

The taxonomy, nomenclatural status and medicinal uses of Ferns and Lycophytes in *Hortus Malabaricus*

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Abstract

Ferns and Lycophytes in *Hortus Malabaricus* are provided here with detailed description, updated nomenclature, conservation status and their medicinal properties. The photographs of all species also provided here for their easy identification. *Hortus Malabaricus* by Andrian van Rheedee is the earliest important book on the Indian botany published in 12 volumes, which includes about 741 species of Malabar plants with 791 illustrations, including 20 illustrations of 18 species of Ferns and Lycophytes of Malabar of Kerala. Recently, Manilal translated it into the English. Even after this, there are nomenclatural changes occurred. Out of the 18 species, 2 species are endemic to South India, 11 species are presently having medicinal properties used by tribal and local people in Kerala.

Keywords: Ferns, Lycophytes, Hortus Malabaricus, Pteridophytes

Introduction

The study of Ferns and lycophytes of Kerala began with *Hortus Malabaricus* by Van Rheedee (1678-1703). Hendrik Adriaan Van Rheedee tot Draakestein was the then Dutch Governor of Cochin. He has published his monumental work in 12 volumes which included 741 species of Malabar plants with 791 illustrations including 20 illustrations of ferns and lycophytes of 18 species. These Pteridophytes were used by the traditional healers of Malabar region (Table 1). *Hortus Malabaricus*, published from Amsterdam,

is also the oldest comprehensive printed book on the natural plant wealth of Asia and of the Tropics.

Ferns and lycophytes, together called Pteridophytes, are free-sporing vascular plants that share a unique life cycle with independent gametophyte and sporophyte phases. They are originated in Silurian period and were a dominant group in Carboniferous period. They are known to human beings for more than 2000 years for their medicinal and other values. There are 12,000 species of ferns and lycophytes are reported in the world (Chapman, 2009). As per the modern taxonomic list of Indian Pteridophytes by Fraser-Jenkins (2020), there are 1188 taxa so far reported from India. The humid tropical climate and luxuriant forest in Kerala support over 250 species of Pteridophytes (Manickam & Irudayaraj, 1992; Nair *et al.* 1988, 1992, 1994 and Madhusoodanan, 2015).

None of the herbarium specimens collected by Rheedee are known to exist (Raizada, 1954, Johnston, 1970). Renowned botanists like Adanson (1763), Jussieu (1789) and Dennstaedt (1818) were used the illustrations to name new taxa citing illustrations as the 'type'. This is also evident that, over 250 species designated by Carl Linnaeus are based on the illustrations and descriptions given in *Hortus Malabaricus*. Datta (1985) made an intensive investigation on the identity and nomenclature of Pteridophytes described in *Hortus Malabaricus* but he had failed to recognize Valli-Varakody-Maravara described by Van Rheedee. Later, Nicolson *et al.* (1988) identified this species as *Leptochilus decurrens*

Blume. Manilal (2003) translated this work to English and Malayalam languages after his critical studies of plants described in it, where he identified the above plant as *Leptochilus bahupunctika* (B.K. Nayar, Madhus. & Molly) Nampy, considering the epiphytic nature and presence of terminal cluster of the narrow cylindrical fertile fronds. During the past 325 years many Europeans and American botanists have tried to interpret *Hortus Malabaricus* in modern, post-Linnean scientific

terms, which are fundamental for the floristic investigations of Asian plant and their medicinal uses (Manilal, 2003). Even after the treatment of Manilal, there are nomenclatural changes in the case of ferns and lycophytes in the *Hortus Malabaricus*. So, the Pteridophytes mentioned in *Hortus Malabaricus* are revisited here against the background of updated taxonomy, classification and nomenclatural changes, status and present medicinal uses.

Table 1
The list of Pteridophytes described in Hortus Malabaricus

Roman Script	Malayalam Script	Scientific name	Family
Patitisjivi-maravara	Pattichevi	<i>Parahemionitis cordata</i>	Pteridaceae
Panna-Kelango-Maravara Welli-panna-kelengu Maravara	Pannakizhengu	<i>Drynaria quercifolia</i>	Polypodiaceae
Welli-Panna-Kelangu-Maravara	Velipanna	<i>Phymatosorus mebranifolius</i>	Polypodiaceae
Tama-Pouel-Paatsja- Maravara	Tamapalpacha	<i>Huperzia phlegmaria</i>	Lycopodiaceae
Para-Panna	Parapanna	<i>Diplazium esculentum</i>	Athyriaceae
Kal-Panna-Maravara	Kalpanna	<i>Cheilanthes tenuifolia</i>	Pteridaceae
Kari-Welli-Panna Maravara	Karivelipanna	<i>Christella parasitica</i>	Thelypteridaceae
Nella-Panna-Maravara	Nellapanna	<i>Asplenium decrescens</i>	Aspleniaceae
Pannamara-Maravara	Panna	<i>Bolbitis terminans</i>	Lomariopsidaceae
Maretta-Mala-Maravara	Marathemala	<i>Pyrosia heterophylla</i>	Polypodiaceae
Valli-Varakody-Maravara	Vallivathakody	<i>Leptochilus bahupunctika</i>	Polypodiaceae
Arana-panna	Aranapanna	<i>Nephrolepis brownii</i>	Nephrolepidaceae
Valli-Panna	Vallipanna	<i>Lygodium flexuosum</i>	Lygodiaceae
Tsjeru-valli-Panna	Vallipanna	<i>Lygodium microphyllum</i>	Lygodiaceae
Panna-Valli	Pannavalli	<i>Stenochlaena palustris</i>	Blechnaceae
Avenka	Avenka	<i>Adiantum philippense</i>	Pteridaceae
Bellan-patsja		<i>Lycopodiella cernua</i>	Lycopodiaceae
Tiri-panna	Tiripanna	<i>Pyrosia lanceolata</i>	Polypodiaceae

