

David L. HAWKSWORTH\*: **Chemical and nomenclatural notes  
on *Alectoria* (Lichenes) III\*\*.** The chemistry, morphology  
and distribution of *Alectoria virens* Tayl.

D. L. ハウクスウォース\*: バンダイキノリ属の成分と分類 III\*\*  
モエギイバラキノリの成分, 形態および分布について

*Alectoria virens* Tayl. is a member of *Alectoria* subgen. *Sulcata* (DR.) D. Hawksw. *stat. nov.* (Basionym: *Alectoria* subgen. *Bryopogon* sect. *Divaricatae* subsect. *Sulcatae* DR., *Ark. Bot.* 20A (11): 5 et 19 (1926)—Synonyms: *Alectoria* subgen. *Bryopogon* sect. *Coelocaulopsis* Choisy, *Bull. Mens. Soc. Linn. Lyon* 24: 26 (1955)—not validly published (Art. 36); *Alectoria* subgen. *Sulcaria* Mot., *Fl. Polska, Porosty* 5 (2): 39 (1962)—not validly published (Art. 37): *Typus* subgeneris est *A. sulcata* (Lév.) Nyl.—(lectotypus!) and shows considerable morphological and chemical variability. It is the purpose of this paper to discuss this variability and its taxonomic treatment on the basis of a revision of material of this species in Herb. Dr. D. D. Awasthi (duplicates in Herb. Hawksworth), BM (incl. K), Herb. Botanical Survey of India (Shillong), DUKE, E, FH, TNS and ZT.

**Chemistry** *Alectoria virens* was stated to contain vulpinic acid by Asahina (1955) and psoromic acid and atranorin by Dhar, Neelakantan, Ramanujam and Seshadri (1959). Awasthi (1961) reported a PD+ red substance and Aghoramurthy, Sarma and Seshadri (1961) re-examined the material studied by Dhar *et al.* and proved their reports to be erroneous discovering vulpinic acid and a new depsidone, virensic acid which was the cause of the PD reaction. Hawksworth (1969 a) was unable to demonstrate virensic acid by microcrystal and chromatographic tests but examination of more material of this species proved that this was because it contains races with and without virensic acid and I had previously tried to detect it in specimens lacking this acid. Virensic acid has since been found by Dr. C. F. Culberson and myself to give characteristic reddish crystals in

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\*\* II in *Taxon* 19: 237-243 (1970).

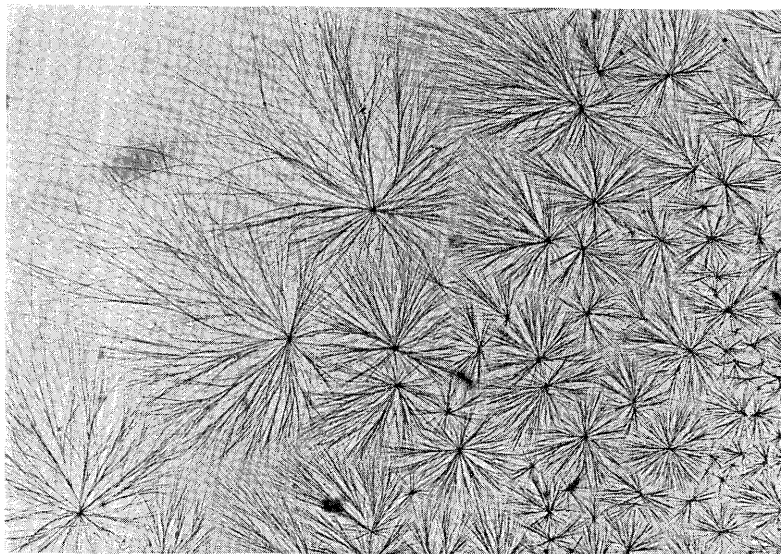


Fig. 1. Crystals of virensic acid in the G. A. *o*-T. solution prepared from the isotype of *Alectoria virens* Tayl. in BM ( $\times 55$ ).

G. A. *o*-T. (Fig. 1) and G. A. An. By microcrystal tests in G. A. *o*-T. 62.5% of the specimens (20 collections) examined contained virensic acid whilst 37.5% (12 collections) did not (see below). By thin-layer chromatography (TLC) Dr. Culberson found an unidentified PD+ compound in two collections also containing virensic acid, and pulvinic acid in two collections containing vulpinic acid but lacking virensic acid. Pulvinic acid has not previously been reported from the genus *Alectoria*. Specimens either completely lacking vulpinic acid (and therefore appearing greyish brown and not a vivid emerald green) or lacking it in parts (and therefore greyish brown in parts and vivid emerald green in others) have been described as var. *decolorans* by Asahina (1966). *A. virens* includes specimens which may or may not contain virensic acid, vulpinic acid, pulvinic acid and an unidentified PD+ substance, but none of those studied contained no lichen products.

