene method.

Ash: Not more than 7.0 %

Folk Medical Uses:

Fruits, diuretic, carminative, for angina pectoris and asthma. The fruits were used by the ancient Egyptians for treating leucoderma. The drug should be used cautiously, since phototoxic dermatitis following its use for vitiligo has been reported.

Phytopharmaceuticals in the Egyptian Market:

Meladinine and Neo-Meladinine in different dosage forms *viz*, tablets, creams, lotions and paints (**Memphis**).

Economic Potential:

The plant is and will continue to be of high economic potential for the widespread use of its galenicals as well as its furanocoumarins in the treatment of leucoderma. Cultivation of the plant is not favoured by the farmers. This is referred to two reasons: a- the lack of good knowledge of the cultivation of this plant among the farmers, b the improper harvest methods usually lead to the shedding of the fruits leading to their dispersal and infesting the field in the next season.

References:

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2-Ammi visnaga (L.) Lam. Fl. Fr. 3: 462 (1778)
Daucus visnaga L. Sp. Pl. ed. 1, 242 (1753)

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|-----------------|---------------------------------------|-----------|
| Arabic: | <i>Khillah - Khelal</i> | كحلا ت ؟؟ |
| | <i>Khilla Baladi</i> | ?t?rT |
| | <i>Gazar Sheitani</i> | ??ofU tUS |
| | <i>Kammoun Habashi</i> | ?Urš ???? |
| Berber: | Tabellaout | |
| English: | Pick-tooth, Tooth pick, Bishop's weed | |
| French: | Herbe aux cure-dents | |
| German: | Zahnstocherkraut | |

Morphological Description

Stout, tall, winter annual, with thick stem and pinnatisect leaves. Umbel rays, dense (*ca* 80 *per* umbel), with very numerous long stiff rays and white flowers. The rays spread in flower and become contracted in fruit. Bracts of the involucre, long, filiform and tripartite. The fruiting pedicels are thick and frutescent. Fruit, ovate, laterally compressed, with thick ribs, brownish with violet tinge and splitting into two mericarps (Plates 5 & 6).

Ecology

The plant is an element of the mesophytic community of the cultivated fields where it grows among the crops, on canal banks and in neglected areas close to the fields. It grows mainly in the northern part of Delta. It is cultivated on a limited scale in the Delta for its fruit and dry umbels..

Distribution:

Local : Growing mainly in the Nile region, rare in the Eastern Mediterranean region.

Regional : North Africa : Egypt, Tunisia, Algeria, and Morocco.

Global : North America, Argentina, Chile, Mexico, Europe, Temperate Western Asia.

Status:

The plant is easily cultivated as a winter crop in Egypt. Numerous studies have been undertaken as regards the effect of manure and fertilizers on the yield of the plant. However, there is a great need to conserve the good genetic characters in some cultivars. The plant is safe and is not subjected to threatening impacts.

Parts Used

a-The **fruits**,

Arabic: *Bizr Khellah*

??T t Tr

English: Ammi visnaga fruit, Visnaga fruit.

French: Fruits de Khella

German: Visnaga Früchte, Bischofskraut Früchte

Latin: *Fructus Ammi visnaga*

b-**Toothpicks:** At fruiting, the rays become frutescent, curved and used as tooth picks (Plate 6).

Khella contains not more than 10.0 % of its stalks and foreign organic matter, and yields not less than 1.0 % of the nonglycosidal furanochromone derivatives, calculated as khellin.

Description: Odour, slightly aromatic; taste, aromatic, bitter and slightly pungent.

Macroscopical: **Fruit**, cremocarp, usually separated into its 2 mericarps, rarely entire, with a part of the pedicel attached. **Mericarp**, small, ovoid, about 2 mm long and 1 mm broad; crowned with a disc-like nectary, the **stylopod**; brownish to greenish-brown with a violet tinge (Distinction from *Ammi majus*); **externally**, glabrous, marked with 5 distinct, pale brownish, rather broad primary ridges and 4 inconspicuous dark secondary ridges; **internally**, the mericarp shows a pericarp with 6 vittae, 4 in the dorsal and 2 in the commissural side, a large oily orthospermous endosperm and a small apical embryo. **Carpophore**, single, no split; passing at the apex into the raphe of each mericarp.

Microscopical: **Epidermis** of pericarp consists of polygonal cells, elongated on the ridges, with occasional crystals of calcium oxalate and finely striated cuticle; no hairs.

Mesocarp, formed of parenchyma, traversed longitudinally by the schizogenous vittae, each surrounded by large, slightly radiating cells, and traversed in the ridges by vascular bundles, each forming a crescent around a comparatively large vitta (Distinction from *A. majus*) and accompanied by fibres and reticulate, lignified cells; the innermost layer of the mesocarp consists of large, polygonal, brown-walled cells, with thick porous inner walls. **Endocarp**. composed of narrow tangentially elongated

cells; some of these being regularly arranged in groups, variously oriented, adhering to the brown seed-coat which is formed of similar but wider and somewhat shorter cells. **Endosperm** consists of polygonal, thick-walled, cellulosic parenchyma, containing fixed oil and numerous small oval aleurone grains, each enclosing a minute rounded globoid and a micro-rosette crystal of calcium oxalate with a dark center. **Carpophore**, traversed by a vascular strand of fibres and spiral vessels.

Constituents

- 1- Furanochromones (?-pyrones): 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.
- 2- Pyranocoumarins (visnagans): 0.2-0.5 comprising visnadin, samidin and dihydrosamidin.
- 3- Furanocoumarins: traces of xanthotoxin and ammidin.
- 4- Flavonoids: 0.02- 0.03% comprising quercetin and isorhamnetin and their 3-sulphates as well as kaempferol.
- 5- Volatiles : containing among other compounds: camphor, carvone, ? -terpineol, terpinen-4-ol, linalool, *cis* and *trans* linalool oxides.
- 6- Fixed oil: 12-18%. 7- Protein: 14%.

Folk Medical Uses:

Fruit, diuretic, appetizer, carminative, stimulant vasodilator, antispasmodic, for urinary disorders, angina pectoris, asthma, and the infusion releases renal stones.

Pharmacological Actions and Indications :

The drug acts as spasmolytic, especially on the musculature of the bronchi, gastrointestinal tract, biliary tract, urinogenital system, the coronary vessels and also as diuretic.

Using K^+ (60mM)-depolarized guinea pig aortic strips, the involvement of a Ca^{+2} channel blocking mode of action could be established.

Visnadin exhibits peripheral and coronary vasodilator activities and has been used for the treatment of angina pectoris.

The drug is indicated in whooping cough, cramp-like conditions of gastrointestinal tract, biliary colic, painful menstruation, for removal of small bladder and kidney stones, and in angina pectoris and bronchial asthma. Khellin may have a role to play in the treatment of vitiligo and psoriasis.

Phytomedicines containing standardized extracts are included in cardiac remedies, bronchospasmolytics, spasmolytics, urological remedies and coronary remedies.

Adulterants and Substitutes :

May be adulterated or substituted by fruits of *Ammi majus* which can be detected by macro- and microscopical examination and tests for furanocoumarins.

Authentication :

- 1- Macro- and microscopically following E.P. 1984.
- 2- Pyrones not less than 4% calculated as Khellin.
- 3- Foreign matter not more than 2%.
4. Loss on drying not more than 10%.
- 5- Ash not more than 10%, acid-insoluble ash not more than 3.5%.
- 6- Fruit of *Ammi majus* should be absent.
- 7- Absence of starch
- 8- Boil about 0.05g of *Khella* with 5 ml of water for a minute, strain, add 1 or 2 drops of this decoction to 1 ml of solution of sodium hydroxide (1 in 1), and shake; a rose-red colour is produced within 2 minutes.

Phytopharmaceuticals in the Egyptian Market

Ampoules and tablets containing Khellin as single component or in multicomponent pharmaceuticals e.g. Khellalgon capsules **Mepaco**, Khellalgin and Glucolynamine ampoules **Memphis**.

Economic Potential:

The plant is and will continue to be of high economic potential for the widespread use of its galenicals as well as Khellin in the phytotherapy of urinary tract problems. The local supply is not sufficient for the pharmaceutical industry. Farmers are not willing to cultivate the plant due to the fluctuating prices from year to year.

References:

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3-Citrullus colocynthis (L.) Schrader, Linnaea 12: 414 (1838)

Cucumis colocynthis L., Sp, Pl., ed. 1, 1011 (1753)

Colocynthis vulgaris Schrad., Ind. Sem. Hort., Gott., 2 (1832)

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| Arabic: | <i>Handal</i> | ٣٤٧ |
| | <i>Handhal</i> | ٣٤٧ |
| | <i>Oorky</i> | ??? |
| | <i>Tatoor</i> | تاتور |
| | <i>Hadag</i> | تاتور |

Berber: Tadjellet, Alkat, Taferzizt, Tifersit, Ubruzi

English: Colocynth, Bitter apple, Bitter gourd

French: Coloquinte, Chicotin

German: Bitterzitrulle, Bitterapfel

Morphological Description:

A perennial very scabred herb with long trailing branches. Leaves, triangular in outline, deeply 3-5 palmate-lobed with pinnate cleft narrow segment. Branched tendrils arise in leaf axis. Flowers, yellow. Young fruits, fleshy, mottled with dark green, turning dry and yellow when ripe apple size, extremely bitter in taste (Fig. 3, Plates 7 & 8).

The plant is very common in sandy places in all the phytogeographical regions of the country. Colocynth presents a curious look with patches here and there in the extensive blazing deserts of all the Arab countries. The plants are suffering from winter and recovering again in summer. They have wonderful adaptation ability to grow up on the hot sandy soil of summer months where scarcely any plant can survive. The tap root is succulent and very deep.

Ecology:

The plant grows in deep sandy habitats. It appears as groups in depressions receiving runoff water (Plate 7).

Distribution:

Local : In sandy habitats in almost all the deserts of Egypt.

Regional : All North African countries.

Global : Semi-deserts and deserts of North Africa, southern Europe, and Asia, from the Canary Islands eastwards to India.

Status:

The plant is safe and is common in all the North African countries. However, cultivation of the plant for medical purposes is recommended. Being a member of the *Cucurbitaceae*, it could be cultivated in a manner similar to water melons. However, it is more drought-resistant. The plant produces numerous fruits every year, *ca* 40-60 fruits *per* plant.

Part Used:

Colocynth; Colocynth Pulp; Bitter Apple.

Colocynth is the dried unripe, but fully grown fruits of *Citrullus colocynthis* (L.) Schrad. deprived of its seeds and hard outer part of pericarp.

Colocynth contains not more than 5.0 *per cent* of its seeds, and not more than 2.0 *per cent* of the outer sclerenchymatous part of the pericarp.

Description:

Odour, slight, or almost odourless; taste, intensely bitter and persistent.

