

# ネパール産生薬ニルビシの塊根の解剖学的研究

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**Anatomical Study on  
Tuberous Roots of the Nepalese Crude Drug  
Nirbisi, *Aconitum orochryseum* (Ranunculaceae)**

T.K.ラジバンドリ\*・御影雅幸\*\*・鈴木三男\*\*\* :  
ネパール産生薬ニルビシの塊根の解剖学的研究

**Abstract**

The tuberous roots of a Nepalese aconite, *Aconitum orochryseum*, was studied morphologically and anatomically. They have some prominent anatomical features, e.g., an undulate continuous cambium band and scarce cortical stone cells are in the mother root, while the same type of cambium band and no stone cells are present in the daughter tuber. Ayurvedic traditional crude drug named Nirbisi or Nirmasi, which has been used as an antidote to poison, was collected from several herb markets in Nepal and compared anatomically with the tuberous roots of *A. orochryseum*. Specimens from two markets were identified to this species, while the other specimens from different markets were not, although fundamental anatomical features of the latter also agreed with those of *Aconitum*. Nirbisi has been regarded as the roots of *Delphinium denudatum* since ancient time. In this paper, *Aconitum* is clarified as the botanical origin of Nirbisi circulated in Nepalese markets, not *Delphinium* species, and furthermore, similar drugs produced in Nepal are derived from the tuberous roots of *A. orochryseum*.

**Key Words:** *Aconitum orochryseum*—Crude drug—Nepal—Nirbisi—Nirmasi

Aconites (aconiti tuber) are well known not only as poisons but also medical resources. In Nepal, the crude drug named Nirbisi or Nirmasi, used as an antidote to poison, is available in herb markets. This drug has been regarded as the roots of *Delphinium denudatum* WALL. ex HOOK. f. et THOMS. of Ranunculaceae from the ancient time (KIRTIKAR *et al.*, 1933; Council of Science and Industrial Research, 1952; DEVKOTA, 1969), without any investigation and exact identification. However, Nirbisi collected from recent markets seemed not to be of *Delphinium* origins, rather aconites, on account of their tuberous roots. In Nepal, more than 30 wild *Aconitum* varieties are found (HARA and WILLIAMS, 1979), and the tuberous roots of several varieties have been studied anatomically (Table 1). FAUGERAS

*et al.* (1973) studied morphologically and chemically 6 Nepalese *Aconitum* species, including *A. orochryseum* STAPP, which was confirmed as the botanical origin of the Nepalese crude drug Bikhma. After checking the anatomy of Nirbisi obtained recently from several different markets against their report, although their description was quite simple, it is suggested that the botanical origin of some Nirbisi is *A. orochryseum*. This report describes anatomical studies on the tuberous roots of *A. orochryseum*, to confirm the botanical origin of these Nirbisi.

**Methods:** After swelling the materials in the tepid water, the transverse sections are made at the middle portions of tubers with hand microtome, and each section is stained with methyl green or sudan III.

