

A STUDY OF SOME INDIGENOUS PHARMACOPOEIAL HERBS

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The description, occurrence, analytical data and important therapeutic properties of the following indigenous pharmacopoeial herbs have been given : *Podophyllum*, *Belladonna*, *Datura* and *Hyoscyamus*.

Introduction

There is no need to emphasize that the development and progress of a country depend largely upon the exploitation of its natural resources and raw materials. Among a multitude of these raw materials, nature has provided us valuable drugs but it will require extensive research and heavy expenditure of money before we are able completely to assess their medicinal value. Still there are a number of indigenous medicinal plants and herbs which have been fully investigated and their therapeutic value established. These herbs often grow in nature in the plains or hills of West Pakistan and the present communication gives important analytical data that has been obtained on several such plants.^{3,4,5}

Podophyllum

One of the important indigenous drugs available in large quantities is *Podophyllum emodi*, which is locally known as 'Bankakri'. This member of the family *Berberidaceae* is a perennial glabrous herb. Its aerial stem is 6-12 inches high, having big peltate, long-stalked, alternate, curiously reflexed, umbrella-like and usually spotted leaves. The herb produces large, solitary, white and sub-sessile flowers in May, and bear bright orange-coloured fruits of the size of a small lemon, ripening in August or September.

The herb occurs in higher and interior temperate regions of the Himalayas at 6,000-8,000 ft. above sea level from Hazara to Murree Hills, Gallies, Kaghan, Kishanganga and Bhogarmung valleys descending to 6,000 ft. in Azad Kashmir. It is also fairly abundant in Malakand and Khyber, Kurram and Gilgit Agencies, Indus Kohistan and Swat State. It is plentiful on the northern moist forest-clad aspects of these areas especially where the sun shines less and is found scattered on the southern slopes of these mountains.

Experimental.—The estimation of resin from podophyllum was carried out by the following method which is an improvement over Jenkins'

method.² It is easier to carry out and gives better results.

Weigh 10 g. of the drug in No. 80 powder and extract with alcohol (95%) in a Soxhlet apparatus for about 4 hours. Recover most of the alcohol till a little less than 50 ml. of the residue is obtained. Transfer it completely to a measuring cylinder and let it come to room temperature; make up the volume to 50 ml. Pipette out 10 ml. of chloroform and 10 ml. of water containing 0.1 ml. hydrochloric acid. Shake and let the chloroform layer separate. Draw the chloroform layer in a second separating funnel, and extract successively with 20 and 15 ml. of alcohol-chloroform mixture (1:2), adding each separated lower layer into the second separator. Shake the chloroform extracts with 10 ml. of the same acidulated water which was used before, allow to separate, take the chloroform layer in a tared crystallization dish, repeat the extraction successively with 20 ml. and 15 ml. of the above alcohol-chloroform mixture. Evaporate the total extractive on a water bath. Dry at 35°C. and finally over sulphuric acid. Weigh, multiply this weight (2 g. of drug) with 50 in order to get the percentage of resin present in the drug.

The results obtained with *Podophyllum emodi* are given in Table 1.

A perusal of Table 1 shows that Pakistani podophyllum contains resin in commercially exploitable quantities and is considerably superior to the American podophyllum, in which the percentage of resin is only one third of that in the Pakistani variety. It is also superior to the Indian variety. The rhizome yields more resin than the rootlets. The best season for the collection of the drug is the end of August, when the fruit of the plant is about to ripe and contains a maximum quantity of resin.

Since the potency of the crude drug depends chiefly on the presence of a bitter, tonic and purgative principle,⁵ known as podophyllotoxin, the percentage of this fraction is shown in

TABLE I.—RESIN IN *Podophyllum emodi*, Wall.

Month of collection	Locality	Part analysed	Resin (%)	Resin (%) reported elsewhere
October, 1956	Shogran (Kaghan Valley), Southern aspect, 9,000 ft.	Rootlets	7.20	4.17-5.2 in <i>P. peltatum</i> (U.S.A.).
		Rhizomes	12.60	
		Rhizome and rootlets	11.50	
October, 1956	Naran (Kaghan Valley), Southern aspect, 8,000 ft.	Rootlets	8.10	9.55 in <i>P. emodi</i> (Kulu, East Punjab) India.
		Rhizomes	12.00	
		Rhizome and rootlets	10.90	
April, 1957	Naran (Kaghan Valley), Northern aspect, 7,500 ft.	Rootlets	9.98	11.12 in <i>P. emodi</i> (Chamba, East Punjab) India.
		Rhizomes	11.10	
		Rhizome and rootlets	10.99	
August, 1957	Sharan (Kaghan Valley)	Rhizome and rootlets	15.56	—
August, 1957	Sharan (Kaghan Valley)	Rhizome only	16.38	9.0 in <i>P. emodi</i> (Bashahar, East Punjab) India.

