

PAKISTAN MEDICINAL PLANTS - IV

(continuation)

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V. SIND

Much of this former province of Sind, but especially the southerly portion near the coast, is sandy desert with very small annual rainfall. Thus, at Karachi this amounts to only approx. nine inches (J). In parts of Sind, the rainfall is lower even than this, ranging from three to five inches. Three seasons are recognized — the summer (March to June), rainy (June to August), and winter (Oct. to Feb.). The flora is characteristically therophytic (i.e., with a preponderance of annual forms). Most of the tree flora is riverain, growing along rivers, especially the Sind, which is a large river traversing the area. The commonest trees are *Acacia arabica*, *Prosopis spicigera*, *Populus euphratica*, and *Tamarix dioica*. All have been used in the popular medicine but only the first one apparently has any actual importance.

Sind is also a central area of manufacture of many native medicinal plant preparations, following the traditional medical practices of many practitioners. Following the introduction of a bill ca. 1953, the „Unani, Ayurvedic, and Homoeopathic Practices Act” of 1957 was passed by the National Assembly. This legislation was intended to curb quackery in these non-allopathic medical professions or systems of medical practice. The Unani Research Centre was established at Karachi in 1953. Modern types of medicinals (including tinctures, extracts, syrups, pills, tablets, vaccines, etc.) are also manufactured in Karachi (also in Lahore).

1. *Acacia arabica* WILLD. (*A. scorpioides* A. CHEV.), babul, has been claimed the most valuable tree in Sind; it is certainly the commonest, and more of the trees grow in Sind than elsewhere in Pakistan. Not only does it occur commonly in the wild state, but it is also planted in parts of West Pakistan (in Sind, the Panjab, and in the NWFP village forests). The „water-soluble” gum (Babul gum) which exudes from the trunk is quite similar to acacia (or gum arabic) in its properties (demulcent, adhesive) and has been used as

a substitute („Indian gum arabic”); hence, the tree is sometimes referred to as „Indian gum arabic tree’. Although it is said that the gum is produced in Kalat State, this fact is not mentioned in an article on the medicinal plants of that area (KA), hence is probably of minor importance now. The bark is used medicinally as an astringent (in vaginitis, etc.) and as a tan and dye bark (contains 19% tannin). The pods are also astringent (27% tannin in pods less seeds). Although the gum has sometimes been called „Gum Ghat(t)i”, this name has also been applied mostly and perhaps more correctly to the product of the Indian tree, *Anogeissus latifolius* WALL. (TS).

The gum is also sometimes collected from *Acacia modesta* which occurs commonly in the Panjab (where called „phulai”).

2. Guar (or Gowar) gum is a product in manufacturing use currently in the United States: it is derived from the seeds of *Cyamopsis tetragonolobus* (L.) TANK. (*Leguminosae*), which has long been cultivated in India (now West Pakistan) as a fodder (or stock feed), especially for cattle. (The fruit has been used as a laxative).

3. *Sesamum indicum* L., sesame, til (teel), or gingelly, (jingili), was briefly mentioned (Qual. Plant. Mater. Veg. 7: 1960) as a crop of the Panjab. It is also important in the Sind as an oilseed product, and the oil is of considerable use in medicine preparation; seed said emmenagog (WB)

4. *Tamarindus indica*, imli, is cultivated throughout the original area of India, hence in both East and West Pakistan, including Sind. The plant has many uses. Thus, the leaves, bark, fruit pulp and shell, seeds, and flowers are all mentioned by DATTUR (D) as having medicinal applications.

Tamarinds (the fruit) are often exported into the U.S. packed either in molasses or in brine. A quite new product of the seed, „tamarind kernel powder” or „tamarind starch”, representing a very crude form of starch, was introduced for use in textile finishing. This utilizes large quantities of materials previously thrown away, thus in the old India, 130,000 tons of seeds were discarded annually (figures for ca. 1943). Pectin has also been prepared from the fruit. (JC) (JIT). The fruit has the distinction of having the highest total amounts of sugar and acid (mostly citric) of any of the commoner edible fruits. The market preparation involves fermentation procedures, requiring a good degree of care and skill. In one series of analyses, tamarind seed kernels contained 62.88—63.22% carbohydrates (mostly as starch), the balance consisting of proteins, fatty oil, fiber (cellulose and lignin), ash, and water.

5. *Capparis decidua* EDGEW. (*C. aphylla* ROTH.) is said to be used considerably in the native medicine (called kari(r) or kirar); the root is said to be used for hepatic and splenic (enlarged spleen)

disorders; the fruit is pickled and used as a food. The pickled capers popular in western countries come of course from the shrubby European *C. spinosa* L., which however is also said to be cultivated in Sind. The fruit of *C. decidua* is also used in the folk medicine of Pakistan as an epispastic and in dentalgia (etc.) (JA).