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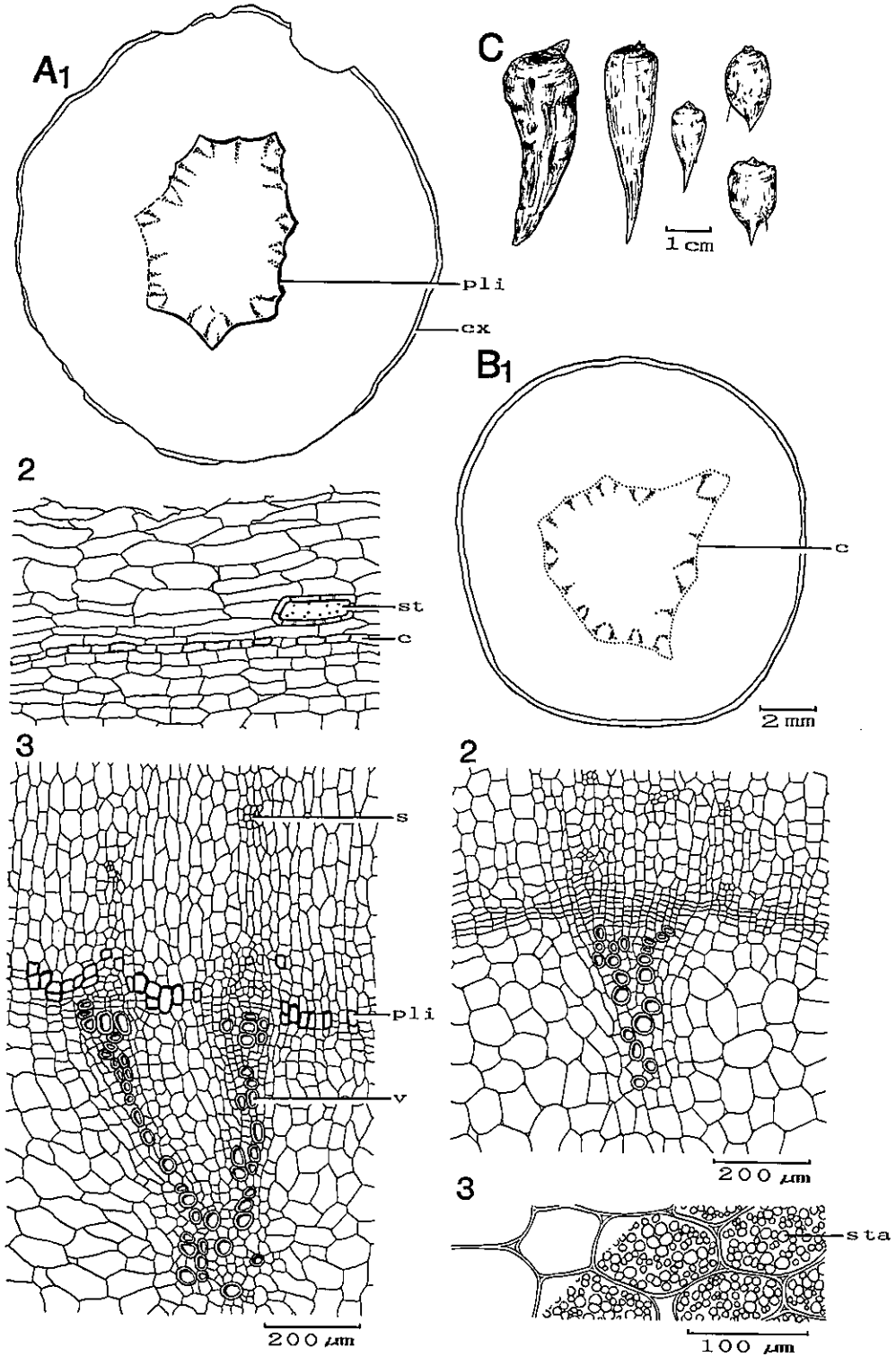


Fig. 1 *Aconitum ochryseum* (A, B) and Nepalese crude drug Nirbisi (C). A, transverse sections of the middle part of mother tuber; illustration (1), cortical portion (2) and vascular bundle (3). B, daughter tuber; illustration (1), vascular bundle (2) and starch grains in the pith (3). C, Sketches of Nirbisi. Abbreviations: c, cambium; cx, cortex; pli, lignified parenchyma cell; st, stone cell; s, sieb tube; sta, starch grain; v, vessel.

Table 1. Outer and inner morphology of daughter tubers of some Nepalese Aconite

Species	Elements	Root Shape*	Root size		Inner morphology	
			length (mm)	diameter (mm)	cambium type	stone cell
<i>A. heterophyllum</i>		Cyl	20- 40	5 -10	Anthora	absent
<i>A. bisma</i> (= <i>A. palmatum</i> )		Con to Cyl	40-100	7.5-30	Anthora	absent
<i>A. deinorrhizum</i>		elongated Con	65- 95	18 -35	Anthora var.**	present
<i>A. balfourii</i>		Con-ob	30- 70	10 -20	Anthora var.	present
<i>A. spicatum</i>		Con to Con-ob	80-150	18 -30	Napellus	present
<i>A. laciniatum</i>		Con-ob	35- 65	15 -20	Napellus	present
<i>A. orochryseum</i>		Con	30- 60	10 -15	Napellus	absent

The data of upper 6 species are summarized from the report of DATTA *et al.* (1945), and those of the last one are the results observed in this study.

\* : Cyl, cylindrical; Con, conical; Con-ob; conic-oblong.

\*\* : Anthora variation type.

### Results

*Aconitum orochryseum* STAPP (Fig. 1): Suikar, Gandaki Zone, T. K. RAJBHANDARI *et al.* 98 (D.F. P.R., H.M.G., Nepal)

Outer morphology: Both mother tuber with several small rootlets and daughter tuber are conical in shape, having dark brown outer surfaces and brown fractures. Both tubers measure about 30 mm in length and 9 to 11 mm in diameter, in dry specimens.

