BULL. BOT. SURV. INDIA
Vol. 17, Nos. 1-4 : pp. 1-6, 1975

PHARMACOGNOSTIC STUDY OF THE ROOT AND RHIZOME OF *PARNASSIA NUBICOLA* WALL. EX ROYLE (FAM.: PARNASSIACEAE), A SPECIES USED AS 'MAMIRA'

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ABSTRACT

A survey conducted in the neighbourhood of Kedarnath and the adjoining area brought to light that the wayside traders employ roots and rhizomes of *Parnassia nubicola* Wall. ex Royle (Parnassiaceae) as 'Mamira', reputed to be good for various eye ailments. The roots of this species look similar in gross appearance to those of *Thalictrum foliolosum* DC. (Ranunculaceae), which is one of the various species that have been attributed to 'Mamira' (Chopra *et al.* 1956).

The present paper deals with a detailed pharmacognosy of the root and rhizome of *Parnassia nubicola* Wall. ex Royle.

Millions of pilgrims visit various religious shrines of India and on the way in the vicinity of these they are frequently offered and ultimately persuaded to buy native cures prepared from local natural resources. As there is practically no control over the sale of local preparations, this affords ample opportunity among unscrupulous traders to deceive pilgrims.

A very common herbal preparation of this type sold near the Himalayan shrines such as Badrinath, Kedarnath, Vaishnodevi and others, is 'Mamira' which is used as a collyrium or eye salve. Eye is a delicate and sensitive organ and, therefore, the sources of 'Mamira' traditionally preferred by people than the modern medicines should be carefully investigated.

A survey conducted with this objective, in the neighbourhood of Kedarnath, Chamoli District, Uttar Pradesh brought to light that the wayside traders employ roots and rhizomes of *Parnassia nubicola* Wall. ex Royle (Parnassiaceae ; under Saxifragaceae of Bentham & Hooker) as 'Mamira', of which authors failed to trace any mention as 'Mamira' in literature. The roots of this species, however, do look similar in gross appearance to those of *Thalictrum foliolosum* DC., one of the species attributed to 'Mamira' (Chopra *et al.* 1956). Plants of Saxifragaceae are, in general, mentioned beneficial to eyes in folk-lore medicine (Leyel, 1957). The American Saxifrages usually applied or taken internally in the treatment of eye complaints, have the greatest use in serious eye diseases like glaucoma, iritis, ophthalmia, cataract, etc. (Leyel, 1957). Root of *Bergenia ligulata* (Wall.) Engler, an Indian species, is considered useful in ophthalmia (Chopra *et al.* 1956).

The identity of the genuine 'Mamira' has been a subject of controversy. The word 'Mamira' or 'Mamiran' is of Muhammadan introduction into India and early Indian authors on Sanskrit Materia Medica were ignorant of it. Ainslie (1826) mentioned about a bitter root imported into India from China under the name of Sou-line or Chynlen and possessing stomachic virtues. According to him, "this was also noticed by Virey, in his *Histoire Naturelle des Medicamens* (p. 322), who says, that the decoction of it is powerfully febrifuge (see *Bulletine de Pharm* pour 1813, p. 395"). Souline and Hwang-lien or Hong lane, and Chuen-

lien or Choulin of China and 'Mamira' or 'Maha mirana' of Sindh and Bombay were regarded to be the names belonging to the same drug (vide Watt, 1972). 'Mamira' was found to be used in Sindh as a collyrium in the treatment of eye diseases, a purpose identical with that for which *Mauipas* or the *Mounpa* of the early European writers (Like Paulus Aegineta) was employed (Dymock *et al.* 1890; Watt, 1972). The Mamira' was identified to be the rhizomes of *Coptis teeta* Wall. ex Royle a plant commonly known as Mishmi Bitter and Mishmi Tita (Pareira, *Pharm. Jour.* XI, 1852* vide Watt, 1972; Bentley & Trimen, 1880). Khory (1887) also mentioned that its roots made into a paste with 'Rasavanti' were used as a collyrium in catarrhal and rheumatic conjunctivitis. The rhizomes were used to be brought to Bengal in neat little baskets or bags, with open meshes, made of narrow slips of rattan (Waring, 1868), and then distributed to the markets of India.

Because *C. teeta* did not grow in China, it was argued that it was Indian in origin but came to the Indian markets through Chinese territory or the Chinese drug alluded by Ainslie was something else. It was suggested that the Chinese drug could be some other species of *Coptis* or that of any of the allied genera *Isopyrum* or *Heleborus*. Dymock *et al.* (1890) recorded that the drug used to come to Bombay from China via Singapore.

