



Editorial Comment

Global phytochemistry: the Egyptian experience

Ancient Egyptians were advanced in a number of sciences, including astronomy, mathematics, chemistry and medicine. In December 2002, Egypt celebrated the centenary of the Egyptian Museum. Among the exhibitions are several enscriptions outlining the daily life habits of Ancient Egyptians. These include, among others, cultivation, small industries, medical treatments, animals, fish and plant life. Plant life is documented on monuments and papyrus paper in the museum as well as on temples all over Egypt. The most common plants mentioned are sycomore figs (*Ficus sycomorus* L.), lettuce (*Lactuca sativa* L.), lotus flowers (*Nymphaea lotus* L.), pomegranates (*Punica granatum* L.) and papyrus (*Cyperus papyrus* L.).

Although several scholars have described the plant life in Egypt over the years, one of the first comprehensive reports for the flora of Egypt is that by Täckholm (1974). This was revised and updated in the first three volumes of four parts recently published (Boulos, 1999, 2000, 2002). This shows use of medicinal plants was, and still is, widespread among the Egyptians for the treatment of several ailments. This has led to a build up of wealth in the field of folklore medicine, and scientists have attempted over the years to record and study the old recipes, an effort strongly needed in view of the fact that many wild plants are threatened by urbanization. Furthermore, there is an increasing trend towards the use of natural remedies, and hence the role of naturally occurring compounds and herbal teas are proving to be of increasing interest in the field of alternative medicine. Many plants are still used today in folklore medicine (Fig. 1), and are sold at herbal venders and shops (Boulos, 1983). A few examples of some plants common to Egypt and their uses in ailment treatments are:

- *Acacia nilotica* (L.) Willd. ex Delile: gum exudates, fruit infusion used for diarrhoea and reported to be useful against diabetes.
- *Achillea fragrantissima* (Forssk.) Sch.Bip: flowering heads infusion relieves abdominal pains.
- *Ambrosia maritima* L.: decoction used to expel kidney stones.

- *Citrullus colocynthis* (L.) Schrader: used against snake bites and scorpion stings and antifungal and other skin diseases.
- *Cleome amblyocarpa* Barr. & Murb.: leaf infusion relieves abdominal and rheumatic pains.
- *Cleome droserifolia* (Forssk.) Delile: anti-hyperglycemia.
- *Seriphidium herba-album* (Syn. *Artemisia herba-alba*): leaves and flowers used for skin diseases, coughs and stomach ailments.
- *Solenostemma argel* (Delile) Hayne: effective against coughs, gastrointestinal and urinary cramps.

Many plants, the world over, are also used as a source for nutrients or refreshment drinks. Examples of those common to Egypt are:

- *Ceratonia siliqua* L.: pods infusion used as a soft drink, served cold in summer time.
- *Cyperus esculentus* L.: tubers highly nutritious.
- *Daucus carota* L. var. *boissieri* Wittm.: red carrots endemic to Egypt.
- *Hibiscus sabdariffa* L.: perianth used as a tea effective in lowering blood pressure.
- *Pulicaria incisa* (Lam.) DC.: replaces tea by Bedouin.
- *Raphanus sativus* L. var. *aegyptius*: white radish, endemic to Egypt.

Only a few naturally occurring active compounds from plants have been developed by the pharmaceutical industry into products presently found on the market. The following active principles have been isolated and are prescribed for the following treatments:

- Ammoidin and khellin (from *Ammi visnaga*). For the treatment of vitiligo and psoriasis.
- Nigella seed oil (from *Nigella sativa* seeds). Pulmonary and general improvement of immune system.
- Proximol (from *Cymbopogon proximus*). Propulsive for ureteric stones and urinary antiseptic.
- Senna extract (from *Senna alexandrina* pods). Laxative.

Although folklore medicine is popular throughout Egypt, wild plants rich in medicinal and aromatic plants are best known in the Sinai Peninsula, the southern part of the Red Sea coast as well as parts of the North

