

PRELIMINARY CHEMICAL INVESTIGATIONS ON SOME INDIAN SUBSTITUTES OF MALE FERN

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To find suitable indigenous substitutes for the official male fern, *Dryopteris filix-mas* (L.) Schott, which has to be imported into India, fourteen species of *Dryopteris* Adanson, two of *Ctenitis* C. Chr. and one each of *Hypodematium* Kuhn and *Cyrtomium* Presl, have been assayed to determine the percentage of oleoresin and crude "filicin" in each. The studies have revealed that some of the Indian species have a far higher oleoresin and crude "filicin" content than the official drug. Only some species occur in abundance in nature; their pharmacological activity has not yet been assessed.

INDIA is mainly dependent upon foreign countries for the rhizome of male fern and its extract, as the species of the crude drug official in the British Pharmacopoeia and the United States Pharmacopoeia are not found in India. The British Pharmacopoeial drug is derived from the rhizomes and frond bases of *Dryopteris filix-mas* (L.) Schott, a fern indigenous to Great Britain. In America *D. marginalis* (L.) Asa Gray, which is found in eastern and central United States and north to Prince Edward Island, forms the source of American male fern, and has been official in the United States Pharmacopoeia since 1881¹.

However, there are other taxonomically valid species of *Dryopteris* which grow wild in the temperate Himalayas and in mountainous ranges of Kashmir and Darjeeling in particular, which required evaluation for possible exploitation as a substitute for the official drugs. The literature revealed that except for two notes by Handa and others^{2,3} ferns have not been investigated with this purpose. These authors determined the amount of active principle in five species of *Dryopteris* collected from Kashmir and Mussoorie Hills.

The present study was undertaken to find suitable indigenous substitutes, and for this purpose 18 members of the family Aspidiaceae have been analysed for their oleoresin and "filicin" contents.

MATERIAL

The sources of material for the present investigation are summarised in Table I.

The identification was confirmed by the late Mr. A. H. G. Alston of the British Museum of Natural History, London, and Dr. R. R. Stewart of the Gordon College, Rawalpindi, Pakistan, to whom our thanks are due.

The rhizomes were collected in their entirety, washed free of soil, and most of the fronds, roots, and dead tissues were removed. These were

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carefully dried at a temperature below 70° since the active principle is decomposed at or above 80°. The collections were made for three consecutive years in late August or September, because of the higher amount of active principle present during this season.

TABLE I
SOURCES OF MATERIAL

Species	Locality	Altitude ft.	Frequency
<i>Dryopteris hirtipes</i> (Bl.) O. Ktze.	Lebong forest, Darjeeling	5,500	Locally abundant Growth localised and scanty
<i>D. scottii</i> (Bedd.) Ching	Lebong forest, Darjeeling	5,000	
<i>D. cochleata</i> (Don) C. Chr.	Raiwala forests, Dehra Dun ; Majitar Bridge, Darjeeling	1,500- 3,000	Exceedingly common
<i>D. barbigera</i> (Moore) O. Ktze.	Alpine meadows, above Khillanmarg, Kashmir; on way to Rohtang Pass, Kulu hills	10,000- 13,000	Fairly abundant
<i>D. serratodentata</i> (Bedd.) Hayata	On exposed rocks, Sandakphu, Darjeeling	11,000	Rare
<i>D. splendens</i> (Hk.) O. Ktze.	Along water streams, on way to Sanchal Lake and Gairabas, Distt. Darjeeling	8,500	Fair
<i>D. fibrillosa</i> (Clarke) Hand-Mzt.	On exposed rocks, Sandakphu, Darjeeling	11,000	Rare
<i>D. rosthernii</i> (Diels) C. Chr.	Forest Floor on way to Aadoob, Pahlgam, Kashmir	6,000	Fair
<i>D. blanfordii</i> (Hope) C. Chr.	Forest floor around Gulmarg, Kashmir	9,000	Fair
<i>D. chrysocoma</i> (Christ) C. Chr.	All round Darjeeling. Also Tehri Road, Mussoorie	5,000- 8,000	Exceedingly common
<i>D. paleacea</i> (Don) Hand-Mzt.	Along roadside to Tiger hill and also Sandakphu, Dar- jeeling; on way to Chandan- bari, Pahlgam, Kashmir	7,000- 9,000	Fair
<i>D. ramosa</i> (Hope) C. Chr.	Pahlgam, Gulmarg, plentiful above Ningli Nallah, Tungmarg, Kashmir	6,000- 8,000	Fairly abundant
<i>D. pulvinulifera</i> (Bedd.) O. Ktze.	Along roadside to Aloobari Monastery and also on Carmechal Road, Darjeeling	6,500	Not common
<i>D. sparsa</i> (Don) O. Ktze.	Forest floor, near Sedrapong, Darjeeling	3,500	Fair
<i>Ctenitis apiciflora</i> (Wall.) Ching	Forest floor, near Tiger hill summit, near Dak Bungalow Tonglu and Sandakphu, Darjeeling	9,000- 12,000	Fairly common
<i>C. nidus</i> (Clarke) Ching	Near Dak Bungalow, Tonglu, Sandakphu, Darjeeling	10,000- 12,000	Not common
<i>Hypodematium crenatum</i> (Forsk.) Kuhn	Dehra Dun—Rajpura, on way to Mussoorie	2,500	Common
<i>Cyrtomium falcatum</i> Presl	Along water streams, Brewery Road, Mussoorie	5,000	Common

