BOTANY SECTION

MEDICINAL PLANTS OF LEBANON

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The Country

Lebanon is a small mountainous country of about 10,170 square kilometers and occupies a narrow coastal strip of the Eastern Mediterranean situated at the cross roads of three continents: Asia, Europe and Africa. The mountains rise steeply from the coast and then fall down to a high plain which is again flanked by another chain of mountains in the East which may rise to more than 3,000 meters. This topographical variety results in the formation of several climatic zones rich in the number and variety of species and each containing its own peculiar flora. These zones are not closed to each other, however; neither are they closed to the surrounding countries and thus the flora as a whole is Mediterranean but is open to infiltration from outside floras, particularly that there are no geographical barriers to such infiltration except in the East. One may distinguish, [1,4,8] the following climatic zones: a humid Mediterranean climatic zone; a mountainous zone which itself may be divided into low, subalpine and alpine zones; a humid continental zone; and finally a subdesertic zone. To this variety of climatic zones, another variety can be found in the soil which, although mostly calcareous or siliceous, may also be argillaceous. Rainfall is limited to the few winter months when some 30-40 inches of rain pour down within a relatively short period. Hardly any rain falls during the four or five months of the late spring and summer, and the bright sun beats down on plain and mountain drying up all herbs.

The Flora

Thus one can hardly speak of any specific drug plants of Lebanon. Although the country's flora is rich in the number of plant families, genera and species represented in this very small area, the "quantity" so to speak of most species growing wild is so limited that one cannot say that these have any economic value. Again, most if not all of the relatively few species used medicinally are really home remedies common to the whole Mediterranean area and known to Western medicine old and new.[3]

Those medicinal species which can be spoken of as Lebanese are very few indeed and belong to few families. All kinds of medicinal virtues are attributed to these species ranging from the curing of various types of abdominal disturbances to the curing of diabetes, pneumonia, hemorrhoids or malaria.

The Medicinal Plants

No effort will be made here to enumerate all the medicinal plants of Lebanon. Such information could be found in a survey made by Fahmi.[3] Rather it is our intention here to speak of a few native plants which had been subjected to analysis by different workers and to mention a few local plants to which common people attribute certain curative effects.

The eastern Mediterranean is known for four

or five native medicinal crops of commercial importance some of which were usually exported from Beirut (Lebanon) by Lebanese druggists but were really drugs imported from neighbouring countries. Liquorice, for example, which grows in Syria and constitutes an export item for this country; Levant scammony (coming from Aleppo) which, however, is at present practically unobtainable and has lost its former importance; nutgalls, opium and tragacanth which are really products of Turkey rather than of Syria, although nutgalls and tragacanth could be procured in Northern Province of the United Arab Republic.

By its special geographical position Lebanon is a country of transit operations and when a researcher takes a drug either for investigation or for pharmaceutical use he has to make sure of the origin of the drug he buys, in case he cannot supervise the harvest or gather the plants by himself. For instance Lebanese pumpkin seeds are well known to give a satisfactory anthelminthic treatment especially against Taenia saginata. P. Lys and J. Ades, of the French Faculty of Medicine and Pharmacy of Beirut tried a few years ago[11] to judge the value of pumpkin seed extracts using as indicator the paralysis of a "proglottis" of *Taenia saginata* put in a muscle-warmer in a physiological solution. But Lys and Ades have observed like other workers that this physiological test was not enough and must be confirmed by clinical trials. Recently one of their students, Miss Y. Badre[2] has done some work on the seeds of *Cucurbita pepo* L. and *Cucurbita maxima* Duch. She did not succeed in isolating the active principle of these seeds, however, she tried many processes of extraction using different solvents. Nevertheless, Miss Badre isolated a saponin-like substance. Using ion-exchange resins, paper chromatography and paper electrophoresis she identified and evaluated the sugars and amino acid content of pumpkin seeds. On the basis of physiological tests and clinical trials she confirmed the earlier findings of Lys and Ades[11] that ethanol was the best solvent of the active principle, especially ethanol at seventy per cent. She observed, like other authors, great discordance between clinical and physiological results, and between different pumpkin seed extracts prepared by the same process. After an inquiry, she concluded that there were on the Beirut market pumpkin seeds of different origin: some of them are Lebanese, some others are imported from China, others from Hungary, Roumania or Bulgaria. On segments of *Taenia saginata* in a muscle-warmer, following the technique of Rebello, da Costa and Toscano Rico, [15,16] or in clinical assays, Badre found important differences in activity which may be explained by difference in content of active principle. The Lebanese pumpkin seed gave 80 per cent of success in clinical trials while the other seeds gave less. That confirms the reputation of Lebanese seeds, already pointed out by Seelkopf and Graaf.[19] Miss Badre concluded that the different pumpkin extracts do not kill the *Taenia* but only provoke a paralysis in it. So she insists on the absolute necessity of giving a saline purgative after the administration of the taeniafuge.*

