NEW SPECIES OF PARMELIA SECT. HYPOTRACHYNA (LICHENES)

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Parmelia addita Hale, sp. nov.

Thallus ut in P. imbricatula Zahlbr., superficie isidiatus, isidiis cylindricis, subtus rhizinosus, rhizinis dichotome furcatis, sed thallo minore, acidum echinocarpicum continente differt.

Holotype: Layang Layang, Kinabalu National Park, elev. 2600 m, M. E. Hale, no. 28342, August 1964 (US).

Chemistry: Atranorin in the cortex, barbatic acid, 4-O-demethylbarbatic acid, echinocarpic acid and associated unknowns in the medulla.

Specimen examined. PHILIPPINES: Mt. Data, Mountain Prov., Hale 26059, 26382, 26385 (US). SABAH: Along Mesilau Trail, Kinabalu National Park, Hale 28557, 29049, 29277 (US). The following specimens had fumarprotocetraric acid in place of echinocarpic acid: SABAH: Along Mesilau Trail, Kinabalu National Park, Hale 28191, 29024 (US); MALAYA: Cameron Highlands, Pahang, Hale 30196 (US).

This species belongs to the pantropical isidiate P. imbricatula complex. The Asian population characteristically lacks obtusatic acid and norobtusatic acid (which are present in the type of P. imbricatula from Brazil) and is represented by P. orientalis described below. P. addita differs from P. orientalis in producing echinocarpic acid, the basis of the P + red test in the medulla. It occurs only in Asia on oaks and pines at higher elevations. Three specimens listed above are anomolous in containing furmaprotocetraric acid instead of echinocarpic acid. They are tentatively identified with P. addita pending more detailed studies on the structure of this acid. On the average P. addita is smaller and less robust than P. imbricatula or P. orientalis, the lobes narrower and more

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[1] I wish to thank Dr. C. F. Culberson, who determined the chemistry of all specimens of Parmelia addita, P. adjuncta and P. orientalis cited.

finely branched, suggesting that the echinocarpic acid population is already diverging in morphology as well as chemistry.

Parmelia adjuncta Hale, sp. nov.

Thallus ut in P. exsecta Taylor, superficie pustulatus vel crasse isidiato-pustulatus, centro pustulorum eroso nigricanteque, subtus rhizinosus, rhizinis dichotome furcatis, sed acidum echinocarpicum continente differt.

Holotype: Virgin pine forest, about 10 km N of Mt. Data, Mountain Province, Philippines, elev. about 1800 m, M.E. Hale, no. 26085, August 1964 (US).

Chemistry: Atranorin in the cortex, barbatic acid, 4-0-demethylbarbatic acid, echinocarpic acid, and three associated unknowns in the medulla.

Specimens examined. JAPAN: Mt. Mitake, Prov. Musashi, Kurokawa 50110 (TNS, US). MALAYA: Gunong Brinchang, Pahang, elev. about 2000 m, Hale 29941, 29900 (US). PHILIPPINES: Mt. Data, Hale 26191, 26207, 26324 (US), 10 km N Mt. Data, Mountain Province, Hale 26138, 26137 (US). SABAH: Kinabalu National Park: Layang Layang, Hale 29165, ridge between East and West Mesilau Rivers, Hale 29089, East Mesilau River, Hale 28486, Sosopodon Shelter, Hale 29116b, above Kambaranga, Hale 28934 (US).

Parmelia adjuncta is morphologically closely related to P. exsecta Taylor, a widespread montane Asian species with atranorin, barbatic acid, and 4-0-demethylbarbatic acid. The type of P. exsecta (FH), however, is P- and lacks echinocarpic acid. Both of these species are Asian in distribution with P. exsecta on the whole commoner, overlapping the range of P. adjuncta with extensions into Nepal. They occur on both pines and oaks in the higher elevation forests.

Parmelia nakanishii Hale, sp. nov.

Thallus ut in P. gondylophora Hale (vide Hale, 1967, fig. 7) superficie sorediatus, subtus rhizinis dichotome furcatis, sed differt materia chemica alia continente.

Holotype: Mt. LeConte (Alum Cave Trail), Great Smoky Mountain National Park, Sevier Co., Tennessee, elev. 1960 m, S. Nakanishi, no. 205, 8 May 1971 (US; isotypes in KOBE, DUKE, TNS).

Chemistry: atranorin in the cortex, echinocarpic acid, gyrophoric acid (?), and unknown substances in the medulla.

Specimens examined: TENNESSEE: Mt. Le Conte (Alum Cave Trail), Nakanishi 200, 213, 214, 217, 219 (KOBE); Mt. LeConte (Rainbow Falls Trail), Nakanishi 235 (KOBE).