METHODS AND RESULTS

Each of the species was assayed 6–10 times (within one year after collection) for their oleoresin and “flicin” contents according to the methods given in the British Pharmacopoeia 1953. The results are summarised in Table II.

For determination of ether extractive it was found that soxhlet extraction with ether was quicker, and yet gave results which were comparable to the percolation method of the B.P. 1953. The rhizomes, divested of their adhering roots and dead tissues, were reduced to a moderately coarse powder (22/60) and exhausted by percolation or soxhlet extraction with ether. The ether extract was evaporated on a water bath to a thick oily consistency till it no longer gave any smell of ether. The residue was

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weighed and from it the percentage of ether extractive or the oleoresin calculated. The proportion of crude filicin in the extract was determined by the B.P. 1953 method.

TABLE II
OLEORESIN AND "FILICIN" BY B.P. 1953 METHOD

Species	Oleoresin per cent	Crude "filicin" in the oleoresin per cent	Crude "filicin" in the drug per cent
<i>Dryopteris hirtipes</i>	8-10	20-25	2.0
<i>D. scottii</i>	9-11	25-30	2.4
<i>D. cochleata</i>	7-9	20-25	1.8
<i>D. barbiger</i>	7-9	25-30	2.2
<i>D. serrulatodentata</i>	8-11	26-36	2.9
<i>D. splendens</i>	12-14	30-37	4.1
<i>D. fibrillosa</i>	9-11	20-26	2.3
<i>D. rosthernii</i>	8-11	24-32	2.6
<i>D. blanfordii</i>	8-10	26-32	2.6
<i>D. paleacea</i>	7-10	28-40	2.8
<i>D. chrysocoma</i>	14-17	25-30	4.3
<i>D. ramosa</i>	12-15	25-30	3.8
<i>D. pulvinulifera</i>	11-15	25-30	3.5
<i>D. sparsa</i>	In traces	Nil	Nil
<i>Ctenitis apiciflora</i>	7-9	32-40	2.9
<i>C. nidus</i>	12-16	18-24	2.8
<i>Hypodematium crenatum</i>	Nil	Nil	Nil
<i>Cyrtomium falcatum</i>	In traces	Nil	Nil

B.P. and U.S.P. require that the drug, "male fern" should contain not less than 1.5 per cent of crude filicin as determined by the official assay method.

DISCUSSION AND CONCLUSIONS

It is evident from Table II that all the species of *Ctenitis* and *Dryopteris*, with the exception of *D. sparsa*, form excellent substitutes of the official drug with respect to their ether extractive value and the crude "filicin" content. *Cyrtomium falcatum* and *Hypodematium crenatum* may contain oleoresin in traces but are totally devoid of "filicin". Furthermore, Table II shows that while *D. cochleata* just meets the official requirement, the crude "filicin" content is higher than the official requirement in the other species. The highest amount is contained in *D. chrysocoma*, *D. splendens*, *D. ramosa* and *D. pulvinulifera*.

As seen in Table I, *D. chrysocoma*, *D. ramosa*, *D. barbiger* and *D. cochleata* grow in abundance in nature and can thus be exploited to advantage commercially. *D. cochleata*, though not very rich in active principle compared to the other investigated species, can still be of a substantial commercial value because of its luxuriant growth in Dehra Dun forests where it is easy to collect. *D. splendens* and *D. pulvinulifera* and many other species though relatively richer in crude "filicin" content are not so abundant, and thus may not be a profitable proposition unless cultivated. However, further exploration in the Himalayas may show their abundance in certain areas.

The pharmacological activity of the extracts was not assessed, and therefore the true value of these substitutes has yet to be determined. A comparison with the official male fern preparations is in hand.

REFERENCES

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