

Research note Mitsuo Suzuki¹, Koji Yonekura¹ and Shuichi Noshiro²: **Distribution and habitat of *Toxicodendron vernicifluum* (Stokes) F. A. Barkl. (Anacardiaceae) in China**
鈴木三男¹・米倉浩司¹・能城修一²: ウルシ *Toxicodendron vernicifluum*
(Stokes) F. A. Barkl. (ウルシ科) の中国における分布と生育状況

要 旨 近年、日本にはウルシ *Toxicodendron vernicifluum* が縄文時代から生育していて漆液が利用されていたことが明らかとなったが、ウルシは中国原産であり、縄文時代の初頭に中国からもたらされたと考えられている。日本で栽培されているウルシの起源をさぐる第一歩として、中国におけるウルシの分布範囲の確認と生育状況の現地調査を行った。日本では、従来ウルシ属 *Toxicodendron* とヌルデ属 *Rhus* (日本産ではヌルデのみが含まれる) は区別されてこなかったが、近年の分類学的な見解は両者を独立のものと考えている。標本調査と中国の地方植物誌によると、ウルシは北緯 25°～41°の、東は遼寧省から西は西藏自治区におよぶ広い範囲に分布していることになる。我々の調査結果では野生のウルシは湖北省西部と遼寧省本溪市に生育していたが、浙江省では自生のものを見つけることができなかった。ウルシの栽培は湖北省西部と浙江省の一部で見ることができたが、遼寧省では行われていないし、漆液の採取も行われていなかった。ウルシは、ヤマウルシとヤマハゼ、ハゼノキといった他のウルシ属植物とは生育場所が異なっており、野生ウルシの生育地にはこの3種はなく、この3種の生育地には野生ウルシは生育していなかった。

In East Asia, the lacquer of *Toxicodendron vernicifluum* (Stokes) F. A. Barkl. (= *Rhus verniciflua* Stokes) has been used as a kind of paint and an adhesive from prehistoric periods. In Japan, the oldest lacquer ware found at the Kakinoshima-B site is dated at ca. 9000 yr BP of the earliest Jomon period (Minami-kayabe Town Archaeological Research Group, 2002; Nara National Research Institute for Culture Properties, 2004). On the other hand, the oldest lacquer ware in China found at the Kuahuqiao site (跨湖橋遺跡) in Zhejiang Province is dated at ca. 7500 yr BP (Zhejiang Provincial Institute of Cultural Relics and Archaeology and Xiashan Museum, 2004). Although older lacquer wares are expected to be recovered with further excavation in China, the older age of the oldest Japanese record may imply independent origins of the lacquer utilizing culture in China and Japan. In spite of insufficient evidence, *Toxicodendron vernicifluum* has been considered as the source of prehistoric lacquer used for those lacquer wares, because other lacquer plants of Anacardiaceae such as *Toxicodendron succedaneum*, *Gluta laccifera* and *G. usitata* grow in areas to the south of Japan.

Recently the presence of *Toxicodendron vernicifluum* in Japan during the Jomon period was confirmed from studies on fossil remains excavated from archaeological sites. Yoshikawa (2006) distinguished the pollen grains of *T. vernicifluum* from those of related species native in Japan by the sculpture and identified its pollen grains at the Sannai-Maruyama and other sites of the early to middle Jomon periods in Aomori Prefecture. Yoshikawa & Ito (2005) reported the pericarp fossils of this species from the Sannai-Maruyama, Iwatari-kotani no. 4, and several other sites in Aomori Prefecture. Noshiro & Suzuki (2004) and Noshiro et al. (2007) identified the wood fossils of this species

from 25 prehistoric sites in central to northern Honshu ranging from the incipient Jomon (ca. 10,000 yr BP) to the Kofun periods (3rd–7th century AD). Thus, the source plant of prehistoric lacquer in Japan has been confirmed to be *T. vernicifluum*.