**Morphology** Two main morphotypes occur in this species, one in which the main stems are more or less terete except at the axils and one

in which the main stems are split along the 'sulcati' (the continuous longitudinal pseudocypheolate fissures characteristic of subgen. *Sulcata*) and dorsiventrally expanded so that the medulla is exposed. The latter type is var. *forrestii* D. Hawksw., also characterised by less frequent and more irregular branching than that of var. *virens*, and a characteristically prostrate rather than a pendent habit. Some splitting also occurs, particularly near the main axils, in var. *virens*, but here the width of the branches rarely exceeds 2.0 mm and is usually less than 1.5 mm whilst in var. *forrestii* the main branches are characteristically 3-5 mm wide. Lateral spinules, which are usually constricted basally, are frequent to rare in different specimens but seem to have little taxonomic significance.

**Taxonomic treatment** The chemical race lacking virensic acid appears to have no taxonomic significance as it occurs sporadically throughout the range of the species and there is no evidence of any ecological differences; it may therefore be regarded as a chemotype (see Hawksworth, 1970). The race lacking vulpinic acid in all or part of the thallus is, however, known only from E. Nepal and Sikkim and therefore may have greater taxonomic significance, although plants completely devoid of this acid may have been overlooked for *A. sulcata* var. *barbata* D. Hawksw. which is readily distinguished microchemically (PD+ yellow, containing atranorin and psoromic acid; whilst *decolorans* is PD+ red, containing virensic acid). This race does, however, appear to parallel *A. sulcata* f. *vulpinoides* Zahlbr., known only from N. W. Yunnan (China), which differs from f. *sulcata* only in the presence of vulpinic acid and consequently should be accorded similar taxonomic status. The rank of variety is most appropriately used for chemical races with clear cut chemical differences correlated with well marked differences in either ecology or geographical distribution (see Hawksworth, 1969 b; Laundon, 1970) and so is consequently not applicable to this race which I consider should also be regarded as a form. Insufficient is known about the distribution of the unidentified PD+ compound and pulvinic acid found by Dr. Culberson to assess their significance. Pulvinic and vulpinic acids have, however, been proved to have similar biosynthetic routes (Maass and Neish, 1967; Mosbach, 1964) and differ from each other only in a single methyl group in one side chain: consequently this probably has little taxonomic significance. The taxonomic treatment of var. *forrestii* is discussed

further by Hawksworth (1969 a).

The following key illustrates the diagnostic characters of the infraspecific taxa of *A. virens* recognised by me:

- 1 (a) Thallus pendent, main stems mainly terete, to 1.5 (-2.0) mm diam, bright emerald green or greenish yellow throughout, or greyish brown throughout or in parts ..... 2  
 (b) Thallus prostrate, main stems split and expanded dorsiventrally, 3-5 mm wide, bright emerald green or greenish yellow throughout .....  
 ..... var. *forrestii* D. Hawksw.
- 2 (a) Thallus bright emerald green or greenish yellow throughout .....  
 ..... var. *virens* f. *virens*  
 (b) Thallus greyish brown throughout or with most of the main branches greyish brown and the apical parts bright emerald green or yellowish.....  
 ..... var. *virens* f. *decolorans* (Asah.) D. Hawksw.

#### Typification and Nomenclature

***Alectoria virens*** Tayl. in Lond. Journ. Bot. 6: 188 (1847).—*Bryopogon virens* (Tayl.) Gyeln. in Feddes Repert. 38: 229 (1935). Type: India, Sheopore, January 1821, Wallich (FH—holotype; BM—isotype).

f. ***decolorans*** (Asah.) D. Hawksw. stat. nov.—Basionym: *Alectoria virens* var. *decolorans* Asah. in Hara, Fl. E. Himal. 604 (1966). Type: India, Sikkim, Darjeeling, Phalut, 9 May 1960, M. Togashi (TNS—holotype; TI (not seen)—isotype).

var. ***forrestii*** D. Hawksw. in Misc. Bryol. Lichen. 5: 1 (1969). Type: China, Prov. Yunnan, Jhi Shan east of Tali Lake, lat. 25°48' N, alt. 10,000 ft., on rocks in dry open situations, August 1914, G. Forrest 13471 (E—holotype).

This species was given herbarium names independently by N. J. von Jacquin and J. D. Hooker under the genera *Alectoria* and *Evernia*, respectively, but does not appear to have been validly published by them.

