

極西部ネパール産の *Polygonatum cirrhifolium* と *P. verticillatum* の根茎の外部及び内部形態

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Masayuki MIKAGE* and Mitsuo SUZUKI** : A Morphological Study on the Rhizomes of *Polygonatum cirrhifolium* and *P. verticillatum* (Liliaceae) from Far West Nepal

御影雅幸*・鈴木三男** : 極西部ネパール産の *Polygonatum cirrhifolium* と *P. verticillatum* の根茎の外部及び内部形態

Abstract

The rhizomes of *Polygonatum cirrhifolium* and *P. verticillatum* of Liliaceae have been used as a remedy so called "Ra-mNye" in Tibet. These plants are hard to distinguish from each other due to their similar gross morphology and anatomy. In this study, the morphology of the rhizomes collected in Far West Nepal was examined externally and internally to find a new character for distinguishing them. As a result, the rhizome of *Polygonatum cirrhifolium* is differ from *P. verticillatum* by its papillose surface. Additionally, the unknown botanical origin of the Tibetan crude drug "Ra-mNye" obtained in Kathmandu is clarified to be *Polygonatum verticillatum*.

Key words: *Polygonatum cirrhifolium*, *Polygonatum verticillatum*, Ra-mNye, rhizome anatomy, Tibetan crude drug.

The rhizomes of *Polygonatum cirrhifolium* (WALL.) ROYLE and *P. verticillatum* (L.) ALL. (Liliaceae) are used as a remedy in Tibetan traditional medical system (Tibetan medicine) under the name of "Ra-mNye", "Ra-Mo-Shag" or "Lug-Mo-Shag".

Among *Polygonatum* plants in Himalaya, *P. cirrhifolium* and *P. verticillatum* are quite similar to each other in gross morphology, on the basis of having verticillate leaves and almost same size in height. The rhizomes of these two species also similar to each other, and the former species can be distinguished from the latter only by its curly leaf tips. A morphological and anatomical study on rhizomes of these two species by NAMBA *et al.* (1991) concluded that the two have close resemblance and hard to separate them. Although their anatomical comparison was in detail, the examined rhizomes of *Polygonatum cirrhifolium* were smaller in size than those of *P. verticillatum*. Therefore, it is necessary to examine fully matured rhizomes of two species to make an adequate comparison. In addition, since the Himalayan

species have no distinguished feature for taxonomical use, the most closely related Chinese species *Polygonatum strumulosum* is used to help make a distinction. From these, it may be able to find anatomical and/or morphological differences.

In 1991, we collected many plants with well grown rhizomes of *Polygonatum* in the Far West Nepal. Those plants were identified to *Polygonatum cirrhifolium* and *P. verticillatum* based on HARA's key to the Nepalese *Polygonatum* (HARA *et al.*, 1978). Though the rhizomes of those two species are quite similar in shape and size, they could be easily distinguished by surface structure; of *Polygonatum cirrhifolium* was papillose, while that of *P. verticillatum* was almost smooth (Fig. 1). The Chinese species. *Polygonatum strumulosum* D.M. LIU *et* W.Z. ZENG, has been described to have the following characters, i. e., the rhizome with rough papillose surface and the leaves with papillae on the upper surface and margin (LIU and ZENG, 1986). Our observation of the herbarium specimens identified as *Poly-*

*Faculty of Pharmaceutical Sciences, Kanazawa University, Takaramachi 13-1, Kanazawa 920, Japan 〒 920 金沢市宝町 13-1 金沢大学薬学部