Macroscopical: Colocynth occurs as light spongy, easily broken, globular masses or in pieces of variable size, up to about 6 cm long and 2 cm thick; white, or pale yellowish-white, with occasional small patches of darker epicarp and consisting of narrow mesocarp and three wide bifid placentas; **externally**, convex with ridges and flattened areas, 5 to 10 mm wide; **internally**, irregularly concave and showing numerous ovoid depressions, about 10 mm long, left by the removal of the seeds. **Seeds**, very few flattened, ovoid, yellowish-white to dark brown, about 7 mm long, 5 mm broad and 2 mm thick, albuminous, with narrow oily endosperm, 2 oily cotyledons and small radicle.

Microscopical: Colocynth, formed of spongy tissue, composed of large, more or less rounded parenchymatous cells, almost devoid of contents, with large intercellular spaces and have thin cellulosic, occasionally lignified walls, with oval or circular pitted areas at the junction of contiguous cells; traversed by bicollateral vascular bundles, having spiral and annular vessels and accompanied in the phloem by irregularly tubular laticiferous vessels, the contents of which give red colour with sulphuric acid. **Epicarp**, if present, shows epidermis of radially elongated cells, occasional stomata of ranunculaceous type, subjacent parenchymatous cells, and an inner layer of isodiametric and radially elongated sclereids. **Seed**, if present, with an epidermis of thick-walled lignified palisade-like cells and inner layers of thick-walled, pitted, or reticulately thickened lignified sclereids. **Endosperm** and **cotyledons**, parenchymatous, with fixed oil and aleurone grains, up to about 7 microns diameter.

Constituents:

Colocynth contains cucurbitacin B and E (? -eleatrin), colocynthin, sterols (? -spinasterol and others), alkanes, aliphatic alcohols alkaloids, and choline base.

The seed contains about 16% fixed oil, reddish-yellow, with green fluorescence, almost odourless, with a very bitter taste.

Folk Medical Uses:

The leaves are diuretic and used in treatment of jaundice and asthma. The root is useful in inflammation of breasts, amenorrhoea, rheumatism, joint pains and is used externally in ophthalmia and uterine pains. The fruit is pungent, cooling purgative, anthelmintic, antipyretic and carminative. It cures, tumours, leucoderma, ulcers, asthma, bronchitis, urinary discharge, enlargement of spleen, tuberculous glands of the neck, dyspepsia, constipation, anaemias and throat diseases. The fruit pulp is purgative, diuretic, antiepileptic, and is used against gonorrhoea.

Derived veterinary preparations which contain colocynth are used for itch. Cataplasm of green or dried plant is used as a remedy for leucoderma; cataplasm resolvent, astringent. Hot sap of plant is used to cure skin diseases of camels. In Morocco, it is used as antihypertensive and antidiabetic.

Pharmacological Actions and Indications

Purgative. The drug exhibited antiinflammatory and antitumor activities. The leaves and pulp extract (i.v.) caused a dose-independent increase in blood pressure in vivo in rats, and both extracts reduced heart-rate and the force of contractions in isolated rabbit hearts. The leaf extract(800mg/Kg) p.o.) exhibited antiinflammatory activity in the carrageenan-induced paw oedema test in rats, but was severely toxic (60% of animals died, the remainder had severe diarrhoea and hepatorenal damage).

Toxicity :

The ethanolic extract of the fruits produced stimulation, accompanied by increased motor activity, tremors, convulsions, diarrhoea and rapid irregular respiration preceding death in mice. The spermatogenic disfunction was also significant. The same extract demonstrated cytotoxic as well as mutagenic effects. It causes irritation of stomach and intestine. It is seldom prescribed alone. It induced haemorrhagic colitis. Three examples of toxic acute colitis were reported after ingestion of colocynth for ritual purposes. Its clinical feature was dysenteric diarrhoea.

Authentication

- Microscopical examination.
- Petroleum ether extractive, not more than 3% when dried at 100 °C.
- Ash, not more than 15%.
- Acid-insoluble ash, not more than 8%.

Tests for Purity:

Petroleum-benzine extractive: Not more than 3.0 % when dried at 100°C.

Alcohol (60 per cent) extractive: Not less than 23.0 %.

Ash: Not more than 15.0 %.

Acid-insoluble ash, not more than 8.0 %.

Pharmacopeias :

Fruit of colocynth is still official in several pharmacopeias due to their cathartic value, e.g. Egyptian Pharmacopoeia 1984 and Pharmacopoe Francaise 1965.

Phytopharmaceuticals in the Egyptian Market :

No-habit, lotion, **Tri M Medical.**

Economic Potential :

Since the plant grows quite abundantly in the deserts of the North African countries, as well as other Arab countries, their proper utilization is likely to afford a good source of revenue for the Bedouins.

Egypt exported in 1983 ten tons of colocynth ; each at a rate of 652 Egyptian Pounds, 4 tons in 1984 at a rate of 1063 Egyptian Pound and one ton in 1985 at a rate of 1584 Egyptian Pound. Prices expected range from 2000 to 2500 Egyptian Pound *per ton.*

References:

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Fig. 4- *Citrullus colocynthis* : **A-** Flowering and fruiting branch, **B-** Portion of leaf showing hairs, **C-** Male flower, **D-** T.S. in fruit, **E-** Seed.
(After: Jafri, 1977, Flora of Libya, No. 32, Cucurbitaceae).

4-**Datura stramonium L.**,Sp.Pl.,ed.1,179 (1753)

Datura tatula L.,Sp.Pl.,ed.2, 256 (1759)

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| Arabic : | <i>Datura</i> | ر ?رœ |
| | <i>Nafir</i> | t fL? |
| | <i>Taturah</i> | R ?uœ |

Berber : Tabourzigt, Tidilla.

French : Datura, Stromoine, Pomme épineuse, Herbe aux sorcieres, Pomme épineuse, Dature, Endormie Endormie, Herbe du diable. Pomme du diable.

German: Echter Stechapfel, Tollkraut.

Berber : Tabourzigt, Tidilla.

Morphological Description

A glabrous, green-stemmed annual which attains a height of one metre or more. Leaves, ovate, sinuate or angled or even cut-toothed. Flowers, large, 8-20 cm long, white or violet. Capsules ovoid, erect, with stout prickles, dehiscent, 4-valvular. Seeds numerous, black, reniform (Fig. 4, Plate 8).

Ecology :

The plant is occasionally cultivated, also escapes cultivation, in the gardens. The plant is cultivated in many European countries as well as the United States of America. It can easily be grown from seeds. It prefers a rich calcareous soil. When fully developed, the plants should better be spaced at distances of one metre from each other in a row. It is sensitive to frost and hence requires special shelter during the severe winters. An acre of land yields about 450-680 kg of leaves and about 320 kg of seeds. Application of nitrogenous manures favours both vegetative growth and alkaloid formation. For the production of higher alkaloid content, large-leaved tetraploid plants have been raised by colchicine treatment with the result that double the amount of alkaloids have been produced by these plants. Alkaloids have been found to concentrate in the upper epidermal cells, phloem parenchyma, midrib and the petiole. The upper leaves and branches are more rich in alkaloids than the lower ones.

Part Used

Stramonium is the dried leaves with or without the flowering tops of *Datura stramonium* L. collected from the plant in flower.

Description :

The dried leaves are greyish-green in colour, brittle, twisted and often broken. The leaves are variable, 8-25 cm long and 7-17 cm wide, shortly petiolate, ovate or triangular-ovate in shape; they are acuminate at the apex and have a sinuate dentate margin. The fresh leaf is somewhat dagger-shaped. The flowers is white, with streaks of purple colour appearing sometimes on the ribs and tips of the corolla lobes. They are solitary in the axils and point upward. They produce round greenish fruits or capsules that enclose black, flat, reticulated, kidney-shaped seeds. The plant has a bitter, saline taste with a disagreeable odour when fresh but the dried plant has a tea- like odour.

Constituents :

The plant is a known source of the tropane alkaloids hyoscyamine, atropine and scopolamine. The total alkaloid yield has been estimated to be between 0.06 and 0.50%. The young leaves contain mainly scopolamine, whereas hyoscyamine is the major constituent of the mature leaves. In addition to these alkaloids, the plant contains other minor tropane derivatives, as well as chlorogenic acid and lectins. The seeds contain up to 30% of fixed oil and about 0.2% alkaloids. Withanolides comprising a new 21-hydroxy withanolide were isolated from the leaves. Pseudo-peptide (γ -L-glutamyl-L-aspartic acid) was also reported.

Folk Medical Uses :

The whole plant is used for asthma and as a sedative. The leaf extract is an ingredient in remedies for cough and chest complaints. Plant boiled in water is taken to ease asthmatic breathing and for sedation. Dried leaves and flowers are smoked as tobacco to relieve difficult breathing. Seeds are taken as analgesic in small doses. The seeds of ripe fruits are burnt and the smoke inhaled for treating epilepsy. *D. stramonium* is an alternative medicine treatment for parkinson's disease.

Pharmacological Actions and Indications :

The drug is valued in clinical medicine as a cholinergic agent. The alkaloids of *Datura* are used as spasmolytic, antiasthmatic and anticholinergic. The drug has been employed in proprietary products for the treatment of excessive salivation in parkinson's disease. It is used in some skin diseases, e.g. tlcotes.

In high doses, *Datura* induces strong hypnosis. Hyoscine, also known as scopolamine, in therapeutic doses causes CNS suppression, which manifests as drowsiness, amnesia, fatigue and dreamless sleep with a marked reduction in rapid movement. Scopolamine is employed as an adjunct to anaesthetic agents or for

preanaesthetic medication. *Datura* leaves are incorporated into cigars smoked as a euphoria inducing substance and frequently abused.

Toxicity :

All parts of the plant are toxic, especially the seeds. Consumption of any part of the plant can result in severe anticholinergic toxicity, atropine poisoning, hallucination and mydriasis. Rubbing skin and eyes after contact with this plant is dangerous. Symptoms include headache, nausea, vertigo, extreme thirst, dry burning sensation in the skin, general nervous excitation, dilated pupils, loss of sight and voluntary motion, palpitation of the heart; in extreme cases, mania convulsions and death.

Adulterants and Substitutes :

The common adulterants of *D. stramonium* leaves are *Xanthium* species (Asteraceae), *Carthamus* (Asteraceae) and *Chenopodium* (Chenopodiaceae) which are easily distinguished from the genuine drug.

Authentication :

- ✍ Characteristic morphology of leaves and flowers.
- ✍ Microscopical features.
- ✍ After shaking the seeds with water a light green fluorescence may be seen under long wavelength (365 nm) UV light.

Pharmacopoeias :

Egyptian Pharmacopoeia 1984.

Phytopharmaceuticals in the Egyptian Market :

There are many pharmaceuticals in the market containing the active principles derived from *Datura*, especially the alkaloids, such as Nospan (**EPICPO**), Buscopan, Buscopan Compositum (**CID**), etc...

Fluid extract, dry extract, standardized powder and tincture are ingredients of many formulations.

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Fig.4-*Datura stramonium* : **A-** Habit, **B-** Flower, **C-** Mature fruit showing dehiscence, **D-** Seed.

(After: Siddiqi, 1978, Flora of Libya, No. 62, Solanaceae).