Inner morphology: (Mother tuber; Fig. 1-A) The transection of middle part is sinuous in outline. Most of epidermal cells are decayed off, and the outermost layer, primary cortex, consists of 5 to 8 cell layers of tangentially oblong parenchyma cells. In the cortex, stone cells measuring ca. 150  $\mu$ m in tangential and ca. 50  $\mu$ m in radial directions are scarcely recognized, and sometimes no stone cells are observed in some sections. The endodermis or even secondary cortex may be partially the outermost tissue. The cambium is Napellus type, that is, a continuous stellate band (see Table 2). One to three layers of the parenchyma cells just outside the cambium band are lignified, including phloem areas (Fig. 1-A<sub>2</sub>). No stone cells appear within endodermal ring. Many starch grains are contained in the parenchyma cells, and most of them are simple grains measuring from 5 to 15  $\mu$ m in diameter.

(Daughter tuber; Fig. 1-B) The transection of middle part is round in outline. The metaderm of one to three cell layers is recognized. The cortex is thin and peel easily, and has no stone cells. The figure of cambium band is as same as that of mother tuber, but the parenchyma cells just

outside of cambium are not lignified.

### Commercial Nirbisi and Nirmasi

All the Nirbisi and Nirmasi examined anatomically in this study consist of daughter tuber roots. Some of them are confirmed to be the tubers of *A. orochryseum*, while others are not. In the latter materials, some have the Anthora type cambium (see Table 2), and others the more extreme stellate cambium band and bigger pith parenchyma cells. The morphology of the tubers being confirmed as that of *A. orochryseum* are as follows.

Materials: Nirbisi from Gorkha market, Gandaki Zone; from Bagmati market, Kathmandu. Nirmasi from Kathmandu market, 1986, (KANP, N-109).

Outer morphology: The tubers are conical, conic-oblong, and some are elongated conical in shape, measuring from 8 to 15 mm in diameter, from 15 to 50 mm in length, in general. Nirbisi have dark brown surfaces and Nirmasi are covered with a whitish powder that is the lime for drying of tubers.

The inner morphology of the samples agrees well with those of *A. orochryseum*, on account of the Napellus type cambium, no stone cell in the sections, etc. The starch grains of some tubers are melted.

### Discussion

- 1) It was anatomically confirmed that the Nepalese crude drug Nirbisi was derived from the tuberous daughter roots of *Aconitum* plants. The botanical origins of some specimens were

Table 2. Three types in anatomical structures of biennial aconite roots  
(1 to 3, GORIS, 1901; 4, DATTA *et al.*, 1945)

1. Napellus type	.....Cambium sinuous, star shaped, always continuous.
2. Anthora type	.....Cambium breaking up into 4 isolated strands.
3. Atrox type	.....Normal central cylinder, within which a phloem-xylem ring with inverted orientataion is formed.
4. Anthora variation type	.....Isolated cambium bands embedded in secondary phloem and the centre occupied by a column of pith. The cambium bands are greater in size than those of the Anthora Type.

confirmed as *A. orochryseum*, although the botanical origin of this drug had been believed to be *Delphinium* plants for a long time.

- 2) The inner morphology of tuberous root of *A. orochryseum* is characterized by a continuous cambium band (Napellus type). In addition, the mother tuber has scarce stone cells in the cortex, whereas the daughter tuber has no stone cells.
- 3) In Nepal, Nirbisi of different botanical origins are also circulating in the markets. The anatomical features of these are quite different from those of *A. orochryseum*, because of the Anthora type cambium or extreme stellate cambium band, etc. In any case, Nepalese Nirbisi is not derived from *Delphinium* plants.
- 4) All the Nirbisi examined in this study consist of the daughter tuber of aconite. In Chinese traditional medicine, the herbal doctors usually discriminate between mother and daughter tuber of aconite for their effects; i.e. the former are more poisonous and latter more useful as a remedy for depressions (NAMBA, 1980). In Ayurveda (Indian traditional medicine), SUSHRUTA (B.C. 6-7 C; see K.L. BHISHA-GRATNA, 1963) described two types of aconite, poisonous and non-poisonous; the former is called Vatsanabha and the latter is known as Ativisha having the meaning of antidote to poison, and the latter is more widely used nowadays. Though it is generally said that the botanical origin of Vatsanabha is *Aconitum ferox* WALL. and Ativisha is *A. heterophylla* WALL. (NADKARNI, 1954), Ativisha in ancient time might be the daughter tuber of aconite because it is non-poisonous. If it is the case, it is interesting that the same part of aconite has

been used as a traditional medicine in both China and India, while many others like the Ainu race in Japan recognize it only a poison.

