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Ethnic Uses of Lichens in Yunnan, China

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Abstract. *In Yunnan Province China, ethnic peoples use five species of lichens as foods (Lobaria isidiophora, L. kurokawae, L. yoshimurae, Ramalina conduplicans, and R. sinensis) and five others as health-promoting teas (Lethariella cashmeriana, L. sernanderi, L. sinensis, Thamnolia vermicularis, and T. subuliformis). Local traditions concerning the use of these lichens are described, and the natural-product chemical constituents of each species are given.*

Today the ethnic peoples of Yunnan Province, China, still continue their age-old uses of lichens for foods, beverages, and traditional medicine. Within the last decade, however, the sale of lichens for folk uses, especially for supposedly health-promoting teas, has increased remarkably as Yunnan has become a popular region for domestic tourism. During 1990–98 the first author studied these folk uses as part of a broader investigation of the lichen flora of Yunnan. He interviewed local peoples about their uses of lichens and visited ethnic markets to buy samples of the lichens offered for sale. Currently about 20 shops in the province sell lichens as foods and medicinals. The present paper summarizes the results of this ethnobotanical investigation, reporting the ten lichen species involved, the uses to which they are put, and their secondary-product chemistries.

The botanically famous Province of Yunnan lies

in the southwesternmost part of the People's Republic of China. It is bordered on the east by the provinces of Sichuan, Guizhou, and Guangxi Zhuang Zizhiqu, on the south by North Vietnam and Laos, on the west by Burma, and on the north by Tibet. Of the 26 different minority nationalities (i.e., ethnic peoples) inhabiting Yunnan today, the Dai, Yi, Bai, Naxi, and Zang still consume lichens regularly. All five of these peoples live in the northern part of the province, which is topographically the eastern part of the Himalayan Mountains.

MATERIALS AND METHODS

Voucher specimens are in the herbaria of the Kunming Institute of Botany, Academia Sinica (HKAS), and Duke University (DUKE). The CFC numbers in the listings of specimens studied refer to analyses for natural products.

Secondary products were identified by thin-layer (TLC) and high-performance liquid (HPLC) chromatography. Thallus fragments were extracted with toluene at room

temperature (3×, totaling 20 min.) and then with warm acetone (3×, totaling 20 min.). TLC used three standardized solvent systems (A, B, and C) (Culberson et al. 1981; Culberson & Johnson 1982), and HPLC used a Beckman ODS column (4.6 × 250 mm; 5 μm) with one of two solvent gradients (G80 and G60) formed by mixing methanol:water:*o*-phosphoric acid (30:70:1) (Solvent 1) with methanol. The 40-min. gradient of G80 was from 80% to 16% Solvent 1, holding at 16% for 15 min. The 40-min. gradient of G60 was from 60% to 12% Solvent 1, holding at 12% for 15 min. For both gradients, the column was flushed at 2% Solvent 1 and re-equilibrated at the initial conditions for 10 min. The flow rate was 1.0 ml/min. and detection was at 270 nm.

LICHENS USED AS FOODS

Five lichens are used in the preparation of foods. Three species of *Lobaria* are fried with pork, and two species of *Ramalina* are used to prepare cold dishes.

Lobaria isidiophora Yoshim. and *L. kurokawae* Yoshim.

Local name for both species: *qingwapi* (Dali and Binchuan Counties, Yunnan).

These two species of *Lobaria* are common foods for the Bai people living in northwestern Yunnan. In the past they were eaten primarily as famine foods, along with various barks and roots, especially by people in remote places. During the last two or three years, however, these *Lobaria* species have become available in markets in northwestern Yunnan—for example, selling in Binchuan, near Dali, for the equivalent of US\$7 per kilogram. Higuchi (1996) reported having eaten *L. kurokawae* in Yunnan.

The lichens are first soaked in boiling water for 10–30 minutes, then in fresh water for 1–2 days, and finally fried with pork. In markets of Binchuan County, the two *Lobaria* species are sometimes found packaged together, however they are easily recognized morphologically: 1) *L. isidiophora* has a thallus often exceeding 15 cm in diameter, an upper surface that is gray-green when wet, and simple to coralloid isidia on the margins and ridges of the thallus; 2) *L. kurokawae* has a thallus up to 10–15 cm in diameter, an upper surface that is brown to brown-black, wrinkled or smooth, and lacks isidia.

Chemistry.—*Lobaria isidiophora*: Gyrophoric, lecanoric (trace), stictic, cryptostictic (trace), constrictic (trace), and norstictic (trace) acids. Sichuan. Luding Co., 2,450 m, on *Picea* sp., Wang 96-16930 (CFC11505). Yunnan. Lijiang Co., Shigu village, bought in Shigu market, Wang 99-18774 (CFC11914).

Lobaria kurokawae: Thelephoric acid, retigeric

acids A and B, and unidentified triterpenoids. Yunnan. Dali, Huadianba, 2,700 m, Wang 98-18399 (CFC11915). A report of tenuiorin (Wu 1987) probably refers to a different species.

Lobaria yoshimurae Kurok. & Kashiw.