Materials and Methods

Pteridophytes enumerated in the *Hortus Malabaricus* were listed out. All these species were collected from the field and herbarium specimen prepared according to standard methods. The specimens were identified using pertinent literature and the identification was authenticated

with authentically identified herbarium specimens and by Pteridologists. The nomenclature of the taxa was updated with recent literature and the plant list (online website). Brummit and Powel (1992) were followed for author citation. The present distribution of these species in world, India, the Western Ghats and Kerala were studied

consulting relevant literature. The current conservation status of these species was also checked with IUCN-Red List. The informations of medicinal properties of Pteridophytes used by tribal and local people were also gathered through field studies and literatures. The herbarium specimens prepared were deposited in the herbarium of the Department of Botany, Karivattom, University of Kerala (KUBH).

Enumeration of species

Avenka

Adiantum philippense L., Sp. Pl. 2: 1094. 1753; Manickam & Irud., Pterid. Fl. W. Ghats 98. 1992. N. C. Nair *et al.*, J. Eco. Tax. Bot. 16 (2): 272. 1992; B. K. Nayar & Geev., Fern Fl. Malabar 142. 1993; Easa, Biodiv. Doc. Kerala 5: 29. 2003.

Rhizome erect or suberect densely covered by scales all over; scales ovate-lanceolate, 3 x 0.4 mm, apex acuminate, margin entire, pale brown at the periphery, dark at the centre. Fronds 25-33 x 4.5-5 cm, tufted; stipes 10-18.5 cm long, wiry, numerous, dark brown or black, scaly at the base, glabrous above, rounded abaxially, grooved adaxially; lamina 14.5-15 x 4.5-5 cm, simply pinnate, dark green, herbaceous, glabrous; pinnae up to 12 pairs, up to 2.8 x 1.2 cm, alternate, distinctly stalked, fan shaped, dimidiate, the lower edge nearly in line or oblique with the petiole, upper edge rounded, lobed, acroscopic base truncate, margin entire or subentire in sterile pinnae; veins distinct above and below, dichotomously, flabellately branched, free, reaching the margin. Sori marginal, continuous along the edge of the lobe, crescent-shaped, indusiate; indusia pale brown; spores trilete, exine irregularly granulose.

Ecology: Common. Terrestrials, along the road sides and earth cuttings. *Reshma 10402 (KUBH).*

Distribution: Pantropic.

Med. Uses: The decoction made from the roots and rhizome is used against fever by *Malappandaram* tribes in Kollam District.

Nella-Panna-Maravara

Asplenium decrescens Kunze, Linnaea 24: 1881; Manickam & Irud., Pterid. Fl. W. Ghats 210. 1992; N. C. Nair *et al.*, J. Econ. Tax. Bot. 16 (3): 531. 1992; Easa, Biodiv. Doc. Kerala 5: 57. 2003; *Asplenium contiguum sensu* Bedd., Ferns S. India 47. t. 140. 1864, *non* Kaulf., 1824.

Rhizome long creeping, densely covered by scales all over; scales up to 3 x 0.5 mm, ovate-lanceolate, dark brown, clathrate,

apex long acuminate and gland tipped, margin slightly toothed. Fronds 36-45 x 7.5-14 cm, scattered; stipes 14-16 cm long, dark brown, rounded abaxially, grooved adaxially, glabrous and polished; lamina 22-29 x 7.5-14 cm, simply pinnate, oblong-lanceolate, pale green, chartaceous; pinnae up to 15 pairs, 4-7 x 1-1.7 cm, shortly stalked, opposite or subopposite in the lower part of the lamina, alternate above, lower most pinnae slightly reduced, lanceolate, falcate, dimidiate with long, caudate, acuminate apex, basisopic base slightly excised, acroscopic base truncate, margin irregularly lobed one-third to two-third way to the centre; lobes oblong, serrate at the apex; veins distinct below, obscure above, many, crowded, forked 4-5 times. Sori linear, produced on the vein forks near the costa, at first slightly diverging, but later form two parallel rows close to the costa, few obliquely arranged sori seen on the basal lobes; spore monolete, reniform with densely reticulate ridges.

Ecology: Not common. Lithophytic, in evergreen and montane forest. *Reshma 10492 (KUBH).*

Distribution: India, Sri Lanka, Malay Peninsula, Australia, Africa & Brazil.

Med. Uses: The decoction made from rhizome is given to treat dysentery by *Irular* tribes Palakkad.

Pannamara-Maravara

Bolbitis terminans (Wall.) Gandhi & Fraser-Jenk., Indian Fern J. 32: 183-185. 2015. *Acrostichum terminans* Wall., Num. List no. 2168. 1830. *Poecilopteris terminans* (Wall.) Bedd., Ferns S. India 68, t. 203. 1864. *Bolbitis subcrenatooides* Fraser-Jenk., Tax. Revis. Three Hundred Ind. Subcont. Pterid. 346. 2008.

Rhizome short creeping, thick, covered by scales densely at the apex; scale ovate-lanceolate, 3 x 1mm, basally attached, clathrate, gland tipped. Fronds in two alternate rows, not crowded, 25-85 x 15-30 cm, simply pinnate, distinctly dimorphic. Stipes 10-35 cm, crowded, sterile fronds, green, rounded abaxially, grooved adaxially, sparsely scaly throughout. Sterile lamina 18 x 36 cm, widest at the base, progressively narrowed towards apex; pinnae shortly stalked, subopposite, lanceolate, terminal pinnae much longest, proliferous at the apex; veins anastomosing, costa and lateral veins prominent, secondary veins originate at an oblique angle, meet at the centre forming more than three pairs of areoles on either side of costa, all areoles except costal one bear included excurrent veinlet towards the margin tips of lateral veins and secondary veins end freely. Fertile fronds longer than sterile one, upto 60 cm

long; pinnae 5-7 pairs, alternate, highly reduced. Sori acrostichoid.