5- *Glycyrrhiza glabra* L. Sp.Pl.ed.1:741 (1753)

Arabic : *Shagaret es-sûs*

u ?U ?SU

Erqsûs.

u ?U i tw

English : Licorice, Sweet wood.

French : Réglisse, Reglisse glabre , Reglisse Officinale.

German : Echtes Sussholz.

Italian : Dolce radice, Regolizia, Logorizia.

Turkish : Meyan kokü, Meyan otu, Biyan kokü, Ayi kulozi.

Berber : Azrar azidane.

Morphological Description:

Erect perennial, 30-60(-100) cm. or more, simple or branched from the base, stems striate with raised ridges especially above, glabrous or sparingly pilose, and furnished throughout with sessile, shining, viscid glands. Stipules brownish-membranous, ca 2 mm, subulate, falling early. Leaves imparipinnate, 10-25 cm long, petiole 1-5-3 cm, petiole and rhachis \pm ridged, often pilose at least below, densely glandular; leaflets in 4-8 pairs, lanceolate, elliptic, ovate or oblong, 20-40(-55) x 5-18(-25) mm, entire, acute or retuse above, densely punctate-glandular on the lower surface, hairy on the midrib below and with scattered hairs occasionally also on the surface, glabrous and eglandular above; petiolules ca 2 mm, commonly pilose. Inflorescence racemose, elongate and lax or shorter and more compact, shorter than or subequalling, rarely much longer than the subtending leaf, flowers very shortly pedicellate; peduncles 1-5-3 cm., glandular and shortly hairy; bracts ca 1 mm. lanceolate, brownish membranous falling early. Calyx 4-6 mm, tubular, glabrous or sparingly hairy, glandular, teeth lanceolate, the upper pair broader and slightly shorter, fused below, the lower 3 narrower and about equalling the tube. Corolla pinkish-blue to purple; standard elliptic-lanceolate, 9-12 x 3-5 mm, acute or acuminate at the apex, attenuate to a short claw below; wings 7-10 mm, lamina falcate-oblong, acute, 3 times as long as the claw, auricles short and blunt; keel 6-8 mm, lamina narrowly oblong, shortly acuminate, about twice as long as the claw. Pod linear-oblong, compressed, ca 5 mm. wide, up to 30 mm long according to the number of seeds (1-7), straight or almost so, shortly beaked, glabrous or glandular, \pm constricted between the seeds, tardily dehiscent. Seeds subspherical, smooth, ca 2.5-3 mm, light to dark brown (Fig. 5, Plate 9).

Ecology :

The plant is salt and drought tolerant. It grows in Egypt in the oases, where there are salinity and drainage problems.

Distribution :**Local** : Bahariyah and Siwa oases.**Regional** : Mediterranean region and Middle East countries**Global** : Mediterranean and E. Europe (native in Sardinia, Italy, Sicily, Yugoslavia, Albania, Greece, Bulgaria, Rumania C. & S. Russia) France, Spain, Crete Rhodes, Cyprus, Syria, Lebanon, Palestine, Jordan, Iraq, Turkey, Caucasus, Iran , Afghanistan, W. Siberia, C. Asia, and N. W. India.**Status:**

The plant is naturalized in the oases. However, it is not well used for its therapeutic value. Importation is the followed practice. There is a need to make use of the waste land and slightly saline areas to cultivate this plant.

Part Used :

Liquorice is the dried, peeled or unpeeled roots and rhizomes (stolons) of *Glycyrrhiza glabra* L. and its varieties known as :

| | | |
|-----------------|-------------------|------------|
| Arabic : | <i>Erqusous</i> | u ?U i t w |
| | <i>Sous</i> | u ?U |
| | <i>Jizrulsous</i> | u ?U i t w |

English : Liquorice, Liquorice root, Sweet wood, Licorice.**French** : Réglisse officinale, Racine de réglisse. Bois doux, Racine douce.**German** : Sussholz wurzel, Spanisches or Russisches Sussholz, Lak- ritzenwurzeln.**Latin** : *Radix Glycyrrhizae*, *Rad. Glycyrrh.*, *Glycyrrhiza*, *Liquiritiae Radix*, *Rhizoma Glycyrrhiza nativum*, *Liquiritiae*.

Description:

Liquorice occurs in nearly cylindrical pieces; 14-40 cm or more long and 0.5-5.0 cm in diameter. Unpeeled pieces are dark brown, reddish brown or purplish brown, longitudinally wrinkled. Peeled liquorice is externally yellow, smooth, fibrous, finely or roughly striated. It has a faint and characteristic odour and a very sweet taste, almost free from bitterness and acidity.

Constituents :

The major constituent of *Glycyrrhiza glabra* is 6-13 % triterpene saponin glycyrrhizin as potassium and calcium salts which have a sweet taste . Further triterpenes of *G. glabra* are: liquiritic acid, glabrolide, isoglabrolide, deoxyglabrolide, glabric acid, deoxyglycyrrhetic acid, 18 ? -hydroxyglycyrrhetic acid, glycyrrhetol, 21 ? -hydroxyisoglabrolide, 23-hydroxyglycyrrhetic acid, 24-hydroxy- 11-deoxy-glycyrrhetic acid, 24-hydroxyliquiritic acid, liquiridolic acid, 28- hydroxyglycyrrhetic acid and soyasaponins.

Other components include :

Flavones, isoflavones, chalcones, rhamnoliquiritin, liquiritin, liquiritoside liquiritigenin, isoliquiritin, isoliquiritoside, isoliquiritigenin, neoisoliquiritin, neoliquiritin, licuroside, saponaretin, vitexin, pinocembrin, prunetin, glabranin, formononetin, glabrone, glabrene, glabridin, glabrol, 7-acetoxy-2-methyl-isoflavone, 7-methoxy-2-methyl-isoflavone, 7-hydroxy-2-methyl- isoflavone, licochalcones A & B, kanzonol-T, 4-hydroxychalcone, licoumarin, neolicuroside, herniarin, umbelliferone, licoflavanone, glycyrrhizoflavone, glycyrrhisoflavanone, licocoumarone, quercetin, isoquercitrin, kaempferol, astragalol, astragalol monoacetate, isorhamnetin, genkwanin, folerogenin and isomucronulatol, glabrocoumarins A&B

The volatile fraction (0.04-0.6%) contains ?- nonalactone, linalool, ? -terpineol, p-cymene, thujone, fenchone, guaiacol, thymol, geraniol, eugenol, estragole, anethole, indole, cumic and hexanoic acids.

A polysaccharide (glycyrrhizan GA), 5-15% sugars (glucose and sucrose), about 1-2% asparagine, a bitter principle glycyramarin in the outer tissues, 22-23-dihydrostigmasterol, sitosterol, mannitol, about 20% starch.

Folk Medicinal Uses :

Extract of root is used for hoarseness of voice, cough, respiratory ailments, gastritis, abdominal pains, diuretic, febrifuge, emmenagogue, to relax uterine muscles, demulcent and expectorant.

Infusion of root for cough due to its emollient, depurative and sweetening properties. Decoction boiled to facilitate the period due to the presence of oestrogenic hormones in appreciable amounts.

Roots chewed for throat troubles and rheumatism, Addison's disease and various inflammatory conditions. Refreshing drink made from root, antispasmodic, and for gastric ulcers. Liquorice is used as a flavouring agent in tobacco and confectionary and to mask taste of bitter drugs. It is added to beer to increase foaminess.

Pharmacologicals Action and Indications:

Glycyrrhizin obtained from liquorice cured chronic gastric ulcers orally. Glycyrrhizin also exhibited an antiviral effect against various viruses including human immunodeficiency virus.

Glycyrrhiza glabra extract, glycyrrhizin and 18 alpha- and 18 beta-glycyrrheinic acids inhibited mutagenicity induced by *Salmonella typhimorium*. Polysaccharides of *G.glabra* have a pronounced activity on the reticuloendothelial system, immune system. Isoliquiritigenin is an aldose-reductase inhibitor which may be effective in preventing diabetic complications.

It has an antiallergic and antiinflammatory actions, and used in treatment of peptic ulcer and Addison's disease. Both glycyrrhizin and its aglycone prevent the development of experimental cirrhosis in animals.

Toxicity :

High doses of liquorice preparations should not be taken for longer than 4-6 weeks. During this time a potassium rich diet should be taken e.g. bananas, dried apricots and dates. Persons with circulatory problems should avoid consumption of significant amounts of liquorice.

Authentication :

Liquorice should contain not less than 25 % water-soluble extractives, ash, not more than 6.5% for the peeled and not more than 10 % for the unpeeled. Acid-insoluble ash, not more than 1.5% for the peeled, and not more than 2.5 % for the unpeeled.

Substitutes :

Glycyrrhiza uralensis Fisher or other species or varieties of the same genus.

Adulterants :

Powdered liquorice may be adulterated with flour, or olive stones.

Pharmacopoeias :

DAB : 10, 1991; Ph . Eur. II, 1980; AB-DDR, 1979; Ph. Hlv. VII, 1987; OAB, 1990, J. Pharm; 1986; Chinese Pharm.. 1985

Phytopharmaceuticals in the Egyptian Market :

Compound powder of liquorice: 15 g / 100 g (**Kahira**) Iopnol syrup : Dry extract of liquorice 1.1 g/ 100 ml (**Kahira**); Glucafene syrup Extract Glycyrrhizae 5 g/180 ml (**Memphis**); Meloids pastiles. : liquorice juice 93.3 % (**Boots**), 7 Herbs 20 mg liquorice/400mg capsule (Misr Co).

Candies sold in the market are called *Rub sous*.

Cultivation:

The plant could be considered a harmful weed, where it occurs in arable land. However, it is very useful for the important constituents of the root stock. The liquorice root contains the sugary substance which gives liquorice extract, its peculiar flavor and slight demulcent property.

The plants grow wild but has been domesticated in Siwa and Bahariyah oases. The plant grows in the Mediterranean and East European countries, Spain and Syria where it produces considerable amounts of liquorice.

Though the plant tolerates drought, it can grow in waterlogged soils. It tolerates considerable salinity. Cultivation of liquorice is not recommended on arable or good fertile land, as it is too difficult to eradicate it once it has been established. It is best to cultivate the plant in waste land with salinity levels not proper for traditional crops. Natural salines or anthropogenic salines and drainage water could be used in cultivation of this plant.

Cultivation of liquorice would permit economic use of waste, slightly saline land and low quality drainage water This plant could help in lowering the level of the water table by absorption and transpiration, i.e. helps in biological drainage in the oases.

The plant is cultivated using cuttings of the underground rootstocks. Cuttings are 10 to 15 cm long. The proper time for cultivation is February.

Planting rate :

One feddan requires about 15,000 cuttings. This amount of cuttings could be obtained from a field of liquorice with an area of 500 sq. m.

Method of cultivation :

Along lines 100-120 cm apart, with cuttings planted at a distance of 50 cm.

Irrigation :

The plant needs moderate amounts of water. It may be irrigated once every month in summer and about 1.5 month in winter. When the plant is established there is no need for regular irrigation, especially when it is cultivated in wetland.