6. *Cucumis prophetarum*, called variously kandir, dangar selas, etc., is common in Sind. The plant somewhat resembles the muskmelon but is reputedly a useful medicinal, the root being used as a purgative, the above-ground parts being emetic. From the fruit pulp, a bitter resin called myriocarpin has been isolated, which is an active purgative and emetic. The juice of the green leaves is used in Baluchistan to make cheese.

7. *Tamarix troupii* HOLE. (*T. gallica* auct. non L.), the tamarisk, called jhau in Hindi and lei lai in Sind furnishes an astringent bark and twigs, sometimes used in diarrheas and dysentery; the galls also occur on the tree (hence one specific name „*gallica*” which apparently has no French association, as generally used), which are used in similar manner as astringent (the galls contain 50% tannin). The tree is said to be somewhat commoner in Baluchistan. A mann a is also prepared.

8. *Calotropis procera* (AIT.) R. BR., ak (Panjabi), ispalhwan, occurs on the bunds (raised land along edges of fields or irrigation ditches) and is so toxic that animals will not forage on it. It is one of the plant species now being grown in the Thal area of West Panjab to stabilize the constantly shifting sand dunes of that desert area. The plant has many uses in the folk medicine of this general area, for treatment of which see the Pharmacopoeia of India (PH) (CHO 46). In a medical investigation made in 1905—6, the drug was found to be active in dysentery although inferior to ipecacuanha (IN).

9. *Phoenix dactylifera* L., the date palm or date tree, is common in this sandy area, and as might be expected finds many economic applications, including the medicinal. Thus, the kernels of the seed are used in drug preparations. The flesh of the drupe itself (dates, dactyli, L.) is a highly nutritious food, constituting the chief food of many peoples in areas of western Asia; dates are sold in almost „astronomical amounts” — thus, India in one year (1937/8) imported 156, 605,000 lbs., while producing enormous quantities domestically as well. Spirituous liquors have been prepared from dates (PO).

Drug Plants of Potential Value (Sind):

1. *Coccinia cordifolia* (L.) COGN. (*C. indica* W. et A.), kanduri (Panjabi, Sindi), kunduri (Hindi), was being studied recently as a possibly useful treatment for diabetes by peroral administration

(leaf and root juice). The root bark is cathartic, and the fruit is eaten as a vegetable (CHO 72).

2. *Farsetia jacquemontii* HOOKER fil. et TH., growing in Sind and elsewhere, has been called a „specific” in rheumatism and used accordingly. (CHO 117).

3. *Cissampelos pareira* L., false pareira brava, belpath (Sindi), patha (Sanskrit), par(h)i (Hindi), root is used in folk remedies for gastric atony and externally for abscesses and snake bite wounds. It grows throughout the sub-continent. Research is being carried on in its possible use as a neuromuscular blocking agent like curare. The drug contains tertiary ammonium bases, especially hyatin. It deserves more study.

4. *Pavonia odorata* WILLD., sughanda bala (Hindi), is much cultivated in Sind and Baluchistan for its fragrant flowers; it also grows wild. The root has been used as an astringent in dysentery, as demulcent, and as carminative (CHO 187).

5. *Alhagi pseudalhagi* (BIEB.) DESV., jawasa (Hindi), grows in Sind and the Panjab. The plant serves as a laxative and diuretic (infusion diaphoretic), and the flowers in hemorrhoids; there is also a manna.

6. *Nerium indicum* MILL. (*N. odorum* SOLAND.), kaner (Hindi and Panjabi), a toxic plant, is much used in Indian medicine and deserves further research study (CHO 175). One *Nerium* variety growing in Israel is much used as a digitaloid stimulant.

Plants for Experimental Growing in Sind

1. Aloë. Some species (*A. barbadensis* and others) are now cultivated and in fact naturalized, especially near the coast. The pulp of the leaves is boiled by the natives and used as a fomentation (K) representing a folk remedy which recalls the valued North American use of the leaf pulp in treating X-ray and other severe burns.

2. Henna, mehndi (Urdu), from *Lawsonia inermis* LAM., is commonly cultivated throughout India and Pakistan. Thus, in 1946/7, there were 7544 acres of henna reported from the Panjab alone (A). The tree was seen growing occasionally in Karachi. Henna attar, the composition of which is secret, apparently contains as one ingredient the volatile oil of the very aromatic (and handsome) henna flowers (KE).

3. Senna, *Cassia angustifolia* VAHL, Hindi sana (Hindi), is found wild in Sind scatteringly and might well be tried as a commercial crop, in view of the large consumption of the leaflets in many popular proprietaries. It is much cultivated in the Tinnevely district at the southern tip of the Deccan peninsula of India.

4. *Abelmoschus moschatus* MEDIC. (*Hibiscus abelmoschus* L.), ambrette seed: the seeds, containing an aromatic volatile oil, are

used as stimulant, antispasmodic, cooling, and carminative; the product is quite important in trade.

5. *Rubia tinctoria* L. or madder is a cultivated crop in Sind, Kashmir, etc. Besides its dye use, it is said to be of value in menstrual disorders (CHO 216).