Ecology: Rare. It grows as terrestrial or lithophyte in well shaded forest floor near streams. *Reshma* 10493(KUBH).

Distribution: Endemic to South India.

Note: The earlier workers treated this species as *Bolbitis subcrenata* (Hooker & Grev.) Ching. Later, it is found that this species different from *Bolbitis subcrenata*, which having broader sporophylls and endemic to Sri Lanka. As it is a distinct species, Fraser-Jenkins (2008) given a new name as *Bolbitis subcrenatooides* Fraser-Jenk., (nom. nov.). However, Gandhi noticed that under *A. terminans* Wallich had cited Pre-Linnaean description of "Pannamara Maravara" in Van Rheed (1693), *Hortus Malabaricus*, validated the name *A. terminans* Wall. Since Beddome cited Wallich, he was merely making a combination, not a new species (Gandhi & Fraser-Jenk., 2015). So a new name is given for this plant by Gandhi & Fraser-Jenk.

Kal-Panna-Maravara

Cheilanthes tenuifolia (Burm. f.) Sw., Syn. Fil. 129. 332. 1806; Manickam & Irud., Pterid. Fl. W. Ghats 90. 1992; N. C. Nair *et al.*, J. Econ. Tax. Bot. 16 (2): 268. 1992; B. K. Nayar & Geev., Fern F. Malabar 122. 1993; Easa, Biodiv. Doc. Kerala 5: 24. 2003. *Trichomanes tenuifolia* Burm. f., Fl. Ind. 237. 1768.

Rhizome short, densely scaly at the apex; scales up to 2 x 0.23 mm, lanceolate, uniformly pale brown, acuminate at apex, margin entire. Fronds 24-35 x 8-15 cm, crowded; stipes 16-18 cm long, dark brown or reddish-brown, rounded abaxially, grooved adaxially, glabrous, glossy; lamina 8-17 x 8-15, ovate-lanceolate, quadripinnate below, tripinnate at the middles, bipinnate above, dark green, herbaceous, glabrous, acuminate at apex, cuneate at base; primary pinnae up to 6 pairs, up to 9 x 6 cm, obliquely ovate-lanceolate, ascending, opposite or subopposite, distinctly stalked; secondary pinnae larger on the basiscopic side, up to 5 pairs, opposite or subopposite; tertiary pinnae up to 1 x 0.3 cm, pinnatifid up to the midrib; ultimate lobes ovate, subacute at apex, margin entire or shallowly lobed; veins slightly distinct, forked once or twice, free. Sori marginal on each ultimate lobe, indusiate; indusia formed by modified reflexed margin; spores trilete, dark brown, exine granulose.

Ecology: Common. It grows as terrestrials or lithophytic, along the earth banks and earth cuttings in open places and moist deciduous forest. *Reshma* 10492 (KUBH).

Distribution: India, Sri Lanka, Australia, Bangladesh, China, Malaysia, Nepal, New Zealand, Philippines, Polynesia, Taiwan, Tanzania & Uruguay.

Medicinal uses: The decoction made from the whole plant is used as hair wash by *Kani* tribes in Thiruvananthapuram District.

Kari-Welli-Panna-Maravara

Christella parasitica (L.) H. Lev., Fl. Kouy-Tcheou 475. 1915; Manickam & Irud., Pterid. Fl. W. Ghats 195. 1992; N. C. Nair *et al.*, J. Econ. Tax. Bot. 16 (3): 542. 1992; B. K. Nayar & Geev., Fern Fl. Malabar 307. 1993; Easa, Biodiv. Doc. Kerala 5: 50. 2003. *Polypodium parasiticum* L., Sp. Pl. 1090. 1753.

Rhizome short creeping, scaly at the apex; scales upto 9 x 1.5 mm, linear-lanceolate, acuminate at apex, margin entire or with minute hairs. Fronds 39-72 x 16-25 cm; stipes 15-32 cm long, grey-green when fresh, straw coloured when dry, rounded abaxially, grooved adaxially, scaly at the base, soft, whitish, acicular hairs distributed on stipe; lamina 24-40 x 16-25 cm, deltoid or broadly ovate, bipinnatifid, pale green, herbaceous; rachis copiously covered by long and short acicular hairs; pinnae up to 17 pairs, 7-12 x 1-1.8 cm, subopposite at the base, alternate towards the distal part, basal pinnae slightly reduced, usually deflexed, normal pinna linear-lanceolate, sessile, truncate or broadly cuneate at the base, acuminate at the apex, margin lobed one-third or two-third to the costa; lobes upto 25 pairs, oblique, basal acroscopic lobe slightly larger than the others; costa densely covered by long and short hairs on both surfaces; veins up to 8 pairs, one pairs of basal anastomosing to form an excurrent vein reaching the sinus membrane, next pair reaching above the sinus base; both surfaces of costules, veins, interveinal areas covered by short acicular hairs. Sori round, submarginal, indusiate; indusia reniform, pale brown, densely hairy; spores monolete, exine irregularly granulose.

Ecology: Occasional. Terrestrials, near streams in evergreen forest. *Reshma* 10494 (KUBH).

Distribution: India, Asia, Tropical America, Queensland, Hawaii, East Africa, Australia & Polynesia.