Fertilizers:

Manure is important. Superphosphate and Potassium Sulphate could be added under intensive agriculture. However, when the plant is cultivated in waste land, it can be grown without fertilizers. The growth of the plant even with limited productivity under minimal tillage and agricultural operations should be economic by virtue of its use in rehabilitation of otherwise useless saline and water-logged land.

Harvest :

Harvest starts by cutting of the vegetative growth at a height of 5 cm from the ground level. The land is then deeply ploughed. The rootstocks are removed, cleaned. They may be cut into pieces 5 - 10 cm long; the bark is removed by hand.

Sun drying is preferred. The dried pieces are then ground into a coarse powder. The best time for harvest is late summer and early dry root stocks from autumn. One Feddan produces 2 - 3 tons which the bark is removed, The green vegetative part has a weight of 15 - 20 tons per Feddan

If we are reducing the tillage operations and the inputs, the yield also will be reduced. However, production of liquorice from wasteland is economic.

Extraction :

Liquorice powder could be extracted at normal temperature or at higher temperature 130 - 150°C.

Marketing :

The main producers and exporters of liquorice containing underground parts are: Iran, Russia, and China, while the major exporters of the extract are: USA, France, Italy, Iran, Iraq, Israel, Japan, Turkey and China. The main importer of liquorice roots is U.S.A., which is also the main exporter of the extract. Japan is the second largest importer of liquorice - about 10,000 tons roots and 200 - 250 tons dry extracts per year. France and Italy are European pioneers in importing liquorice. The main sources are China and Russia. It is to be noted that a small part is used in medicine, while the major part is used for flavouring.

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Fig. 5- *Glycyrrhiza glabra* : **A-** Flowering branch, **B-** A part of inflorescence,
C- Fruiting branch, **D-** Roots cut into pieces.
(After: Chakravarty, 1976, Plant Wealth of Iraq).

Description:

Egyptian *Hyoscyamus* occurs generally in matted masses or broken loose pieces of shrivelled leaves; intermixed with stems and flowering tops and also few fruits; odour, slightly foetid and narcotic; taste, bitter, acrid especially on chewing.

Macroscopical:

Stem, cylindrical, slightly compressed, greyish-yellow, finely longitudinally striated slightly hairy; hollow, with hairy branches. **Leaf**, pale green to yellowish, petiolate or nearly sessile; varying in shape and size. **Petiole**, up to 9 cm long. **Lamina**, oval rhomboidal to broadly elliptical, up to 15 cm long; tapering to an equal base and acuminate apex; entire or with 2 to 5 triangular acute teeth on each side; both surfaces, densely hairy; **midrib**, broad, prominent on the lower surface; venation, pinnate reticulate, the main side veins, at an angle of 45 degree to the midrib. **Lower leaves**, smaller, shortly petiolate to nearly sessile; with less teeth to entire margin. **Flowers**, crowded together in a more or less unilateral cyme; each shortly pedicellate, pushed to one side of a large, hairy, leafy bract. **Bract** usually ovate lanceolate to narrowly lanceolate. **Calyx**, very hairy, tubular, striated 2 to 4 cm long and 2 cm wide at the mouth, with 5 short, unequal triangular obtuse teeth. **Corolla**, when dried yellowish sometimes with deep coloured patches, zygomorphic, funnel shaped, with 5 broad, unequal lobes, slightly longer than the calyx tube and almost of the same width at the mouth. **Stamens**, 5, epipetalous, unequal in length, with hairy purplish filaments and brownish or sometimes purplish anthers. **Ovary**, ovoid, superior, bicarpellary, bilocular, slightly hairy, containing numerous campylotropous ovules, attached to axile placenta. **Fruit**, pyxis, enclosed in the persistent calyx, cylindrical, 1.5 cm long and 0.6 cm broad, slightly laterally compressed, apiculate, with or without the lid. **Seed**, minute, yellowish-grey to brown, more or less reniform, laterally compressed, about 1 mm long, with reticulate testa; internally, shows a curved embryo, embedded in an oily endosperm.

Constituents:

It contains up to 1.3% and not less than 0.8 percent of total alkaloids, calculated as hyoscyamine. (leaf alkaloids 1.70%, ripe fruits 1.34%, stems 0.569%, flowers, 2.0%). Other alkaloids are : hyoscyamine 0.02%, tigloidine, cuscohygrine, hygrine, apo-hyoscyamine, atropine, norhyoscyamine, 3 ?-tigloyloxytropine, noratropine & apoatropine. Maximum crop growth and alkaloid yield were obtained when sown from 25. October to 25. November at a spacing of 30x30 cm.

Folk Medical Uses:

The plant relieves painful spasmodic conditions of non-striated muscles, characteristic of lead colic and irritation of the bladder. It is used to allay nervous irritation of hysteria and irritable cough. Fresh leaf cataplasm allays pain. Smoke of cigarettes is effective against asthma. It is used in toothache, cough mixtures and for treatment of some forms of fever.

Pharmacological Actions and Indications:

It is used as cerebral and spinal sedative, hypnotic, narcotic in insomnia when opium can not be used. It also relieves the gripping caused by drastic purgatives. It is prescribed in cases of irritable bladder, in irritable cough, and to allay nervous irritation of various forms of hysteria,

Authentication:

Egyptian *Hyoscyamus* contains not more than 45.0% of its stems, not exceeding 10 mm in diameter, and not more than 2.0% of foreign organic matter, and yields not less than 0.8% of total alkaloids calculated as hyoscyamine. It should give positive test for alkaloids. It should be free from ammoniacal odor, ash not more than 30.0%, and acid-insoluble ash not more than 15.0%.

It should be stored in well-closed containers, in a cool dry place, protected from light.

Substitutes:

- *Hyoscyamus niger* herb.
- *Datura stramonium* herb.
- *Atropa belladonna* herb.
- *Hyoscyamus albus* herb.

Adulterants:

- Exhausted Egyptian *Hyoscyamus*.
- Deteriorated Egyptian *Hyoscyamus*.

Pharmacopoeias :

Egyptian pharmacopoeia 1984.

Phytopharmaceuticals in the Egyptian market:

The following pharmaceutical forms are used:

- *Hyoscyamus muticus* fluid extracts.
- *Herba Hyoscyami mutici*.
- Standardized powder of *Hyoscyamus muticus*.
- Tincture of Egyptian *Hyoscyamus*.

- Avicenne powder, **Kahira**, 20 g *Hyoscyamus* leaves, 75 g.
- Buchu and *Hyoscyamus* mixture.

Cultivation :

The plant is best cultivated by transplants. Seeds are sown in the nursery during the period February - April or September - October. Transplanting starts 45 days after sowing. Transplants should be 8 cm high and have at least three leaves. Cultivation in summer is preferred as the growth rate is higher with high temperature.

Rate of seeding :

For one Feddan, 150 gm seeds are needed to be sown in the nursery. The seeds are minute, so this amount may produce almost 20,000 transplants.

Seeds could be obtained easily from the naturally growing *Hyoscyamus* plants along Cairo - Ismailia or Cairo - Suez roads.

Transplanting :

Transplanting should be in moist soil.

Irrigation :

Hyoscyamus is a sensitive plant to water. It grows rapidly with irrigation, but with very low alkaloid content. Irrigation could be every month in summer and every one month and half in winter.

After the establishment of the plant, and the roots reach the permanently wet layer at a depth of 60 cm or more, there is no need for irrigation.

Harvest :

The proper time for cutting the herb is during flowering and before fruiting. Cutting is performed to leave a stump of 5 cm above the ground level.

Drying and preparation :

The cut twigs and leaves are dried in air. It should be continuously turned to avoid the growth of microorganisms due to its succulent nature. It is best to dry the herb in shade.

Yield:

The yield as a dry herb amounts to 7 - 8 ton per feddan. The alkaloid content is higher in plants growing in the desert than those growing in the coastal region or in lower Egypt.

The plant exhibits good growth in light soils and the alkaloid content is higher under limited water supply. The plant is a water - economic desert plant.

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PLANTAGO spp.

The genus *Plantago* comprises 21 species growing in Egypt. Some of them are very rare, others are common either in the desert or the cultivated land. The seeds of the plantain family are well-known to be a good source of mucilages, an important group of drugs, both from the pharmaceutical as well as the therapeutic viewpoint. The most important species from these points are : *P. ovata*, *P. afra* for their seeds and *P. lanceolata* for the herb and leaves. The seeds of *Plantago afra* and *P. ovata* are official drugs in many pharmacopoeias. The leaves of *P. lanceolata* is pharmacopoeial in the German Pharmacopoeia.

7-Plantago afra L., Sp. Pl., ed. 2, 168 (1762)

Plantago psyllium L., Sp. Pl., ed. 2, 167 (1762),

non L., Sp. ed. 1, 115 (1753)

Plantago parviflora Desf., Fl. Atlant. 1: 141 (1798).

| | | | |
|---------------|---|------------------------------|-----------|
| Arabic | : | <i>Qatoona</i> | ر??u? |
| | | <i>Hashishet el-brageeth</i> | RfZCfRfUš |
| | | <i>Asludj</i> | S?Uw |
| | | <i>Merwash</i> | u C? ? |
| | | <i>Harmola</i> | r??A š |
| | | <i>Umm rwis</i> | u f? ? |

English : Flea wort.

French : Herbe aux puces, Puciere, Psyllium.

German : Flohwegerich.

Morphological Description:

A stout richly branched annual herb. The plant is glabrous or glandular hairy with distinct stem. Leaves opposite, linear. Flowers in long peduncled heads (Plate 11).

Ecology :

The plant is rare and grows in particular sandy habitats.

Distribution:

Local : It is of rare occurrence in the Mediterranean, Arabian Desert, Red Sea, Gebel Elba and Sinai regions.

Regional : North Africa

Global : South Europe

Status :

The plant is rare. It is endangered due to the threatening of its habitats. It needs conservation *ex situ*. It is cultivated and sometimes becomes a weed in the fields of cumin in Upper Egypt. It is called by the farmers: *kammoun dakar* (*dakar* : An Arabic word denoting male).

Part Used:

The seed known as

Arabic : *Bizr qatoona* ر??و?ا Tr

Habbul Baraghit RfZCEKS

English : Flea Seed; Pulicaria Seed;

French : Pucière

German: Flohsamen

Psyllium contains not more than 5.0 % of foreign organic matter.

Description:

Odourless, or having very weak, not characteristic odour; taste, mucilaginous, and slightly bitter.

Macroscopical: **Seed** of *P. psyllium*, boat-shaped, elongated; oblong to oval, with rounded ends; dark brown, shining and glossy, transparent; 2 to 3.2 mm long, and 0.6 to 1.5 mm wide; **dorsal side**, convex, smooth and shining, having, in the middle, a slight transverse constriction and a light-coloured spot, running almost the whole length of the seed, indicating the position of the embryo, **ventral side**, concave, with a longitudinal deep furrow, having, in its middle, a pale, circular scar, the hilum. The seed is hard. When it is soaked in water, it swells becoming surrounded with a layer of transparent, colourless mucilage (Distinction from seeds of *Plantago lanceolata*); it is reniform in cross section, and formed of thin brown, mucilaginous testa, translucent, hard horny endosperm filling the seed almost completely, and a straight embryo, lying near the dorsal surface, and having two cotyledons with their upper surface flattened adjacent, in the middle of the seed. 100 seeds weight 0.07 to 0.14 g.