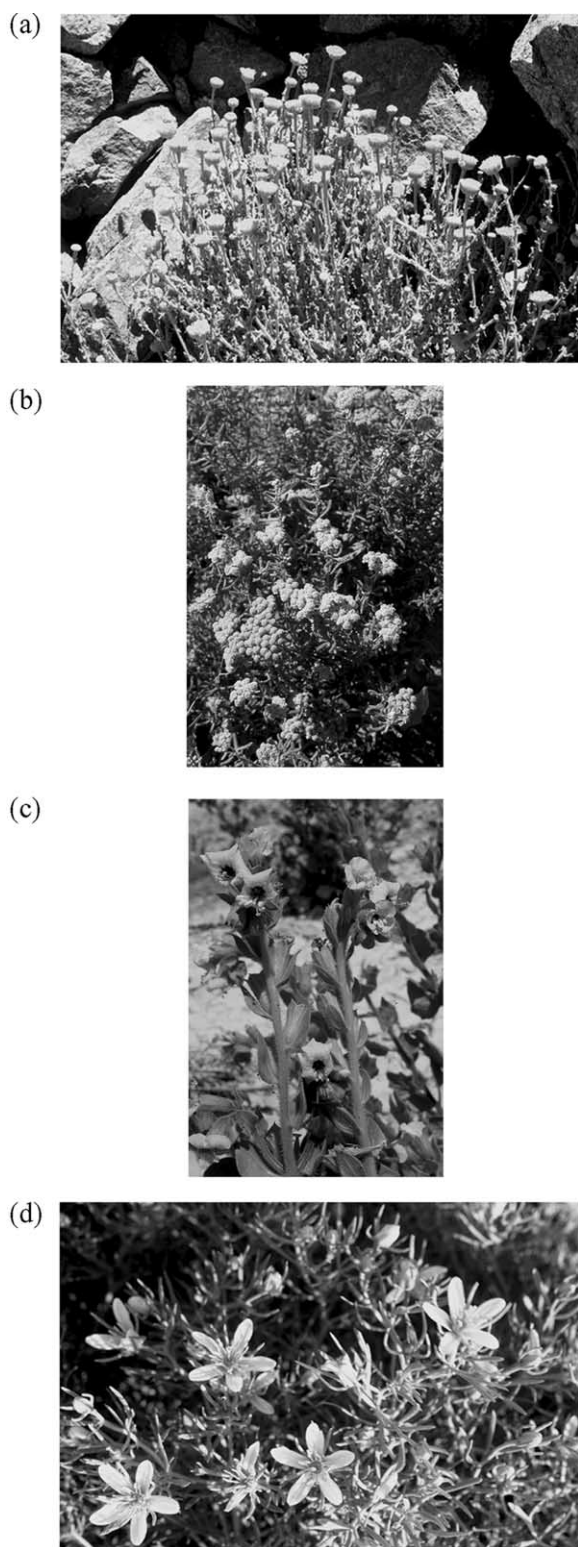


Fig. 1. Four local medicinal plants. (a) *Pulicaria incisa*, (b) *Achillea santolina*, (c) *Hyoscyamus muticus*, (d) *Peganum harmala*.

Western coast along the Mediterranean Sea. Egypt has close to 2000 km of coastal lines along the Mediterranean and Red Seas. Both are also rich in their marine flora and fauna, particularly the Red Sea which is unique in parts of it, and known for its coral reefs. Recently, urbanization has been threatening the wild life, particularly along the coastal areas. On the national level, a National Strategy and Action plan for Biodiversity Conservation has been prepared and is in action, covering the period from 1997 to 2017. This is implemented through the Egyptian Environmental Affairs Agency (EEAA) affiliated to the State Minister for Environment. Currently, 21 protected areas exist in Egypt, covering about 8% of the total national surface, with plans to have this extended further to 17% by 2017. Visitors centres are established in 11 of the protected areas and a world class visitor center containing displays of cultural, historical and natural features of southern Sinai, is under construction at St. Katherine's protected area. South Sinai has 40% of its surface as protected areas, and is a focal point for support by the European Union. Other activities include the ongoing implementation of a long-term monitoring programme for coral reefs, as well as the initiation of a programme for the restoration of *Acacia* trees within southern Sinai. Within the framework of the GEF-supported strategic action program for the Mediterranean Sea, initiatives are implemented for the protection of wetlands along the Mediterranean coast of Egypt. Future plans include the establishment of a Natural History Museum, a National Gene Bank, a Captive Breeding Programme for rare and endangered animals destined for re-introduction to their natural habitats. Furthermore, a Marine Park is to be established along the coast of the Red Sea, in addition to the conservation and sustainable use of medicinal plants by the bedouin.

Increasing interest in the cultivation and production of medicinal plants with the aim of covering increasing demands for the local needs as well as for export purposes. Total cultivated areas for medicinal and aromatic plants in Egypt have increased from a total of 50,000 acres in 1997 to 63,000 acres in 2001. Consequently, figures indicate an increase in exports of cultivated medicinal and aromatic plants, from 10,500 tons in 1994 to 13,300 tons in 1996 and 23,400 tons in 2001. Major exported crops are fennel, coriander, camomile, hibiscus, basil, cumin, marjoram, geranium oil and jasmine concrete.