6. *Luffa echinata* ROXB. fruit is purgative and used in colic; it is a common bazaar medicine (C-2: 677). *L. cylindrica* (L.) ROEM. is cultivated in the Rawalpindi district, and the young fruits are eaten.

7. *Commiphora mukul* (HOOK. ex STOCK) ENGL., bdellium; the oleo-gumresin is used as antiseptic, carminative, antispasmodic, and emmenagog.

8. *Piper betle* L., pan, is a vine, the cultivation of which is being tried in Sind (CH). The leaves are aromatic and carminative, the fruit expectorant. The leaves are used to wrap the betel nut „mix” and in fact give the name „betel” to this.

6. CHITRAL

This area of West Pakistan was not visited; however, some studies of the botanical medical flora have been made by CHAUDHRI (CH-C). The state is rich in forests and might be expected when better developed and more accessible to furnish medicinal crops.

1. *Cannabis indica*, called bhang, ganja, hashish, and so on, is from *Cannabis sativa* L. var. *indica*. The plant growing in the highlands of Chitral is said to furnish a superior quality for its special use as a pernicious narcotic agent, which in various forms is reputed to produce a kind of desperate psychosis with frenzy. However, the plant grows wild and is cultivated occasionally in other parts of West Pakistan, including NWFP, Azad Kashmir, the Panjab, Baluchistan, as well as in East Pakistan. In passing through the city of Kaghan in the Kaghan valley, a heavy growth of the species was noted in a vacant city lot; apparently no one paid any heed to the plant, quite in contrast to the prompt eradication measures which would have been taken in an American city, where the police are regularly trained to recognize the plant. A common intoxicating preparation is the paste-like resin called charras, churus, or chars. The fatty oil of the seed is also prepared and used. In the old India, it is said that procuresses often treated customers to this drug and to others such as opium, tobacco, etc. Trading in the drug is now illegal in Pakistan; thus, the newspapers there reported (IV-22-51) the seizure of 845 tolas (ca. 14.9 lbs. av.) of charas in Lahore; on the next day, 1920 tolas (ca. 34 lbs.) worth Rs. 7000 (then worth ca. \$224.— U.S.) were seized at Gulistan from persons attempting to smuggle it into Quetta. Even this notorious

narcotic drug has had medicinal usage in the older India; thus, at one time cannabis smoking in tetanus was recommended (WB).

2. *Astragalus strobilifera* ROYLE can be used to prepare a tragacanth-like gum; the plant is also found in the NWFP (Kurrām Valley) and the Panjab. The roots of another sp. of *Astragalus*, called „gugar kund”, is said to be used for toothache and also in making tooth brushes.

3. *Saxifraga ciliata* ROYLE, zakhām-i-hayat (Urdu), grows in high mountainous areas quite commonly. The root (rhizome) is used as a tonic in fevers, diarrhea, etc., and for furunculosis. Superficially, it is rather similar to rhubarb and is sometimes used to adulterate this drug.

4. Other drug plants discussed elsewhere in this series:

Artemisia

Berberis

Colchicum

Datura

Ephedra spp. occur commonly in this area and might furnish supplies where needed.

Juniperus

Macrotomia

Mentha spp.

Opium

Punica granatum L., pomegranate or anar (Chitrali): nearly all parts of the plant, even the flowers, are sold and used in Pakistani medicine. The small tree occurs in many parts of Pakistan, such as Azad Kashmir.

Rheum

Taraxacum

Thymus serpyllum.

7. OTHER AREAS OF WEST PAKISTAN OF POTENTIAL IMPORTANCE

Other parts of W. Pakistan not visited, where now little is done with the medicinal flora but which are potential production areas for crude drugs include Kalat, Swat, Dir, Bahawalpur, Las Bela, Makran, etc. In the Astor (Astore) and Upper Guraiz valleys (Azad Kashmir), 106 medicinal plants were described in an article (KS), and of these only a few have been or are being exploited for drug use: ephedra, podophyllum, *Saussurea lappa*, *Colchicum*, licorice, aconite, *Astragalus strobiliferus*, henbane, caraway, cumin, juniper, etc.

8. MISCELLANEOUS DRUG PLANTS

There are a number of other plant species of interest medicinally which either abound in many parts of West Pakistan or were not included elsewhere in this paper. Some are cultivated; others might be cultivated.

1. *Achyranthes aspera* L., prickly chaff flower or phut kanda (Urdu) is a weed found in the Panjab and Baluchistan and in East Pakistan. The flowers, root, and ashes are used in dermatitis, rabies (!), snake bite (!), etc., as a laxative, diuretic, etc. (KH) (CHO 4).

2. *Adiantum capillus-veneris* L., maiden hair fern or kawka (Azad Kashmir), is used a good deal in the Unani system of medicine, thus in treating coughs and fevers; the hakims recommend it in rabies (!) and to prevent hair from falling (!) Other species of *Adiantum* are also used in medicine (CHO 7).