For years a root drug was being sold to the pharmacists of Lebanon as senega. Its identity could not be established until a student of Prof. Lys succeeded in obtaining a flowering specimen from a man who was collecting it near Damascus (Syria). Meanwhile the plant had been called "Polygala de Syrie" by Prof. Lys. Paris and Lys[13] published their findings on this "Syrian senega" which they found to be *Spergularia marginata* Kittel, a member of the Caryophyllaceae. It contains 0.5 per cent of a saponin which is believed to be gypsophylla saponin. This plant is less toxic than senega. Paris and Lys believe it could be used instead of senega if made official. This "Syrian polygala" has been widely found as substitute to senega in Belgium.

If the two above-mentioned drugs are not Lebanese, on the other hand many medicinal plants grow spontaneously in Lebanon. White squill grows abundantly on the coast and the coastal hills of Lebanon but is not exploited commercially at present though few common people use it at times as raticide. It was observed, however, that only the mountain-grown squill possessed the raticide activity. Dr. Georges Fawaz from the Department of Pharmacology, School of Medicine, American University of Beirut, became interested in this problem and as early as 1942 began work on the investigation of the raticide principle which he succeeded in isolating in 1944 using an entirely different procedure from that used by Stoll and Renz in the isolation of scilliroside, a fact which was unknown to him at the time because of the war. In a paper published in 1953 Dr. Fawaz reported the isolation of a glycosidal mixture possessing raticide activity.[5] He proved the raticide principle to be scilliroside. This, however, constituted only 30-35 per cent of the glycosidal mixture while the rest was only cardiotoxic and not raticide. Paper chromatography and paper electrophoresis showed the mixture to consist of two substances: scilliroside

*See more recent work of L. Karamanukian and J. Mirhij (American University of Beirut) on *Comparative Study of Cueurbita Seeds*, Leban. Pharm. J., **6**, 110 (1960).

and the rat inactive substance: the two substances behave similarly on the alumina column, and have almost identical elementary composition and molecular extinction coefficients. Hydrolysis of the mixture with hydrochloric acid-acetone at room temperature yielded two aglucones which could have only come from the rat inactive substance. These aglucones were purified and characterized as follows:

Aglucone I—needles, from methanol, m.p. 233-225°C.:(i)C, 73.66;H, 7.76%. (ii)C, 73.41;H, 7.45%.

Aglucone II—leaflets, from ethanol, m.p. 232-234°C.: C, 76 .33; H, 8.01%.

Cannabis and its resin was until recently an important clandestine crop wholly intended for illegal export. Its cultivation is prohibited at present. In 1935 one of our chemists has studied, in Professor Lys laboratory (French Faculty of Medicine and Pharmacy), *Cannabis sativa* growing in Lebanon.[18] For some good samples Miss Safi (now Mrs. Chehab) found more than 39 per cent of extract which was a good percentage even compared with the Indian "haschich."