The word *teeta* is derived from Sanskrit 'tikta' (bitter) so some of the bitter drugs came to be alluded to 'Mamira', or one of them was the genuine drug and the rest including *Coptis teeta* were the substitutes or inadvertent adulterants. *Picrorhiza kurrooa* Benth. (Fam.: Scrophulariaceae) sold in the Indian markets under the name of 'Karu' (=bitter) was suggested as the possible source of 'Mamira'. This drug a well known indigenous medicine in India, has nothing to do with the eyes.

A considerable trade had been recorded in the past from Kumaon and Kashmir and also from the Khasi Hills of Meghalaya in the root of *Thalictrum foliolosum* DC. (Ranunculaceae) called 'Mamira' or 'Pili-jadi'. Another member of Ranunculaceae *Actaea spicata* Linn. too has been suggested as a possible source. Both the above species are available in abundance, and have dark yellowish bitter roots somewhat like those of *Coptis teeta*.

Dr. Aitchison (*vide* Watt, 1972) found *Corydalis ramosa* Wall. ex Hook. f. & Thoms. (Fumariaceae) being employed medicinally by the natives in Kurram Valley in the treatment of eye-diseases. He opined that it might be because of a yellow watery juice of the plant, as every plant with a yellow juice seemed to be considered by the natives a sovereign medicine and called indiscriminately as 'Mamiran'. The roots of *Geranium wallichianum* Sw. (Fam.: Geraniaceae) were also shown to him as a medicine called 'Mamiran'. Yellow juice of *Corydalis govaniana* Wall. was reported to be employed in the treatment of eye-diseases like 'Mamiran' (Nadkarni, 1954).

It has been pointed out that *Coptis* and *Berberis* spp. which are recommended for obtaining drugs used in catarrhal and rheumatic affections of the conjunctiva contain the alkaloid berberine. Berberine is also present in a number of other yellow and bitter substances, which for external similarity, might have come to be used coincidentally for the same purpose as 'Mamira' It must, however, be recognised that absence of berberine could scarcely be viewed as militating against a particular species from being adopted as a substitute for 'Mamira'.

The rhizomes and roots of *Parnassia nubicola* having been found in actual use are being investigated for their efficacy as a collyrium or an eye salve.

*Original not seen.

In a preliminary study of the biological activity of the drug, the aqueous and chloroform soluble extractives exhibited a positive action against a penicillin resistant strain of the Gram-positive bacterium, *Staphylococcus aureus* Rosenbach. *Staphylococcus* spp. have been found to be the commonest pathogenic organisms in various eye diseases such as corneal ulcer, chronic dacryocystitis and conjunctivitis (Koul, *ined.*).

While further study of the biological activity and detailed chemistry of the drug is in progress, the present paper deals with the pharmacognosy of the root and rhizome describing macro- and micro-characters, behaviour of drug on treatment with different chemical reagents, fluorescence analysis of the powdered drug under ultra-violet light, physical constant values and preliminary phyto-chemical tests.