3. *Aesculus indica* COLEBR., Indian horsechestnut or hunak dun (Kashmiri), is one of several tree species being planted systematically in the village forests of the NWFP. LAWRENCE (L) reported that it was used as a cathartic; the seed fatty oil has also been used externally. (The flowers have a strong odor resembling that of a skunk, so that although very ornamental it will give off an obnoxious odor even in a large room.)

4. *Adhatoda vasica* NEES, Malabar nut tree, baikar (Punjabi), arusa (Urdu), grows throughout India and Pakistan and is a very popular medical article. The leaves, flowers, and root are used in medicine, especially for cough, asthma, tuberculosis, and ophthalmia. (KH).

5. *Ajuga bracteosa* WALL. ex BENTH., kauri booti (Urdu, Punjabi, Jhelum), is a small herb growing in the Panajb and Azad Kashmir. The herb is used as bitter tonic, astringent, the leaves in fevers.

6. *Anacyclus pyrethrum* DC., pyrethrum root or akarkar(h)a (Azad Kashmir) was formerly used in occidental (including American) medicine. It is claimed of use in rheumatism, for toothaches, and in the preparation of toothpastes.

7. *Arisaema* sp., „cobra plant”, sap boti (Azad Kashmir), is poisonous to live stock when eaten; the villagers use the plant to destroy varmints, such as rats, etc., also as vermicide and insecticide.

8. Two or more species of *Canscora* (*Gentianaceae*) are used in the Orient to treat insanity and epilepsy, and as a nerve tonic, so-called. One of these species, *C. decussata* SCHULT. is also used for cases of tuberculosis.

9. *Digera muricata* (L.) MART (*D. arvensis* FORSKAL.), lulur (Baluchistani), is a common plant throughout most of India; the

entire plant is used as a laxative, also in the preparation of kushtas (kusth) or bhasmas, which is the ash representing calcinations with various metals. Although such preparations are called „purifications” of the metal by the hakims, actually they are the reverse, since they represent forms of the oxide or basic oxide of the metal; the advantage of the preparation appears to be in rendering the metal more soluble (KH).

10. *Dioscorea deltoidea* WALL., kitra (Punjabi), is used in the Murree Hills, etc., as anthelmintic, insecticide, and piscicide (HU; C-2: 696). The roots are rich in diosgenin, hence this plant is of potential interest in the manufacture of cortisone.

11. *Elaeagnus angustifolia* L. (*E. hortensis* BIEB.), shiulik (Hindi), is considerably used in the native medicine of Afghanistan (sinjit), Iran, and Baluchistan. The „berries” („Persian dates”) are mostly used as food (AI); the seeds sometimes are used in bronchial disorders. The tree is commonly cultivated.

12. Various *Euphorbia* species are used in medicine in various parts of West Pakistan. CHOPRA (CHO 113—5) lists 25 species used medicinally in India and adjacent countries.

13. *Gynandropsis gynandra* (L.) BRIQUET (*G. pentaphylla* DC.), karalia (Hindi), is found in NWFP, Sind, and East Pakistan. The seeds and leaves are used in convulsions; the seeds are reputedly anthelmintic, and in folk practice, they are used in oil for head lice. The plant is eaten as a vegetable (ED).

14. *Holarrhena antidysenterica* WALL., kurchi (Hindi), has long been used in Indian medicine, thus, the bark in dysentery, the seeds as anthelmintic.

15. *Lavatera kashmiriana* L., resha khatmi, root is used for cough and as antispasmodic in irritable states of the intestine and bladder. Over-collection has depleted the natural growth of this plant, and it has been recommended that it be cultivated.

16. *Melia azedarach* L., China berry, Persian lilac or bead tree, has been much used in Indian medicine. Although this tree has now been grown for many years in the southern U.S., its only well known medicinal use there has been apparently to „worm” mules (vermifuge). In India, the root bark is used as a bitter tonic (like chirata), the leaf juice as anthelmintic (in roundworm), the seeds in rheumatism, etc.

17. *Orchis latifolia* L., salep or salab misri (Azad Kashmir), is fed to diabetics in milk and also used as a convalescent food; in Azad Kashmir, it is termed a „nerve tonic”. The plant is not common and was imported from Afghanistan. This and other *Orchis* species are much used in Unani medicine.

18. *Paeonia emodi* WALL., mamekh (Urdu), is a common herb in

the NWFP and is there used in „nervous conditions”, uterine disorders („backache”), etc. The seeds are purgative and emetic.

19. *Polygonum* species are considerably used in the indigenous medicine of Asia, as they so frequently are also in that of Europe. The uses are too numerous, complex, and conflicting to review briefly.

20. *Pteris aquilina* L., common bracken fern or kungi (Azad Kashmir), rhizome is used as anthelmintic and astringent, hops substitute, etc., and the plant is sometimes boiled as a vegetable (pot herb).