**College of Liberal Arts, Kanazawa University, Marunouchi 1-1, Kanazawa 920, Japan 〒 920 金沢市丸ノ内 1-1 金沢大学教養部

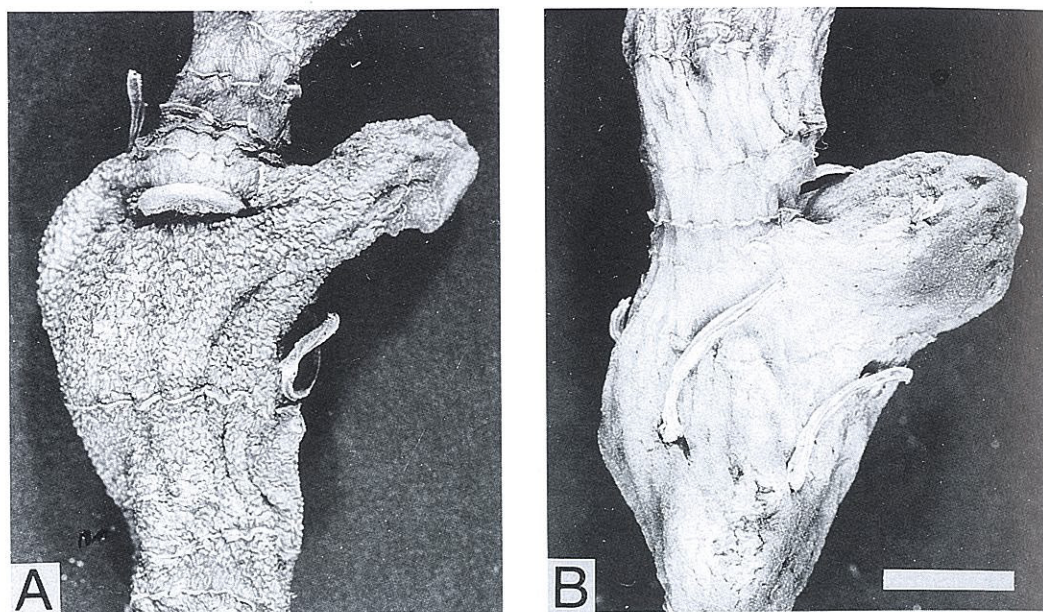


FIG. 1. The surface of the rhizome of *Polygonatum*.
A, *Polygonatum cirrhifolium*. B, *P. verticillatum*.

gonatum strumulosum by LIU D.M. and deposited in TMPW (D.M.LIU *et al.* 2306: C.X.GUAN *et al.* 1458) revealed that the plants have dense papillae leaves, and also on the stems and flower stalks, though LIU and ZENG have not reported on this character. As leaves of *Polygonatum cirrhifolium* and *P. verticillatum* used in this study have no papilla on the surface of leaves, stems nor stalks except on the leaf margin, the occurrence of papilla on plant body will be regarded as a useful taxonomical character and should be used for its classification.

Additionally, the rhizomes in our study show some anatomical differences from Chinese one reported by LIU *et al.* (1993). Therefore, re-evaluated descriptions on the rhizomes of two Himalayan species are given here. Furthermore, the botanical origin of "Ra-mNye" is also discussed.

Experimental

1. *Polygonatum cirrhifolium* (WALL.) ROYLE

Material—(Far West Nepal) Karnali Zone, Kalikot Dist., between Chaukebada and Haudi, 2, 100m alt., M. SUZUKI *et al.* 9191149[KANP].

Botanical characters of the specimen—Stems

270 cm in height. Leaves 6~8 verticillate, filiform to subulate with curly tips, 4~7 mm wide and 7~14 cm long. With magnifier, papillae recognized on the margin and near margin of upper surface of the leaf, and no papilla on the stem and flower stalk.

Outer morphology of the rhizome (Fig. 1-A) —Rhizome is moniliform in shape as like as the rhizomes of some kind of orchid such as *Bletilla striata* REICHENB. fil., 10~20 mm wide in dry. Its surface is rough and papillose-like as the shark skin in dried condition with axially long ridges, and is brown or yellowish brown in color.

Anatomical character of the rhizome (Fig. 2) —Cross section elliptical, 15×22 mm in diam. Peripheral part remarkably wavy, and the papillose-like projection triangular or semicircular, filled with normal thin-walled parenchyma cells or sometimes with corky cells. Cuticle 8~10 μm thick. Epidermal cell 25~40 × 40~70 μm (radial × tangential diam.). Parenchyma cell in the central cylinder 150~220 μm in diam. Mucilage cell of lignin free wall, including a crystal bundle of 70~120 μm long, appears mainly in the cortical part and inconspicuously in the central cylinder, 120~170 and 200~310 μm in diam.,