In spite of the older archaeological record in Japan than in China, most Japanese botanists believe that the lacquer tree, *Toxicodendron vernicifluum*, is not native in Japan, but was introduced from China, because it never grows in natural forests (e.g., Ohwi, 1965; Satake et al., 1989; Iwatsuki et al., 1999). The presence of *T. vernicifluum* in the prehistoric period in Japan raises questions about the origin, timing, and route of its introduction into Japan, which is important for the history of Japanese prehistoric culture. As the first step of clarifying the history of *T. vernicifluum* in Japan, we studied the present distribution and habitat of *T. vernicifluum* in China.

Taxonomy of lacquer plants

The genus *Toxicodendron* was established by Miller (1768) mainly based on the poison-ivy complex of North America, designating *T. vulgare* Mill. (= *Rhus toxicodendron* L.) as the lectotype species. Linnaeus (1753) regarded these species as members of *Rhus* L., and his view was generally accepted until recently. Detailed studies by Barkley (1937, 1940), however, showed the independence of *Toxicodendron* from *Rhus*. A recent molecular phylogenetic study (Aguilar-Ortigoza & Sosa, 2004), moreover, revealed that *Toxicodendron* is not sister to *Rhus*, but to South African *Smodingium*, revealing the distinctness of *Toxicodendron* from *Rhus*. Morphologically, *Toxicodendron* has usually drooping axillary inflorescences and eglandular exocarp, which is easily peeled from waxy mesocarp