This species adds another variable to the richly evolved sorediate Hypotrachnya species in the high elevation Abies forest of the Great Smoky Mountains, a list that now includes P. densirhizinata Kurok., P. gondylophora Hale, P. laevigata (Sm.) Ach., and P. rockii Zahlbr. The species must in general be separated by appropriate color or microchemical tests.

The large subapical, coarse and centrally eroding soralia are identical with those of P. gondylophora, but the chemistry is complex and unusual. The P+ reaction is caused by echinocarpic acid, previously known mostly from Asian species. The C+ rose test results from gyrophoric acid apparently or a closely related C+ substance. In addition there is at least one unknown that forms a very distinctive weakly white UV fluorescent salmon pink spot (near R_f .3) in hexane-ether-formic acid.

Parmelia nakanishii is restricted to the Abies fraseri forests of Mt. Le Conte at about 1900 m elevation, although several specimens now under study from Roan Mountain, Tennessee, may belong here too. It is still not known from nearby Clingmans Dome, where the predominant species are P. rockii (lecanoric and evernic acids) and P. gondylophora (fumarprotocetraric and sublimbatic acids). While the chemical structure of echinocarpic acid is still unknown it appears to be a depsidone related to fumarprotocetraric acid, showing the very close affinity between P. nakanishii and P. gondylophora. Parmelia gondylophora, as a matter of fact, is a much more widespread species, occuring commonly in the Smokies but also in the West Indies, Mexico, and Venezuela with a probable record (in US) from South Africa.

Parmelia orientalis Hale. sp. nov.

Thallus ut in P. imbricatula Zahlbr., superficie isidiatus, isidiis cylindricis, erectis, subtus rhizinosus, rhizinis dichotome furcatis, sed acidum obtusaticum et acidum norobtusaticum non continente differt.

Holotype: Doi Sutep, Chieng Mai, Thailand, elev. 100-1676 m, S. Kurokawa, no. 1650, 16 Feb. 1964 (US; isotypes in TNS, UPS).

Chemistry: Atranorin in the cortex, barbatic acid and 4-O-demethylbarbatic acid in the medulla (trace lecanoric acid present?).

Specimens examined: NEPAL: Helok-Baroya Khimty, Togashi s. n.

(TNS, US). PHILIPPINES: near Mt. Mandalagan, Negros Occid., elev. 850 m, Hale 26585 (US). MALAYA: Cameron Highlands, Pahang, Hale 30195 (US). SABAH: Kambaranga roadhead, Kinabalu National Park, Hale 28822 (US).

This chemical segregate of the P. imbricatula population lacks obtusatic and norobtusatic acids as well as echinocarpic or other P+ acids (see discussion under P. addita above). It is much closer in size and robustness to the South American P. imbricatula than is P+ P. addita. In general it seems to have a more westerly range in mainland Asia, being less common in the Philippines and Sabah than other species in the group.

Parmelia physodalica Hale, sp. nov.

Thallus ut in P. enderythraea Zahlbr., viridi-albicans, isidiis sorediisque destitutis, subtus rhizinosus, rhizinis dichotome furcatis, sed acidum physodalicum continente differt.

Holotype: Guasca, Cundinamarca, Colombia, E. Perez-Arbelaez, no. 1104, August 1931 (US) (Fig. 1).

Chemistry: Usnic acid in the cortex, physodalic acid in the medulla.

I first identified this as P. caraccensis Taylor, a similar yellow species with long linear lobes, very dense rhizine mat below, and norstictic, salazinic (tr.), glabinic, and usnic acids. Parmelia enderythraea Zahlbr. has identical chemistry but shorter more delicate lobes. The chemistry of P. physodalica, however, proved to be entirely different, physodalic acid, the first report of this depsidone in section Hypotrachyna. It is known only from the type collection growing apparently on rocks in the paramo region near Bogota.

Parmelia rachista Hale, sp. nov.

Thallus 6-12 cm latus, laxe adpresuss, corticola, cinereo-albida, lobis linearbus, dichotome ramosis, 1.5-3.0 mm latis, superne planus, nitidus, sorediis destitutus, apicem versus lobulascentibus, margine et praecipue apice dactyloideo-lobulato ut in figura 2, lobulis suberectis vel prostratis, dorsiventralibus, subtus niger, interdum lobis suberectis anguste albicantibus, rhizinosus, rhizinis dichotome furcatis. Apothecia ignota.

Holotype: Clingmans Dome, Great Smoky Mountains National Park, Swain Co., North Carolina, elev. 6600 ft., S. Kurokawa 6755 (no. 80 in S. Kurokawa, Lich. Rar. et Crit. Exs.), 24 Sept. 1966 (US; isotypes in TNS and other herbaria which received this exsiccate number

Chemistry: Atranorin in the cortex and anziaic acid and perlatolic acid (trace) in the medulla.

