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# PTERIDOPHYTES OF NEPAL: FAMILY- LYGODIACEAE

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## ABSTRACT

**This paper deals the family lygodiaceae of Nepal. Authors has collected two species of genus Lygodium viz; *Lygodium microphyllum* (Cav.) R.Br. and *Lygodium flexuosum* (L.) Sw. *Lygodium microphyllum* (Cav.) R.Br. has been reported first time from Nepal. Authors has studied their structural details, epidermal details like stomatal structures, frequency and sinuosity of upper and lower epidermis in great details. Spores sporangial and venation details are also studied in details.**

**KEYWORDS :** Stomata, Epidermal details, frequency, Spores

Pteridophytes in general and ferns in more particularly have attracted a great deal of attraction of botanists from all over the world due to their occupying a pivotal central position in world of higher plants. The present day pteridophytes consists of more than 400 living genera and approximately about 13000 living species are (Crabbe et al. 1975 ).

The genus of family Lygodiaceae are terrestrial fern, rhizome slender, creeping, dichotomously branched, hairy. Rhizome clothed with hairs in younger regions. Rachis slender and twining. Fronds compound, born in two rows on the dorsal side of the rhizome, large, of indefinite apical growth. Fertile and sterile pinnae are different in size and shape. Leaf is tripinnate, veins usually free. Fertile pinnae are narrower than the sterile ones. Fertile pinnae bear marginal lobes, having two rows of sporangia. Each sporangium is solitary towards the apex of the veinlet of the marginal lobes, having two rows of sporangia and protected individually by a marginal indusium. The sporangium is of the leptosporangiate type. Sporangium has transversely oriented capsule and on anterior end slightely narrower. It bears different types of annulus, transeverse, ventral or oblique like annulus cells. Spores are trilete, large, perine absent. Ornamentation of exine is granulose or rugulose but rarely it may be reticulate.

## MATERIALS AND METHODS

The present materials *Lygodium microphyllum* (Cav.) R.Br. and *Lygodium flexuosum* (L.) Sw. are collected from Phoolchuki., Nepal. For the epidermal studies , pieces of young as well as mature pinnae were fixed in farmer's fluid (ethyl alcohol and acetic acid 3:1) and subsequently stored in the 70% ethyl alcohol . Epidermal peels were taken out by macerating pieces of pinnae in Schulz's fluid, using concentrated nitric acid and potassium chlorate and subsequently washing and treating with a dilute solution of ammonia (about 1%). Epidermal peels thus obtained were stained with saffranin and dehydrated through usual ethyl alcohol series and subsequently mounted in euparol. Venation and general orientation of stomata and epidermal cells were investigated in transparencies made by Foster's Technique (Foster, 1966). The pinnae were cleared in 2.5% aqueous sodium hydroxide solution followed by concentrated chloral hydrate, dehydrated in the usually alcohol series and stained in 1% solution of safranin in equal parts of xylene and absolute alcohol. Then mounted in euparol. Petiolar epidermis was studied in epidermal peels which were taken out often light maceration of petiolar pieces in conc. Nitric acid and potassium chlorate and subsequently treating with dilute aqueous ammonia solution. Epidermal peels thus obtained were also dehydrated in usual alcohol series and stained with 1% safranin in equal parts of xylene and absolute alcohol. Then mounted in euparol.

For spore studies, the procedure described by Nayar (1970) was followed. Observations were made under transmitted light microscope. Spore size was observed on the basis of the mean average calculated from a minimum twenty five readings in each plane of spores and was exclusive of the perine.