21. *Rauwolfia serpentina* and other species, called (chhota) chand. This enormously popular drug, now used all over the world, is potentially a very valuable drug crop in both East and West Pakistan. It was grown successfully in experiments at Abbottabad (KHA).

22. Various *Senecio* species are used medicinally and appear worthy of investigation. Six medicinal species are listed in CHOPRA (CHO). One species is used in Kashmir as an antimalarial (jan-i-adam)

23. *Skimmia laureola* HOOKER, or neera (Kashmiri), is a strongly odorous shrub; popular belief is that the musk deer acquires its characteristic scent from feeding on this plant. The plant has been used occasionally in human and veterinary medicine.

24. *Strychnos nux-vomica* L. is one of several species of the genus which have been used in medicine. This species however is important as a source of the alkaloids, strychnine and emetine, and is cultivated for that purpose in India and East Pakistan. It is said to do well on the Panjab plains.

25. *Syzygium cumini* (L.) SKEELS (*Eugenia jambolana* LAM.), called jam(an) (Urdu), is rather common in both East and West Pakistan (Panjab, NWFP). The powdered seeds are reputedly of use in diabetes mellitus and experimental work is now being done (it is said) with this material.

26. *Teucrium* species, especially *T. stocksianum* BOISS., are sometimes used. The species grows in the Panjab, NWFP, and Baluchistan, where it is used as an antipyretic and for „heart pain” (heart burn?).

27. *Thalictrum foliolosum* DC., arhand (Azad Kashmir), or pilijari (Punjabi), contains berberine; the roots are used as tonic, diuretic, and purgative.

28. *Prunus domestica* L. and var. *insititia* BAILEY, alu-bokhara (Hindi) are primarily esculent fruits. However, the plums of north Waziristan (western NWFP) are said to be in great demand (dried) throughout Pakistan — because of their superior quality for

medicinal use (aperient, refrigerant, and in combinations with other drugs).

29. *Zizyphus vulgaris* LAM., native to NWFP and the Panjab, is a common small tree called anab (Sind), unab (Azad Kashmir), and ber (NWFP), of which the edible fruits are often sold in the bazars; these are also used as expectorants (in the form of a cough syrup). The bark is used to treat wounds and sores (M).

30. *Aegle marmelos* CORREA, the well-known bael (cf. Qual. Plant. Mater. Veg. 6: 135 (1959)), is both wild and cultivated in many places: the fruit, root bark, and leaves are used in dysenteries, diarrheas, fever, ophthalmia, etc. A constituent, imperatorin, has been used experimentally in treating leucoderma and Hansen's disease (leprosy).

31. *Acacia catechu* WILLDENOW, black catechu, khair (Urdu for the plant), katha (Urdu for the product) (cf. Qual. Plant. Mater. Veg. 6: 135 (1959)) represents a valuable tree, which, it is claimed, is not being sufficiently afforested in W. Pakistan. The extract is mostly used as a masticatory in pan, in tanning, and in many other ways.

32. Plants used to make volatile (essential) oils: an almost endless number of plant species of India/Pakistan are used or could be used in the preparation of aromatic volatile oils, for use in perfumes, medicines, etc., thus (cf. K-E):

Acacia farnesiana (cassie flowers)

Achillea millefolium L.

Acorus calamus L.

Angelica archangelica L. var. *himalaica*

Apium graveolens L.

Aquilaria agallocha ROXB. („agar")

Artemisia species

Bursera delpechiana BOISS., source of (Mexican) linaloe oil, or, when cultivated in India, of Indian linaloe oil.

Carum ajowan, *C. bulbocastanum* and *C. carvi*

Chenopodium ambrosioides and var.

Citrus spp. (fruits, flowers, leaves).

Coriandrum sativum L.

Cuminum cyminum L.

Cymbopogon caesius STAPP (ginger grass oil) and other spp.

Daucus carota L.

Eucalyptus spp. (work under way now in Pakistan (BR))

Ferula spp.

Foeniculum capillaceum GILIB.

Jasminum spp.

Juniperus communis L., *J. macropoda* BOISS.

Mentha sylvestris L.

Ocimum spp.

Pandanus tectorius Soland., *P. odoratissimus* ROXB.

Perovskia atriplicifolia BENTH. (*Umbelliferae*) — growing in Baluchistan and Kashmir, used as a „cooling medicine”,

Peucedanum sowa (*Anethum sowa*)

Pinus longifolia and other spp.

Pogostemon heyneanus BENTH. (*P. pathcouli* HOOK. f.)

Rosa damascena MILL., *R. moschata* MILL.

Salvia spp., such as *S. moorcroftiana* WALL., growing in the Kashmir, used to bring boils to a head (L).

Sassafras albidum (NUTT.) NEES; this American species might well be grown for its abundant and attractive essential oil.

Saussurea lappa CLARK.

Vetiveria zizanioides (L.) NASH

Zingiber officinale ROSCOE.