TABLE 2.—PODOPHYLLOTOXIN IN THE RHIZOME OF PODOPHYLLUM.

Name of variety	Place of origin	Podophyllo-toxin (%)
<i>P. emodi</i>	Sharan (Kaghan Valley)	3.90
<i>P. emodi</i>	„ „	3.19
<i>P. emodi</i>	Naran, (Kaghan Valley)	4.10
<i>P. peltatum</i>	U.S.A. ¹	0.77
<i>P. emodi</i>	Bashahr (India) ¹	3.50

Table 2, which reveals that indigenous podophyllum contains three times more podophyllo-toxin than the American drug.

The estimation of the percentage of podophyllo-toxin in the rhizome of podophyllum was done in this Laboratory by the methods of Elder and Schneider.^{5A} The resin (0.5 g.), prepared from podophyllum, was extracted with 15 ml. of chloroform and filtered. Ten ml. of the filtrate was poured in 80 ml. of petroleum ether in a tared flask. When the precipitate subsided, it was filtered

through a tared Gooch crucible, and the precipitate and the flask were washed with 20 ml. of petroleum ether. The fractions of precipitate in the crucible and the flask were dried at 70°C. for one hour, weighed and the percentage calculated.

Solanaceous Drugs

Some important pharmacopoeial drugs like belladonna and hyoscyamus are obtained from several species belonging to various genera in the family, *Solanaceae*. These drugs are not only used for the preparation of galenicals and pharmaceuticals but are also employed for the manufacture of atropine which is one of the most important mydriatic alkaloids and finds wide application in ophthalmic surgery.⁶ Sufficient quantities of these drugs can be collected from different localities in Pakistan. The present work was carried out on various samples of these drugs collected from different localities, to find out the possibilities of their commercial utilization in pharmaceutical industry.

Atropa acuminata Royle ex Lindley, or Indian belladonna, one of the most important of these herbs, is found wild in Indus Kohistan and parts of Azad Kashmir between 6,000-12,000 ft. We could not find this plant growing in Muzaffarabad as mentioned in some books.¹ The plant is known as Angur-e-shifa (Urdu), Yebrug (Bengali), and Mait brand (Kashmiri).

Some samples of belladonna were analysed according to the assay method of British Pharmacopoeia, 1953 and the results are given in Table 3.

TABLE 3.—ANALYSIS OF *Atropa acuminata* ROYLE
EX LINDLEY.

Date of collection	Locality of collection	Part analysed	Total alkaloids % as hoscycamine	
			in local samples	in foreign species ⁷
27-7-1956	Shahid Pani (Bhugarmung Valley)	Air-dried roots	0.67	0.47
15-8-1955	Darband (Indus Kohistan)	Air-dried leaves and flowering tops	0.60	0.45
Aug., 1957	Kamalband (Kaghan Valley)	Leaves only	0.30-0.66	0.45
—	Market sample	Roots only	0.54	0.47
25-7-1958	Experimental Farm, N.R. Labs., Peshawar	Fresh, air-dried leaves	0.54	0.45

Table 3 shows that *Atropa acuminata* contains a higher proportion of total alkaloids as compared with the foreign species. The specimens of roots analysed in this laboratory contain 0.54 to 0.67 percent of alkaloids as compared with 0.4 percent laid down in the British Pharmacopoeia, 1953 and the leaves contain 0.30 to 0.66 percent as compared with 0.3 percent. In view of the presence of suitable percentage of active principles, the drug available in nature can be utilised in industry.

Datura Stramonium L.

Datura stramonium, L. or thorn apple, which is locally known as Siah Dhatura (Urdu), Tor Datura (Pushto), and Kala Datura (Punjabi), is another important medicinal plant which is common in the foothills of Dir, Swat and Chitral States, Azad Kashmir, Murree Hills, Kaghan Valley, Gallies, Kurram Agency, Astore and upper Gurez Valley up to 9,000 ft. It is found scattered all over Gilgit Agency and western Tribal Territories. The plant is also reported to occur in some parts of East Pakistan where it is known as Sada Dhatura.

The results of the various samples analysed according to the assay method of Indian Pharmaceutical Codex, 1953 are given in Table 4.

It is evident from the above data that indigenous

TABLE 4.—ANALYSIS OF *Datura stramonium*, L.

Date of collection	Locality of collection	Part analysed	Total alkaloids % as hyoscyamine	
			in local samples	in foreign species ⁸
14-9-1955	Baragali (Hazara)	Air-dried leaves	0.29	0.25
May, 1956	Abbottabad	Seeds	0.23	0.20
14-7-1956	Abbottabad	Seeds	0.29	0.20
Aug., 1957	Abbottabad	Air-dried leaves and flowering tops	0.23	0.25
11-6-1958	Experimental Farm, N.R. Labs., Peshawar	Fresh air-dried leaves	0.32	0.25

Datura stramonium can profitably be utilised for the manufacture of pharmaceuticals and other medicinal preparations because of its high alkaloidal content when compared with 0.2 and 0.25% in the seeds and leaves, respectively, as laid down by the different pharmacopoeias.