Microscopical: Testa, the outer epidermis is thin, formed of short small cells, 2 to 10 microns high (in glycerin); mucilaginous on the convex side of the seed, and swell radially in water to 70 microns (Distinction from seeds of other *Plantago* species); but the cells on the ventral side are not mucilaginous and do not swell in water. The epidermis is followed by a layer of small, colourless collapsed cells, the remains of the nutritive layer. The inner epidermis of the testa is formed of small rectangular, cutinised cells, containing a dark brown pigment. **Endosperm**, of thick-walled cellulosic cells, with simple pits and granular contents of protein and oil. **Embryo**, of thin-walled cellulosic cells, with minute aleurone grains and oil.

Constituents:

Mucilage in the epidermis of the testa.

Pharmacopoeias:

Egyptian Pharmacopoeia 1984

British Pharmacopoeia 1993

US Pharmacopoeia 1995

Indian Pharmacopoeia 1985

Use in Folk Medicine:

Seeds previously mixed with milk overnight are used against all sorts of dysentery, gastroduodenal ulcers, diarrhoea, chronic constipation. Seeds, emollient, mechanical laxative. Decoction of seeds in cases of internal haemorrhoids. *Plantago* seeds are used in medicine almost exclusively in the treatment of chronic constipation and dysentric disorders. The efficiency of the drug would appear to be entirely due to the large quantities of mucilage in the seeds.

Action and Uses:

Emollient; in chronic constipation; demulcent.

Adulterants and Substitutes:

The dried ripe seeds of other *Plantago* species.

Phytopharmaceuticals in the Egyptian Market :

Metamucil (**Searle**), 50% husk.

Authentication:

1- Macro- and microscopical investigation.

- 2- **Seeds of *P. arlnaria***: Differ from those of *P. psyllium*, in being elliptical to elongated, mostly larger in size; 2.4 to 4 mm long, 1.2 to 2.5 mm broad; paler in colour; and showing several layers of collapsed cells in the nutritive layer. 100 seeds weigh from 0.180 to 0.2 g.
- 3- **Swelling Factor**: Mix 1.0 g of Psyllium with 25 ml of water or of 0.1 M sodium chloride in a measuring cylinder with glass stopper and graduated to a height of 100 to 125 mm and each division equivalent to 0.2 ml. Shake gently and occasionally during 1 hour, and leave for 6 hours at 15°C to 20°C. Read the volume of the seeds and the surrounding mucilage; this is not less than 10 ml.
- 4- **Ash**: not more than 3.0 per cent.

Storage:

In tightly-closed containers in a cool place.

Cultivation:

The plant is cultivated in France, where the planting takes place early in March. The plants mature about the end of August. When the entire field is about three-quarters mature the plants are mowed between dawn and 8 a.m. when the dew is heaviest, so as to prevent many of the seeds from falling during the mowing operation. The plants are allowed to partially dry in the sun, and are then transported to the threshing floor. After threshing, the seeds are cleaned by the means of blowers.

The plant can be cultivated in Egypt as the winter field crops, i.e. in October or November. Maturity is expected to be reached by the end of spring months.

References:

1. Ahmed, Z.F.; Batanouny, K.H. and Hammouda, F.M. 1965. On the taxonomy, ecology and pharmacognosy of the common Egyptian *Plantago* species. *Planta Med.* **13**(1): 28.
2. Koedam, A. 1977. *Plantago* : history and use. *Pharmacologie Weekblad*, **112**, 246.

8- *Plantago lanceolata* L., Sp. Pl., ed. 1,114 (1753)

Arabic: *Athan el-kabsh*

u r??EKE

English: Ribwort, Great hen plant, Rib-grass

French: Plantain lanceole, Oreille de livre

German: Spitzwegerich

Morphological Description:

A stemless perennial herb, nearly glabrous to sparsely pubescent, 15-60 cm high. Leaves rosulate, long-elliptic to lanceolate, or nearly broadly elliptic, up to *ca.* 25 cm long, 6 cm wide, acute, tapering at base to a petiole, 3-7 parallel-veined. Spikes cylindrical, tapering somewhat toward apex, dense, 2-6(10) cm long, *ca.* 0.8 cm wide, on sulcate angled scapes, usually well exceeding the leaves when mature. Bracts, ovate-acuminate, glabrous, scarious-margined, equalling or shorter than the calyx. Sepals, sometimes sparsely ciliate at apex, scarious-margined, reduced to 3, the 2 anterior ones coalescent into a single, 2-striped, weakly-emarginate unkeeled lobe, the 2 posterior ones separate, keeled. Corolla lobes, ovate-triangular, glabrous. Capsule, oblong, 2-3 mm long. Seeds, 2, laterally oblong, dark brown, *ca.* 2 mm long (Plate 11).

Ecology:

Moist habitats in cultivated land and lawns.

Distribution:

Local : The plant is very rare in the Nile Delta.

Regional : No records available.

Global : No records available.

Status:

Due to the rarity of the plant and its confinement to a particular site in Egypt (Cairo-Inshas road), the plant seems to be endangered.

Part Used:

The herb (also the leaf) known as

Arabic : *Athan el-kabsh*.

English : Great Hen plant, plantain Herb, Ribwort.

French : Oreille de livre, herbe de plantain, blond d'Allemagne

German : Spitzwegerichkraut, Heilpsyllium ,Wundwegerich.

Description:**Macroscopical:**

The light to greyish-green, glabrous or sparsely pubescent, pieces of leaf have almost parallel whitish green nerves that are prominent on the lower surface. Longitudinally grooved, green to brownish black fragments of petiole and fragments of the brown, cylindrical flowering spike with its crowded membranaceous bracts are also present. Taste: mucilagenous, somewhat bitter and salty.

Constituents:

- 1- Iridoids: aucubin (0.3 - 2.5%), catalpol (0.3 - 1.1%) and asperuloside.
- 2- Mucilage: *ca* 6.5% comprising at least four polysaccharides.
- 3- Phenolics: tannins; p-hydroxy benzoic, protocatechuic, gentisic, chlorogenic, neochlorogenic acids, aesculetin; flavonoids including apigenin, luteolin and scutellarein.
- 4- Inorganic substances with a high proportion of zinc, potassium and silicic acid.
- 5- Saponin with antimicrobial activity.

Folk Medical Uses:

The pressed juice of the fresh herb is applied externally as a wound-healing and inflammation-inhibiting remedy. An ointment (10% leaf powder) is used in the same way. The drug is also considered to be haemostyptic.

Action and Uses:

- ? The herb is used to alleviate irritation in catarrh of upper respiratory tract (effect of mucilage and tannins).
- ? Macerates, dried extracts, syrups, press juice from the fresh plant, and pastilles are all used for treating inflammation of mouth and throat.
- ? Phenylethanoids isolated from the herb showed inhibitory effects on arachidonic acid-induced mouse ear edema.
- ? Antibacterial as well as hepatoprotective activities had been attributed to aucubin. Decoctions of the leaves induced, after i.v. administration, interferon formation.

Toxicity:

None.

Authentication:

- 1- Macro- and Micromorphology.
- 2- TLC evaluation.

- 3- Swelling index: not less than 6.
- 4- Foreign organic matter: not more than 5% dark to very dark brown fragments, not more than 2% other foreign organic matter.
- 5- Loss on drying not more than 10%.
- 6- Ash: not more than 15%.

Pharmacopoeias:

- 1- DAB 10.
- 2- Pharmacopoeia Helvetica VII.

Adulterants and Substitutes:

Very rare. Occasionally, with the similar looking leaves of *Digitalis lanata* (detected by microscopy).

Phytopharmaceuticals in The Egyptian Market:

Not available.

Economical Importance:

The plant is used medicinally in Europe and other countries. Several formulations are also available. The plant is of potential economic importance in Egypt and has to be cultivated.

References:

1. Bianco, A. 1984. Iridoid and phenyl propanoid glycosides from new sources. J. Nat. Prod. **47**: 901.
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9- *Plantago ovata* Forssk., Fl. Aegypt.-Arab, 31 (1775)

Plantago decumbens Forssk, Fl. Aegypt.-Arab, 30 (1775).

| | | |
|-----------------|-----------------|-------|
| Arabic : | <i>Geneima</i> | ??fS |
| | <i>Djenemax</i> | ??fS |
| | <i>Qurayta</i> | ruft? |

English : Spogel plantain.

French : Ispaghula.

German : Spogel wegerich.

Morphological Description:

A stemless annual herb, about 5-15 cm high, with linear-lanceolate, acute leaves. The leaves taper at base to a petiole. The leaves are densely pubescent to villous giving the plant a silky appearance. Spikes, dense, ovoid to cylindrical, 0.8 -3 cm long, 0.5-1 cm wide, on scapes shorter than or slightly exceeding the leaves. Bracts, glabrous, obovate, obtusish, equalling the calyx, broadly white-scarious margined. Sepals glabrous, elliptic, obtuse, scarious-margined, weakly keeled above. Corolla lobes, glabrous, obovate, mucronate. The petals are broadly lanceolate with brown centre. Capsule ellipsoid, dehiscent near the middle, *ca* 3 mm long. Seeds, 2, oblong, plano-convex and boat-shaped with the flattish side hollowed, brown, 2.3-3 mm long.

Distribution

Local : It is of common occurrence in Mediterranean coastal region, Sinai proper, Isthmic desert and Arabian desert East of Nile.

Regional: All the North African countries.

Global : Many countries of the Arabian Peninsula, and the Indian subcontinent.

Status :

The plant grows in sandy habitats in deserts of the Arab countries. Its appearance and prosperity are affected with the irregular rainfall. Therefore, there is a great need to cultivate this plant in sandy soils to be sufficient for the needs of the market. This has been tried once in Egypt since three decades. It has been successful and needs to be repeated.

Plantago ovata seeds taken to control bowel function was found a useful supplement in weight control diets as it affects fat intake and may have some effect on the subjective feeling of fullness.

Plantago ovata seeds were found to decrease serum cholesterol, mainly LDL cholesterol, through enhancing cholesterol elimination as faecal bile acids.

Doses: *ca* 10 g preswollen with *ca* 100 ml water are taken morning and evening followed by drinking at least 200 ml water.

Adulterants and Substitutes:

The seeds of other *Plantago* species which can be differentiated by their colour and swelling factor.

Authentication:

1. **Swelling Index:** not less than 9%.
2. **Foreign Organic Matter:** not more than 3%.
3. **Loss on Drying :** not more than 10%
4. **Ash:** not more than 4%
5. **Acid-insoluble ash:** not more than 1%

Storage:

Protected from light. The comminuted drug should not be kept longer than 24 hours.