Howe (1911) incorrectly regarded *A. tortuosa* Merrill [in Bryologist 12: 5 (1909)] as a synonym of *A. virens* and this has led to reports of *A. virens* in the North American literature. Motyka (1964) pointed out this error and mentioned some of the characters separating these species which, like Motyka, I consider to belong to different subgenera. *A. tortuosa* is readily

separated from *A. virens* by its nitid brownish branches, which are sometimes yellowish to greenish-yellow in parts, the absence of sulcati and lateral spinules, and the presence of pseudocyphellae which are irregularly arranged and yellow pruinose on larger branches. *A. tortuosa* appears to contain only vulpinic acid and is PD- whilst *A. virens* may be PD- (virensic absent chemotype) or PD+ red (virensic present chemotype). *A. tortuosa* appears to be restricted to the western Pacific coast of North America (British Columbia, California, Oregon and Washington) although there is one report from the eastern Carpathian mountains in Europe which I have been unable to confirm (Motyka, 1958, 1964).

**Specimens examined** The specimens examined by me during this study are listed below and the lichen products detected in them indicated (P=pulvinic acid, VI=virensic acid, VU=vulpinic acid, U=unknown PD+ compound, NC=not examined microchemically). Specimens examined by thin layer chromatography by Dr. Culberson are prefixed with an asterisk (\*); the remaining reports are based primarily on microcrystal tests.

v. **virens** f. **virens**: INDIA. East Indies, 1807, Buchanan (BM ex K), VI, VU; Assam, Hinterindien, Jenkins 315 (BM ex K), VI, VU; Sheopore, Wallich (BM, FH), VI, VU; \*Sikkim, Darjeeling, Phalut, alt. 3600 m, M. Togashi (TNS), P, VU; Sikkim, Lachen, alt. 11,000 ft., J.D. Hooker 1742 (BM ex B), VU; Sikkim, on *Abies webbiana*, tops of lofty trees, 10,000 ft., J.D. Hooker 1741 (BM ex K), VU; Sikkim, Jongri, alt. c. 1,300 ft., M.N. Bose (Hb. Awasthi s.n.), VU; [Garhwál], nr. Raiuri [Ramri], alt. 9-10,000 ft., J.F. Duthie 5224 (BM ex K), VI, VU; \*W. Himalaya, Kukinkal, a mile up Wan on the way to Roopkund, on *Rhododendron* trees, alt. 10,000 ft., collector uncertain (DUKE), VI, VU, U; N.W. Himalaya, Kürz (ZT no. 95), NC; N.W. Himalaya, Chakrata, alt. c. 7000 ft., on trees, T.R. Seshadri A29 (Hb. Awasthi no. 3413), VI, VU; N.W. Himalaya, Garhwál, Kukinkhal, alt. c. 10,000 ft., on *Rhododendron* trees, S. Pranavanand (Hb. Awasthi no. 4024), VI, VU; Himalaya, Simduhfa, alt. 12,000 ft., G. Watt 5399 (BM-2 collections), VU; N.E. Frontier Agency, Bomdila to Rahung, on trees, R.S. Rao 7359 (Hb. Bot. Survey. India, Shillong), VI, VU. NEPAL. Himalaya, no other data (BM), VI, VU; E. Nepal, below Siling Tzokupa-Siling Tzokupa (3,700 m), and return below Siling Tzokupa-Khebang (1,700 m), H. Hara *et al.* (TNS), VU; E. Nepal, Tambur River, J.D. Hooker 1740 (BM ex K), VI, VU;

E. Nepal, ascent to Sandakhpoo (India) from Nepal side, alt. 10-11,000 ft., on branches of *Virburnum* and *Berberis*, D.D. Awasthi (Hb. Awasthi no. 2462), VU. FORMOSA. \*Mt Tsu-Tson-San, Mt Ali, alt. 2300-2900 m, S. Kurokawa 166 (TNS) U, VI, VU; Mt Tsu-Tson-San, Mt Ali, alt. 2200-2600 m, S. Kurokawa 496 (TNS), VI, VU; Mt Nan-Fu-Ta-San, alt. 2600-3000 m, S. Kurokawa 1234 (TNS), VI, VU. TIBET. nr. Rima, alt. 7,000 ft., F.K. Ward 19249 (BM), VU. CHINA. Prov. Yunnan. Chienchuan-Meekong divide, 26° 36'N, 99°40'E, trees and rocks, G. Forrest 22248 (BM, E), VU; \*Meekong-Yangtze divide at Pieu-tien go, 27°66'N, 99°30'E, pendent on branches of forest trees, G. Forrest 25432 (E), P, VU; \*In montium inter Dali (Talifu) et Hodjing regione temperata jugi Dsuningko supra vicum Dienso, 26°24'N, alt. 3,400 m, trunc. viv. *Rhododendron*, H.F. v. Handel-Mazzetti 1101, Int. Sin. no. 6575 (BM ex K, E), VU.