One of the major research organizations working in the field of natural products is the National Research Centre (NRC) with multidisciplinary research groups. The Agricultural Research Centre (ARC) affiliated to the Ministry of Agriculture is also the largest in the region for applied research in the field of agriculture, including medicinal plants. Research in the field of natural products and their biological properties is also

carried out at the Faculties of Pharmacy and Science at the universities of: Cairo, Alexandria, Assiut and Mansoura. The Faculties of Science at El-Minia and Suez Canal Universities are also involved in the chemistry of natural products, while the Faculties of Pharmacy and to some extent, Faculties of Medicine in all universities are involved in biological testing of natural and synthetic compounds. The Faculties of Agriculture in all universities are mainly involved in cultivation of medicinal and aromatic plants, and to a lesser extent in their chemistry. Research in the field of marine biology was established at the Universities of Alexandria and the Suez Canal as well as the NRC. However, this area is still in its infancy and needs to be further developed. Areas that need development are marine biology systematics, as well as the use of advanced technology and equipment for surveying, sampling and recording.

Research in the field of chemistry of natural products is one of the oldest and well-established fields of research in universities and research centres in Egypt. The level of publication in this field is relatively high in international and local abstracted journals. As an example, two books have been published on the chemistry of natural products, one on medicinal and poisonous plants from Qatar which includes several from the Egyptian flora (Rizk and El-Ghazaly, 1995). The second is on the flavonoid chemistry of African Plants, and also includes those from Egypt (Saleh, 1992, 1994). Areas of natural products strongly represented in Egypt are the chemistry of flavonoids, terpenoids, coumarins, plant phenolics and to a lesser extent fatty acids and alkaloids. Although the chemistry of natural products represents the major part of research, biological activity is playing an increasing and important role. Over recent years, the applied side of natural products has led scientists to increase testing natural products as biological active compounds with the aim of discovering new drugs in collaboration with pharmaceutical companies. In addition to the search for bioactive compounds, other important areas are under investigation, e.g. ecological studies, natural products of marine origin and the production of natural products using cell tissue cultures. Although a number of research centres and universities are developing analytical testing methods for bioactive material, yet the most important tests are still being carried out at overseas centres.

There is an increase worldwide in medicines of herbal origin. This is more apparent in developing countries including Egypt, where pharmaceutical medicines are too expensive for the majority of the poor who turn to local herbal drugs instead. This is traditionally available from herbalists who prescribe the plant to be used either

alone or as a mixture of plants, a knowledge handed down for generations. In order to take a scientific approach towards herbal drugs, the following steps are recommended to take place in the new climate of optimised biodiversity use:

- A therapeutical and clinical approach is needed.
- A physician desk reference for herbal practices should be developed and applied similar to that known in Germany and the USA.
- High-throuput bioactivity screening methods should be introduced.
- Methods for biological testing should be developed, for example anti-cancer, anti-HIV, testing immunomodulating agents etc.
- The area of medicinal plants and its prescriptions should be introduced in the curricula of medical schools.
- Intellectual property rights for herbal practices should be studied and developed to protect and encourage their use on a scientific base.

Finally, it is clear that there is an urgent need to develop strong ties between scientists and end users, to make better use of the international cooperation agreements, to strengthen and develop basic sciences and to improve and develop capabilities to solve our own problems. This would only be possible through a solid long-term and well managed national science and technology policy.

References

- Boulos, L., 1983. Medicinal Plants of North Africa. Reference Publications, Algonac, Michigan, USA.
- Boulos, L., 1999. Flora of Egypt, Vol. I. Al-Hadara Publishing, Cairo, Egypt.
- Boulos, L., 2000. Flora of Egypt, Vol. II. Al-Hadara Publishing, Cairo, Egypt.
- Boulos, L., 2002. Flora of Egypt, Vol. III. Al-Hadara Publishing, Cairo, Egypt.
- Rizk, A.M., El-Ghazaly, G.A., 1995. Medicinal and Poisonous Plants of Qatar. Scientific and Applied Research Centre, University of Qatar.
- Saleh, N.A.M., 1992. Flavonoids in the African Flora (1965–1990). In: Dagne, E., Mammo, W. (Eds.), NAPRECA Monograph Series No. 3. Addis Ababa University, Addis Ababa.
- Saleh, N.A.M., 1994. *Phytochemistry* 36, 1109–1115.
- Täckholm, V., 1974. Students' Flora of Egypt, 2nd edition. Publ. Cairo University, Beirut.

Nabiel A.M. Saleh
National Research Centre, 12311 El-Dokki, Cairo, Egypt
E-mail address: nasaleh@idsc.net.eg