

DISTRIBUTION OF SOME IMPORTANT MEDICINAL PLANTS OF WEST PAKISTAN

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Botanical survey of medicinal plants was initiated in Pakistan when the Pakistan Government appointed a technical mission to report on the medicinal plant resources of Azad Kashmir in the year 1949. The members of this technical mission besides the author were Dr. Ali Ahmad, then Director of Development, Government of Pakistan; the late Dr. Bashir Ahmad, then Director; Institute of Chemistry, Punjab University, Lahore, and Agha Ghias-ud-Din Ahmad, Professor of Botany, Agricultural College, Lyallpur; and their report was published in 1949.¹ The author was later sent to Chitral by the Pakistan Government to survey the medicinal plant resources of Chitral State² and on return was appointed Economic Botanist to carry out botanical survey of medicinal plants of Pakistan.

A summarised account of the results of this survey work has been presented in this article. This survey work was mostly qualitative in nature and the only quantitative botanical survey of medicinal plants undertaken so far has been of Kaghan valley by Chaudhri.³

The medicinal plants form an important part of the vegetation of West Pakistan. The number of plants which are supposed to be of some medicinal value exceeds 1,500 species. Most of them are, however, of local importance and others are used generally in the two indigenous systems of treatment, namely Unani and Ayurvedic. In this article mention is only made of medicinal plants having some commercial importance or those which have the potentiality of becoming commercial drugs. In West Pakistan, research on the cultivation of medicinal plants is mainly being carried out at the Agricultural College, Lyallpur, and the Pakistan Forest Research Institute, Abbottabad. Various aspects of cultivation of medicinal plants in Pakistan have been discussed by Chaudhri.⁴ The medicinal plants growing wild are taken care of by the Forest Department. West Pakistan can be divided into three natural regions as far as the medicinal plants are concerned, namely, (a) the plains, (b) moist Himalayan region and (c) the arid hills of western and northern parts of West Pakistan.

(a) Medicinal Plants of the Plains

The West Pakistan plains are a vast alluvial region having been deposited by the river Indus and

its tributaries. It is mostly dead level to the eye approximately gaining after every mile one foot in elevation. The top soil generally contains very high quantities of salts due to excessive evaporation and low rainfall. The salts show up in the form of white incrustations during the dry periods of the year. The salts consist of mostly chloride, sulphate and carbonate of sodium in varying proportions. In the Indus delta region mud swamps are found along the sea coast and in the canal colonies due to the seepage of water some areas have become waterlogged. The most characteristic feature of this area is salinity coupled with high water table. Detached low hills are found scattered throughout the plains. These are calcareous in nature and are the uncovered high tops of the subterranean mountains over which alluvial soil has not been deposited. In the Thal, Cholistan and Thar deserts one comes across shifting sand dunes. Mainly two types of dunes are found in these regions, namely, longitudinal ridges parallel to the prevailing winds and the transverse type which lie at a right angle to the dominant wind direction. The climate of this region in relation to vegetation has been discussed by Chaudhri.⁵ The annual average rainfall in the area is 7.7" at Karachi, 7.09" at Hyderabad, 3.70" at Sukkur, 3.60" at Jacobabad, 7.05" at Multan, 10.04" at Montgomery, 19.21" at Lahore, 9.09" at D. I. Khan, 11.11" at Bannu and 13.56" at Peshawar.