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### 摘 要

ネパールにおける伝統医療はアーユルヴェーダ（インド医学）に依っている。同医学で使用される薬物の一種に Nirbisi あるいは Nirmashi と称されるものがあり、解毒薬として古くから用いられ、その基源はキンポウゲ科の *Delphinium* 属植物の地下部であるとされてきた。しかし、今回ネパールの各地生薬市場で入手した Nirbisi は、その外形から同科の *Aconitum*（トリカブト）属植物の塊根であると思われ、解剖学的にもよく一致した。

一方、ネパールには 30 種以上のトリカブト属植物が分布しており、その多くが民間薬として利用されていると考えられるが、生薬学的な研究はきわめて少ない。今回ネパール中部で採集することが出来た *A. orochryseum* の内部形態の詳細については未記載であったので、その母根および子根の内部形態を検討し、市場品と比較したところ、2カ所の市場品が本種に一致した。それ以外の市場品も明らかにトリカブト属植物であったが、種のレベルで異なるものであった。トリカブト属植物の内部形態に関する過去の報告内容が断片的であるため、今回の不明種については十分な対比が行えず、それらの基源については今後の問題とした。

いずれにせよ、ネパール産の Nirbisi あるいは Nirmashi と称される生薬は、従来云われてきた *Delphinium* 属ではなく、トリカブト属植物の塊根であり、それには *A. orochryseum* も利用されていることが本研究で明らかになった。

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### ○ 照葉樹林にフウリンゴケ見つかる（土永浩史） Hiroshi DOEI: *Bartramiopsis lescurii* (JAMES) KINDB. Found in the Lucidophyllous Forest in Wakayama Prefecture

フウリンゴケはスギゴケ科に属する蘚類で本邦産 1 属 1 種である。本種は茎が細長く、葉鞘部に数本の長い多細胞の毛をもつことで、胞子体がなくとも他の種と容易に区別することができる。蒴があれば、蒴歯をもたないことも大きな特徴とされる。国外ではカムチャッカ、シベリア、北米に分布し、日本では北海道から九州の亜高山から冷温帯にかけて生育している。近畿地方では大台ヶ原・大峰山のほかには知られていなかった。

1989年9月10日、和歌山県西牟婁郡大塔村前ノ川国有林において本種を見出したので記録しておく。生育地は日置川の上流、大塔村木守から東に入った大塔山の山麓にあたる前ノ川の標高約 560 m の地点である。溪流沿いの岩壁にみられ、岩の割れ目などに数個のマットを形成していた。胞子体は見られなかった。この谷底にはタチハイゴケ *Pleurozium schureberi* (BRID.) MITT. やオヤコゴケ *Lophozia cornuta* (STEPH.) HATT. などの亜高山生の蘚苔類も見られ、植物地理学的に非常に興味ある地域である。

本種は通常は亜高山の針葉樹林帯から冷温帯の落葉広葉樹林帯にかけて見られる種で、本地域のようにウラジロガシ、アカガシ、ツクバネガシを主体とした照葉樹林に生育している例はないのではないかとと思われる。この周辺地域の大塔山系では高等植物においてもヒメイワカガミが標高約 300 m まで下降しているなど北方系の種と南方系の種が混在して見られ、複雑なフロラを示している。しかし残念なことにこの前ノ川国有林は現在伐採中で無残な姿をさらしている。なんとかこの貴重な地域を保護する手だてはないものかと考える。

Specimen examined. Honshu, Wakayama Pref., Nishimuro-gun, Ohto-mura, Maenokawa National Forest, ca. 560 m alt., on wet rock near stream, Sept. 10. 1989. H. DOEI no. 12037.

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### ○ 根井正利 分子進化遺伝学 平成 2 年 2 月 5 日発行。A 5 判、433 頁、培風館発行。定価 7910 円。

本書は、1987 年に出版された *Molecular Evolutionary Genetics* (Columbia University Press) の日本語版である。分類学者にとって、特に参考となるのは、第 11 章（系統樹）の部分であろう。私を含め、日本の一般的な分類学者のこの分野に対する知識といえば、“アミノ酸と塩基の置換速度は近似的に一定であり、系統樹の作成の優れた道具となる”という基本的な枠を出ないものではないかと思う。分子情報から系統を構築するにあたり、どのような系統作成法があり、各方法はどのようなケースに最も適しているかといった最新の知識は、