Syo KUROKAWA*: Joint occurrence of diffractaic and barbatic acids in Parmelia, subgenus Amphigymnia (Lichenes)**

While barbatic acid is one of the commonest secondary products of lichens, having been known in number of species of Cladonia, Parmelia, Rhizocarpon, and Usnea, diffractaic acid has been reported only in a few species of Alectoria, Parmelia, and Usnea. In the genus Parmelia, barbatic acid is rather widely distributed in species of various subgenera or sections and is often accompanied with 4-O-demethylbarbatic, obtusatic, and/or norobtusatic acids. In contrast, diffractaic acid has been reported only in three species of Parmelia, P. mesogenes Nyl., P. insueta Kurokawa (Kurokawa 1967), and P. diffractaica Essl. (Esslinger 1972). Although diffractaic acid (=2-O-methylbarbatic acid) is chemically related to barbatic acid, the joint occurrence of these two acids has been known only in some specimens of Usnea diffracta Vain. (Asahina 1958, Nuno 1958) but not known in any species or specimen of Parmelia.

In the course of my study on the genus Parmelia, I recently found the joint occurrence of diffractaic and barbatic acids in four species of Parmelia, which include P. mesogenes and P. insueta and all belong to the subgenus Amphigymnia, whereas barbatic acid was not found in P. diffractaica, a species belonging to the section Irregulares, subgenus Parmelia. Two of these four species will be described as new to science in the present paper. Taxonomic relationships among these four species will be also discussed.


When the present species was described, the author (Kurokawa 1967) reported the production of atranorin, protocetraric acid, and diffractaic acid. The results of the TLC tests, however, show that barbatic acid is also produced in this species along with three substances mentioned above. Morphologically, this species resembles P. praeinsueta, except for the presence or absence of soredia,
as will be discussed under the latter species.

This species is still known only from the type locality in Papua New Guinea.

Specimen examined. Papua New Guinea. Morobe District: Middle Creak logging area, Bulolo, elevation about 850 m, S. Kurokawa 5766—holotype (TNS).

**Parmelia matudae** Kurokawa, sp. nov.

Thallus ad corticem arborum adnatus, irregulariter lobatus, griseo-bulalinus in herbario, ca 8 cm diametro; lobi rotundati, ciliis marginalibus destituti, ad margine sorediati, 6–10 mm lati, sorediis subgranulatis; superficies superior opaca, laevis, emaculata; medulla alba, sed inferior pro parte flavida; superficies inferior nigra, ad apicem lobi castanea, modice rhizinata, rhizinis nigris tenuibusque, usque 2 mm longis. Thallus ca 190 μm crassus; cortex superior ca 10 μm crassus; stratum gonidiale continuum, 30–40 μm crassum; stratum medullare 120–140 μm crassum; cortex inferior nigro-fuscus, 15–20 μm crassus. Apothecia non visa.

Fig. 1. Holotype of *Parmelia matudae* Kurokawa (×1.2).

Thallus K+ flavescens; medulla K−, C−, P−, ad partem flavidam K+ purpurea; thallus atranorinum, acidum diffractaicum, acidum barbaticum et materia flavida continens.

The present new species is closely related to *P. mesogenes* as discussed below. However, it is clearly distinguished from the latter by the presence of soredia.

This species is known only from the type locality in Mexico at present.

**Parmelia mesogenes** Nyl. in Flora 68: 609, 1855.


In 1967, the author reported the production of atranorin, diffractaic acid, and K+ pigment (yellow) in this species. The results of the TLC tests, however, show that barbatic acid is also produced along with these three substances. Barbatic acid was also demonstrated with the TLC methods in an isotype of *P. ebulliens*, which was already reduced as a synonym of *P. mesogenes* by the author (Kurokawa 1967).

Because of the joint occurrence of barbatic and diffractaic acids, *P. mesogenes* might be considered to be related to *P. insueta* and *P. matudae*. *P. mesogenes* and *P. matudae* lack cilia, whereas lobes of *P. insueta* are sparsely ciliate. Therefore, *P. mesogenes* can be considered to be more closely related to *P. matudae* than to *P. insueta*. In addition, common production of yellow pigment in the lower half of the medulla, the lack of protocetraric acid, and the sympatric distribution indicate a closer relationship between *P. mesogenes* and *P. matudae*.

According to the "Artenpaar" or species pair theory developed by Poelt (1972), asexual morphs of lichens are derived from sexual ones by the acquisition of asexual propagules such as soredia or isidia and the suppression of sexuality. When this theory is applied to *P. mesogenes* and *P. matudae*, *P. mesogenes* can be considered as the sexual or primary species and *P. matudae* as the asexual or secondary one and these two species seem to form a species pair.

*Parmelia mesogenes* may be confused with *P. myelochroa* Hale, because these two species produce atranorin, barbatic acid, and yellow pigment and lack asexual propagules. However, the thalli of *P. mesogenes* are more adnate to the substratum than in *P. myelochroa*. In *P. myelochroa*, in addition, barbatic acid is associated with obtusatic acid, as reported by Hale (1974) under *Parmotrema myelochroum* (Hale) Hale, rather than with diffractaic acid and the yellow pigment is K-.