Local name: *qinwapi*, *shuhudie* (Binchuan County, Yunnan), and *laolongpi* (Mianning County, Sichuan).

The Zang (Tibetan) people of northwestern Yunnan use *L. yoshimurae* (syn. *L. gyrophorica* Yoshim.) (Kurokawa & Kashiwadani 1978) as food in years of famine. It seems inevitable, however, that they must also use the extensively sympatric and morphologically indistinguishable *L. orientalis* (Asah.) Yoshim. that produces β-orcinol depsidones in addition to gyrophoric acid and reacts PD+ instead of PD− but all our examined material was *L. yoshimurae*. Thalli are boiled in water for about 30 minutes and soaked in fresh water for 1–2 days. Usually the thalli are fried or cooked to prepare a cold dish with condiments.

Lobaria yoshimurae is very common in northwestern Yunnan, the thalli often exceeding 20 cm in diameter. The upper surface is gray-green when wet, lacks soredia and isidia, and has occasional apothecia on the thallus ridges.

Chemistry.—*Lobaria yoshimurae*: Gyrophoric and lecanoric (trace) acids.

Yunnan. Binchuan Co., bought in the Jizushan Mt. market, Wang 96-18134 (CFC11509, 11916).

Ramalina conduplicans Vain. and *R. sinensis* Jatta

Local names for *R. conduplicans*: *shouxu*, *shikuacai*, and *shuhua* (Jingu County, Yunnan) and *shihuacai* (central Yunnan). Local name for *R. sinensis*: *shuhua*.

In southwestern Yunnan, the Yi, Dai, and Han peoples cook these two species of *Ramalina* to prepare a traditional cold dish served at marriage banquets. According to the local people of Jingu County, southern Yunnan, the dish has been used in this way since ancient times, and couples who eat it at their marriage will love each other more and never separate.

In central Yunnan, however, the local people eat these *Ramalina* species at any time. In Kunming the dried lichen is readily available in public markets for about US\$4 per kilogram. About 100–300 kg are sold per year in a shop in Lijiang (see illustration on the cover of this issue). At Chuxiong, these two species are also used in a stir-fried pork dish. First the lichen is boiled in water with soda

for 10–20 minutes and then soaked in new water for 1–2 days. Sometimes the local people use the lichen with chili powder, salt, and other seasonings.

In the samples of *Ramalina* sold in the local market in Jingdong County, *R. conduplicans* and *R. sinensis* are always mixed together, usually with *R. conduplicans* in greater amount. The local people never distinguish between these two species, although they are morphologically and chemically different. The thalli of *R. conduplicans* are tufted, with branches mostly 0.5–2.0 mm broad, irregular to flattened to almost filamentous, and dichotomously branched. The thalli of *R. sinensis* are tufted, fan-shaped, to 6 cm long and 3–5 cm broad.

Chemistry.—*Ramalina conduplicans*: Usnic (trace), salazinic, and consalazinic (trace) acids and unidentified pigment SV-1 (trace). Yunnan. Lijiang Co., 2,500 m, on a bush, Wang 81-18130 (CFC11510).

Ramalina sinensis: Usnic acid (trace). Yunnan. Lijiang Co., Yulongshan Mt., Li 635 (CFC11917).

LICHENS USED AS MEDICINAL TEAS

The five species of lichens used as supposedly health-promoting teas in Yunnan are prepared in the same way as traditional Chinese green tea: boiling water is added to the dry thalli in a cup or glass, and the infusion is drunk after 3–5 minutes.

Lethariella cashmeriana Krog, *L. sernanderi* (Mot.) Obermayer, and *L. sinensis* Wei & Jiang

Local names for all species: *luxingcha* and *hong-xuecha* (Deqin, Zhongdian, and Lijiang Counties, Yunnan).

We studied materials both as sold in ethnic markets and as collected in the wild. Sold collections are frequently mixtures of the three species listed above, which all have the same orange or rusty-red color, usually with *L. sernanderi* in greatest proportion. For these lichens, we follow the recent taxonomy of *Lethariella* by Obermayer (1997, 2001). He classified the *L. cladonioides* complex, to which the first two species belong and which is variable both in morphology and secondary-product chemistry, into four species: Esorediate, shrubby (as opposed to pendulous) specimens are recognized either as *L. cashmeriana* (gyrophoric acid as the main constituent, +/- norstictic acid; main branches sharply ridged) or *L. sernanderi* (norstictic acid as the main constituent, +/- gyrophoric acid; main branches sharply or weakly ridged). All our material of the *L. cladonioides* group from Yunnan belongs to one or the other of these species. Ober-

mayer (1997) reported *L. cashmeriana* from Pakistan and China (Gansu, Sichuan, and Tibet); our record of it is apparently the first from Yunnan. He also reported *L. sernanderi* from Sikkim, Nepal, and China (Sichuan, Tibet, and Yunnan).

The two other shrubby members of this complex, *L. cladonioides* (Nyl.) Krog sens. str. (psoromic acid the main constituent, +/- gyrophoric acid; often sorediate) and *L. flexuosa* (Nyl.) Wei (same chemistry; esorediate) were not seen from Yunnan; the former is reported from India (Sikkim) and China (Tibet) and the latter from India (Sikkim), Nepal, and China (Tibet and Sichuan) (Obermayer 1997).