Med. Uses: The decoction made from the whole plant is used as hair wash by *Kani* tribes in Thiruvananthapuram District.

Para-Panna

Diplazium esculentum (Retz.) Sw., Schrad. J. Bot. 1801 (1): 312. 1803; Manickam & Irud., Pterid. Fl. W. Ghats 242. 1992; N. C. Nair *et al.*, J. Econ. Tax.

Bot. 16 (3): 506. 1992; B. K. Nayar & Geev., Fern Fl. Malabar 195. 1993; Easa, Biodiv. Doc. Kerala 5: 66. 2003. *Hemionitis esculenta* Retz., Obs. Bot. VI: 38. 1791. *Anisogonium esculentum* (Retz.) C. Presl, Tent. Pterid. 116. 1836; Bedd., Handb. Ferns Brit. India 192. 1883.

Rhizome erect, densely scaly at the apex; scales upto 7 x 1 mm, linear-lanceolate, dark brown, long acuminate at the apex, margin with short, simple teeth. Fronds 65-95 x 35-47 cm, tufted, spirally arranged; stipes 13-25 cm long, black at the base, grey-brown above, sparsely scaly at the base, glabrous above, rounded abaxially, grooved adaxially; lamina 50-70 x 35-47 cm, bipinnate with pinnatifid apex, deltoid, dark green, herbaceous, caudate acuminate at the apex, truncate at the base; primary pinnae upto 6 pairs, 17-28 x 7-11 cm, basal one or two pairs opposite or subopposite, rest alternate, deltoid, terminal pinna deeply lobed, acuminate at the apex, truncate at the base; pinnules upto 7 pairs, 4-7 x 1-3.5 cm, alternate, oblong-lanceolate, acuminate at the apex, truncate at the base, margin serrate towards the apex, shallowly lobed or crenate in the rest; lobes broadly deltoid, oblique, margin serrate, toothed at the apex; costa slightly raised above and below, shallowly grooved above, rounded below, narrow wing on either side of the costa on both surfaces; veins anastomosing. Sori linear, all along the veins except at the base and apex, indusiate; indusia linear, pale brown, margin wavy; spores monolete, exine densely, finely granulose.

Ecology: Common. It grows as terrestrials, along the stream banks in moist deciduous forest. *Reshma 10496 (KUBH)*.

Distribution: India, China, Formosa, Malaysia, Philippines, New Guinea & Samoa.

Med. Uses: The decoction made from fresh rhizome is given internally children against stomach pain by Malappandarum tribes in Kollam District. Young leaves are cooked as vegetables by the tribals and local peoples in Kerala.

Panna-Kelango-Maravara

Drynaria quercifolia (L.) J. Sm., Jour. Bot. 3: 398. 1841; Manickam & Irud., Pterid. Fl. W. Ghats 312. 1992; B. K. Nayar & Geev., Fern Fl. Malabar 382. 1993; N. C. Nair et al., J. Econ. Tax. Bot. 18 (2): 456. 1994. *Polypodium quercifolium* L., Sp. Pl. 2: 1087. 1753.

Rhizome short creeping, stout, adpressed to the substratum tightly, densely covered by scales all over; scale upto 8 x 1 mm, linear-lanceolate or lanceolate, peltate with a short stalk, red-brown,

long acuminate and gland tipped at the apex, gland deciduous, margin dentate-ciliate. Fronds seasonal, dimorphic; nest leaves 13-23 x 7-16 cm, cordate-ovate, simple or shallowly lobed, sessile, closely covering the rhizome, lateral veins very prominent, glossy, green when young but soon turning grey-brown; fertile fronds 78-100 x 40-45 cm; stipes 25-30 cm long, grey-brown, rounded abaxially, grooved adaxially, narrowly winged on either side, glabrous; lamina 53-70 x 40-45 cm, oblong, deeply pinnatifid, dark green, coriaceous; pinnae upto 10-12 pairs, 20-27 x 2.5-3 cm, basal pairs much reduced, oblong-lanceolate, acute at the apex, decurrent at the base, margin entire, cartilaginous; costa and veins raised above and below, interconnected by veinlets, areoles without included veinlets. Sori numerous, distinct, evenly distributed, usually two per each primary areole, round, paraphysis absent; spore monolete, bilateral, pale brown, exine spinulose.

Ecology: Common. Epiphytic and lithophytic, in open places from low altitude to above 1000 m. *Reshma 10495 (KUBH)*.

Distribution: India, Sri Lanka. Malesia to Polynesia & Tropical Australia.

Med. Uses: The decoction made from the rhizome is taken internally against fever by *Kani* tribes in Thiruvananthapuram District. The local people in many districts in Kerala use this plant against jaundice.

Tama-Pouel-Paatsja-Maravara

Huperzia phlegmaria (L.) Rothm., Feddes Report. 54: 62. 1944; Manickam & Irud., Pterid. Fl. W. Ghats 24. 1992; Easa, Biodiv. Doc. Kerala 5: 4. 2003. *Lycopodium phlegmaria* L., Sp. Pl. 2: 1101. 1753; Baker, Handb. Fern allies 22. 1887. *Urostachys phlegmaria* (L.) Herter ex Nessel, Barlappgewachse. 2: 5. 1949.

Stem pendulous, 20-45 cm long, isodichotomously branched up to two times. Leaves 0.8-2.2 x 0.3-0.6 cm, lax, sessile or subsessile, dark green, glabrous, sub coriaceous, ovate-lanceolate, broadly cuneate at the base, acuminate at the apex, margin entire; midrib slightly distinct above and below. Strobili 2-8 x 0.1-0.2 cm, terminal on the ultimate branches, slender, forked up to four times; sporophylls 1.2-1.5 x 1-1.2 mm, broadly deltoid, opposite, decussate, adnate, appressed towards the distal parts, spreading at the basal part; sporangia 0.8-1 x 0.7-0.8 mm, born at the axil of the sprophyll, reniform, yellowish; spores trilete, tetrahedral, ash-greyish colour, exine faveolate.