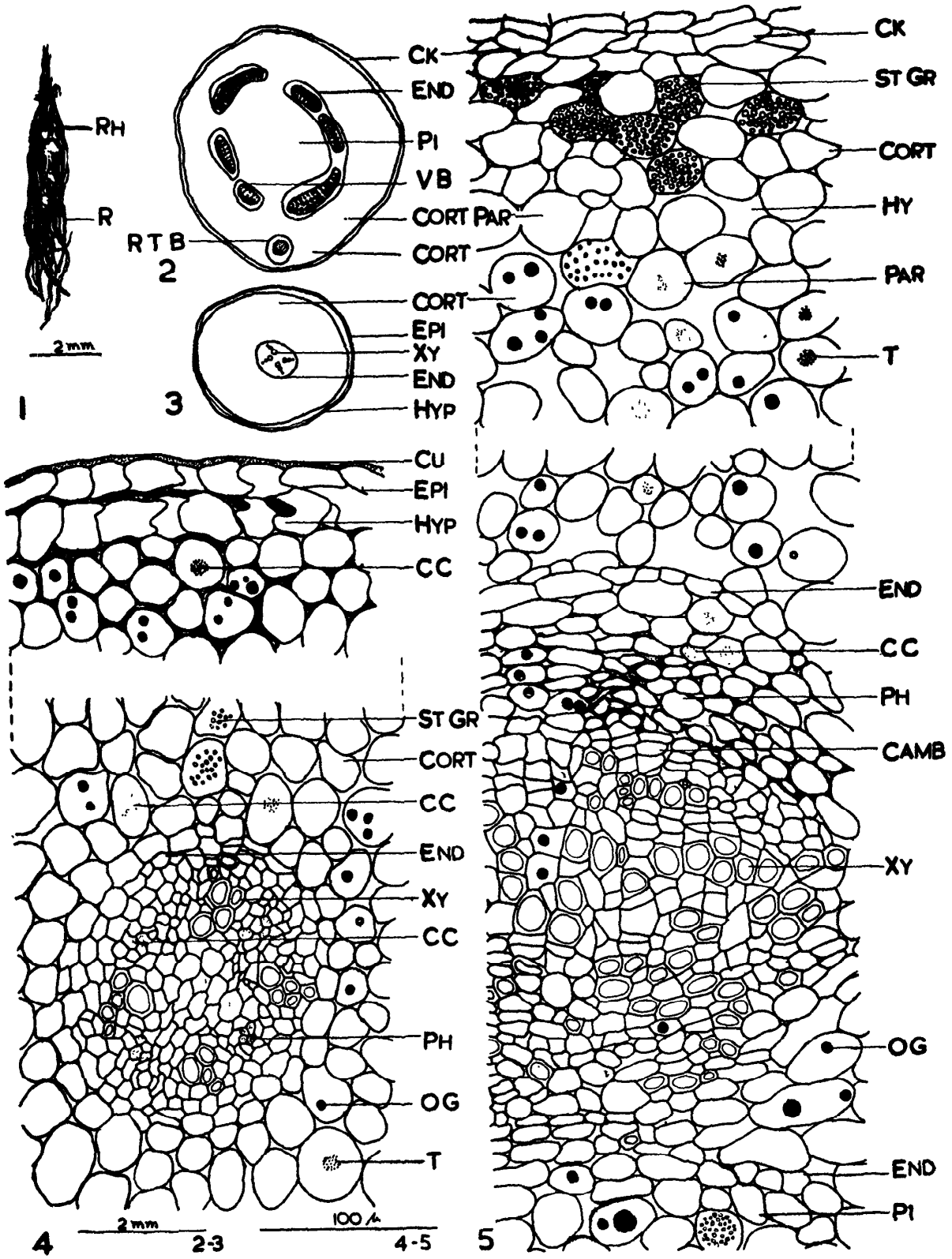
METERIALS AND METHODS

Specimens of rhizome and root were collected from Kedarnath (3300 m). Their macro- and microscopical structures were studied. The histo-chemical tests for the cell contents were performed, according to Johansen (1940), Kay (1938) and Trease (1952). The measurements of the individual tissues were recorded (Table 1). The behaviour of the powdered drug on treatment with different chemical reagents was observed (Table 2). The fluorescence analysis of the powdered drug was carried out under ultra-violet light (Table 3) according to Chase and Pratt (1949). The determination of total and acid insoluble ash, and alcohol and water soluble extractive values (Table 4) was done according to the method of I.P. (Ann, 1966) and the same method was followed in conducting the preliminary phytochemical tests (Table 5).

Macroscopical characters (Fig. 1): The rhizomes are short, 4-6 cm long and 0.5-1 cm thick, brown or yellowish brown in colour, crowned by the remains of the stems, leaves and roots. The upper part of the rhizome is nearly cylindrical but the lower extremity is usually bluntly conical or nearly truncate. The surface of the rhizome is rough, wrinkled and completely enveloped by numerous roots. Fracture is short, the interior being deep yellow in colour, compact and starchy. The roots are thin, 2-10 cm long and 0.5-1 mm thick, yellow in colour, smooth and commonly show a disposition to shrivel longitudinally rather than transversely. Odour is indistinct and taste bitter.

Microscopical characters (Figs. 2-5): *Roots*: Transverse section of root shows a single layer of epidermis followed by a layer of hypodermis, 8-10 layers of cortex and a stele. The cortex is parenchymatous, cells are more or less circular or elongated in shape, thickwalled and cellulosic in nature. Endodermis surrounding the stele is characterised by the presence of Casparian dots. Stele consists of tetrarch xylem alternating with phloem. The parenchymatous cells are filled with starch grains, tannin, yellowish brown contents and oil globules.