Cultivation:

P. ovata seeds can be obtained from the desert in March of the rainy years. The same holds true with *P. albicans*, which grows in the Mediterranean coastal zone. *P. albicans* was tried by the senior auther to be cultivated in the land where Bedouin cultivate barley. In a piece of land at Sidi Abdel Rahman area, the *P. albicans* seed, already collected from the same area, were sown instead of barley. The crop was promising and

References :

1. Ahmed, Z.F., Batanouny, K.H. and Hammouda, F.M. 1965. On the taxonomy, ecology and pharmacognosy of the common Egyptian *Plantago* species. *Planta Med.* **13** (1): 28.
2. Koedam, A. 1977. *Plantago* - history and uses. *Pharmakologie Weekblad*, **112**: 24.

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4. Nordgaard, I.; Hove, H.; Clausen, M.R. and Mortensen, P.B. 1996. Colonic production of butyrate in patients with previous colonic cancer during long-term treatment with dietary fibre (*Plantago ovata* seeds). Scand. J.Gastroenterol. **31**(10): 1011-1020.
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6. Turnbull, W.H. and Thomas, H.G. 1995. The effect of a *Plantago ovata* seed containing preparation on appetite variables, nutrient and energy intake. Int.J.Obes-Relat. Metab. Disord. **19**(5): 338-342.

10- Senna alexandrina Mill., Gard. Dict., Ed. 8, no.2 (1768).

Cassia senna L., Sp. Pl ed. 1,377 (1753).

Cassia lanceolata Forssk., Fl. Aegypt.- Arab,85 (1775).

Cassia acutifolia Delile, Mem. Egypte 3: 316 (1802).

| | | |
|-----------------|--------------------|-----------|
| Arabic : | <i>Sana</i> | سنة |
| | <i>Sana makki</i> | سنة مكة |
| | <i>Sana hindi</i> | سنة الهند |
| | <i>Sana hegazi</i> | سنة هجزي |
| | <i>Salamekki</i> | سنة سلمة |

English : True senna, Alexandria senna.

French : Cassia Sen.

German : Senna Cassie

Italian : Sena Alessandrina

Morphological Description :

A perennial glabrous under-shrub with compound paripinnate leaves. The leaflets are lanceolate with acute margin with the upper surface glabrous or almost so and the lower more or less densely pubescent. The flowers are yellow and arranged in a raceme. Pods flat, shortly falcate-oblong, pubescent when young and glabrous with age (Plates 12 & 13).

Ecology:

C. senna is a common perennial in the southern part of the Eastern Desert and is rare in the northern part. It is one of the most extensively collected desert species as it is a famous medicinal plant. Its distribution and density are probably influenced by the intensity of collection by man.

Dominance of *C. senna* is usually seen in Wadi Abbad and in affluents of the two principal tributaries of Wadi El-Kharit. The plant cover of this community ranges between 5% and 15 % contributed mainly by *C. senna*. *Acacia ehrenbergiana*, *Aerva javanica* and *Zilla spinosa* are the common associates. Other associates are *Acacia raddiana*, *Cassia italica*, *Chrozophora oblongifolia*, *Fagonia parviflora*, *Farsetia ramosissima*, *Morettia philaena*, *Panicum turgidum*, *Polycarpha repens*

and *Stipagrostis plumosa*. Ephemerals include *Arnebia hispidissima*, *Astragalus eremophilus*, *A. tribuloides*, *Euphorbia granulata* and *Zygophyllum simplex*. The ephemerals enrich the ground layer which, like the frutescent layer, is usually thin. The suffrutescent layer is the most notable.

C. senna is a widespread xerophyte within the Nubian Desert. In Wadi Allaqi the plant cover of this community ranges from 5 % to 25 %. Of the three layers, the shrub layer is thin and includes two common associates, *Acacia ehrenbergiana* and *A. raddiana* together with the less common *A. tortilis* and *Balanites aegyptiaca*. The suffrutescent layer is well developed as it includes the dominant together with the common associate *Aerva persica* and the less common *Crotalaria aegyptiaca*, *Dipterygium glaucum*, *Francoeuria crispa*, *Heliotropium arbainense*, *Panicum turgidum*, *Salsola baryosma*, *Solenostemma argel* and *Stipagrostis plumosa*.

Distribution:

Local : The south eastern desert of Egypt, Red Sea region, Sinai and Gebel Elba.

Regional : Egypt, Libya and Algeria

Global : Central Sahara to Arabia and India, Sudan along the Red Sea coast to Somalia and southwards to Kenya.

Status :

The wild plants are overexploited and collected to be sold in the market for its folk medicinal uses. Cultivation of the plant is important. It could be cultivated in the marginal land with limited water resources.

Part used :

a- Senna leaf . b- Senna fruit (Plate 12).

a- Alexandrian Senna leaf :

Arabic : *Sana makki*

English : True senna, Alexandria senna

French : Cassia Sene

German: Senna Cassia

Italian : Sena Alessandrina

Turkish : Sinameki

Description:

Senna leaf is the dried leaflets of the paripinnate leaf of *Cassia acutifolia* Delile, Known as Alexandrian or Khartoum Senna, and of *Cassia angustifolia* Vahl, known as Congo, Tinnevely or Indian Senna.

Senna leaf contains not more than 8.0 *per cent* of Senna stalk (stems and rachis) and not more than 2.0 *per cent* of pods or of other foreign organic matter, and yeilds not less than 2.5 *per cent* of hydroxyanthracene derivatives calculated as sennesoid B.

Macroscopical: Odour, faint and characteristic; taste, mucilagenous, slightly bitter and acrid.

Alexandrian Senna : Leaflet, entire or frequently broken; with very short petiole, about 1 mm long. Lamina, lanceolate to ovate seldom exceeding 4 cm. and 4 mm to 15 mm broad; pale greyish-green base, asymmetric; margin, entire and slightly revolute; both surfaces, very slightly hairy; venation, pinnate-reticulate; the venis, about 60, and anastomosing by small arcs forming a ridge near and parallel to the margin.

Constituents :

The chief active constituents of Alexandrian senna are glycosides derivatives of anthracene. Two of these are named sennoside-A stereoisomers of the dianthrone of rhein. Small amount of free aloe emodin and rhein also occur. Other constituents are kaempferol, myricyl alcohol and a phytosterol, mucilage and calcium oxalate.

Indian senna also contains similar active constituents as alexandrian senna.

Substituents and adultrants :

- *Cassia obovata*, upper Egypt (Dog senna). (= *Senna italica*)
- *Cassia angustifolia*, Southern Arabia (Arabian senna).
- *Cassia angustifolia* in Arabia (Mecca or Bombay senna).
- *Cassia auriculata* (Palthe senna).
- *Cassia holosericea*.
- *Cassia montana*.
- Argel leaves, *Solenostemma arghel*.
- *Tephrosia apollinea*.
- *Colutea arborescens*.
- *Ailanthus glandulosa*.
- *Globularia alypum*.
- *Coriaria auryrtifolia*.

Uses :

Senna is a stimulant laxative used for treatment of constipation and for bowel evacuation. It is usually effective within 6 to 12 hours. Adverse effects include gastrointestinal disturbances.

It stimulates the muscular coat of the intestine and produces purgation which is not followed as is commonly the case, by constipation. It is therefore one of the most useful of purgatives, especially in cases of habitual constipation.

For the treatment of constipation, senna is usually administered as tablets, granules or syrup. In the UK the usual adult dose is the equivalent of 15 to 30 mg of total sennosides given as a single dose at bedtime. Dose up to 50 mg are given in the US. Children over 6 years of age have been given one-half the adult dose.

Doses :

0.5g to 3.0 g.

b-Alexandrian Senna fruit : Leaf-like, flat and thin pods, yellowish green to yellowish brown with a dark brown central area, oblong or reniform. Length, about 40-50 mm; width, 20-25 mm; stylar point at one end, containing ridges on the testa.

Constituents.

Senna leaf contains not less than 2.5% of hydroxyanthracene derivatives (Alexandrian) and not less than 3.4% of hydroxyanthracene derivatives (Tinnevelly) calculated as sennoside B.

The chief active constituents of Senna drug are glycosides derivatives of anthracene. Two of these are named sennoside-A and sennoside-B which are combination of rhein. Small amount of free aloe-emodin and rhein, a phytosterol, mucilage and calcium oxalate.

A new anthraquinone glycoside (emodin, 8-O-sophoroside), 7 known glycosides and two aloe dianthrone diglucosides were isolated from the leaves of *C. angustifolia*.

Two naphthalene glycosides were isolated from senna leaves and pods; namely: 6-hydroxymusicin glucoside from *C. acutifolia* and tinnevellin glucoside from *C. angustifolia*. Both compounds can be utilized to distinguish between the two species.

Volatile constituents (0.047% based on dry weight) was obtained and analysed by GLC and GLC-MS. More than 200 compounds were detected. The occurrence of menthol, geranylacetone, anethole is of interest.

Pharmacological Actions and Indications:

Senna is an anthraquinone stimulant laxative used for treatment of constipation and for bowel evacuation. It is usually effective within 6-12 hours, adverse effects include gastrointestinal disturbances.

Senna may cause mild abdominal discomfort such as colic or cramps. Prolonged use or overdosage can result in diarrhoea with excessive loss of water and electrolytes, particularly potassium. Senna should not be given to patients with intestinal obstruction or with undiagnosed abdominal symptoms.

There is some absorption of anthraquinone laxatives following administration by mouth. Senna preparations are hydrolyzed in the colon by bacteria to release the active free anthraquinones. Excretion occurs in the urine and the faeces and also in the other secretions including breast milk. Senna is usually administered as tablets, granules and syrups. The usual adult dose at bedtime.

The water-soluble polysaccharide isolated from the leaves of *C. angustifolia* showed antitumor activity against the solid sarcoma-180 in CD1 mice.

Hot glycerin extract of *C. angustifolia* showed virucidal activity against Herpes simplex virus. This activity is due to the anthraquinone content.

Authentication :

1. Macro- and microscopically following E.P 1984.
2. Foreign organic matter not more than 2%.
3. Senna stalk not more than 8% in leaf and 2% in fruits.
4. Hydroxyanthracene content not less than 3.4 % in leaf and 2.5 % in fruit.

Pharmaceutical preparations in Egyptian Market :

- Sennalax Tablets (purified calcium salt of extract, 20mg/tablet) **El-Nile Co.**
- Mucinum Tablets, **Amriya Pharm. Ind. Co.**
- Laxative tea bags preparation. **MEPACO Co.**
- Intestinal tea bags preparation. **SEKEM Co**

Senokot, Pugaton, Persunnide

References:

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2. Kinjo, J.; Ikeda, T.; Watanabe, K. and Nohara, T. 1994. An Anthraquinone Glycoside from *C. angustifolia* Leaves. Phytochemistry **37**(6):1685-1687.
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4. Nakajima, K.; Yamauchi, K. and Kumano, S. 1985. Isolation of a new Aloe-emodin dianthrone diglucoside from Senna and its potentiating effect on the purgative activity of sennoside A in mice. *J. Pharm. Pharmacol.* **34**(10): 703-706.
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11- *Senna italica* Mill., Gard. Dict., ed. 8, no. 2 (1968).