The nature of various depositions and cell substances was detected by special histochemical tests

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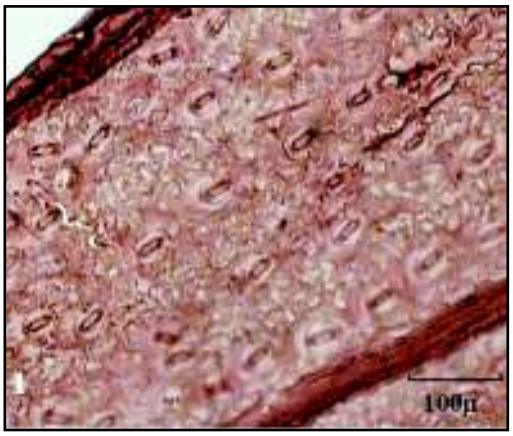


**Figure 1 : Photographs of Lower Epidermis of *Lygodium flexuosum***

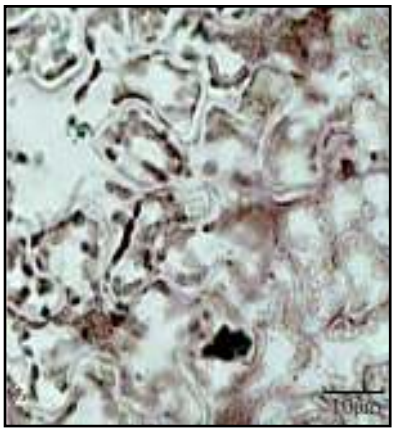

**Figure 2 : Photographs of Upper Epidermis of *Lygodium flexuosum***

**Figure 3 : Photographs of Plant *Lygodium flexuosum***


**Figure 4 : Photographs of Venation Pattern of *Lygodium flexuosum***

performed. Presence of lignin was confirmed by occurrence of red colour after treating the lignified portions with phloroglucinal followed by a drop of 25% hydrochloric acid. Phloroglucinal solution was made by dissolving 1 gm phloroglucinol in 100 ml of 94% ethanol.

## RESULTS AND DISCUSSION

***Lygodium flexuosum* (L.) Sw.**

Large terrestrial climbing fern, rhizome prostrate type, creeping with adventitious roots. Fronds large and glabrous, pairs of fronds pinnate with the pinnules or lobes. Fertile and sterile leaves are different in size and shape. Fertile pinnules are small. Margin of pinnules are serrate and pinnules are elongated, the tip is narrower as compared to base and it blunts are rounded. Pinnules are 10-12cm long and there width is 1-2cm. veins are distinct on abaxial surface. Sori protruding from the margin. Texture is subcoriaceous. Sporangium is slightly narrower at the tip. Cells of annulus are elongated, length is longer than the width. Spores show trilete mark, tetrahedral in shape.,