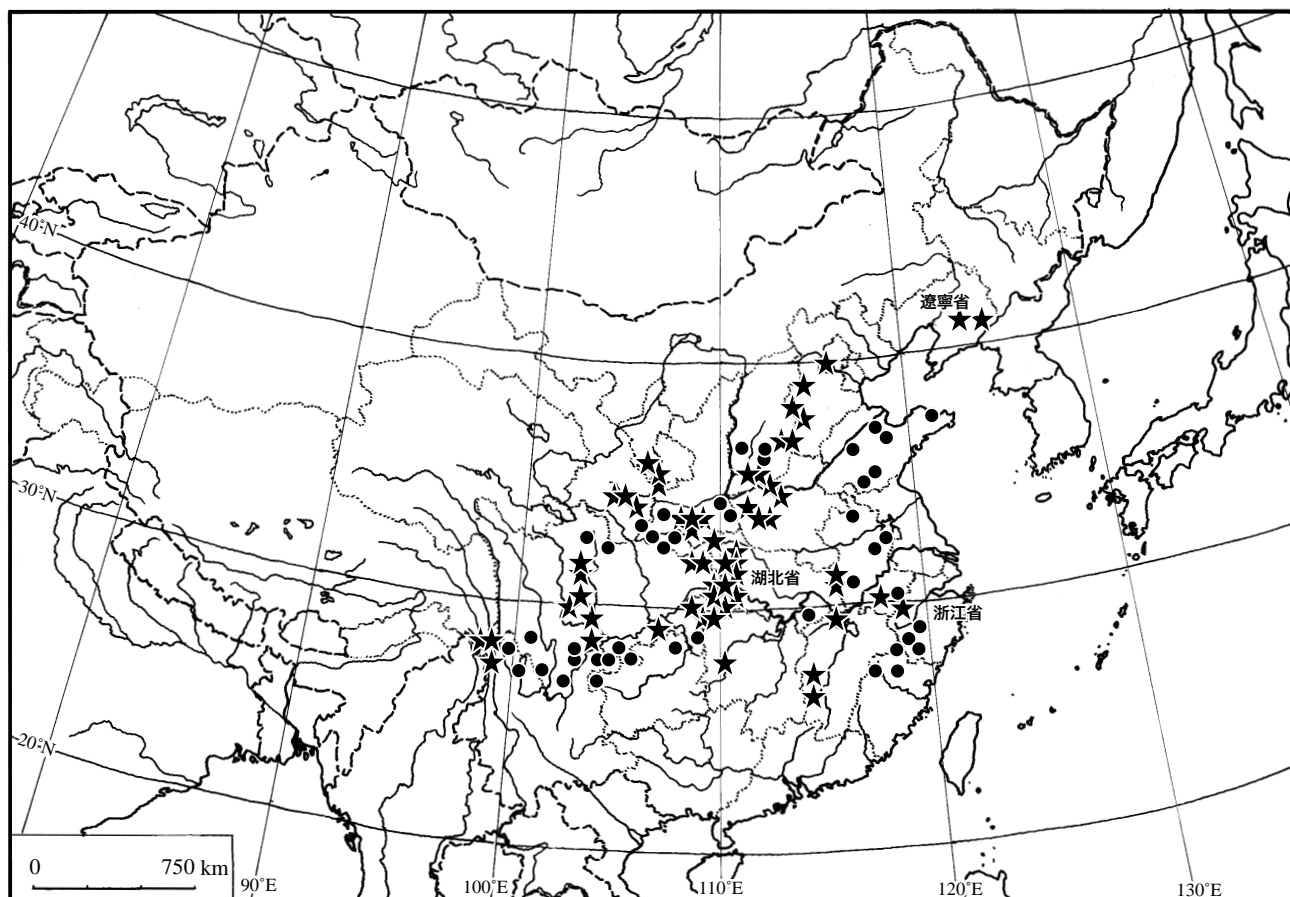


Fig. 1 Tentative distribution map of *Toxicodendron vernicifluum* in China. Stars: specimens in HIB, PE and TUS. Circles: records in local floras in China.

when mature, while *Rhus* has usually erect terminal inflorescences and glandular or rarely completely glabrous exocarp, which is adnate to fibrous mesocarp. Thus, we recognize *Toxicodendron* as a genus distinct from *Rhus* and designate the *Urushi* plant as *Toxicodendron vernicifluum* (Stokes) F. A. Barkl. (1937, 1940), which was originally described as *Rhus verniciflua* Stokes (1812). According to this classification, all the species of *Rhus* s. l. growing in Japan belong to *Toxicodendron* except for *Rhus javanica* L. (Cheng & Ming, 1980).

Tentative distribution map of *Toxicodendron vernicifluum* in China

We drew the distribution map of *Toxicodendron vernicifluum* in China based on the herbarium specimens deposited in HIB (Herbarium, Hubei Botanical Garden, Chinese Academy of Sciences, Wuhan), PE (Chinese National Herbarium, Chinese Academy of

Sciences, Beijing) and TUS (Herbarium, Botanical Gardens, Tohoku University, Sendai), and local floras in China such as *Flora Hebeiensis* (河北植物誌) 2 (1988), *Flora Shanxiensis* (山西植物誌) 3 (2000), *Flora of Zhejiang* (浙江植物誌) 3 (1993), *Flora of Anhui* (安徽植物誌) 3 (1988), *Flora Fujianica* (福建植物誌) 3 (1987), *Flora Hubeiensis* (湖北植物誌) 2 (2002), *Flora Sichuanica* (四川植物誌) 4 (1988), *Flora Yunnanica* (雲南植物誌) 2 (1979), *Flora Xizangica* (西藏植物誌) 2 (1985), and *Vascular Plants of the Hengduan Mountains* 1 (橫斷山區維管植物上冊) (1993). *Toxicodendron vernicifluum* is distributed from Liaoning Province in the east to the Xizang Province in the west between 25°N and 41°N (Fig. 1). This distribution map is, however, a tentative one, because there may be confusion in identification with other species, especially with *T. sylvestre*, in some cited local floras and because most herbarium specimens lack habitat description of “native” or “cultivated”.

Field research of *Toxicodendron vernicifluum* habitats in China

Because of ambiguity in identification and habitat information of *T. vernicifluum* in China, we carried out field researches in three provinces to observe native and cultivated plants of *T. vernicifluum* in China.