Rhizome: Transverse section of rhizome shows 2-3 layers of cork, which are thin and rectangular or tangentially elongated followed by a wide zone of cortex consisting of parenchymatous cells with large intercellular spaces. The cells are circular or oval in shape. Hydathodes are present. Vascular system is composed of 3-4 separate collateral bundles, each bundle being surrounded by an endodermis. Xylem consists of vessels, tracheids and parenchyma and phloem cells are cellulosic in nature. Vessels are usually small and with only simple perforations. Parenchymatous cells of both the cortex and pith are filled with abundant starch grains, tanniniferous contents, yellowish or yellowish-brown contents and oil globules. The central portion is composed of a wide zone of pith consisting of round to oval cells with large intercellular spaces. Starch



Figs. 1-5 : Macro- and microscopical structure of the root and rhizome of *Parnassia nubicola* Wall. ex Royle 1. Rhizome with roots. 2. Transverse section of rhizome (diagrammatic). 3. Transverse section of root (diagrammatic). 4. Transverse section of a portion of root showing details. 5. Transverse section of a portion of rhizome showing details.

CAMB, cambium; CC, cell contents; CORT, cortex; CORT-PAR, cortical parenchyma; CK, cork; CU, cuticle; END, endodermis; EPI, epidermis; HYP, hypodermis; Hy, hydathode; OG, oil globule; PI, pith; PH, phloem; PAR, parenchyma; R, root; RH, rhizome; RTB, root trace bundle; ST GR , starch grain; T, Tannin; VB, vascular bundle; XY, xylem.

grains are simple, small, globular in shape. Root trace bundles are present in the cortical parenchyma.

TABLE 1

Measurements of the individual cells and tissues of the rhizome and root of *Parnassia nubicola* in microns.

Root	
Epidermis	25–50×20–25
Cortex	15–38–45×15–25–45
Endodermis	13–20–25×8–10–18
Rhizome	
Cork	38–50–88×10–13–45
Hydathode	50–75–100×35–50–75
Endodermis	20–38–50×10–13–20
Cortex	25–38–50–75×30–38–45–63
Pith	30–55–63×25–38–45
Starch grains (diameter)	3–5–8

Cell contents: Starch grains are simple or globular and are abundantly present in the cortical parenchyma of root and rhizome and pith of rhizome. Tannins are present as granular masses in the parenchyma of both the root and rhizome. Some of the cells of cortex and phloem are filled with yellowish or yellowish brown contents and oil globules.

TABLE 2

Behaviour of the powdered drug on treatment with different chemical reagents.

Reagents	*Behaviour of the powdered drug*
Picric acid (saturated solution)	Turns yellow
HCl (sp. gr. 1.16)	Pale yellow
H_2SO_4 (80%)	Dark brown
HNO_3 (sp. gr. 1.42)	Orange
Acetic acid (glacial)	No change
Ferric chloride (5%)	Black
Iodine (aq. sol.)	Black
Sudan IV	Red

TABLE 3

Fluorescence analysis of the powdered drug under ultra-violet light

Treatment	*Fluorescence*
I Powder as such	Yellow-green
II Powder mounted in nitrocellulose	Yellow green with violet tinge
III Powder treated with NaOH in methanol	Green with violet tinge
IV Powder treated with NaOH in methanol, dried and mounted in nitrocellulose	Yellow-green
V Powder treated with HCl	Pea green with violet tinge
VI Powder treated with HCl dried and mounted in nitrocellulose	Light green with violet tinge
VII Powder treated with NaOH in water	Light green
VIII Powder treated with NaOH in water, dried and mounted in nitrocellulose	Yellow green
IX Powder treated with nitric acid diluted with an equal volume of water	Light green
X Powder treated with H_2SO_4 diluted with an equal volume of water	Green
XI Powder treated with antimony trichloride	Green with violet tinge

TABLE 4

Physical constants (%)	(Each value is an average of three determination)
Total ash	11.50
Acid insoluble ash	06.75
Alcohol soluble extractive	32.20
Water soluble extractive	21.46

TABLE 5

Preliminary phytochemical tests

Extracts	Colour	Nature	Sterol	Alkaloid	Oil	Resin	Saponin	Flavonoid	Reducing sugar	Polysaccharide
Petroleum ether extract	Yellowish brown	Oily	++++	+	+	+	–	–	–	–
Chloroform extract	Dark brown	Sticky, hygroscopic	++	+++	–	+	–	–	++	+
Alcohol extract	Dark brown	Sticky	–	+	–	+	+	+	++++	++
Water extract	Dark brown	Hygroscopic	–	–	–	+	+++	–	–	–

ACKNOWLEDGEMENTS

The authors are grateful to the Deputy Director-in-Charge, National Botanic Gardens, Lucknow and the Director, Central Council for Research in Indian Medicine and Homoeopathy, New Delhi for providing facilities. Mrs. Shanta Mehrotra is thanked for assistance in carrying out the preliminary phyto-chemical tests. Dr. O. P. Srivastava, Scientist, Central Drug Research Institute, Lucknow, is thanked for preliminary biological screening.

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