**Figure 5 : Photographs of Sporangia of *Lygodium flexuosum***


**Figure 6 : Photographs of Plant *Lygodium microphyllum***

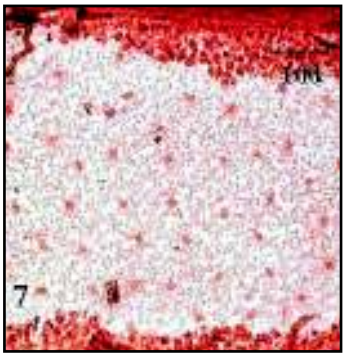


**Figure 7 : Photographs of Upper Epidermis of *Lygodium microphyllum***

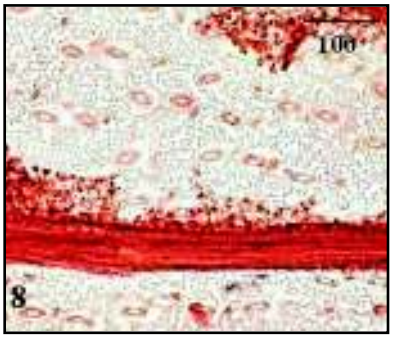


**Figure 8 : Photographs of Lower Epidermis of *Lygodium microphyllum***


**Figure 9: Photographs of Sporangia of *Lygodium microphyllum***

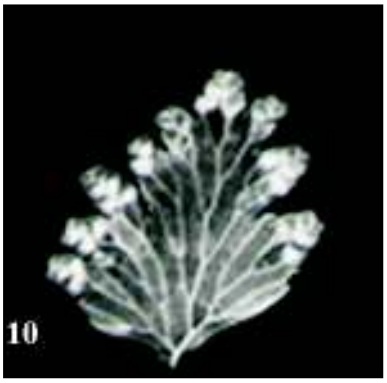


**Figure 10 : Photographs of Venation Pattern of *Lygodium microphyllum***

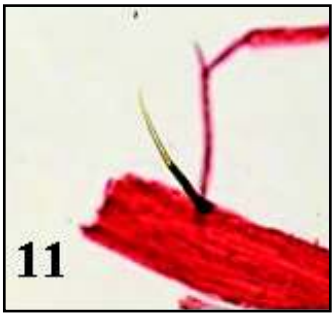


**Figure 11 : Photographs of Trichomes of *Lygodium microphyllum***

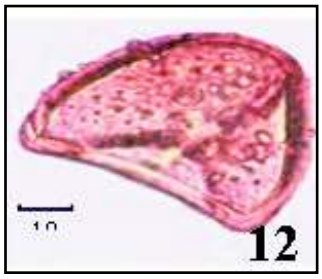


**Figure 12: Photographs of Spore of *Lygodium microphyllum***

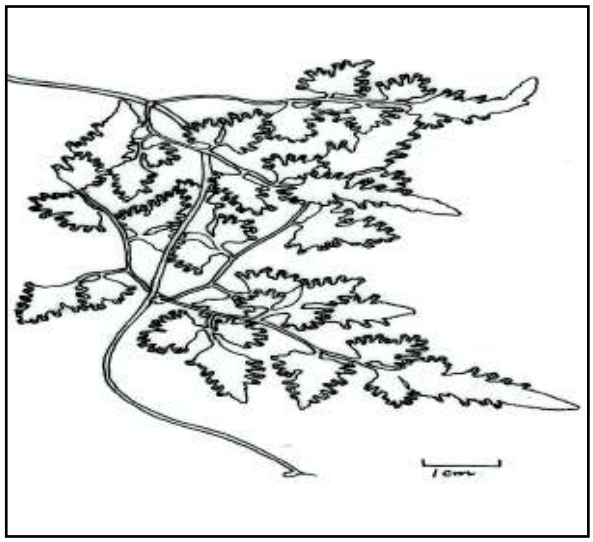

**Figure 13 : Drawing of Plant *Lygodium microphyllum***

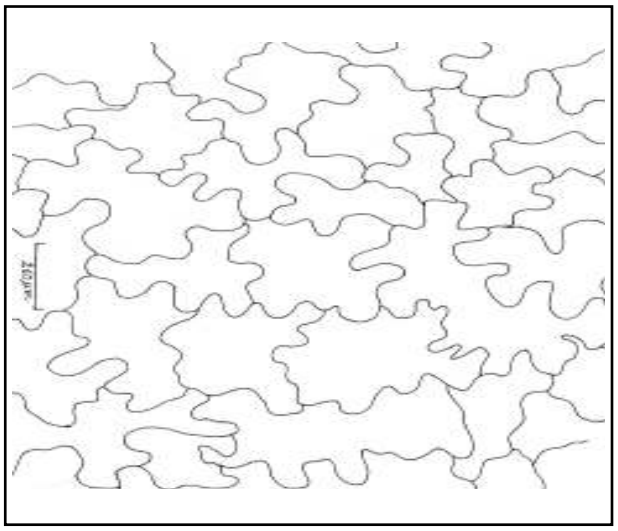

**Figure 14 : Drawing of Upper Epidermis of *Lygodium microphyllum***

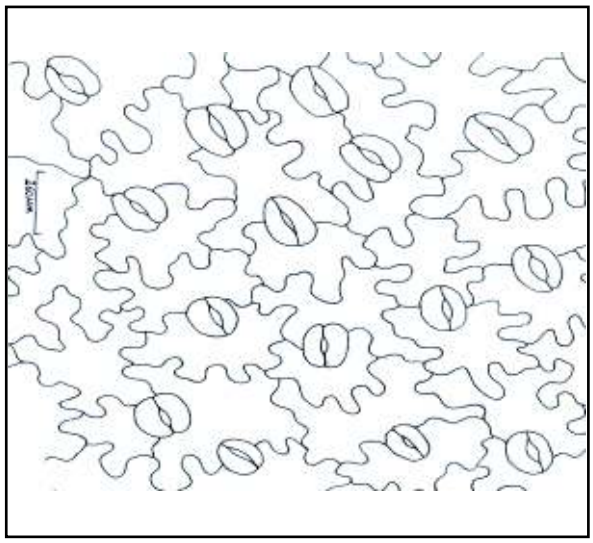

**Figure 15 : Drawing of Lower Epidermis of *Lygodium microphyllum***

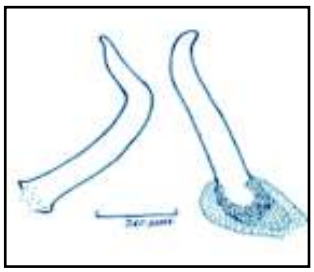

**Figure 16 : Drawing of Trichomes of *Lygodium microphyllum***

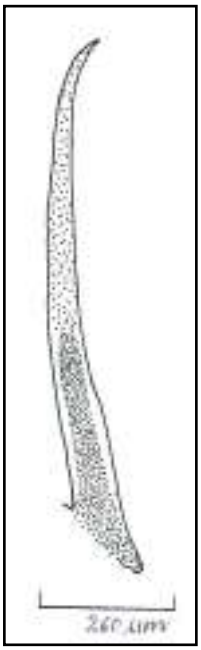

**Figure 17 : Drawing of Pair Trichomes of *Lygodium microphyllum***

nonperinous. Ornamentation is verrucate-reticulate. Size of spore is 51 X 56µm.