1) Hubei Province (湖北省)

We made two trips to western Hubei under the cooperation of Wuhan Botanical Garden, Chinese Academy of Sciences. On June 2005, Suzuki and Yonekura



Fig. 2 Native *Toxicodendron vernicifluum* in a secondary forest (1620 m alt.) at Lücongpo Zhen (綠葱坡), Badong Xian, Hubei Province (Sept. 21, 2006).

visited Wufeng Tujiazu Zizhixian (五峰土家族自治县) of Yichang City (宜昌市), and Xuan'en Xian (宣恩县), Enshi Shi (恩施市), and Lichuan Shi (利川市) of Enshi Tujiazu-Miao Zuzhi Zizhizhou (恩施土家族苗族自治州). On September, 2006, Suzuki, Yonekura, and Noshiro visited Zigui Xian (秭归县) and Xingshan Xian (兴山县) of Yichang City, Badong Xian (巴东县) of Enshi Tujiazu-Miao Zuzhi Zizhizhou, and Jiugongshan (九宫山) Nature Reserve in Tongshan Xian (通山县) of Xianning City (咸宁市). Geomorphologically, Hubei Province consists of the low eastern part at the western edge of Changjiang Plain (长江平原) and the mountainous western part. Except for the Jiugongshan Nature Reserve on a mountain (1543 m alt.) in the low eastern part, all localities are in the mountainous western part of ca. 1000–2000m in altitude.

The distribution of *Toxicodendron* species differs greatly between the western and eastern parts of Hubei Province. In the mountainous western part, *Toxicodendron vernicifluum* grows commonly in disturbed secondary forests between 800 and 2000 m alt. (Fig. 2) and is also cultivated around fields and within villages to collect lacquer (Fig. 3). According to the farmer we interviewed, he can collect better lacquer in larger quantities from wild trees than from cultivated ones. In the western part, other species of *Toxicodendron* seem to be quite rare, and we saw no individuals in the areas we visited in 2005 and 2006. In the eastern part, we