In this paper, an effort has been made to indicate the variety of native medicines available, many worthless perhaps or inferior, others again probably of great value. JOHN ATTYGALE, M. D., said of the Sinhalese materia medica (Ceylon):

„It cannot be gainsaid that with all the defects of the native practice of medicine, these men have efficacious and really valuable remedies for the successful treatment of many diseases, the knowledge of which should be preserved and not allowed to die out by neglect, in the interests of suffering humanity. Native practice of medicine has a vitality that the extensive spread of Western medicine has not been able to crush.” (AT: xii).

The crude drug industry of Pakistan is one of the major supports of the economy of the nation. Thus, the collection of medicinal plants, according to M. A. K. KHALIL (Pakist. J. Forestry 8: 149—79 (1958)) constitutes for many parts of West Pakistan the only source of cash income for the population. It is to be hoped that an active campaign of research in many countries will utilize the great treasury of drug materials available here, whether now used or unused but potentially valuable.

The present paper represents a reworking of the author's report on the medicinal plants of Pakistan (H). He would wish to take this opportunity to acknowledge his gratitude to those officials and others whose kind efforts and collaboration made the preparation of this Report possible.

BIBLIOGRAPHY

- A AGRICULTURAL STATISTICS OF THE PUNJAB, PAKISTAN.
Board of Economic Inquiry, Publ. No. 97 (1950).
- AI AITCHISON, J. E. T. (1890) Notes on the products of Western Afghanistan and of North-Eastern Persia. *Trans. bot. Soc., Edinb.* 18; 63—4.
- AT ATTYGALE, JOHN. (1917). Sinhalese Materia Medica (Colombo).
- B BURKILL, I. H. (1909). A working list of the flowering plants of Baluchistan.
- BA BADEN-POWELL, BADEN H. (1868/72) Punjab Products: Handbook of the Economic Products of the Punjab. 2 vols.
- BAL Baluchistan District Gazeteer Series, vol. 5(R. HUGHES-BULLER (1907)).
- BR BROCKWAY, G. E. (1956). *Pakist. J. For.* 6: 256.
- C CHOPRA, R. N. (1933); Indigenous drugs of India (ed. 1).
- C-2 (1958) ed. 2 of the same.
- C-G CHOPRA, R. N. (1956) et al. Glossary of Indian Medicinal Plants, New Delhi.
- CH CHAUDHRI, I. I. (1953) *Pakist. J. Sci.* 5: 110—6.
- CH-C CHAUDHRI, I. I. (1951) (Chitral), *Pakist. J. For.* 1: 154—8.
- CHO CHOPRA et al. Glossary — see C-G.
- CH-S CHAUDHRI, I. I. (1955). Pakistan Santonica. — *Econ. Bot.* 9: 224—7. See also Anon. Export Review of the British Drug and Chem. Industries, July, 1955, p. 34.
- CM Civil and Military Gazette, Lahore, May 29, 1891.
- C-P CHOPRA, R. N. et al. (1955). Physochlaina. — *Bull. Nat. Inst. Sci. Ind.* 4, 25—7.
- D DATTUR, J. F. (1953 ca.) Medicinal Plants of India and Pakistan, pp. 225—6.
- DFO District Forest Officer, Gilgit and Baltistan, personal correspondence.
- E ENGLER, A. & PRANTL, K.: Die natürlichen Pflanzenfamilien.
- ED EDGEWORTH, MICHAEL PAKENHAM (1862), *Florula Mallica. J. Proc. Linn. Soc. Bot.*, vi, 179—210.
- F ANON. (c. 1952). Five years of Pakistan, Karachi.
- G Baluchistan District Gazeteer Series (1907).
- H HOCKING, GEORGE M. (1952) A study of the medicinal plants of West Pakistan. FAO. ETAP. FAO/52/6/3862 (Rome, Italy). (mimeographed) 38 pp.
- HA HASAN, I. (1959) *Thymus serpyllum*. *Amer. J. Pharm.*
- HOC HOCKING, GEORGE M., (1945). Indian Rhubarb. *Indian J. Pharm.* 7: 89—92.
- HON HONIGBERGER, J. M. (1852) Thirty-five years in the East.
- HU HUSSAIN, S. M. (1953) *Pakist. J. For.* 3: 91—2.
- I IRVIN, R. H. (1848). *Materia medica of Patna.* 392.
- IN Indigenous Drugs Committee, 2nd Report, pp. 41—7 (1909).
- J JAFRI, S. M. H. & F. M. TURK: (1953) *Pakist. J. For.* 3: 39—44.
- JA JAFRI, S. M. H. (1956) Genus *Capparis* in W. Pakistan, etc. — *Pakist. J. For.* 6: 191—202.
- JC Journal of Commerce. 12 July, 1946.
- JIT Journal of Industry and Trade, Feb. 1953, p. 250.
- K KAPOOR, L. D. et al. (1953). — Cultivation of medicinal plants in Kashmir. *JSIR (Ind.)* 12A: 311—6.
- KA KAZMI, M. A. (1953) Drug plants of Kalat State. *Pakist. J. For.* 3: 217—23.