Venation pattern is open dichotomous type. Side veins originate from mid vein. The side veins are forked ones or twice. Mid vein is very prominent in comparison to the side veins. Side veins have free endings at the margin. Leaf is hypostomatic and stomata are present only on the abaxial side. Both the surfaces have sinuous walled cells and irregular in shape. Cells of vein area are elongated and these are less sinuous as compared to the other epidermal cells. Stomata are normally surrounded by two to three neighbouring cells. The amplitude of sinuosity and wavelength of sinuosity of lower epidermal cell is 35µm and 114 µm respectively while amplitude of sinuosity and wavelength of sinuosity of upper epidermal cell is 54µm and 129 µm respectively.

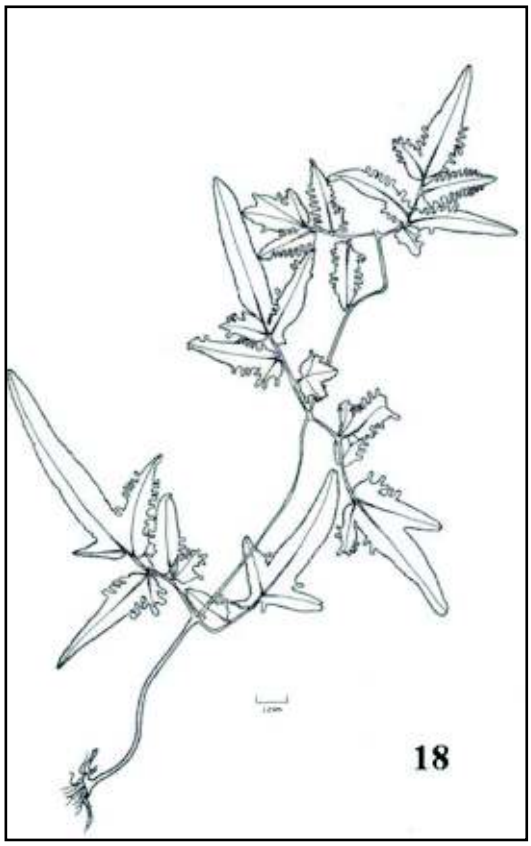


**Figure 18 : Drawing of Plant *Lygodium flexuosum***

***Lygodium microphyllum* (Cav.) R. Br.**

Terrestrial fern, rhizome slender and creeping type. Stipes are slender and twining. Fronds simply pinnate, pinnulus are inserted over the rachises. The terminal pinnule is elongated in comparison to others and more or less lobed, blunt at the end. Shape of the pinules are different. Fertile pinnules have marginal lobes of angular shape. Veins are prominent on abaxial side. Texture is coriaceous. Sporangium becomes narrower at the tip. Annulus cells are elongated and arranged in cone shaped at tip of the sporangium.

