B. K. NAYAR*: On the gametophytes of

_Pleurosoriopsis makinoi_

B. K. ナヤール*：カラクサンダの配偶体について

In a recent publication in this journal (Journ. Jap. Bot. Vol. 50) Shigeo Masuyama (1975) published an account of the gametophyte of the taxonomically controversial Japanese genus _Pleurosoriopsis_ Fomin. He concluded that most of the several characteristic features of the gametophyte are associated with the rupicolous habit of the sporophyte and thus of little phylogenetic value, except the nature of the prothallial hairs, which according to him indicate some affinity to the Polypodiaceae. This appears to be a gross understatement. From the account of prothallial morphology given by Masuyama, it is obvious to any one who has long experience with gametophytes of leptosporangiate ferns, that the gametophyte morphology of _Pleurosoriopsis_ indicates close affinity with Polypodiaceae. This is all the more interesting since sporophyte of _Pleurosoriopsis_, probably on account of its extreme simplicity, does not give sufficient clues to its affinities, as is evident from the totally unconnected taxonomic positions attributed to the genus by contemporary taxonomists (included by Christensen, 1938 and Ching, 1940 in Aspleniaceae; by Copeland, 1947 in Pteridaceae; by Holttum, 1947 in Gymnogrammaceae). The unequivocally Polypodiaceous affinity of _Pleurosoriopsis_ as evidenced by gametophyte morphology is brought out below.

The spores of _P. makinoi_ (Maxim.) Fomin are of the monolette type devoid of perine as in Polypodiaceae whereas the spores of Pteridaceae as well as the Gymnogrammaceae (Nayar and Devi, 1966, 1967) are distinctly of the trilete type, and those of the Aspleniaceae (Nayar & Devi, 1964) though monolette are provided with characteristic perine. Spore germination, by the development of a transversely elongated germ filament (with no distinction between the two ends of the filament) formed by a series of divisions by walls parallel to the polar axis of the spore and devoid of a primary rhizoid, is characteristic of _Christiopteris_ (Nayar, 1967a). As in _P._

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makinoi the spores of Christiopteris are monolete, non-perinate, chlorophyllous and markedly elongated along the equatorial axis. Also, they germinate before they are shed from the sporangia, so that at shedding the spores are often 2-4 celled; all cells produced by the first few divisions of the spore are equal, resulting in a primary filament without any rhizoid and elongated along the equatorial axis of the spore, with both the ends similar. Such a condition is not found in any other fern, though as pointed out earlier (Nayar & Kaur, 1968) is probably derived from the Gleicheniaceous stock. In all Aspleniaceae, Pteridaceae and Gymnogrammaceae spore germination is of the Vittaria-type (by the formation of a wall perpendicular to the polar axis of the spore, cutting off a small rhizoid initial at the proximal pole, followed by divisions in the larger cell by walls perpendicular to the first wall). In all the Polypodiaceae the early rhizoids are brownish in color as in P. makinoi: this character is not found in the asplenioid, pteridoid and gymnogrammoid ferns.

Prothallial development of P. makinoi is typically of the Kaulinia-type (Nayar & Kaur, 1969) as in Christiopteris and other Polypodiaceae possessing ribbon-shaped prothalli (Nayar & Kaur, 1971). None of the asplenioid, pteridoid and gymnogrammoid ferns possess such development pattern. The perennial, branched, ribbon-like adult prothallus of P. makinoi devoid of a distinct apical meristem and midrib, and bearing profuse marginal rhizoids and sex organs on small superficial cushions is characteristic of Christiopteris and several other Polypodiaceae (especially of Kaulinia and its derivatives) as also the closely related family Loxogrammaceae (Nayar, 1967b). Such prothalli are found in the Vittariaceae but are not reported in any Aspleniaceae, Pteridaceae or Gymnogrammaceae. Vegetative propagation by means of prothallial gemmae as found in P. makinoi is found in the Polypodiaceous genera but occurs in all ferns having ribbon-shaped perennial prothalli. The multicellular prothallial trichomes bearing unicellular papillate branches on the penultimate cells are distinctly of the Polypodiaceous type, as pointed out by Masuyama. However, similar prothallial hairs are found in some other groups of leptosporangiate ferns as well, and may not indicate affinity if considered in isolation. But in conjunction with the other similarities as enumerated above, the Polypodiaceous hairs of P. makinoi gain significance. In contrast, the prothalli of the pteridoid- and
gymnogrammoid ferns are characteristically naked (Nayar & Kaur, 1971). Even though possessing ribbon-like prothalli, the vittarioid ferns (which are regarded as gymnogrammoid derivatives) also possess naked prothalli. The Aspleniaceae include taxa which have naked prothalli as well as those bearing glandular hairs (Momose, 1959–62). However, the prothallial hairs of Aspleniaceae do not resemble Polypodiaceous hairs.