Ecology: Rare. Epiphytes, in evergreen and shola forest. *Reshma 10492 (KUBH).*

Distribution: India, Tropics of the Old World extending up to New Zealand and Australia.

Valli-Varakody-Maravara

Leptochilus bahupinctika (B. K. Nayar, Madhus. & Molly) Nampy in Nampy & Madhus., Ferns South India 59. 1998; Easa, Biodiv. Doc. Kerala 5: 82. 2003. *Nistarika bahupunctika* B. K. Nayar, Madhus. & Molly, Fern Gaz. 13 (1): 33. 1985; B. K. Nayar & Geev., Fern Fl. Malabar 404. 1993.

Rhizome climbing, erect, densely scaly at the apex; scales upto 1.5 x 0.5 mm, lanceolate, dark brown, clathrate, peltate, gland-tipped at the apex, base variously lobed at the base. Fronds dimorphic, arranged in four dorsal rows on the rhizome; sterile fronds 20-30 x 2.5-4 cm; stipes 1-3 cm long, articulated, rounded abaxially, grooved adaxially; lamina 19-27 x 2.5-4 cm, simple, lanceolate, dark green, herbaceous, gradually decurrent towards the base, acuminate at the apex, margin slightly recurved on drying, cartilaginous at the edge; veins anastomosing, lateral veins zig-zag, areoles irregular with included veins, included veins simple or forked once with swollen tips; fertile fronds upto 50 x 1.5 cm, seasonal, clustered at the apex, filiform, lamina-less. Sori acrostichoid, borne on the lateral grooves of the costa; spores monoletic, bilateral, exine densely spinose.

Ecology: Rare. Epiphytic, in evergreen forests above 700 m alt. *Reshma 10487 (KUBH).*

Distribution: Endemic to Kerala.

Bellan-patsja

Lycopodiella cernua (L.) Pic. Ser., Webbia 23: 166. 1968; Manickam & Irud., Pterid. Fl. W. Ghats 31. 1992; Easa, Biodiv. Doc. Kerala 5: 5. 2003. *Lycopodium cernum* L., Sp. Pl. 2: 1103. 1753.

Main stem creeping, rooting distantly, growth unlimited; ascending stem anisodichotomously branched, terete, bearing branched roots at the base; main branches sub opposite, decussate, forked two to three times into secondary branches. Leaves 1-3 x 0.2-0.3 mm, sparse on main stem, dense on the rest, pale green, stiff, herbaceous, spreading or ascending, adnate, linear, acuminate at the apex, margin entire. Strobilus 5-13 x 2-3 mm, terminal on the ultimate branches, epedunculate, pendent, cylindrical; sporophylls 1.4-2.2 x 0.4-0.8 mm, yellowish green, thin, broadly ovate, acuminate at the apex, margin fimbriate; sporangia reniform, pale brown; spores trilete.

Ecology: Common. Terrestrials, on earth banks and marshy areas in moist deciduous and evergreen forest from 500 to 1320 m alt. *Reshma 10489 (KUBH).*

Valli-Panna

Lygodium flexuosum (L.) Sw., Schrad. J. Bot. 1800 (2): 7. 106. 1801; Manickam & Irud., Pterid. Fl. W. Ghats 61. 1992; N. C. Nair *et al.*, J. Econ. Tax. Bot. 16 (2): 253. 1992; B. K. Nayar & Geev., Fern Fl. Malabar 92. 1993; Easa, Biodiv. Doc. Kerala 5: 16. 2003. *Ophioglossum flexuosum* L., Sp. Pl. 1063. 1753.

Climber. Rhizome short creeping, densely covered by dark brown, multicellular uniseriate tubular hairs all over. Fronds 2-3.5 x 0.40-0.55 m, oblong lanceolate, tripinnate, pale green, herbaceous; stipes 46-67 cm long, closely arranged, dark brown and densely hairy at the base, stramineous and glabrous above, rounded abaxially, flattened adaxially; primary pinnae 14-27 x 17-23 cm, alternate, about 15 cm apart with about 3 mm long common stalk, forked once and bearing a dominant bud on the forking axis; each forked branch bears two to three pairs simple or forked pinnules alternately; pinnules up to 14 x 2.5 cm, oblong-lanceolate, simple or forked or auriculate on one or both the bases, subacute, acute or acuminate at apex, base cuneate in simple pinnules, subtruncate or cordate in branched or forked or auriculated pinnules, margin regularly or irregularly serrulate in sterile pinnules; costa raised above and below; veins distinct above and below, forked twice or thrice, free, reaching the margin. Sporangia arranged adaxially on sorophores along the margin of the pinnules; sporangia about five pairs, alternate, protected by indusium; spores trilete, tetrahedral, yellowish green.

Ecology: Occasional. Terrestrials, in moist deciduous forest and grasslands. *Reshma 10401 (KUBH).*

Distribution: India, Japan, Sri Lanka, Malay Peninsula, Malesian Islands, Philippines, China, Australia.

Med. Uses: The *Malappandaram* tribes in Kollam District use the plant to cure burns.

Tsjeru-valli-Panna

Lygodium microphyllum (Cav.) R. Br., Prod. Fl. N. Holl. 162. 1810; Manickam & Irud., Pterid. Fl. W. Ghats 62. 1992; N. C. Nair *et al.*, J. Econ. Tax. Bot. 16 (2): 252. 1992; B. K. Nayar & Geev., Fern Fl. Malabar 94. 1993; Easa, Biodiv. Doc. Kerala 5: 17.