At present, *P. mesogenes* is known from Mexico and Jamaica.

Parmelia praeinsueta Kurokawa, sp. nov.

Thallus ad corticem arborum laxe adnatus, pallido cinerascens, irregulariter lobatus, ca 11 cm diametro; lobi rotundati, isidiis sorediisque destituti, 4-10 mm lati, in margine sparsissime ciliati, ciliis usque 1 mm longis; superficies superior opaca, emaculata; medulla alba; superficies inferior nigra, ad apicem lobi castanea, sparsim rhizinata, rhizinis nigris, usque 1 mm longis. Thallus 180-280 μm crassus; cortex superior 20-25 μm crassus; stratum gonidiale subcontinuum, 20-30 μm crassum; stratum medullare 120-200 μm crassum; cortex inferior fusco-niger, ca 20 μm crassus. Apothecia subsessilia, 7-10 mm diametro, disco brunneo, imperforato, amphithecio opaco, leviter maculato; hymenium 90-100 μm altum; sporae 8-nae, hyalinae, simplices, 10-12×25-28 μm.

Fig. 2. Holotype of Parmelia praeinsueta Kurokawa (×1).

Thallus K+ flavescens; medulla K-, C-, P+ aurantiaco-rubescens; thallus atranorinum, acidum protocetraricum, acidum diffractaicum et acidum barbaticum continens.

The present new species resembles P. mesogenes because of the lack of soredia and isidia and the production of atranorin, diffractaic acid, and barbatic acid.
However, it is clearly distinguished by the presence of sparse cilia, the production of protocetraric acid, and the lack of K+ pigment (yellow) in the lower half of the medulla. In addition, this species seems to be endemic to Papua New Guinea, whereas *P. mesogenes* is distributed in tropical America.

This species is apparently closely related to *P. insueta*. The only difference between these two species is the presence or absence of soredia, and they can be considered to constitute a species pair, even though spores of *P. insueta* are not known at present.

*Parmelia praensisueta* may be confused with *P. elacinulata* Kurokawa, another endemic species to Papua New Guinea, which also produces atranorin and protocetraric acid. However, diffractaic and barbatic acids are never produced and cilia are more dense and distinct in *P. elacinulata*.

Specimen examined. Papua New Guinea. Morobe District: Watut Valley, ca 1500 m, epiphyte on upper branches of *Araucaria hunsteinii*, B. Grey s.n.—holotype (US) and isotype (TNS).

References

アメリカに分布し、前者は無性生殖器官が多く、後者は無性生殖器官として粉芽をも
ち、この両者は Poelt (1972) のいう Artenpaar の関係にあるものと考えられる。さら
に、無性生殖器官のない P. praeinsueta と、粉芽をつける P. insueta はともにニューデニア特産種で、この両者も同様な関係にあるものと考えられる。一方、すでにジフラクター酸の産出が報告されている P. diffractaica では、バールボチン酸は検出されなかった。なお、P. diffractaica は subgenus Parmelia に属し、マツゲゴケに近縁の種で
ある。

最近、種々の共生生物が特異かつ有用な生理活性物質を生産することが知られるに及び、
広く化学、薬学、農学等の人々からも注目されるようになった。本書は藻類と他の生物群との共生を扱った著書で、北米植物学者による第3回合同会議が1980年にカナダ・ヴァンクーヴァーで開催の折に行われた同名のシンポジウムの講演を収録する。序章を除
く9章から成り、1. 動物と藻の共生についての総論、2. サンゴと海藻藻藻、3. 有孔虫と海
藻藻藻、緑藻、珪藻など、4. 放散虫と海藻藻藻やプラシノ藻など、5. 原緑藻類 Pro-
chloron とホヤ、6. 軟体動物体内における藻緑体の生存、7. アカウキクサと藻藻アナベ
ナ、8. 地衣体における藻と菌、9. 種々植物の葉や果実内の緑藻、特に Cephaleuros と
Phycopeltis、などの共生関係に関する分類、形態、生態、生理、生化学の最近の知見
が盛られている。

Verlag, Stuttgart. ¥8,880。藻類や菌類の教科書は対象群を門や綱ごとに記述するものが多いが、また構造と機能を章ごとに取り上げて、細胞、個体、群落といった順序で
記述したものもある。本書は後に属する藻類の教科書で、序論・藻類の定義等 (1-19)
に続く細胞 (20-183), 形態 (184-258), 生殖 (259-363), 生活環 (364-383), 分類群
の概観 (384-439), 生態と分布 (440-485) と巻末の文献 (486-522) と索引 (523-549)
で構成される（カッコ内は頁数）。162頁を費した「細胞」の章は最近の電子顕微鏡によ
る研究成果もよく取り入れ、優れた内容である。著者は淡水藻の単細胞性や群体性藻類の
分類に秀で、緑藻 Chlamydomonas (1975) や Carteria (1979) などについての千
余余のモノグラフの作成やパッシャー以来の伝統をもつ "Süsswasserflora von Mit-
teleuropa" の編集・著作などで知られる当代の顕界を代表する学者の一人である。

（千原光雄）