Cassia obovata Collad, Hist. Nat. Med., 92 (1816).

Cassia italica (Mill). F.W. Andrews, Fl. Pl. Anglo-Egypt. Sudan, 2: 117 (1952).

| | | |
|-----------------|-------------------|-----------|
| Arabic : | <i>Sana mekki</i> | سنة مكى |
| | <i>Sana mekki</i> | سنة مكى |
| | <i>Sala mekky</i> | سنة مكى U |
| | <i>Ischrik</i> | إشريك |

English : Senna

French : Senne

Morphological Description:

Erect to ascending-spreading branched shrublet with blue-green foliage; to *ca* 1 m high. Leaves, paripinnate with 3-6 pairs of oblong to obovate, obtuse, mucronate leaflets which are 1.5 to 3 cm long, 1-2 cm wide, sometimes unequal at base, on petioloules *ca* 1 mm long. Flowers racemed, on pedicels 3-5 mm long; petals, yellow with darker veins, 1-1.7 cm long. Pod flat, curved-oblong, 3-5 cm long, 1-1.8 cm wide, obtuse, minutely pubescent to glabrescent, with a transverse series of creases and a longitudinal series of short crests on face (Plate 13).

Ecology:

The plant grows in habitats sometimes similar to that of *Senna alexandrina*. However, the geographical amplitude of *Senna italica* in Egypt is wider. It grows in sandy habitats.

Distribution :

Local : All over the deserts of the country, especially the eastern desert, Red Sea region, Sinai and Gebel Elba.

Regional : Egypt, Libya, and Algeria.

Global : North Africa from Cape Verde Is. to Egypt, extending south to Nigeria, Sudan and Somalia, also in Arabia to S. Iran and Pakistan.

Status :

The plant is fairly common in its habitats. However, the disturbance of its habitat in addition to the collection of the herb have a great effect on the plant.

Constituents:

Ten flavonoids were isolated from the aerial parts including a new compound identified as tamarixetin (3-rutinoside-7-rhamnoside). Moreover, b-sitosterol, stigmasterol, alpha -amyrin, 1,5-dihydroxy-3-methyl anthraquinone and a new anthraquinone were isolated.

Uses, Pharmacological Action and Indications :

More or less the same as *Senna alexandrina* Mill.

A new anthraquinone isolated from the plant exhibited antibacterial properties and inhibited tumor promotion induced by *Agrobacterium tumefaciens*.

Extracts of leaves and pods stimulate intestinal contractions with dose-dependent relation and this supports the purgative activity of the plant.

The ethanolic extract of the whole plant exhibited antiinflammatory, antipyretic, analgesic, antineoplastic and antiviral activities as well as prostaglandin (PG) release by rat peritoneal leukocytes. The ethanolic extract exhibited also CNS depressant properties, manifested as antinociception and sedation. It showed weak effect on writhing induced by acetic acid.

Toxicity:

Fresh shoots, leaves and fruits when given by stomach tube in daily doses of 0.5-10 g/Kg were equally toxic to sheep and goats. Clinical signs included diarrhoea, dyspnea, ataxia and anaemia.

Cultivation:***Planting date :***

The proper time is springtime when the air temperature starts rising. It is not recommended to be later than April.

Soil :

Light sandy soils with good infiltration are the best for senna. Heavy soils are not preferred. Addition of manure's or other fertilizers is usually recommended.

Sowing :

Manual planting in leveled land, with 14 rows every 7 meters, at a distance of 30 cm. Mechanical planting, a planter or grain drill is used in rows 45 cm apart at a distance of 20 cm between the successive plants.

Sowing rate, per Feddan : Mechanical (planter) : Manual 5 - 6 kg seeds 8-9 kg deeds Seeds may be soaked in water for 12 hours before sowing to increase germination.

Herbicides :

Soil is sprayed with the herbicide triflan at a rate of 1 kg / Feddan before sowing. The land is ploughed after spraying and before sowing. This is not important in newly reclaimed land and where manure from cultivated land is not used.

Irrigation :

It is to be noted that senna is sensitive to water, e.g. it needs very little water. Sprinkler irrigation could be used with application every 5 days. after the establishment of the plant. Irrigation should be reduced after flowering. Excessive water causes chlorosis of the leaves and decreases the glycoside content.

Fertilizers :

It has been recommended to add per feddan :

500 kg Ca Superphosphate
200 kg Ammonium Sulphate
100 kg Potassium Sulphate

Foliar fertilizers could be used at a rate of 4 gm / liter, 200 liters / Feddan

Harvest :

It is possible to get three cuttings, the first about three months from sowing, the next one month later; harvest timing depends on the tillage and irrigation processes and fertilizers, etc. If inputs are reduced to save inputs, the harvest may be reduced to two cuttings instead of three during the growing season.

The time of harvest depends on the drug to be used ; the leaves or the fruits; or both. In case of leaves, cutting would be 2 or 3 times, while in the case of fruits harvest generally is in July; daily picking of the fruits is required.

Yield:

One feddan would produce from 1 to **1.5** ton of dry fruits. In case of cuttings for leaves, one feddan produces from 1 to **1.5** tons of leaves mixed with fruits. The total glycosides in mature fruits range from 4.3 to 5.6 percent and in the dry leaves from 1.5 to 2.8 percent. Experiments showed that one feddan produces from 750 to 1000 kg of air dry leaves, 2.5-3 ton of twigs and 350-400 kg of dry fruits.

Prices and values :

| | Price | Value / Fd |
|--|------------------|------------|
| 1. One ton dry leaves (glycosides not less than 2.5 percent) | LE 1,700 - 2,000 | 1,000 |
| 2. One ton dry fruits (glycosides not less than 3.5 percent) | LE 2,500 - 3,000 | 1,000 |

International markets :

It is to be noted that India is the main producer of senna (5000 - 7000 ton per year); two thirds are leaves and the rest dry fruits. One must take into consideration that India is transferring its raw material into calcium sennosides (about 50 ton of senna). This practice is to protect its production from senna.

The Sudan exports 10 percent of the market demands. Thailand exports about 70 ton every year to Germany according to a treaty.

The main consumers are Germany, Japan and USA. In the year 1982 the world market price of one kg of senna reached 2 pound / sterling.

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12- **Silybum marianum (L.) Gaertn.** Fruct. Sem. Pl. 2:378 (1791)

Carduus marianus L. Sp. Pl., ed. 1, 823 (1753)

| | | |
|----------------|------------------------|------------|
| Arabic: | <i>Qortom</i> | ؟ت؟ |
| | <i>Akub</i> | R??w |
| | <i>Harshaf barri</i> | ?tr Z Ut š |
| | <i>Shouk el-diman</i> | ??t?EU |
| | <i>Shouk el-nasara</i> | ? t d ??EU |

Berber: Tataoura Doujnilourman.

English: Milk thistle, Holy thistle.

French: Chardon argente, Chardon marie, Artichaut sauvage.

German: Echte Mariendistel, the fruit is called: Mariendistel Früchte.

Morphological Description:

Biennial or annual thistle, stout herb, up to 2 m high, almost glabrous. Stem, striate, branched. Leaves with spiny margins and characteristic white veins and spots. Basal leaves, very large, petiolate, forming rosettes, pinnatifid. Upper leaves, sessile, clasping, auriculate. Heads, large with spiny involucre bracts. Flowers, purple or white. Achenes have yellowish pappus. The fruit is about 6.7 mm long, *ca* 3 mm wide, and *ca* 1.5 mm thick (Fig. 6, Plate 14).

Ecology:

The plant is common on canal banks and in wet grounds, mainly in the Nile region. The soil supporting this plant is fine-textured and moist.

Distribution:

Local : Nile region, Oases, Western Mediterranean coastal region near the Delta.

Regional: All North African countries.

Global : Central and Southern Europe, Southern Russia, Asia Minor, North and South America, South Australia.

Status:

The plant is common in the Nile Delta. It is not seriously endangered. Trials to cultivate it were successful. The amounts needed for industry could be obtained by cultivation.

a- The Fruit

1. Silymarin competitively suppresses the action of hepatotoxic substances. Prophylactic administration is more effective than therapeutic administration after the liver damage has occurred. The demonstrated antihepatotoxic effect is explained by a “membrane-stabilizing action”, probably through antioxidant and radical-scavenging actions.
2. Silybin increases the rate of synthesis of ribosomal ribonucleic acids through stimulation of the nuclear polymerase I which enforces protein synthesis and accelerates cell-regeneration processes.

The fruit as well as silymarin are indicated for the prophylaxis and treatment of liver damage caused by metabolic toxins, e.g., alcohol, tissue poisons, in liver dysfunction and after hepatitis, in chronic degenerative liver conditions, such as liver cirrhosis and fatty liver and in latent hepatopathies.

Studies revealed free radical scavenging and antioxidative properties of silybin complexes on microsomal lipid peroxidation. Silymarin was found to provide substantial protection against different stages of UVB-induced skin carcinogenesis, possibly via its strong antioxidative properties. Long-term treatment with silymarin was found effective on hyperinsulinemia, exogenous insulin need and malondialdehyde levels in cirrhosis diabetic patients. Silymarin retards collage accumulation in early and advanced biliary fibrosis secondary to complete bile-duct obliteration in rats.

b- The Herb:

Different from the fruit; as a cholagogue in supportive treatment of hepatic and biliary functional disorders. Data to substantiate these applications are lacking.

Authentication of the Fruit

1. Macro- and microscopically.
2. The drug must not smell or taste rancid.
3. Foreign vegetable and/or mineral matter, not more than 2%.
4. Loss on drying not more than 8%.
5. Ash: not more than 8%.
6. TLC test of identity entails detection of silymarin and taxifolin.
7. Silymarin not less than 1% calculated as silybin $C_{25}H_{22}O_{10}$ (Mr= 482.4).

For further information see DAB 10.

Pharmacopoeias :

Deutsches Arzneibuch 10. 1991

Phytopharmaceuticals in the Egyptian Market

1. Legalon tablets (**CID** by liscence from **Madaus** AG, Germany).

2. Silymarin granules (**SEDECO**).

Economic Potential:

The plant is and will continue to be of high economic potential for the widespread use of its flavolignans as antihepatotoxic agents. Trials for cultivating the plant in farms in the Delta have been undertaken. Pilot experiments for the use of the fruits and the herb were done in some Egyptian pharmaceutical companies.

Cultivation:

The plant can be easily cultivated in the delta with achenes collected from the common wild plants along the canals.

References:

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Fig. 6- *Silybum marianum*
(After: Täckholm, 1974, Students' Flora of Egypt).

13- Urginea maritima (L.) Baker, J. Linn. London (Bot.) 13:221(1873)

Scilla maritima L. Sp. Pl. ed. 1, 308(1753).