Specimens examined. TENNESSEE: Mt. Le Conte, Sevier Co., Nakanishi 203 (US, KOBE). NORTH CAROLINA: Clingmans Dome, Swain Co., Imshaug 22425 (MSC, US), Hale 33390, 33191, 33192, 33309 (US), Sheard 1489c, 1490f (CAN, US); Mt. Kephert, Degelius s.n. (US) (as P. lobulifera var. sanguineoreagens Degel., isosyntype). MEXICO: Tuxtepec-Oaxaca, Oaxaca, Nakanishi 378 (US, KOBE), 18 km SE San Cristobal, Chiapas, Hale 20286 (US). PANAMA: east side of Volcan Chiriqui, Chiriqui, Scholander s.n. (US). COLOMBIA: Paramo de Cruz Verde, Cundinamarca, Cuatrecasas 450Z (US).

This entity was first recognized by Degelius (Ark. f. Bot. 30A (3):63. 1941, plate 1) as P. lobulifera var. sanguineoreagens, but he designated var. luteoreagens (barbatic acid group present, =P. imbricatula) as the typical form of P. lobulifera. The C+ red test is caused of course by anziaic acid. I had been identifying these specimens with P. prolongata Kurok. (Hale & Kurokawa, 1965), but chromatographs showed that the chemistry of this species had been incorrectly determined. The holotype (Imshaug 23210, not 3233 as mistakenly given in the original publication) and Wetmore 3233 from the same locality are more complex in chemistry than had been previously thought from crystal tests. There are a number of spots on TLC plates indicating the presence of at least four distinct compounds, including perhaps minute traces of anziaic acid. The chief component (a large spot below anziaic in hexane-ether) is not yet determined. P. prolongata also produces a distinct pigment but no specimens of P. rachista contain pigments, the acetone residues being white. The lobules in P. rachista are also different, much more numerous and finely dissected than in P. prolongata (Fig. 2). Thus P. prolongata is now known only from Haiti, whereas P. rachista has a wide range in higher elevation montane forests from North Carolina to Columbia.

Literature Cited

Hale, M. E. 1967. New Taxa in Cetraria, Parmelia, and Parmeliopsis. Bryologist 70:414-422.

Fig. 1. Holotype of Parmelia physodalica (scale in mm).

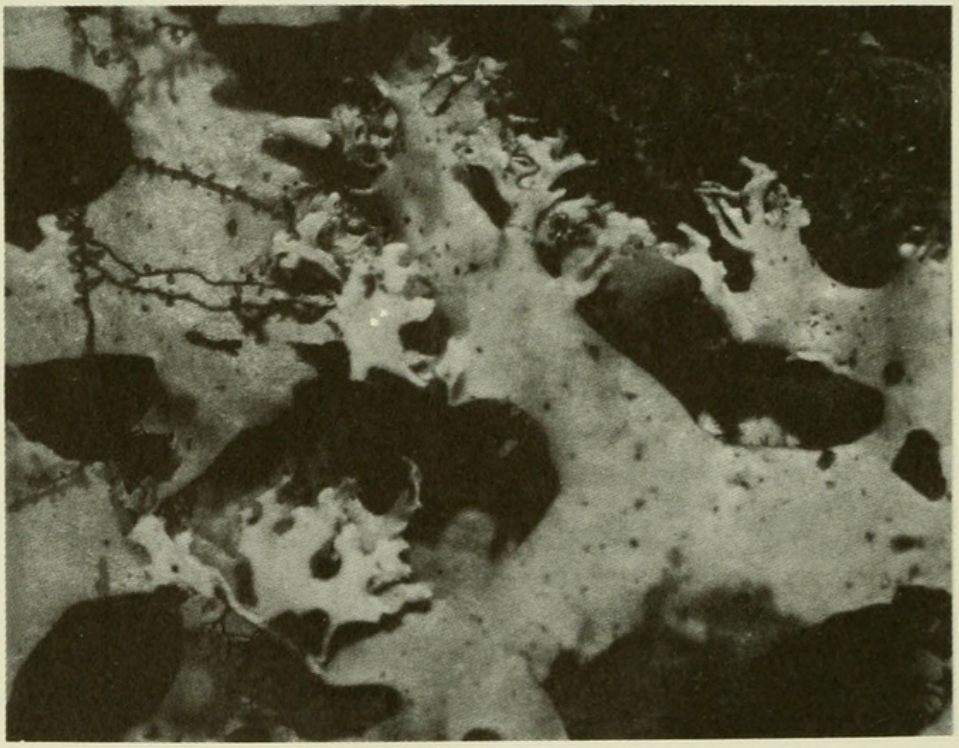

Fig. 2. Closeup of isidiate lobules of Parmelia rachista (about X10).