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1903" concluded that they account Indian liverworts work most open with the contribution of late Prof. Kashyap.

Being highly impressed with the contribution made to Indian liverworts, Prof. Groebel wrote him, "you have struck a goldmine in the western Himalaya & made a most valuable addition to our knowledge to liver-worts".

With the lateral expansion of the thallus cross partition as well as sublinear sec. portions appeared between the lamellae for the stability of the thallus. A/c to this concept, then the lower layer of the thallus in this form is morphologically a part of the lamellae. They are not only made up of a single layer of the cells but these component cells also closely resemble those of the lower epidermis.



Diagrammatic representation of the method of the origin & differentiation of the thalli from foliose ancestors. B in figure, D, represented the basement while number 1, 2 staged for the first & second "stony" respectively (Mitra sp.)

CONCLUSION:

Of the several contributions of the most imp. & outstanding have been in contributions of Prof. Kashyap on the Indian liverworts. P. Maheshwary & R.N. Kapil is in the 'Journal' "Fifty yrs of science in India (Progress of Botany)"

So that the secourably arranged leaves became basal at the points of intact resulting in a flat lamina which only one layered on either side of mid-rib. The posterior margin of leaves which are covering the leaves behind are left in the form of lamella which are thus one called in thickness. Thus a permanent feature in the genus Petalophyllum. Next, there is an elimination of the lamellae which are merely the vestige of the upper portion of the former leaves & are obviously sub efflores structure. Indications to this effect are deserved in certain thallus of Petalophyllum indicum which show only a very feeble development of lamellae. The complete disappearance of the lamellae would result in a form like Sewardiella.

Mehra [1957 (a) 1957 (b)] has also ~~at~~ attempted the derivation of the Marchantiaceae ~~is~~ isaceous thallus from a form like Pentophyllum which has simple layer thallus wing bearing the obliquely directed lamellae on its upper surface. They would result in mid-rib to the margin like those seen in Stephensoniella & in Sporelings of the Marchantiaceae. The open cavities being unsuitable for exposed cond. of life, there has a roofing of the chambers by sec. growth of the margins of the cavities resulting in regular chambers - a step which is also also recapitulated in Sporelings. In early stages this roof formation was not too regular, leaving large gaps or pores such as one seen in Stephensoniella & Riccia, but later later ~~precise~~ precise pores with regular cavities & a complex configuration were developed in adaptation to drier cond^{ns}.

Important Contribution on Indian Liverworts

From the very beginning, Indian liverworts have attracted numerous workers from different countries & from various capacities, who have contributed a lot, from time to time. But the Indian bryologists have shown much interest in the studies of liverworts of the country as compared to the Botanists of USA & UK.

1. Early record of liverworts of India:

(a) Royle (1839) presented a brief reference in his illustrations of Botany & others related branch of natural history of the Himalayan mountains.

(b) Wallich + Wright reported their collections in Synopsis 'Hepatocurum'.

(c) Griffith (1869) published some references of about 50 spp. of Indian liverworts in Dothman memoir.

(2) Mitten (1861): → Comprehensive account of Indian liverworts in "Proc of Linn Soc. 1861". He gave a systematic account of the liverworts of India collected by Hooker + Thompson from Khasia hills.

After Mitten publication significant work was done in India except from some isolated contributions by systematists, forest, botanists. Some surveyors & travellers till the end of his century.

(3) Goebel (1910) → published his paper on Monoclethium tenurum on Indian liverworts. It was on the basis of studies of this plant that he supported the reduction theory of Marchantiata.

(4) Kashyap (1914-39): - Given only imp. plants start from contribution.

(5) Gelas (1914): - Contribution on liverworts of Kashmir including 11 spp.

6) Kashyap + Pandey (1922) :- Contributed to ~~life~~ life history of Anemone indica in J.I.B.S.

Progress of Research During 1937-72 :- 7

During last four decades, ~~also~~ a large no. of contributions were made on the studies of Hepatic vegetation of India with reference to their systematic & taxonomy.

a) Chorau (1937) :- reported some new spp. of cyanodium from ~~Darje~~ Darjeeling & Baroda.

b) Chopra (1938) published the list of more than 100 spp. of Hepatiaceae. Most of them rise from South India. He published a similar list from Bengal & Himalaya.

c) P.N. Mehra (1938) studied the cytology of spp. of Tortombonia, Petallophyllum & Sarverniella. He found the chromosome no. to be $2n=18$.

d) P.N. Mehra + H.L. Mehra (1938) described the Phenaceniella a monotypic genus from India. P.N. Mehra with his collaborates made certain valuable contribution on Anthocerotaceae. He supported reduction theory on the basis of several important Marchantiaceae.

e) Mahabali (1941) showed cytology of Riccia hemata-yensis, $2n=8$. In the same year he discovered a new spp. of combeaeae - Aspiranitia - Uritines.

f) Mahabali + Chatto (1965) :- studied the structure & its cytology. He also suggested the gradual reduction of the Marchantiales.

g) Pandey + Khanna + Srivastava (1943-53) collected some specimen from Jalpokan (Darjeeling) eg - Austella,

Kheerana, Pandey & his associates strongly supported the theory Cräbel.

(h) Pandey (1960) gave a detailed account of Anthracoseptoria in his presidential address to the Indian Science Congress.

(i) Kaul, Mitra, Tripathi (1961) have described the morphogenetic response of the thallus of Marchantia to several growth substances eg - IAA, IBA, NAA, 24-D, T CPA, MH, IIBA & 2,4-D NP. Among their response, they found an inhibition of rhizoidal formation & callusing of thallus.

(j) Udvar & Chandra (1960) extracted 12 enzymes from the thalli of Riccia discolor. They are similar to those found in green tissues of higher plants. The male plants were found to have a greater enzyme activity than the female plants.

- Udvar & Chandra (1960) as have also indicate the possibility of hepatic thalli proving an excellent source for the extraction of RNA or its compounds.

One of the outcome of their researches has been in the elaboration of two important evolutionary theories! —

On the origin of thalloid from the foliose habit & the other on the origin of marchantiaceous thallus. Many bryologists have held that the thallose form in Jungermanniales were probably derived from the leafy form by acquiring a prostrate habit, followed by the disappearance of leaves & the flattening of central axis.

Mehra & Varistha (1950) have proposed a diff. theory. They start from a form like Fossombronia which is supposed to have become very much compacted & condense.