2003. *Ugenia microphyllum* Cav., Ic. Decr. Pl. 6: 76. t. 595. 1801.

Climber. Rhizome long creeping, dichotomously branched, densely clothed with short, brownish-black hairs. Fronds 2-3 x 0.15-0.21 m, tripinnate, pale green, glabrous, herbaceous; stipes up to 50 cm long, rounded abaxially, flattened adaxially. Primary branches borne up to 15 cm apart on adaxial side of the rachis, bearing a dormant bud at the apex, with dense brown hairs; a pair of secondary branches borne subapically; secondary rachis 8-9 mm long; secondary rachis branches pinnate, 8-11 x 4.5-7.5 cm, oblong, geniculate, terminated by a terminal pinnule similar to the lateral ones or forked equally or unequally; tertiary rachis and stalk of the pinnules narrowly winged above; pinnules up to four pairs, alternate, sterile pinnules 2-3.5 x 1.4-1.7 cm; fertile pinnules 1.2-1.5 x 0.8-1 cm, ovate, rounded at the apex, cordate at the base, margin finely crenate in sterile pinnules; veins distinct above and below, raised on lower surface, flabellately branched, free, reaching the margin. Sporangia borne on the adaxial surface of the sporophores along the margin of the pinnules, up to six pairs in two rows per sporophore, covered by an indusium; spores trilete, exine densely verrucate.

Ecology: Occasional. Terrestrials, in marshy area in evergreen and moist deciduous forest. *Reshma 10498 (KUBH)*.

Distribution: India, Malay Peninsula, Malesian Islands, Sri Lanka, Africa to Polynesia and Australia.

Med. Uses: The decoction made from leaves is given to treat dysentery by Kani tribes in Thiruvananthapuram District.

Arana-panna

Nephrolepis brownii (Desv.) Hovenkamp & Miyam., Blumea 50 (2): 293. 2005. *Nephrodium brownii* Desv. 252. Mem. Soc. Linn. Paris 6 (3): 1827. *Nephrolepis multiflora* (Roxb.) C. V. Morton, Contrib. U. S. Nat. Herb. 38. 309. 1974; Manickam & Irud., Pterid. Fl. W. Ghats 142. 1992. *Davallia multiflora* Roxb., Calcutta J. Nat. Hist. 4: 55. t. 31. 1884.

Rhizome erect, bearing stolons which branched and producing daughter plants, woody, densely covered by scales all over; rhizome scales up to 3 x 1 mm, appressed, ovate-lanceolate, pale brown at the periphery, dark at the centre, acuminate at the apex, margin fimbriate and ciliated. Fronds 70-100 x 11-13 cm, tufted; stipes 11-22 cm long, brown when fresh, grey-brown when dry, rounded abaxially, grooved adaxially, densely scaly at the

base, sparsely above; lamina 59-78 x 11-13 cm, oblong-lanceolate, simple pinnate, pale green, chartaceous; pinnae up to 45 pairs, up to 4-7 x 0.7-1 cm, spreading, subopposite or alternate, sessile, basal few pairs progressively reduced and deflexed, normal pinna oblong-lanceolate, acuminate at the base, auricled on acroscopic base, margin serrate; costa slightly raised above and below; veins well distinct in younger fronds, obscure in mature fronds, forked up to three times, parallel, free, not reaching the margin, ending with a hydathode; pale brown, linear, fimbriate scales mixed with hairs distributed sparsely all over the lamina. Sori submarginal at the vein end, reniform, indusiate; indusia dark brown, reniform, margin entire; spores monoete, reniform, yellowish-brown, exine granulose.

Ecology: Common. Terrestrials, in tea plantations. *Reshma 10479 (KUBH)*.

Distribution: Tropical Asia, India, Sri Lanka, China, Japan, Taiwan, Indochina, Malesia, New Guinea, New Caledonia, Australia, New Zealand and Fiji.

Welli-Panna-Kelangu-Marvara

Phymatosorus membranifolius (R. Br.) S. G. Lu, Guihaia 19 (1): 27. 1999; Manickam & Irud., Pterid. Fl. W. Ghats 317. 1992; N. C. Nair *et al.*, J. Econ. Tax. Bot. 18 (2): 465. 1994; Nampy & Madhus., Ferns South India 99. 1998; Easa, Biodiv. Doc. Kerala 5: 86. 2003. *Polypodium nigrescens* Blume, Enum. Pl. Jav. 2: 126. 1828. *Pleopeltis nigrescens* (Blume) Bedd., Handb. Ferns Brit. India 367. t. 208. 1883.

Rhizome short creeping, terete, green and fleshy when fresh, black when dry, sparsely scaly at the apex; scales up to 5 x 4 mm, peltate, broadly ovate, clathrate, margin glandular. Fronds 40-84 x 28-38 cm, arranged in two dorsal rows on the rhizome; stipes 17-24 cm long, cylindrical, shiny, stramineous, articulated; lamina 23-60 x 28-38 cm, broadly ovate, deeply pinnatifid, dark green when fresh, dark brown dry, herbaceous, glabrous; pinnae up to 5 pairs, 20-30 x 2.5-3 cm, ascending, alternate, oblong-lanceolate, abruptly decurrent on the basiscopic base, acuminate at the apex, margin entire; costa distinctly raised below, slightly raised above, rounded above and below; veins distinct on both surfaces, copiously anastomosing to form two rows of larger areoles along the costa in addition to irregular shaped smaller areoles along the margin, areoles with branched included veinlets. Sori in one row either side of the costa, round, deeply sunken and protruding adaxially; spore monoete, bilateral, exine smooth.