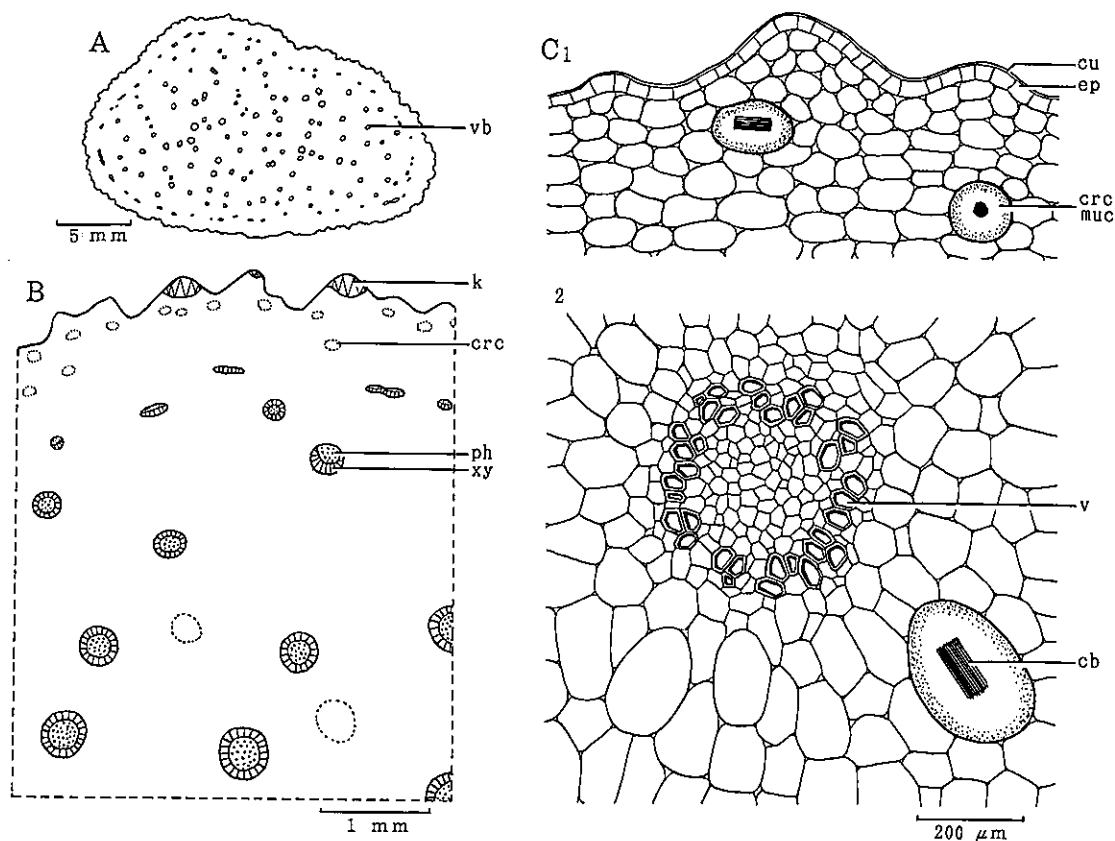


FIG. 2. The transverse section of the rhizome of *Polygonatum cirrhifolium*.

A, B, illustration. C, detailed drawings; 1, near epidermis; 2, a part of central cylinder.

Abbreviations—cb, crystal bundle; crc, crystal cell; cu, cuticle; ep, epidermis; k, projection filled with corky cells; muc, mucilage cell; ph, phloem; v, vessel; vb, vascular bundle; xy, xylem.

respectively. Vascular bundle mainly of ectoxylar concentric type, and sometimes that of collateral type recognized, 200~380 μm in diam. Vessels 40~70 μm in diam. Columnar crystal such as observed in the materials from West Nepal (Namba *et al.*, 1991) absent.

2. *Polygonatum verticillatum* (L.) ALL.

Material—(Far West Nepal) Karnali Zone, Kalikot Dist., between Chaukebada and Haudi, in *Alnus-Rhododendron* forest, 2,120 m alt., M. SUZUKI *et al.* 9191150(KANP); Bheri Zone, Dailekh Dist., between Ranimatta and Rato Hhola Ghodabas, 2,100 m alt., M. SUZUKI *et al.* 9191051(KANP); Bheri Zone, Dailekh Dist., near Beuli, 2,400 m alt., M. SUZUKI *et al.* 9191101(KANP).

Botanical characters of the specimen—Stems 100~200 cm in height. Leaves usually 4 verticillate, linear to narrow lanceolate, 8~15 mm wide and 10~15 cm long, papillae recognized on the

margin and on the vein of lower epidermis. Papillae rarely on the fruit stalk, not on the stem.