Prothallial morphology thus indicates that *Pleurosoriopsis* is a polypodiaceous fern and is not related to the Pteridaceae, Gymnogrammaceae or Aspleniaceae. It seems to be close to *Christiopteris* and *Kaulinia* both of which as well as the kaulinioid derivatives are terrestrial ferns like *Pleurosoriopsis*. The non-indusiate, elongated, superficial sori and creeping rhizome of *Pleurosoriopsis* (Copeland, 1947) support this. Further confirmation of affinities can be had from chromosome counts and perhaps also from the nature of the juvenile leaves of *Pleurosoriopsis* (the Polypodiaceae possess simple, narrow, entire, juvenile lamina supplied by a single usually unbranched vein; a midrib is established by unequal dichotomy of the vein followed by overtopping: in the asplenioid, pteridoid and gymnogrammoid ferns the juvenile lamina is short, broad and supplied by a repeatedly dichotomized vein; a midrib is formed as a separate branch originating from the base of one of the primary branch veins of the first dichotomy).

References

ヤマアイの染色性について（渡辺清彦）Kiyohiko Watanabe: Possibility of *Mercurialis leiocarpa* as blue dye in ancient Japan

最近辻村喜一氏が「熊野に生する山あいを用いた小種（おみ）の青捺について」と云う、20頁ばかりの小冊子を送って下さった。それは学术論文と云う形のものではないが、ヤマアイの在我の我々の考証を一変させる実験である。ヤマアイがインジゴを含まぬ事は、本誌44巻314頁に久内清孝氏も書いて居られるし、又昭和46年発行の三木産業KKの「阿波藍譜・精蓝事業篇」503-512頁に、戸田隆幸。後藤健一、安村二郎三氏合著の「内地産山藍は青蓝分を含まない－分光光電光度計による山蓝および蓼蓝中のインジゴの分析」と云う報文がある。ヤマアイの葉をすりつぶしてその汁を濾紙に滴下すると、葉緑素による色斑の周囲が色の薄いシミが拡がり、暫くしてそれが青色に変る事は周知の事である。またヤマアイの葉緑素を含まぬ白色の地下茎を搾って青色の汁を滴下すると、色と青色に変る事も容易に実験出来る。然しこれは多くは数日のうちに赤変し、且つ水を入れるとこの色は溶け去るので染色性はない。

これが出州の*Mercurialis annua*でHerimidinと呼ばれるものと推定されるが、辻村氏によるとの青変は日光にさらすと著しく進み、数日日光に当てたヤマアイの乾燥体を粉末にして、少量の水で（弱アルカリが良いと思）浸出すと青色液が出来、これで布を染めて鋼塩（硫酸鋼等）で媒染するとそのまま色が定着し、水で洗しても脱色しない事を報告している。そして氏はこれが古代の山アイの染捺であろうと論じている。我々がヤマアイを用いて特に作り出す事は特有の悪臭のある事である。ヤマアイにはインジゴは無いか、アイのインジゴ、グサのトリコトミン、貝紫のディプロムインジゴ等、インジゴイドが皆悪臭のある事と何等かの関係もありそうにと思われる。

辻村氏は染料系統の方であるが、今更第一線に出てヤマアイの化学成分を追及される御意をもない様に思われるので、何方かこの問題を追及して下さる方があればと、紹介する。なお氏は和歌山県田辺市湧三栖口1580-4，〒646に住んで居られる。

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