The most important wild medicinal plants of this region are *Plantago ovata* Forsk, *Peganum harmala* L, *Citrullus colocynthis* Schrad, *Acacia arabica* Willd and *Cassia angustifolia* Vahl *Plantago ovata* Forsk, and *Peganum harmala* L. are found in the 'rakh' forests. *Plantago ovata* Forsk, is a winter annual and grows wild in the northern parts of the plains having pronounced winter rains. In the Peshawar, Rawalpindi and Lahore divisions the seeds of this plant are collected by the local population in the month of April. It is also cultivated on a small scale throughout the plains. *Peganum harmala* is also found mostly in the northern plains having pronounced winter rains. It is a perennial plant and avoids saline soils. The seeds of this plant are collected in large quantities in summer months and are extensively used in the indigenous systems of medicine. *Cassia angustifolia* Vahl is a ruderal species mainly growing along the roads, railway tracts and other areas under the human influence in the

southern parts of the plains. Large scale collection of leaves of this plant used to be carried out for export before the establishment of Pakistan but it has not been possible to establish export of this valuable drug after the migration of the Hindus who used to handle this trade. At present it is collected only for local consumption. *Citrullus colocynthis* Schrad is found in the sandy desert region of Thar, Cholistan and Thar and is a plant good for building sand dunes. Large scale collection of the fruits is carried out from this region for its use in the indigenous and veterinary medicines. The fruits are not peeled before drying and hence these cannot be used in the Western system of medicine. Extensive forests of *Acacia arabica* Wild are found in the riparian tract of the lower parts of the plains along the Indus river. The gum, fruits and bark are used extensively in the indigenous system of medicine.

In recent years in the West Pakistan plains large areas have been brought under cultivation by constructing one of the greatest canal irrigation system of the world from Indus and its tributaries. This region constitutes one of the most important potential source of cultivated medicinal plants. At present medicinal plants belonging mostly to condiment and spice crops like *Capsicum annum* L, *Carum carui* L, *Curcuma longa* L, *Coriandrum sativum* L, *Foeniculum vulgare* Goerth, *Mentha piperita* L, *Petcedanum graveolens* Benth, and *Rosa damascena* Mill, are cultivated on a commercial scale in this region. Besides the above mentioned spice and condiment plants, *Papaver somniferum* L, and *Ricinus communis* L, are also grown on a large scale. There are immense possibilities of extending the cultivation of the above-mentioned plants. In some cases lack of data about the quantities required is a great hinderance in further extension of its cultivation because even a few more acres may result in over-production and unprofitable prices.

(b) Moist Himalayan Region

This region comprises Azad Kashmir, Murree Hills, Hazara district and Swat. The annual rainfall in this region is above 40" and whole of the tract is mountainous. In the lower scrub forest up to 3,000 feet height are found *Acacia catechu* Willd, *Cassia fistula* L, and *Adhatoda vasica* Nees,. In these forests olive plantation has been raised after grafting them on the stock of *Olea cuspidata* Wall, which is common tree of this region. Between the altitude of 3,000 to 5,000 feet are found forests of *Pinus longifolia* Roxb, which are tapped for their resin which is processed at Jallo near Lahore and now also at Havelian in Hazara district. At present this is the only conifer where resin resources have been properly

explored. The temperate zone conifer forests between the altitude 5,500 to 11,500 feet are very rich in a number of medicinal plants like *Atropa belladonna* L, *Valeriana wallcichi* D.C., *Podophyllum emodi* Cowan, *Viola serpens* Wall, *Colchicum luteum* Baker, *Dryopteris filix-max*, *Berberis lycium* Royle, *Gentian kurroo* Royle, growing as forest undergrowth. Details about *Atropa belladonna* and *Podophyllum emodi* have been given by Chaudhri. 6,7 In the subalpine and alpine regions are found *Rheum emodi* Wall. *Picrorhiza kurroo* Benth and *Saussurea lappa*, Clarke *Datura stramonium* L and *Hysocymus niger*, L. are common weeds in the maize fields and waste areas around villages in this region. So far from the development point of view this region has been completely neglected. No attention is generally paid by the forest authorities regarding artificial regeneration of some important medicinal plants growing as forest undergrowth. In the absence of any step for artificial regeneration uncontrolled collection in the past has resulted in the scarce distribution of many useful species.