Ecology: Not common. Epiphytic, in tea plantations and semi exposed places in evergreen forests.

Reshma 10499 (KUBH).

Distribution: India, Sri Lanka, Malesia, Polynesia & Australia.

Med. Uses: The juice made from the leaves use to kills worms by *Ulladan* tribes in Pathanamthitta District.

Maretta-Mala-Maravara

Pyrrhosia heterophylla (L.) M. G. Price, Kalikasan 3: 177. 1973; Easa, Biodiv. Doc. Kerala 5: 87. 2003. *Acrostichum heterophyllum* L., Sp. Pl. 2: 1067. 1753. *Drymoglossum heterophyllum* (L.) Trimen, Jour. Linn. Soc. 24: 152. 1887; Manickam & Irud., Pterid. Fl. W. Ghats 310. 1992; B. K. Nayar & Geev., Fern Fl. Malabar 380. 1993.

Rhizome long creeping, wiry, slender, densely scaly all over; scales upto 1.5 x 0.5 mm, ovate-lanceolate, appressed, peltate, uniformly pale-brown but dark brown at the attaching region, acuminate at the apex, margin dentate to ciliate. Fronds dimorphic, scattered; sterile fronds 25-35 x 10-13 mm; stipes 3-5 mm long, articulated, terete, densely scaly at the base; lamina 22-30 x 10-13 mm, simple, ovate, rounded at the apex, cuneate at the base, pale green, coriaceous, bearing stellate hairs densely on abaxial surface when young, sparsely when mature; fertile fronds 20-50 x 3-5 mm, simple, oblong to linear-lanceolate, rounded at the apex, cuneate at the base, margin entire; veins indistinct above and below, anastomosing to form larger costal areoles and smaller marginal areoles with free, simple or forked included veinlets. Sori acrostichoid, all along the abaxial surface of the lamina except at the midrib; sporangia intermingled with stellate hairs; spores monoletate, bilateral, warty with conical spines.

Ecology: Common. Epiphytic, in moist deciduous forest and tea plantations. (500-700 m). *Reshma 10500 (KUBH).*

Distribution: South India, Sri Lanka & Seychelles.

Med. Uses: The Kani tribes in Thiruvananthapuram District use the leaves for treating Jaundice. The local people in Kerala also use this plant for treating jaundice.

Tiri-panna

Pyrrhosia lanceolata (L.) Farw., Amer. Midl. Nat. 12: 245. 1930 ('*lanceolatus*'); Manickam & Irud., Pterid. Fl. W. Ghats 322. 1992; N. C. Nair *et al.*, J. Econ. Tax. Bot. 18 (2): 459. 1994; Easa, Biodiv. Doc. Kerala 5: 88. 2003. *Acrostichum lanceolatum* L., Sp. Pl. 2: 1067. 1753.

Rhizome long creeping, slender, densely scaly at the apex, moderately dense in older regions; scales upto 4 x 0.5 mm, lanceolate, peltate, attachment region golden brown, other regions light brown, long acuminate at the apex, rounded at the base, margin ciliate. Fronds 10-17 x 1-1.5 cm, distantly placed, monomorphic to moderately dimorphic; stipes 1-3 cm long, articulated, pale brown, densely scaly at the base, rest of the part sparsely covered by stellate hairs; lamina 9-14 x 1-1.5 cm, simple, lanceolate or oblanceolate, dark green on uppersurface, brownish on lower surface, acute at the apex, cuneate at the base, coriaceous, densely covered by stellate hairs on lower surface, glabrous on uppersurface, margin entire; veins indistinct above and below, anastomosing to form areoles, areoles with 2-3 simple, free, included veinlets. Sori irregularly distributed mainly in the distal part of the lamina, orbicular, dark brown; spores monoletate, bilateral, light yellow, exine with few prominent tubercles.

Ecology: Not common. Epiphytic or lithophytic, in exposed places in moist deciduous forest and tea plantations. *Reshma 10439 (KUBH)*

Distribution: India, Sri Lanka, China, Taiwan, Bhutan, Malaysia & Sumatra to New Guinea.

Patitijivi-maravara

Parahemionitis cordata (Roxb. ex Hook. & Grev.) Fras.-Jenk., New Sp. Syndr. 187. 1997; Easa, Biodiv. Doc. Kerala 5: 26. 2003. *Hemionitis cordata* Roxb. ex Hook. & Grev., Ic. Fil. t. 64. 1828. *Parahemionitis arifolia* (Burm. f.) Panigrahi, Amer. Fern J. 83 (3): 90. 1993; *Asplenium arifolium* Burm. f., Fl. Ind. 231. 1768. *Hemionitis arifolia* (Burm. f.) T. Moore, Ind. Fil. 114. 1859; Manickam & Irud., Pterid. Fl. W. Ghats 93. 1992; B. K. Nayar & Geev., Fern Fl. Malabar 125. 1993.

Rhizome short creeping, densely covered by scales; scales ovate-lanceolate 3 x 0.5, dark at the centre, whitish at the periphery, margin entire, about one-third part of the scale towards the distal part is completely whitish without median dark band. Fronds dimorphic; sterile fronds 22-28.5 x 6-6.2 cm; stipes 14.5-18.5 cm long, compact, black or dark brown, polished, brittle, terete, densely scaly at the base; lamina 7.5-10 x 6-6.2 cm, simple, cordiform, deltoid, pale green, chartaceous, long, soft, pale brown scales distributed all over the lower surface of the sterile lamina, rarely on adaxial side; fertile frond up to 43.5 x 9.5; stipes up to 37 cm long; lamina up to 6.5 x 9.5, deltoid, trilobed; costa raised below, grooved above; veins obscure, anastomosing, areoles seen as depressions in dry fronds. Sori

continuous along the veins filling the entire surface of the lamina when mature, intermixed with hairs and scales; spores trilete, spherical; exine with minute reticulations.