- K-E KHAN, A. A. (1954). Essential oil industry in Pakistan. - *Pakist. J. For.* 4: 285—300.
- KH KHAN, A. H. (1955). *Pakist. J. For.* 5: 16.
- KHA KHAN, A. H. (1958), *Pakist. J. For.* 8: 128—9 - see also *idem.* 5: 230 (1955) (E. Pak.)
- KS KAZMI, M. A. & SIDDIQUI, I. A. (1953) *Pakist. J. For.* 3: 186—213.
- L LAWRENCE, WALTER R. (1894). The Valley of Kashmir, chap. 4, etc.
- M ANON. (1956). Medicinal Plant Branch, Pak. Forest Research Inst., Abbottabad: A note on the plants of medicinal value found in Pakistan. ed. 2. Revision of ed. 1. (1951).
- P „Pakistan 1954/5”. pp. 127, 133 (Publ. by the Centre, Karachi).
- PH Pharmacopoeia of India. (1868) pp. 141, 457—8 (Indian Office, London) (N.B. This is not a true pharmacopoeia, as being defined an official compendium of standards).
- PO POSTANS, T. (1843). Personal Observations in Sindh. London.
- Q QAZILBASH, NAWAZISH ALI: (1945). *Pharm. J. Dec.* 1,
- R RANDHAWA, M. S. (1958). Agriculture - animal husbandry in India. New Delhi.
- S SHARANI, J. R. (1951) (Forest Dept., Baluchistan), Report.
- SA SIAL, N. M.: (1955) *Acacia catechu. Pakist. J. For.* 5: 23—32.
- SH SHAH, S. M. I. (1949). Agriculture Pakistan 1, No. 1.
- SI „Sixth Year, Pakistan” (1953), p. 78; (1954), *Pakist. J. For.* 4: 165.
- SID SIDDIQUI, I. A.: (1953). *Pakist. J. For.* 3: 224—7.
- ST STEWART, R. R. (1950/1). Notes on the flora of Kashmir. Punjab (Pakistan) Forest Records 1: 2.
- SU SULEYMAN KHAN, M. (1948). Report on the survey of medicinal herbs in the North-West Frontier Province, mimeog., 28 pp. Printed 1952, 33 pp.
- T „Ten Years of Pakistan” - Karachi (The Centre) (ca. 1957). See also *Pakist. J. For.* (1952) 2: 50—2, 229—30; (1957) *ibid.* 7: 44—8 - ABDUL HAMID KHAN. (1954) *Ibid.* 4: 119—22 (N.A. Qazilbash); 196—9.
- TS TSCHIRCH, ALEXANDER (1912). Handbuch der Pharmakognosie, 2: 435.
- W WHITAKER'S Almanack (1951).
- WA WATT'S Dictionary - various references.
- WB WARING, EDWARD JOHN (1907). Bazaar medicines... of India. London. ed. 6.
- WI WICHMANN (1958) *Pharmazie* 13; 487—98; *Planta Medica* 6: 117—39.
- WT WATSON, J. FORBES (1872). A list of Indian products with details rel. to certain operations... Part II. London: India Museum.

OTHER LITERATURE:

1. CHAUDHRI, I. I. (1959). Kaghan medicinal plants. *Pakist. J. For.* 9: 16—28.
2. ANON. (1958). Podophyllum emodi. *Pakist. J. For.* 8: 230—3.
3. KHAN, A. H. (1958). Essential oil bearing plants of Pakistan. *Pakist. J. For.* 8: 262—89; 342—373.
(Oddly including some fatty oil plants, such as castor bean).
4. KHAN, A. H. (1957). Growth and cultivation characteristics of medicinal plants (Abbottabad cultivation). *Pakist. J. For.* 7: 319—69.
5. STEWART, R. R.: (1957) The Flora of Rawalpindi District, W. Pakistan. - *Pakist. J. For.* 7: 232—300; (1958) 8: 13—111 - Also reprinted in book form (Peshawar Univ., Peshawar, W. Pakistan) (1958).

SUMMARY

- Part I. (1) Baluchistan.
- Part II. (2) North-West Frontier Province
 (i) Hazara including Kaghan
 (ii) Kurram (Kurrum) Valley
 (3) The Panjab
 (i) Murree Hills Dist. and Rawalpindi Area
 (ii) The Plains.
- Part III. (3) (cont.) (iii) The Salt Range
 (4) Kashmir
 (i) Azad Kashmir
 (ii) Gilgit Agency
- Part IV. (5) Sind
 (6) Chitral
 (7) Other Areas of West Pakistan of Potential Importance
 (8) Miscellaneous Drug Plants.
 Bibliography
 Other Literature
 Summary; Errata
 Index of Genera

ERRATA TO THE FIRST THREE PARTS OF „MEDICINAL PLANTS OF PAKISTAN”