(c) Medicinal Plants of Arid Hills

The western and northern arid hilly region consists of Baluchistan, Waziristan, Kurram, Khyber, Chitral, Indus Kohistan, Gilgit and upper parts of the valleys of Dir, Swat, Kaghan and Kishan-Ganga. As a result of aridity and soil erosion there is generally no top soil on the basic rocks of the hills. The valleys between the hills are generally fertile and cultivation is restricted to these depending on the availability of water for irrigation. The most characteristic feature of this region is rainfall which is mostly received during the winter and spring months. Thus the climate resembles that of the mediterranean region in this respect. The average annual rainfall in this region ranges from 4.84" at Pangur, 9.44" at Quetta, 10.83" at Fort Sundeman, 12.6" at Wana, 13.6" at South Miranshah, 29.25" at Parachinar, 18.0" at Drosh, 13.6" at Chitral, 5.18" at Gilgit and 6.3" at Skardu. In northern parts of this region the greatest glaciers of the world outside the polar region are found.

As the other forest and agricultural resources are very much limited in this region, the development of medicinal plants is of great importance for the local population. Already good results have been achieved regarding the utilization of *Artemisia maritima* L, and *Ephedra Gerardiana* Wall, which are the most important medicinal plants of Pakistan and have been dealt in some detail by Chaudhri. 8,9 The most important wild medicinal plants of this region are *Artemisia maritima* L, *Ephedra Gerardiana* Wall, *Juniperus marcopoda* Boiss, *Carum bulbocastanum* C. Kock,

Ferula asafoetida Boiss, *Thymus serpyllum* L., *Rheum emodi* Wall, and *Acacia senegal* Willd.

In the low calcareous hilly tract of Hyderabad, Karachi, Lasbela and Mekran regions *Acacia senegal* Willd, is found in varying densities depending on the rainfall. This plant is restricted to the hills which are not under the influence of winter rains in the southern parts of the country. At present gum arabic is being extracted only on a limited scale. The forest department is carrying out investigations in the Hyderabad region, to find out the best season for gum collection. There are great possibilities of increasing gum production for export and internal consumption.

Ephedra Gerardiana Wall is found throughout the region between the altitudes of 6,000 to 14,000 feet. It is restricted to the arid bare rocky mountains growing among the crevices and in certain places it is almost the sole vegetation. At present the plant is collected only from the Baluchistan region because of the nearness of the source to the Ephedrine factory at Quetta. All the *Ephedra Gerardiana* Wall plants growing in Baluchistan are owned by the Forest Department and their branches are collected from the beginning of October to the middle of December. The present annual consumption of the crude drug in the factory is around 1,000 tons. Pakistan has a world monopoly for meeting the entire world demand for natural ephedrine but is facing serious competition with the synthetic drug.

Artemisia Maritima L source of santonin in Pakistan is found wild throughout this region. It is one of the pioneer plants which likes stony places and soil erosion seems to help its spread. It grows pure over large areas between the altitudes of 5,000 to 14,000 feet and in these regions few other plants can compete with it. Pakistan has become one of the largest santonin-producing countries of the world with a present annual production of over 1,000 tons of crude drug and has the potentialities of producing unlimited quantities of the drug. It used to be collected from the Rattu area of the Gilgit Agency from the wild sources until recently but at present the entire supplies come from the upper Kurram valley where this plant has been introduced as a cultivated crop. The aerial parts of the plant at ground level are cut from August to September under the supervision of the Agriculture Department. After determining the price on the basis of santonin content the drug is despatched to the factory at Rawalpindi.

Juniperus macropoda Boiss forests are found throughout this region between the altitudes of 6,500 to 14,000 feet. The most important

Juniperus tract occur in Baluchistan where they are estimated to cover a total area of not less than 1,500 square miles. The flowers appear in spring and fruit ripens in September and October in the second year. The berries are collected on a limited scale for local consumption and export to India. There are possibilities of further expansion of trade in Juniper berries. *Juniperus communis* L, is also found in abundance in the alpine region between 11,000 to 13,000 feet. *Thymus serpyllum* L, is found throughout the juniper tract and large quantities of this can be collected from this region.