Ecology: Rare. Lithophytic, on dry rock in evergreen forest from 600 to 1100 m alt. *Reshma 10432 (KUBH)*.

Distribution: South India, Sri Lanka, Bangladesh, Myanmar, Philippines.

Med. Uses: Fresh leaves are made into a paste with water and consumed in empty stomach in the morning half an hour before meals controlling sugar level in blood by Kani tribes in Thiruvananthapuram District (Ajikumaran *et al.*, 2006).

Note: This species has been earlier known as *Hemionitis arifolia* (Burm. f.) T. Moore. Panigrahi (1993) transferred it to *Parahemionitis* as *P. arifolia* (Burm. f.) Panigrahi. But Morton (1974) was the first modern Pteridologist in his work on Roxburgh's names to note that the type of *P. arifolia* is an immature juvenile *Acrosticum aureum*. The next available name is *cordata*. Thus the species is known as *Parahemionitis cordata* (Roxb. ex Hook. & Grev.) Fras.-Jenk. and not *Parahemionitis arifolia* (Burm. f.) Panigrahi.

Panna-Valli

Stenochlaena palustris (Burm. f.) Bedd., Ferns Brit. India, Suppl. 26. 1876; Manickam & Irud., Pterid. Fl. W. Ghats 303. 1992; N. C. Nair *et al.*, J. Econ. Tax. Bot. 16 (3): 549. 1992; Easa, Biodiv. Doc. Kerala 5: 78. 2003. *Polypodium palustre* Burm. f., Fl. Ind. 234. 1768.

Rhizome long creeping, scandant, stramineous with few scattered scales, often reaching the top of trees, climbing by hairy, palmately arranged groups of roots on the abaxial side, younger roots protected by scales; scales upto 4 x 1.5 mm, ovate, dark at the centre with straight, uniformly arranged cells, pale brown at the periphery with curved, irregularly arranged cells, acuminate at the apex, margin ciliated. Fronds 56-110 x 26-35 cm, scattered, dimorphic; stipes 14-29 cm long, abaxially rounded, flattened adaxially, pale brown when fresh, glabrous, glossy; lamina 42-81 x 26-35 cm, ovate or oblong-lanceolate, simple pinnate, slightly narrowed towards apex, glabrous, coriaceous; pinnae upto 13 pairs, 11-21 x 2-3 cm, spreading, shortly stalked, alternate, lanceolate, acuminate at the apex, cuneate at the base, basiscopic base slightly excised, margin cartilaginous, sharply and irregularly serrate, glossy and glabrous on both surfaces; terminal

pinna is similar to lateral ones; costa raised on both surfaces; veins simple or rarely forked once, free, reaching the margin or rarely forms costal areoles and lateral veins anastomosing. Fertile fronds seasonal, borne at the distal part of the plant, more or less of the same size and shape of sterile ones with much contracted pinnae; fertile pinnae 15-24 x 0.2-0.3 cm, linear, stalked, acute at the apex. Sori acrostichoid, completely covering the lower surface, protected by pale brown, firm, entire, reflexed margin; spores monoete, planoconvex or reniform, pale green, exine sparsely spinulose.

Ecology: Common. Terrestrials, in moist deciduous forest. *Reshma (10410) KUBH*

Distribution: India, Australia, Myanmar, Fiji, Malaysia, Polynesia & China.

Results and Discussion

The study found that there are 20 illustrations of pteridophytes belonging to 18 species, 16 ferns and 2 lycophytes in *Hortus Malabaricus*. These 18 species belonged to 10 families as per the recent classification (PPG I), which based on gross morphology and molecular studies. Seventeen species out of the 18 mentioned in the work were collected from field. Their herbarium specimens are deposited in Kerala University Herbarium (KUBH). The distributions of these 18 species in the world also analyzed. Two species are endemic to the Western Ghats, of which the distribution of one species is restricted to Kerala. There are nomenclatural changes occurred in the case of three species. The study also revealed that all the species of ferns and lycophytes included in *Hortus Malabaricus* have economic importance and most species are used for medicinal purposes in Kerala by local and tribal people. Most of the ferns and lycophytes in *Hortus Malabaricus* are common and low altitude pteridophytes with wide distribution but some species viz. *Huperzia phlegmaria*, *Asplenium decrescense* and *Leptochilus bahupunctika* are now seen only in high altitude areas above 600 m above. Rheed's specimens were mainly collected from the coastal areas from secondary vegetation types. During 17th century, the lower lands of the Western Ghats might have had more dense vegetation and cannot deny the presence of high altitudes ferns in lower altitude areas of those days.

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Plate: 1 A-F Ferns in *Hortus Malabaricus*
A. *Adiantum philippense*, B. *Asplenium decrescens*, C. *Bolbitis terminans*, D. *Cheilanthes tenuifolia*,
E. *Christella parasitica*, F. *Diplazium esculentum*



Plate: 2 A-F. Ferns and Lycophytes in *Hortus Malabaricus*
A. *Drynaria quercifolia*, B. *Huperzia phlegmaria*, C. *Leptochilus bahupunctika*, D. *Lycopodiella cernua*,
E. *Lygodium flexuosum*, F. *Lygodium microphyllum*



Plate: 3. A-F. Ferns in *Hortus Malabaricus*
A. *Nephrolepis brownii*, B. *Parahemionitis cordata*, C. *Phymatosorus membranifolius*, D. *Pyrrosia heterophylla*,
E. *Pyrrosia lanceolata*, F. *Stenchaena palustris*