` Venation pattern is open dichotomous type. Mid vein is not distinct. Veins are forked several times and they have free endings. Usually vein end are present up to the end of sporangium in each fertile pinnules. Leaf is hypostomatic and stomata are present at the abaxial side. Both the surfaces have sinuous walled cells. Stomata are usually surrounded by three to four cells. Hairs are present on the upper epidermis. Hairs are of several types. Hairs base are broader

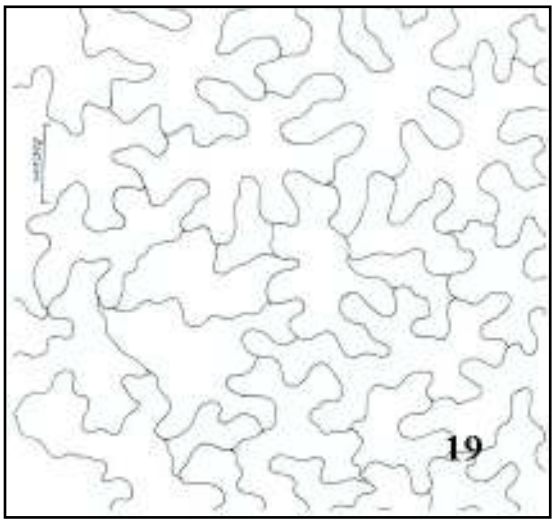


**Figure 19 : Drawing of Upper Epidermis of *Lygodium flexuosum***

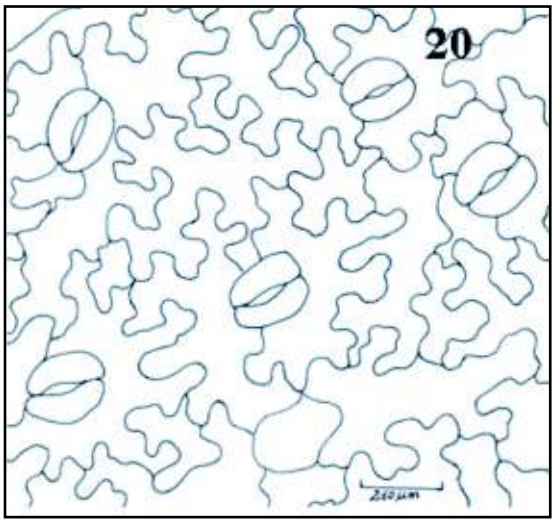


**Figure 20 : Drawing of Lower Epidermis of *Lygodium flexuosum***

and the tip is blunt or acute. Upper epidermal cells have amplitude of sinuosity 43 µm and wavelength of sinuosity is 119 µm while the amplitude of sinuosity and wavelength of sinuosity of lower epidermal cells are 38 µm and 102 µm respectively.

As far as the authors know, only three species of *Lygodium* are known from different localities of Nepal these are *Lygodium flexuosum* (L.) Sw., *L. japonicum* (Thumb.) Sw., *L. scandens* (L.) Sw.(see Sinha & Gurung 1985, Gurung 1995). However the present author collected only two species of Lygodium and these include- *L. flexuosum*

(L.) Sw., *L. microphyllum* (Cav.) R.Br. Both these were subjected to their study. The later species eg-L. microphyllum has not reported earlier from Nepal by above workers. Although Beddome reported five species of *Lygodium* from India viz; *L. circinatum* (Sw.), *L. microphyllum* (Cav.) R. Br., *L. flexuosum* (L.) Sw., *L. japonicum* (Thumb.) Sw., *L. polystichum* (Wall.). Both the species *L. flexuosum* and *L. microphyllum* are different in shape and size. *L. microphyllum* is small and cordate shape fertile pinnulus while *L. flexuosum* has elongated fertile pinnulus. The venation pattern is entirely different in both species. *L. microphyllum* has no prominent mid vein and side veins fork several times while *L. flexuosum* has a very distinct midvein. Nayar & Kaur (1974) mentioned nearly ten species of *Lygodium* from India.

## ACKNOWLEDGEMENT

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