Some Labiatae oils are distilled on a small scale. The firm of "Lautier fils" of France has a small factory just outside Beirut where few oils are obtained by distillation or solvent extraction. The most important of these are the oils of rose, neroli, bitter orange peel, petit-grain, broom flowers (*Spartium junceum* L.), *Mentha aquatica* L., *Lavandula stoechas* L., *Laurus nobilis* L., *Salvia triloba* L. f., cassie (*Acacia farnesiana* (L.) Willd.) and origanum oil obtained from *Origanum syriacum* L., *O. ehrenbergii* Boiss. and *O. barbarae* Bornm. Origanum oil is rich in phenols containing a high proportion of carvacrol and a much smaller proportion of thymol. Rose water and orange flower water are also prepared. Sometime ago, rosemary oil was also distilled. Lavender and many other oil-yielding Labiatae will grow well if cultivated at the proper altitude and in the proper soil.[7] Many species of *Teucrium* (Labiatae) such as *T. polium* L., *T. creticum* L., *T. scordeum* L., *T. flavum* L. and *T. yebrudi* Post are used in the form of an infusion for many abdominal complaints. Some of these species have been reported to contain glycosides, others bitter substances, and some people attribute to them antimalarial properties. The leaves of *Salvia triloba* L.f. are employed in infusion form in liver complaints and are exported in quantity to France, perhaps because of their elevated content of cineole.

In a personal communication, Dr. V. Seferian, one of our colleagues teaching at the French Faculty of Medicine, observed that an intravenous injection of a decoction of *Ocimum basilicum* L., produced, in an anesthetized dog, a marked and prolonged hypotension. He is still continuing his experiments. Dr. Seferian also told us that he has tried on a dog an extract of stem and leaves of *Polygonum aviculare* L., commonly prescribed as diuretic. He observed an increase in diuresis but there was evidence of hematuria. Therefore he concludes that the drug is not innocuous and should not be used.

The dried flowering herb *Micromeria juliana* L. Bentham and the flowers of *Eleagnus angustifolius* L., are used in the form of a tea in the same way that wild chamomile is used; *Matricaria chamomilla* L. is very common.

Parietaria officinalis L., *P. judaica* L. and *Ceterach officinarum* Lam. have been reported to have healing effects on wounds and infections. The roots of *Rheum ribes* L. is sold as "Shirsh el Rubass" and is made into a laxative syrup. It contains about 3 per cent of anthraquinones.[4] Another anthraquinone-containing plant, which has been suggested as a substitute for cascara is the bark of *Rhamnus alaternus* L., a plant growing on the coastal hills and containing about 2 per cent of emodin.[22]

Paronychia argentea Lam., (Paronychiaceae) has been reported by many as a potent diuretic. *Ammi majus* L. and *A. visnaga* (L.) Lam. grow wild as weeds as well as many other Umbelliferae. Butcher's broom, *Ruscus aculeatus* L., a known diuretic, was examined pharmacologically by Rossman,[17] at the American University of Beirut. Rossman however, examined an extract of the above ground parts and found them to contain diuretic and vaso-pressor principles. On the anesthetized dog, the diuretic fraction causes a small increase of urine flow and a marked increase in the specific gravity of the urine. A marked increase in the relative and absolute excretion of chlorides was observed. On the unanesthetized dog he obtained a marked increase of urine flow.

Chamaepeuce mutica (Cass.) DC. and particularly its variety *polycephala* (DC.) Halacs. have been reported as effective antidiabetics. Various species of Silene, for example *Silene venosa* (Gilib.) Aschers have been found useful in hemorrhoids.

Equisetum ramosissimum Desf., *Fibigia clypeata* (L.) Medik and *F. eriocarpa* (DC.) Boiss, *Plantago cretica* L., *Poterium verrucosum* Ehrenb., various species of Hypericum, etc. have been credited with various salutary effects on liver and kidney affections. Hypericum in particular is effective in

healing warts. *Erythraea centaurium* (L.) Pers. is used as a bitter tonic. The roots of *Eremostachys laciniata* (L.) Bunge was at one time reported to have given good results in tuberculosis.