Mixed with the collection (Wang 81-18132) of *L. cashmeriana* and *L. sernanderi*, from Lijiang County, Yunnan, were hairlike strands of the pendulous, psoromic acid-producing *L. sinensis* (syn. *L. mieheana* Oberm.) (Obermayer 2001). It has isotomic dichotomous branching as opposed to the anisotomic dichotomous branching of *L. cashmeriana* and *L. sernanderi*. *Lethariella sinensis* was previously known from Sichuan and is here reported from the adjacent province of Yunnan for the first time.

According to a medical doctor in Lijiang, teas prepared from *Lethariella* are a traditional Tibetan medicine for lowering blood pressure and body fat. The local ethnic people drink them in the same way that Chinese people do Chinese green tea, even when they are not being used for medicinal purposes. They are also believed to be useful to reduce inflammation. This lichen has become available in shops in northwestern Yunnan during the past two to three years. It sells for the equivalent of US\$5–6 per kilogram in Lijiang and Zongdian, with about 300–500 kg being sold per year in the Lijiang shop. It is also exported to Guangdong Province. Photographs show a traditional herbalist shop (cover illustration of this issue) that offers lichens in Lijiang, Yunnan, and *Lethariella* in bulk quantities (Fig. 1) and packaged for retail sale (Fig. 2) in this shop.

Chemistry.—*Lethariella cashmeriana*: Atranorin, gyrophoric acid (major medullary constituent), lecanoric acid (trace often only by HPLC), norstictic acid (major to trace), connorstictic acid (usually only by HPLC), canarione. Yunnan. Material purchased in Yunnan, (CFC11802b,d). Lijiang Co., 3,900 m, Wang 81-18132 *pro parte* (CFC11501g-1, n-p, r, t).

Lethariella sernanderi: Atranorin, norstictic acid, connorstictic acid (trace, sometimes only by HPLC), canarione. Yunnan. Lijiang Co., bought in the market in Lijiang, Wang, 1999, (CFC11797a-l);



FIGURES 1–2. *Lethariella* and *Thamnolia* in the herbalist shop shown on the front cover of this issue. — 1. Bulk collections of *Lethariella* (right) and *Thamnolia* (left). — 2. These lichens packaged for retail sale; *Lethariella* (left) and *Thamnolia* (right).

3,900 m, Wang 81-18132 (CFC11501a-f, m, q, s). Deqen Co., 4,300 m, Wang 93-13420 (CFC11449). Commercial material purchased in Yunnan, (CFC11802a, c). Tibet. Material purchased in Yunnan but said to have come from Tibet, *Culberson* 22496 (CFC11796a-c).

Lethariella sinensis. Atranorin, psoromic acid (major), 2'-*O*-demethylpsoromic acid (minor), gyrophoric acid (moderate/trace), canarione, unidentified substance (trace; Rf classes B2C5). Sichuan. Daocheng Co., 4,200 m, on *Juniperus saltuaria*, Wang 81-2409 (CFC11913). Yunnan. Lijiang Co., 3,900 m, Wang 81-18132 *pro parte* (CFC11798). Deqin Co., Baimaxueshan Mt., 4,800m, Wang 81-2210 (CFC11912).

Thamnolia subuliformis (Ehrh.) W. Culb. and *T. vermicularis* (Sw.) Schaer.

Local name for both species: *xuecha* (Zongdian and Lijiang), meaning “a tea ingredient found only at high elevations.”

Thamnolia, which is mono- or ditypic depending upon taxonomic interpretation, is found throughout the arctic and alpine regions of the world. Highly visible and easily collected, it has been used in many folk cultures. A curious Himalayan use of these worm-shaped lichens, recalling the European idea of the Doctrine of Signatures, involves ridding buttermilk of worms by remote tribes in India (Upreti & Negi 1996). A more common use, especially in the eastern Himalayas of Yunnan, is as a tea, locally called “snow tea” and mentioned by several recent authors (Harada 1996; Kurokawa 1996; Richardson 1997).

Thamnolia has been believed to counteract inflammation and has been used in traditional Chi-

nese medicine for hundreds, perhaps thousands, of years. For the past ten years, it has been available in shops and is now also exported to Japan. A shop in Lijiang sells 500–1,000 kg each year. The current price is the equivalent of US\$3–5 per kilogram. Samples sold by the Naxi people at a market in Lijiang are a mixture of both *Thamnolia* species, which are morphologically indistinguishable. These lichens are shown (Figs. 1–2) in a shop in Lijiang, Yunnan.

Chemistry.—*Thamnolia subuliformis*: baecomycesic, squamatic, barbatic (trace), and 3- α -hydroxybarbatic (= 8-hydroxybarbatic) (trace by HPLC) acids. Yunnan. Lijiang Co., 4,100 m, Wang 81-18131A, 81-18131C (CFC11503a, 11503c).

Thamnolia vermicularis: Thamnolic and decarboxythamnolic (trace) acids. Yunnan. Same locality, Wang 81-18131B, 81-18131D (CFC11503b, 11503d).

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