Another plant of datura genus is *Datura alba* Nees, called Sufaid Dhatura in Urdu and Spin Datura in Pushto. It is common all over the plains of the former N.W.F.P., lower hills of the former Punjab and Azad Kashmir up to 3,000 ft. It also occurs in the central parts of the Punjab and northern Sind and is found scattered in the waste places of West Pakistan and Karachi. Table 5 shows the alkaloidal contents of the drug worked out according to the assay method of I.P.C., 1953.

TABLE 5.—ANALYSIS OF *D. alba* NEES.

Date of collection	Locality of collection	Part analysed	Total alkaloids % as hyoscyamine	
			in local samples	in foreign species ⁹
Sept. 1955	Peshawar	Roots	0.01	—
May, 1957	Peshawar	Air-dried leaves	0.25-0.3	0.22
Oct., 1957	Peshawar	Seeds	0.24	0.23
11-6-1958	Expt. Farm, N.R. Labs., Peshawar	Fresh air-dried leaves	0.14 hyoscyne	0.32

Leaves of *Datura fastuosa*, L. cultivated at the Experimental Farm of these Laboratories, collected at different times of the year, were also analysed and the results are given in Table 6.

TABLE 6.—ANALYSIS OF *D. fastuosa* Linn.

Date of collection	Locality of collection	Part analysed	Total alkaloids % as hyoscyamine	
			in local samples	in foreign species ⁸
24-6-1958	Experimental Farm, North Regional Labs., Peshawar	Fresh air-dried leaves	0.109 Hyoscyamine	0.22 0.22
10-7-1958	"	"	0.112 Hyoscyamine	0.22
24-7-1958	"	"	0.120 Hyoscyamine	0.22
12-12-1958 (before sun-rise)	"	Fresh leaves	0.260 Hyoscine	0.22

Tables 5 and 6 reveal that the total alkaloids of these two species are below the standard for the preparation of galenicals, but, in view of the suitable environmental conditions in Pakistan for this herb, it is worth experimenting to improve its quality by cultivation.

Hyoscyamus Niger, L.

Hyoscyamus niger, L. (Henbane), or *Khurasani ajawain* as it is called in Urdu, is commonly found in Baluchistan, Gilgit Agency and Western Tribal Territories from 10,000-15,000 ft. *H. muticus*, L., another species of hyoscyamus, is common in Baluchistan, Khyber Agency and other tribal areas, and is found scattered in the former N.W.F.P. and Punjab. Some samples of this herb were analysed according to assay method of B.P. 1953 and the results are given in Table 7.

The above analysis of *Hyoscyamus niger* shows that it is up to the standard laid down by B.P. 1953. It is believed that the low alkaloidal content of the cultivated drug can be improved by adopting better methods of collection and cultivation.

Discussion

It will be observed that indigenous podophyllum can not only feed the local pharmaceutical industry but can also be exported as it can

TABLE 7.—ANALYSIS OF *Hyoscyamus niger*.

Month of collection	Locality of collection	Part analysed	Total alkaloids % as hyoscyamine	
			in local sample	in foreign species ⁷
July, 1956	Darband (Indus Kohistan)	Leaves and flowering buds	0.046	0.45
2-9-1956	Saiful Maluk (Kaghan Valley)	" "	0.058	0.45
Aug., 1 57	Kaghan Valley	" "	0.058	0.45
13-5-1957	Landi Kotal	Leaves and flowering tops of <i>H. muticus</i>	0.053	0.45
20 5-1958	Expt. Farm N.R. Labs., Peshawar	Leaves only	0.015	0.45
—	Market sample	Leaves and flowering buds	0.038	0.45

easily compete with the podophyllum of other countries in the world market, for the reason that the percentage of resin as well as the percentage of active principles in the resin is comparatively high. The drug should be collected at the end of August when the herb contains the maximum quantity of resin. Wild growing plants deserve the protection and control of the Government to preserve the natural sources. The cultivation of the herb should also be tried at suitable places like Abbottabad and other hilly tracts.

As regards solanaceous drugs, the Pakistani herbs, *Belladonna*, *Hyoscyamus* and *Stramonium*, contain active principles up to the pharmacopoeial standard and can be utilised in the pharmaceutical industry. As the plants are not abundant in nature or are found scattered, it is advisable to start their cultivation at suitable places in the country. Under controlled conditions, it should be possible to improve the percentage of alkaloidal contents by improving the soil and manure etc., and to ensure uniform crops collected at the proper time.

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