v. **virens** f. **decolorans**: INDIA. Sikkim, Darjeeling, Phalut, M. Togashi (TNS), VI, VU p.p. NEPAL. no other data, (BM ex K), VI, VU; E. Nepal, Bilbatay Bhanjang-Tutay (2400 m)-Tinjuray (2900 m)-Hati Sar (2700 m), H. Hara *et al.* (TNS), VI alone; E. Nepal, Hati Sar-Mangalbare (2600 m)-Lam

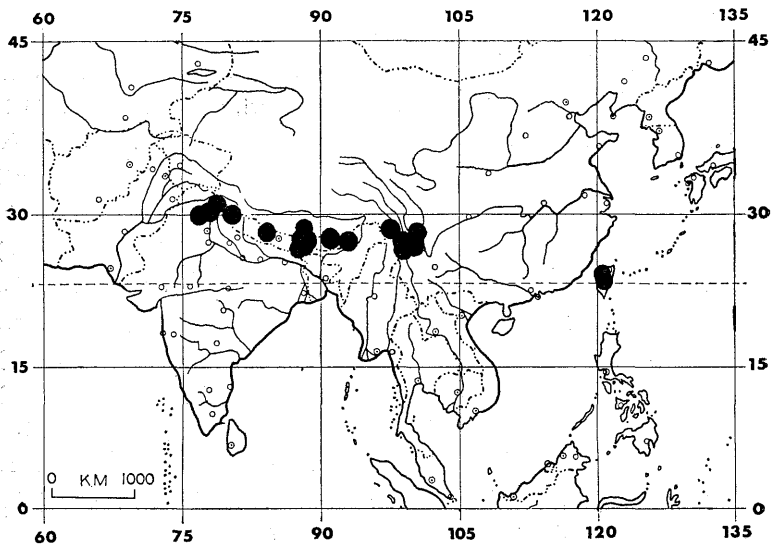


Fig. 2. Distribution map of *Alectoria virens* Tayl.

Pokhari (2900 m)-Minchin Dhap (2900 m), H. Hara *et al.* (TNS), VI, VU p. p.; E. Nepal, Mewakhola valley, alt. 11–12,000 ft., on trees, D. D. Awasthi (Hb. Awasthi no. 2270), VI, VU p. p.

v. **forrestii**: CHINA. Prov. Yunnan, Jhi Shan east of Tali Lake, 25° 48'N, alt. 10,000 ft., on rocks in dry open situations, G. Forrest 13471 (E), VI, VU; Bei-ma-Shan, 28°18'N, 99°12'E, on limestone rocks and trees in coniferous forest, G. Forrest 20808 (BM, BM ex K, E), VU. INDIA. [Himachal Pradesh], Shalai [Shali], nr. Simula [Simla], 9,000 ft, G. Watt (BM-2 collections), VI, VU.

**Distribution** The known world distribution of *A. virens* is shown in Figure 2 which is based on a compilation of reliable literature reports and specimens examined by me. The type locality (Sheopore) has not been spotted as it seems probable that the material was collected in the Western Himalayas north of this city. *A. virens* is essentially a Himalayan species occurring in Nepal, India (Assam, Sikkim, Garhwál, Dehra Dun and Himachal Pradesh areas), Tibet, and China (Prov. Yunnan) with outlying stations in the mountains of Formosa. The var. *forrestii* is known from Prov. Yunnan and Simla (Himachal Pradesh district) only. The virensic acid absent chemotype appears to occur sporadically throughout its range but has not been reported from Formosa, and f. *decolorans* appears to be confined to E. Nepal and Sikkim.

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モエギイバラキノリ (*Alectoria virens*) は *Sulcata* 亜属に属し、形態的にも化学的にもかなりの変異を示す。これらの変異を検討した結果、地衣体が垂れ下り主な分枝の断面が円形で、直径 1.5 (-2.0) mm までのものを var. *virens* とし、地衣体が多少基物上に平臥し、主な分枝に亀裂があって扁平となり、巾 3-5 mm に達するものを var. *forrestii* とした。また、var. *virens* にはプルピニン酸の含量が少なく、地衣体の大部分あるいは全体にわたって灰褐色になるものがあり、これを f. *decolorans* として区別した。モエギイバラキノリはいわゆるヒマラヤ要素の一つと考えられるが、台湾にも分布している。化学的にはプルピニン酸のほかにはビレンス酸 (*virensic acid*) を含むものがあり、ビレンス酸を含まないものと様に、分布の全域にひろがっている。また、プルピニン酸を含むもの 2 点も見つかった。

○ *Lepidium sativum* の和名らしく用いられた “Serderie” について (久内清孝) Kiyotaka HISAUCHI: The word used as the Japanese name for *Lepidium sativum* L.

ゆえあって *Lepidium sativum* についてしらべてみた。この草本は現在なお残存しているかどうか、寡聞にしてよく知らないが、江戸末期のころから明治の初期にかけ