Squilla maritima Steinh., Ann.Sc.Nat.Ser.2, 6:276 (1836).

| | | |
|-----------------|---|--|
| Arabic: | <i>Basal; Far'on</i> | ??wt z ³ Ur |
| | <i>Onsul, Onsel Onsul, Onsel</i> | ³ U ?w |
| | <i>Basal el- far</i> | t ā r |
| | <i>Buseil; Basul</i> | ³ / ₄ U æ ³ / ₄ Ur |
| | <i>Samm el-far</i> | t ā r |
| | <i>Ishkil</i> | ³ / ₄ U æ |
| Berber: | Ichkil, Isfil, Ikfilen, Lobsol bouchen, Ibsel idam. | |
| English: | Medicinal Squill, Sea onion, Squill. | |
| French: | Scilla maritime; Oignon marin, Scille. | |
| German: | Echtemerzwiebel. | |
| Italian: | Scilla marina, Cipolla marina Squilla, Pancrazio, Scilla d' Italia. | |
| Turkish: | Ada Sogani, Ansel, Yaban Sogani. | |

Morphological description:

A bulbous plant with rosetted leaves. The leaves appear at the beginning of winter. Leaves, basal, lanceolate to linear-lanceolate, 10-35 x 2-7 cm ,glabrous, margin smooth. Leaves become dry by the onset of summer and the plant becomes dormant for a period of 23 months depending on the climatic conditions as well as the soil moisture content. In August, or even one month later flowers appear. The bulb is huge (Plates 15 & 16), frequently white, or red, growing in clumps up to 70 together, each bulb more than 10 cm across and weighing more than 1 kg. Inflorescence, a long scape reaching 60 cm to 1.5 m high and carrying small flowers from the middle upwards. Red squill has longer and more stout scapes (1-1.5 m), while white squill has shorter ones (60 cm). Fruits are produced by the end of October. They are larger in red squill than in white squill. Seeds, 1-4 in each fruit, minute, very light, compressed, oblong *ca.* 3x7 mm and dark black-glossy coloured (Plates 14, 15 & 16).

U. maritima is a polymorphic species with various varieties and forms. Batanouny *et al.* (1970) reported that in Egypt there are three distinct morphological features collected from the different localities. The specimens collected from Sidi Barrani along the western Mediterranean coast, show two features regarding the

colour and size of the bulb. The average diameter of the bulb of white squill is 8.5 cm (Plate 16), while it reaches 17 cm in the case of red squill (Plates 15 & 16). On the other hand, in the specimens collected from the eastern Mediterranean coastal zone between El-Arish and Rafah, the bulbs have intermediate diameter and their white tunics have reddish tinge. So, squills growing in Egypt show distinctive features regarding the morphology of their bulbs. One with moderate size and reddish tinge in the eastern coastal region, the second with white tunics and small size, while the third with dark-red tunics and very large bulbs. The latter two grow in the western Mediterranean coastal region, which extends westwards to the rest of the North African countries. It is noteworthy that the phytochemical screening showed that they are different regarding their constituents. Taxonomical, ecological, phytochemical and cultivation studies should be undertaken on the three forms.

Ecology:

Habitat conditions:

The growth of *U. maritima* is confined to the coastal zone. It is not recorded in the inland desert. In a study in Sidi Barrani, along the western Mediterranean coast, it has been found that the white and red squills grow on soils with different physical and chemical properties. Soils supporting the white squill are shallower, more compact, with higher content of carbonates and soluble salts than those supporting the red squill. The soils supporting the red squill are of sandstone origin, while those supporting the white squill are of limestone origin.

The total plant cover of the community dominated by the white squill is about 60 percent; almost half of it is occupied by the squill. On the other hand, in the case of the red squill, the total plant cover is 68%, and the squill occupies about 90% of this cover.

The number of bulbs in 100 sq. m was found to be 430 in white squill and 250 in red squill, while the weight of these bulbs was 70 kg white squill and 123 kg red squill.

Distribution:

Local : The plant is of rare occurrence in the Mediterranean coastal region (Sidi Barrani Area) and the Isthmic Desert. In the latter region, it is found in maritime sand as well as in stony grounds and ascending hills.

Regional : All North African countries

Global : Mediterranean region and the Canaries.

Status:

Recently, the plant has been subjected to severe uprooting and collection for pharmaceutical companies. It is now rare as compared with its status since thirty

years. In a study by Batanouny *et al* (1970), it has been shown that a more or less equal number of bulbs would be established three years after collection. However, the weight of the newly established bulbs would be 13.7 kg compared to the 70 kg from a natural unharvested area (Plate 15). This confirms that the reestablishment of the squill will take numerous years even in the case of protecting the habitat after collection.

Conservation of this plant and its cultivation for further use by the pharmaceutical companies is essential. It is a very endangered species. The plant, being unpalatable, there is no fear to cultivate it in the coastal Mediterranean region without enclosure. Reseeding of the plant would be in the areas from which the bulbs were collected. One must consider that the collection of the bulbs is usually undertaken in late summer before flowering; at which time the active principles are at their highest level and in the meantime, the plants were not yet fruiting. This means that the soil will be deprived from the seed rain which enriches the seed bank.

Part used:

The dried fleshy scales of the bulb of *Urginea maritima* (L.) Baker. (Fam, *Liliaceae*), collected after withering of the leaves, known as:

- Arabic :** Basal-ul-onsol **U ʔʔr**
English : White Squill, Sea Onion, Squill.
French : Bulb de Scille
German: Meerzwiebel.
Italian : Cepa Marina
Latin : Bulbus Scillae, Scillae Bulbus, Scillae.

Description:

The scales are odourless or with a slight odour, and a mucilagenous, bitter, acrid and disagreeable taste. They occur in irregular, curved, flattened narrow pieces, frequently tapering towards both ends; 0.5 to 5 cm long, 3 to 8 mm wide in the middle, 2 to 5 mm up to 8 mm thick; yellowish-white to pale yellow, somewhat translucent, exhibiting raised slightly darker points or lines, the vascular bundles; brittle when quite dry, tough and flexible when moistened; fracture, short. The transverse cut surface shows a line of prominent vascular strands near the concave edge and numerous small strands scattered in the mesophyll.

Constituents:

It contains 0.2- 0.4% bufadienolides, comprising about 41 bufadienolides. Main glycosides are proscillaridin A (0.005 - 0. 05%), scillaren A (ca. 0.6%) and

glucosyllaren A (ca. 0.05%). Scylliglaucoside (0.07 %), scyllaphaeoside (0.04 %), 9-hydroxyscylliphaeoside and scyllacyanoside (0.05 %) are minor constituents.

The leaves of *U.maritima* contains vicenin-2, vitexin, isovitexin, orientin and isoorientin as well as sinistrin, a fructan polysaccharide.

The highest growth rate, carbohydrates, reducing sugars, scyllaren A and B contents were observed when bulblets of *U.maritima* were planted in 40-cm pots containing sandy soil and irrigated 7 times each 0.5L/pot per year.

Folk Medical Uses:

White squill bulbs are applied fresh for treatment of wounds and tumours, expectorant in bronchitis, chronic catarrh and pneumonia. In strong doses, emetic, cathartic and upsets nerves. Fresh bulb is vesicant, rubefacient, anthelmintic, useful for rheumatism, oedema and gout. Its cardiac action is like that of *Digitalis*, slowing down the pulse and increasing its strength, emmenagogue, abortive, aphrodisiac. Dried powdered bulbs made into tablets, sucked slowly in the mouth against internal tumors. Infusion of dried bulb is a strong purgative. Aqueous infusion of the fresh bulb is used for treatment of diabetes. A piece (2g) of fresh fleshy leaves, boiled in a glass of water. Cool and drink every morning for 45 days(Matrouh). For treatment of painful joints: A slice of red squill is warmed in direct heat then placed on the joint after painting it with cooking oil 3 times day over a period of 45 days(Matrouh).It is reported to be used by ancient Egyptians in dropsy.

The bulb extract is usually used as an expectorant if small doses were taken, in large doses it is usually used as an emetic. The Frontier soldiers usually use it as an emetic when one has some food poisoning. The plants are also used for curing dermal fungal infections.

In the Eastern Mediterranean zone in Egypt (El-Arish- Rafah zone), the plant was used as territory marker. This practice was also recorded in Libya. However, these days, it is difficult to find such markers in Egypt.

Pharmacological Actions and Indications:

Bufadienolides of squill accelerate the heart beats in small doses, thus increase the volume of blood pumped through the heart. They increase diuresis due to dilatation of the capillaries of the kidneys as well as through increased volume of blood passing through kidneys. They also have an antitussive action in treatment of cough due to their poor absorption from the gastrointestinal tract and their mild gastric irritation causing a reflex secretion from the bronchioles

Dose: 0.06 to 0.50 g. In large doses, it causes vomiting.

Toxicity:

The plant is poisonous. Dose should not be exceeded. Toxicity due to ingestion of 2 bulbs of *U.maritima* as a folk remedy for arthritic pains by a 55-years old female was reported. Symptoms shown were cardiac glycoside intoxication which included nausea, vomiting seizures, hyperkalaemia, atrioventricular block and ventricular arrhythmias resembling digitalis toxicity. The patient died 30 hours after ingestion.

Authentication:

Squill contains not more than 2.0% of foreign organic matter. It contains no slices of red, pink or purplish scales of red squill, Alcohol extractives not less than 65.0%, ash not more than 6.0%, acid - insoluble ash, not more than 2.0%. It should be stored in well-closed containers, in a cool dry place protected from light.

Substitutes:

Indian squill:

It consists of the dried longitudinally sliced, bulb of *Urginea indica* (Roxb.) J. P. Jessopp). It is used as cardiotoxic, in small doses as an expectorant.

Adulterants:

Red squill:

It is the red variety of *Urginea maritima*. It is distinguished by the reddish brown outer scales and the white to deep purple inner ones. In addition to the cardio-active glycosides, the bulb of red squill also contains scilliroside and scillirubroside. It is used as rodenticide.

Pharmacopoeias:

Egyptian Pharmacopoeia, 1984.

British Pharmacopoeia 1988.

Phytopharmaceuticals in the Egyptian market:

The following pharmaceutical forms are used:

Fresh bulbs, Dried scales, Tincture squill, Compound squill linctus, Liquor pro tincture squill, Squill elixir, Pediatric opiate squill linctus, Squill oxymell, Squill liquid extract, Squill vinegar, Squill pastilles. Scillaren, 0.5 mg / ml ampoule (**Sandoz**), 0.8 mg tablet (**Sandoz**), 0.8 mg /ml drops (**Sandoz**). Palmocadil syrup: Tr.Scilla 9 ml / 120 ml (**Nile**). Cosylan syrup: Fluid ext. of Squill 2ml/4froz (**Park_Davis**). Lobestra syrup: Tr. Scillae 0.5 ml /200 ml.(**Nile**). Expectyl syrup ;Tr. Squill 2 ml / 100 ml (**Adco**). Broncho cough syrup: Tr.Scillae 3ml / 100 ml (**Mepaco**).

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