Outer morphology of the rhizome (Fig. 1-B)—Rhizome of this species is quite similar in shape to that of *Polygonatum cirrhifolium*, except that the surface is smooth and has partly small wrinkles. Color of the surface is yellowish brown.

Anatomical character of the rhizome—Cross section elliptical, 19 \times 25 mm in diam. Peripheral part almost flat. Cuticle 4~5 μm thick. Epidermal cell 25~40 \times 40~70 μm in diam. Parenchyma cell of inner part 200~250 μm in diam. Mucilage cell of 200~400 μm diam. distributes obviously in both the cortical part and central cylinder, including a crystal bundle of 100~200 μm long, and is apparently bigger than the neighboring parenchyma cells in size. No other type of crystal appears. Vascular bundle 200~500, and the vessels 40~60 μm in diam.

3. Ra-mNye (Ra-Mo-Shag)

Material—obtained from a Tibetan doctor in Kathmandu, Nepal, Nov. 1992, No. 2054(KANP).

Morphology and botanical origin—The sample, nearly 100 pieces of hard dried rhizomes, cut in pieces of 5~10 mm or more thick, 10~20 mm wide and 25~50 mm long, the outer surface yellowish brown and cut surface grayish brown in color.

Surface structures and anatomical characters are well agreeable to those of *Polygonatum verticillatum*.

Discussion

1. It is clear that rhizomes of *Polygonatum cirrhifolium* and *P. verticillatum* from the Far West Nepal can be easily distinguished morphologically from each other by the surface characteristics of rhizomes; that the former is papillose, while that of the latter is almost smooth, though they are quite similar in shape and size. This obvious feature would be very useful to identify and separate them from Tibetan crude drug "Ra-mNye", which is derived from the rhizomes of *Polygonatum* plants.
2. The botanical origin of "Ra-mNye (or Ra-Mo-Shag)" used by Tibetan doctors in Kathmandu, obtained in 1992, was identified as *Polygonatum verticillatum* based on its smooth surface.
3. The rhizomes of *Polygonatum cirrhifolium* and *P. verticillatum* are anatomically similar to each other. The differences of the type of crystals of calcium oxalate was reported as one of diagnostic characters to discriminate between them in a previous paper (NAMBA *et al.*, 1991). However, this character was not appropriate for the materials examined in this study, and only the different size of needle crystals among the two species was seen.
4. The rhizomes with rough surface and the leaf with papillose upper surface were reported as the diagnostics to *Polygonatum strumosum* differentiated from *P. cirrhifolium* (LIU and ZENG, 1986). On the basis of these characters, one may consider *Polygonatum cirrhifolium* in this study, as *P. strumosum*. But, the former plants are apparently different from the latter on account of having the leaves with smooth upper surfaces, smooth stems and smooth flower stalks. Furthermore, the rhizomes of the two species are also

different in some anatomical features (LIU *et al.*, 1993). As wide polyploid varieties with morphological variations has been reported in *Polygonatum verticillatum* (Delectis Florae Reipublicae Popularis Sinicae, 1978), such anatomical and morphological varieties of rhizomes and papilla occurrence may be also expected in Himalayan *Polygonatum*. Further taxonomical study would be necessary on *Polygonatum cirrhifolium* including polyploid ones.

5. Studying the figure of Ra-Mo-Shag written in an old Tibetan herbological book ('Jam-dpal Rdo-rje, published early in the 19th century), the botanical origin would be supposed to be *Polygonatum verticillatum* because of its non-curling verticillate leaves. However aerial parts and rhizomes of *Polygonatum cirrhifolium* and *P. verticillatum* reported in this study are quite similar morphologically and in their habitats with almost same distribution ranges. Therefore, the both species will be considered to be the botanical origin of Ra-mNye. As reported previously (NAMBA *et al.*, 1991), the rhizomes of *Polygonatum cirrhifolium* are actually used as Ra-mNye in local areas. In the Far West and West Nepal, *Polygonatum cirrhifolium* is rather poor in quantity as a medical resources than *P. verticillatum*, and this will be the reason why the rhizome of *P. cirrhifolium* is rarely circulated in town area.