Ferula asafoetida Boiss grows in the desert region over an area of about 2,000 square miles of Baluchistan adjoining the Afghanistan border. The drug is collected in May and June when the top of the root stock is exposed and a slice from the top cut off. The dried latex is collected after few days and this process is repeated till the latex is exhausted in the root stump. In the Gilgit and Chitral areas are found allied species like *F. Jaeschkeana* Vathe and *F. nartex* Boiss, which can also yield the drug. About 25 maunds of the drug is produced every year in the Baluchistan region, and its purity is certified by the Forest Department.

The wild black caraway is collected by the local population in Baluchistan and Gilgit and other adjoining areas. The caraway mainly consists of seeds of *Carum bulbocastum* C. Koch but seeds of other allied wild species also constitute the caraway. *Carum bulbocastum* C. Koch grows wild in very arid regions, and attempts to cultivate it in Baluchistan have not met with success. The collection of the seeds start on the same day by agreement by all the population of the area. The estimated quantity of seeds collected is about 8,000 lbs., per year.

Rheum emodi Wall is found in comparatively drier areas of Baluchistan, Waziristan, Kurram and Khyber between the altitudes of 8,500 to 12,000 feet and is collected on a small scale. Another species *Rheum tibeticum* Maxim is found in abundance in Chitral and Gilgit. Both of these species are good substitute for the official drug obtained from *Rheum peltatum*.

The areas under conifer forests have common medicinal plants of the moist temperate forests of Western Himalaya like *Podophyllum emodi* Wall, *Valeriana wallichii* DC, *Viola serpens* Wall and *Saussurea lappa* Clarke.

Among the cultivated medicinal plants of this region the most important are *Papaver somniferum* L, *Cannabis sativa* L and *Olea europea* L, besides

Artemisia maritima L. *Papaver somniferum* L, is cultivated throughout this region. In the tribal areas of this region like Gilgit, Chitral, Swat, Khyber and Waziristan its cultivation is specially popular because it is not under the control of the Excise Department. The seeds are sown in spring and collection of opium is done mostly during the summer months. *Cannabis sativa* L, is cultivated on a fairly large scale towards the Thurkho and Mastung side of Chitral and in northern parts of Gilgit Agency. This crop needs a very specialized type of climate for gum production which should be free from rain and should be cold. The cultivated plants belong to different variety than the wild species as the cultivated plants have more compact inflorescence and bigger seeds. It is sown in April and harvested in November. After drying, leaves and flowering tops are rubbed against a thick cloth bound on the mouth of a big vessel. The resinous matter called 'charas' goes down into the vessel. It is gently heated and grounded to make it of uniform consistency. About 8,000 lbs., of 'Charas' is produced every year in Chitral and adjoining regions of Gilgit.

Plantations of *Olea europaea* L, have been raised in Baluchistan and other parts of West Pakistan in the scrub forest of *Olea cuspidata* Wall by grafting it over the stock of the indigenous species. Such plantations have started bearing recently but so far fruiting has not been so profuse as in its home countries in the Mediterranean region.

Concluding Remarks

In West Pakistan plains even after fully utilizing the water resources millions of acres will still remain unirrigated. There is a great need for searching and developing plants which could grow in such regions without any irrigation in the so-called waste lands. In the sandy desert region *Citrullus colocynthis* Schrad grows wild. This is one of the best plants to bind the sand dunes which is so very important to save the fertile irrigated lands from the onward march of shifting sand dunes in the Thar, Cholistan and Thal regions. If its medicinal aspect is also utilized on scientific lines in addition to its utility of binding sand dunes, it being a pharmacopoeial drug can be a source of revenue.