- I. p. 148, line 7 replace „from” with „through”.
 p. 151, line 20 — „obasht(a)” (Pushto), not as given
 152, line 3 from bottom. After „leaves,” add „for basketwork”
 153, line 4 — Chitral State (not Chistral)
- II. p. 124, line 6 — add „and” before „as the European-used” . . .
 126, line 6 — after „variety” add „in this area”
 130, line 4. — Pine turpentine is now being produced in Azad Kashmir.
 133, line 7 from bottom: West (not East) Pakistan.
 124 bottom — 125 top: Kurram *Artemisia* cultivated at Abbottabad (NWFP) showed a max. of only 0.99% in the unopened floral „bud” stage (collected in Nov.) (SIDDIQI, I. A., *Pakist. J. For.* 3: 93—4 (1953). Higher yields were obtained at earlier stages, thus over 2%, with a maximum of 2.63% (Sept. 20, 1953), after that decreasing (*ibid.* 5: 37—9 (1955).
- III. p. 94 (bottom). Analyses of Gilgit Agency *Artemisia* (SID) showed large variations in santonin content, from almost nothing to a

maximum of 1.63%; only that from around Ratu was considered sufficiently high yielding to be worth extracting.

GENERA DISCUSSED IN „Pakistan Medicinal Plants”. I—IV. (also including a few Latin titles for drugs) This does not include cases of brief mention.

Abelmoschus IV	Cannabis IV
Acacia IV	Canscora IV
Achyranthes IV	Capparis III, IV
Aconitum III	Capsicum II
Acorus III	Carbo III
Adhatoda IV	Carthamus III
Adiantum IV	Carum I, II
Aegle II, IV	Carum ajowan II,
Aesculus IV	C. carvi II
Ajuga IV	C. bulbocastanum III
Alhagi IV	Cassia Fistula II
Alkanna III	C. absus II
Allium II	C. senna IV
Aloë IV	Catechu II, IV
Ammi II	Cedrus III
Anacyclus IV	Ceratonia II
Apium II	Chenopodium II
Arachis II	Chirata II
Arisaema IV	Cichorium II
Artemisia II, IV	Cinnamomum II
Asafoetida I	Cissampelos IV
Aspidium II	Citrullus I
Astragalus IV	Citrus II
Atropa II	Coccinia IV
Azadirachta II	Colchicum III
	Colocynthis I
Bael II, IV.	Commiphora IV
Bassia III	Coriandrum II
Belladonna II	Crocus II
Berberis II	Cucumis IV
Brassica II, III	Cuminum II
Bursera IV	Curcuma III
Butea II	Cyamopsis IV
	Cydonia III
Calendula III	Cymbopogon II, III,
Calotropis IV	
Camphora II	Datura II

Digera IV	Macrotomia III
Digitalis II	Mallotus II
Dioscorea IV	Matricaria III
Dryopteris II	Meconopsis III
	Melia IV
Elaeagnus IV	Mentha I, III
Ephedra I	Morus II
Eucalyptus IV	Moschus III
Euphorbia IV	
	Nannorhops I
Farsetia IV	Nardostachys III
Ferula I	Nicotiana III
Foeniculum II	Nigella II
Fraxinus III	
	Olea I
Gentiana II	Onosma II, III
Glycine III	Orchis IV
Glycyrrhiza III	Oryza III
Gossypium II	
Granatum II IV	Paeonia IV
Guizotia III	Panax III
Gynandropsis IV	Papaver (I), IV.
	Pavonia IV
Halorrhena IV	Peganum III
Henna II	Perovskia IV
Hibiscus IV, III	Phoenix IV
Hymenocrater I	Phyllanthus II
Hyoscyamus II, III	Physochlaina III
	Picrorrhiza III
Inula III	Pinus II
Ipomoea II	Piper IV
Iris III	Pistacia I
	Plantago II
Juglans III	Platanus III
Juniperus I	Podophyllum III
Jurinea III	Polygonum IV
	Prunus III
Kaladana II	Psoralea II
Kamala II	Psyllium II
	Pteris IV
Lavatera IV	Punica II, IV
Lawsonia IV	Pyrethrum flor. II
Linum II	
Lobelia II	
Luffa IV	Rauwolfia IV

Rheum III	Tamarindus IV
Rhododendron III	Tamarix IV
Ricinus II	Taraxacum III
Rosa III	Terminalia II
Rubia IV	Teucrium IV
	Thalictrum IV
Saccharum III	Thea II
Salix III	Thymus III
Santonica II	Tinospora II
Saussurea III	Triticum III
Saxifraga IV	Turpethum II
Senecio IV	
Senega II	Urginea II
Senna IV	
Sesamum II, IV	Valeriana II
Silajit III	Vetiveria III
Skimmia IV	Viola III
Solanum III	
Stramonium II	Withania II
Strychnos IV	
Swertia II	Zea III
Syringa III	Zingiber II
Syzygium IV	Zizyphus IV