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摘 要

ユリ科の *Polygonatum cirrhifolium* (WALL.) ROYLE と *P. verticillatum* (L.) ALL. の根茎はチベット医学で "Ra-mNye" の名称で薬用にされている。両

種はともに輪生葉を有する点で類似し、また根茎の形状も似ているが、ともに種内変異の大きい種である。本研究では極西部ネパールで採集した両種の根茎を互いに区別する目的で外部及び内部形態的に検討した。その結果、内部形態でも両者は区別されたが、外部形態的にも *Polygonatum cirrhifolium* の根茎表面に多数の小疣状突起があることで容易に *P. verticillatum* の根茎と区別できることが明らかになった。その結果、今回カトマンズで入手したチベット薬物 Ra-mNye の原植物は *Polygonatum verticillatum* であることが確認できた。

なお根茎表面の小疣状突起は、劉代明らにより 1986 年に新種として発表された *Polygonatum strumosum* の一特徴とされているが、本研究における実験材料を同種のタイプ標本と比較した結果、同種の地上部の特徴とされた乳頭状突起の分布と明らかな違いが見られた。本種は倍数性をも含め、さらに分類学的な検討が必要であろう。

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○日本植物分類学会(編著)レッドデータブック——日本の絶滅危惧植物 A 4 判, 143 頁。1993 年 5 月 10 日発行, 農村文化社(〒101 東京都千代田区内神田 1-3-5)。3,500 円。

1989 年に、「我が国における保護上重要な植物種および植物群落の研究委員会植物種分科会」(岩槻邦男座長)は、日本自然保護協会および世界自然保護基金日本委員会の協力を得て「我が国における保護上重要な植物種の現状」(いわゆるレッドデータブック)を発刊した。ここには科別および県別の絶滅種・絶滅危惧種・危急種・現状不明種の総数 895 種の植物が記録された。

今回出版されたレッドデータブックはこの本の普及版であり、編集は日本植物分類学会絶滅危惧植物問題検討委員会(矢原徹一委員長ほか 3 名)、執筆者は井上健氏ほか 9 名の若手の植物分類学者である。本の構成は、第 1 章 絶滅のおそれのある植物種の現状、第 2 章 絶滅のおそれのある代表的な植物、第 3 章 わが国における保護上重要な植物種リストとなっている。第 1 章は野生植物の種の保護の必要性、わが国における野生植物の生育地の現状など、ほぼ 1989 年版レッドデータブックを踏襲した内容となっている。この本の特色は、第 2 章にある。ここでは代表的な植物としてマツバラシ・ヤクダネゴヨウ・ミクリ類・アツモリソウ属・キビヒトリシズカ・ムラサキツリガネツツジなど多くの種が生育地のカラー写真とともに分り易く解説され、危急・絶滅危惧などのランクが示されている。第 3 章は 895 種の道府県別一覧表である。私はかつてヨーロッパやオーストラリアなどで絶滅危惧植物のカラー図鑑やポスターをみ、日本でこの種の出版物を出したらどんな影響がでるか危惧していたものだが、今やわが国でもヨーロッパ並みの国情になったものと感慨深いものがある。それにしても、この本の出版のかけには、名前の挙げられた各位のほかに、各地の植物研究者や愛好者など実に多くの協力者があったことを忘れるわけにはいかない。

(清水建美)

○筒井貞雄(編)福岡県植物研究会 福岡県植物目録 第 2 巻 B 5 判, グラビア 60 頁+本文 385 頁。1992 年 4 月 1 日発行, 福岡県植物研究会。頒価 8,000 円。

第 1 巻のシダ植物に続き、第 2 巻がこのほど発行された。本書は、第 1 部福岡県産種子植物標本目録と第 2 部同分布図集から成り、巻頭には生育地の植物のカラー写真 40 頁、基準標本の白黒写真 12 頁、植物図 8 頁を収める。とり上げられた植物は、裸子植物および双子葉植物綱古生花被亜綱ヤマモ科からアブラナ科まで科毎の短い解説に続く種毎の標本リストと主として分布に関する短いノートがある。第 2 部ではこれらすべての種の分布図が 5 万分の一の地形を 16 等分したメッシュ法で示されている。昨今は、生物の多様性保全の世界的な趣性とも相まって、地方植物誌の編集が期待され各地で進められるようになって来た。本書のように正確な標本に基いた植物目録の出版は、地方植物誌のあり方を示すものとして評価される。

(清水建美)