Cassia angustifolia Vahl, is another wild plant which is very drought resistant. This has also great potentiality of being grown on a large scale in the catchment areas between the valleys of the low hills in the arid region of Karachi and Hyderabad. In the valleys between the detached

hills where dry farming is being carried out by constructing bunds to catch rain water it can be grown without any difficulty. Another plant which is able to flourish under arid condition of Karachi is *Aloe vera* L. This plant holds great promise of becoming important commercial drug of this region. *Aloe vera* L, was introduced into the graveyards but now it has run wild and many plants of this are found to grow in the waste lands in the Karachi area.

In the western and northern arid mountainous region of West Pakistan *Artemisia maritima* L, has already made history. This is the most common plant of this tract and is now extensively cultivated in the upper Kurram valley. The wild medicinal plants like *Carum bulbocastanum* C. Kock, *Ferula asfoetida* Boiss, *Rheum emodi* Wall, *Acacia senegal* Willd of this region are one of the most drought resistant plants of the world. It is important to know their autoecology so that they could be grown more extensively. At present no regeneration measures are being undertaken which are so essential to sustain the continuous yield of these drugs.

The greatest need of the time is to take up development measures to organize the production of drugs on scientific lines. There are great possibilities for finding substitutes for the imported drugs or introducing entirely new remedies into scientific medicine. Such work in the past is responsible for bringing into use a large number of crude drugs like *Podophyllum emodi* Wall, *Rheum emodi* Wall, *Ephedra gerardiana* Wall, and *Artemisia maritima* L, which grow wild in West Pakistan and have thus come into use as good Pakistani substitutes for the official variety of drugs. Many more such examples can be cited where Pakistani drugs which otherwise perished unobserved in nature gained economic importance in the world. It is also definite that out of the large number of drugs used in the indigenous systems there must be at least some which deserve the reputation they have earned as cures. Such drugs need to be worked out scientifically.

The drug trade in Pakistan is faced with the difficult task of obtaining genuine crude drugs as can be seen by the survey report of Chaudhri and Kazmi.¹⁰ This is one of the major problems facing the proper utilization of crude drugs. There is great need for stopping adulteration and substitution and for supplying standardised drugs by enacting suitable legislation.

Summary

West Pakistan can be divided into three natural regions, namely, (a) the plains, (b) moist Himalayan

region and (c) arid hilly tract. The wild medicinal plants of the plains are *Plantago ovata* Forsk., *Peganum harmala* L., *Citrullus colocynthis* Sch., *Acacia arabica* Willd., and *Cassia angustifolia* Vahl. The cultivated medicinal plants consist of mostly condiment and spice crops like *Capsicum annum* L., *Carum carui* L., *Curcuma longa* Linn., *Pencedanum graveolens*, *Rosa damascena* Mill besides *Papaver somniferum* L., and *Ricinus communis*. The characteristic medicinal plants of moist Himalayan region are *Acacia catechu* Willd., *Cassia fistula* Linn., *Adhatoda vasica* Nees, *Olea europaea* Linn., *Pinus longifolia* Roxb., *Atropa belladonna* L., var. *acuminata*, *Valleriana wallichii*, DC., *Podophyllum emodi* Wall., *Viola serpens* Wall., *Colchicum luteum* Baker, *Dryopteris filiformis*, *Berberis lycium* Royle, *Gention kurroo* Royle, *Rheum emodi* Wall., *Saussures lappa* Clarke, *Datura stramonium* L., and *Hyoscyamis niger*. The wild medicinal plants of the arid hill region consist of *Acacia senegal* Willd., *Artemisia maritima* L., *Ephedra gerardiana* Wall., *Juniperus macropoda* Boiss., *Carum bulbocastanum* C. Kock, *Ferula asafoetida* Boiss., *Thymus serpyllum* L., and *Rheum emodi* Wall. Most important cultivated plants of this region are *Papaver somniferum* L., *Cannabis sativa* L. and *Olea europaea* L.

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