Bongardia chrysogonum (L.) Boiss. and *Leontice leontopetalum* L. have a powerful antiepileptic action but are rarely used because of their toxic properties. They contain saponins and according to a preliminary report by Lys and Ades [10] *Leontice leontopetalum* also contains alkaloids one of which was confirmed (by paper chromatography) to be berberine. Mc. Shefferty, Nelson, Paterson, Stenlake and Todd isolated the saponin and identified some other alkaloids from specimens of *L. leontopetalum* which they received from Beirut.[20] They isolated leontosaponin, which yields hederagenin, glucose and arabinose on hydrolysis. Of the alkaloids, they have identified a small quantity of a crystalline alkaloid, leonticine, and of a colourless oily alkaloid, possibly identical with leontamine, both obtained from the ether-soluble fraction of the total chloroform-soluble alkaloids. Precipitation of the ammoniacal liquors remaining after the extraction of the chloroform-soluble alkaloids with ammonium reineckate yielded a water-soluble alkaloid, petaline chloride $C_{20}H_{22}O_3NCl,H_2O$. The authors point out that these alkaloids are the same which were first isolated from *Leontice albèrti* and *L. eversmanni* Bunge. The authors also did some preliminary observations on the pharmacological action of petaline and leonticine. They have found that petaline chloride acts as a central nervous depressant in both mouse and rabbit. It also shows antiacetylcholine activity on isolated skeletal frog muscle. The effect of petaline chloride, although it is significantly less potent, bulbar paralysis is preceded by active clonic spasms.*

Another toxic plant is *Cephalaria syriaca* (L.) Schrader. Its fruits (achenes) were often found mixed with wheat (especially that imported from Syria during the last war) to the extent of 10-15 per cent. A glucoside, cephalaroside, was isolated from it by Lys.[9] Cephalaroside was found to have properties similar to meliatoside.

The rhizome of *Ferulago syriaca* Boiss. has been reported to be effective in impotence in the male. The fresh juice from the fruits of *Ecballium elaterium* (L.) A. Rich. instilled in the nose of few people suffering from jaundice resulted in an abundant nasal discharge followed by a clearing of the jaundice in a few days.

Rue (*Ruta graveolens* L. and *R. chalepensis* L.), fenugreek, lupine, corn silk, various species of *Malva* and *Althaea*, etc., are used for the same purposes they are used for elsewhere.

A native species of digitalis is *Digitalis ferruginea* L. It grows near Tripoli and in Seer(Lebanon) over a very small area but is found abundantly in Turkey. While it has cardiotonic glycosides, it is not employed medicinally in Lebanon. Recently Stoll and Renz[21] reported finding in it lanatosides A and B and *beta*-acetyl digitoxin from plants collected in Turkey. *Digitalis purpurea* L. is not native to the country and will not grow except in certain areas in the hills where the climatic conditions are favourable for its growth. *Nerium oleander* L. grows well in the country and could be utilized for its glycosides.

Berberis cretica L. grows naturally in certain restricted areas on rocky and not very easily accessible spots. This plant was examined a few years ago by one of us[1] and found to contain both berberine and hydrastine in varying proportions: the root was found to contain about 3 per cent of berberine and 0.28 per cent of hydrastine, the stem contained 1.4 per cent of berberine and 0.23 per cent of hydrastine, while the leaf was rich in tannin but contained only traces of berberine and 0.46 per cent of hydrastine.

The castor oil plant will grow like a weed in Lebanon. A host of many official drugs such as stramonium and certain species of *Hyoscyamus* could be grown. *Datura stramonium* L., *Datura metel* L. (actually *D. innoxia*),[6] *Datura arborea* L., *Hyoscyamus reticulatus* L. and *Hyoscyamus aureus* L. grow in the country. Lys and Ades have done many determinations of the alkaloid content in these species. They have not published their results yet and are continuing their investigation with the collaboration of thier students, trying various techniques of the different pharmacopoeias, and making ecological studies also.

Conclusion

This short account of the medicinal plants of Lebanon will emphasize the need for a thorough investigation of the many interesting species which grow in the country, very little having been done in this direction so far. As we find various soils and various climatic zones in Lebanon it becomes readily apparent how important it is for any one proposing to go into the cultivation of these or other plants to first study very carefully

*See Paper by K. Ahmad and J.J. Lewis: *On the Pharmacology of Petaline Chloride, etc.*, J. Pharm. Pharmacol., **12**, 163 (1960).

the needs of each plant as to climate, soil and water requirements and thus choose the proper site before going ahead with his venture. The study of the plant association of any one region may also give him an indication of the suitability of the chosen site. He should equally well take into consideration the economic aspects.

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