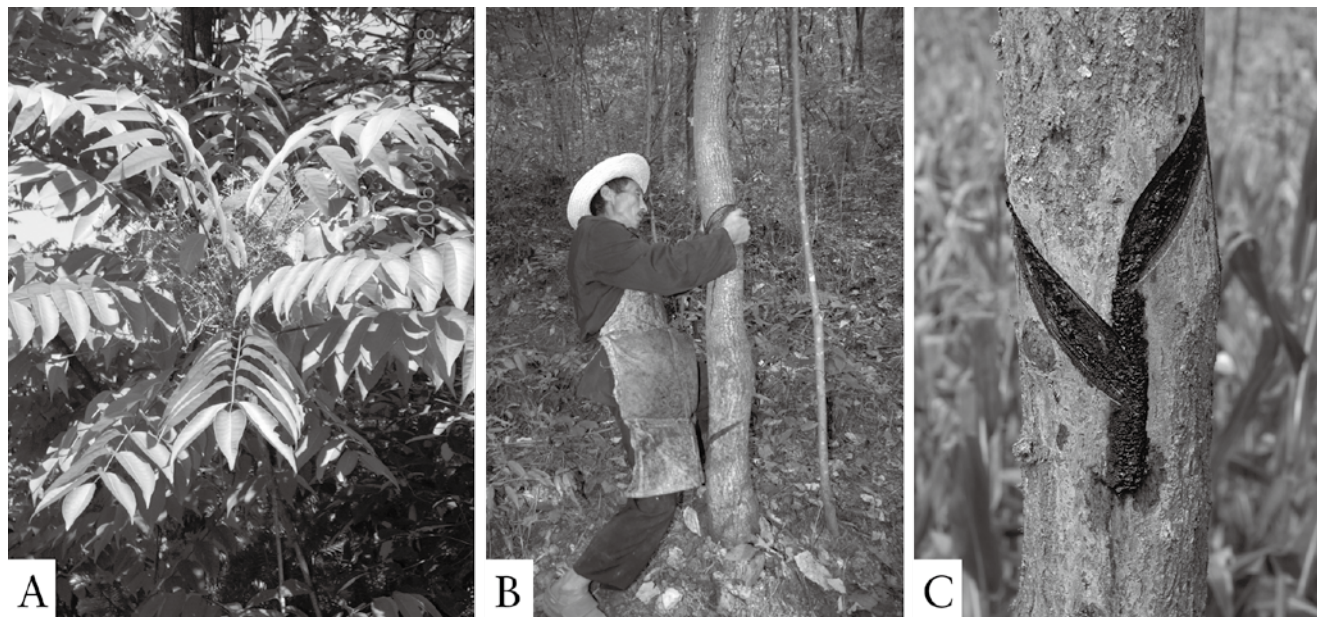


Fig. 3 Native *Toxicodendron vernicifluum* and lacquer collection in Hubei Province. — A: A shoot of a native male tree at Hupingshan (壺坪山, 1360 m alt.), Wufeng Tujiazu Zizhixian (June 14, 2005). — B: Lacquer collector in a secondary forest (1295 m alt.) at Wangerhuang Cun (王二荒村), Zigui Xian (Sept. 19, 2006). — C: Scars of lacquer collection observed in Zigui Xian area.

could see *Toxicodendron* plants only around Mt. Jiugongshan. In this area, there are no wild or cultivated trees of *T. vernicifluum*. In its stead, *T. succedaneum* and *T. sylvestre* grow between 400 and 1100 m alt. in secondary forests on mountain slopes, and *T. trichocarpum* occurs above the range of these species at 1050–1250 m alt.

2) Liaoning Province (遼寧省)

Suzuki visited Benxi Shi (本溪市), Benxi Manzu Zizhixian (本溪滿族自治縣) and Huanren Manzu Zizhixian (桓仁滿族自治縣) in Benxi Shi of Liaoning Province on June and August, 2006.

In Liaoning Province, *Toxicodendron vernicifluum* naturally grows in secondary forests mixed with deciduous trees, shrubs, and pines on the slopes of low mountains (ca. 100–400 m alt.) around villages (Fig. 4). Trees are usually small, about 2–6 m tall and 3–15 cm in diameter. The largest tree observed at Shajianzi Zhen (沙尖子鎮) of Huanren Manzu Zizhixian (210 m alt.) was 35 cm in diameter and about 10 m tall. All villagers and forest officers said that the trees are native and poisonous without any use. They know from television programs that lacquer is collected in southern provinc-



Fig. 4 Native *Toxicodendron vernicifluum* in a secondary forests of deciduous trees at Xiaoshi Zhen (小市鎮, 300 m alt.), Benxi Manzu Zizhixian, Liaoning Province (August 20, 2006).

es from the same tree, but curiously, they do not collect lacquer here. Other species of *Toxicodendron* were not observed in this province.

3) Zhejiang Province (浙江省)

Suzuki and Noshiro visited areas around Hangzhou City (杭州市) in August, 2006.

Toxicodendron vernicifluum grows only in cultivation in restricted places such as Qiantan Zhen (乾潭鎮) and Xiaoyang Zhen (小洋鎮) of Jiande Shi (建德市) in Hangzhou City (Fig. 5). Trees are planted to 11–12 yr old and felled after collection of lacquer. According to farmers, this area used to produce much lacquer, e.g., 20,000 kg in the 1930s, and was known as Yanzhou Fu (嚴州府). The production, however, decreased in the 1990s, and only a limited number of families now continue lacquer production.

In Zhejiang Province *Toxicodendron succedaneum* and *T. sylvestre* grow commonly in open evergreen forests or roadside bushes up to 500 m alt. according to our observation in Jiande Shi (建德市), Chun'an Xian (淳安縣), Tonglu Xian (桐廬縣), around Xihu (西湖) of Hangzhou City, and Anji Xian (安吉縣) of Huzhou City (湖州市). *Toxicodendron trichocarpum* occurs only in deciduous forests above 1000 m alt. such as at Qianmutian (千畝田) on Mt. Longwang Shan (龍王山, 1580 m alt.) of Anji Xian.

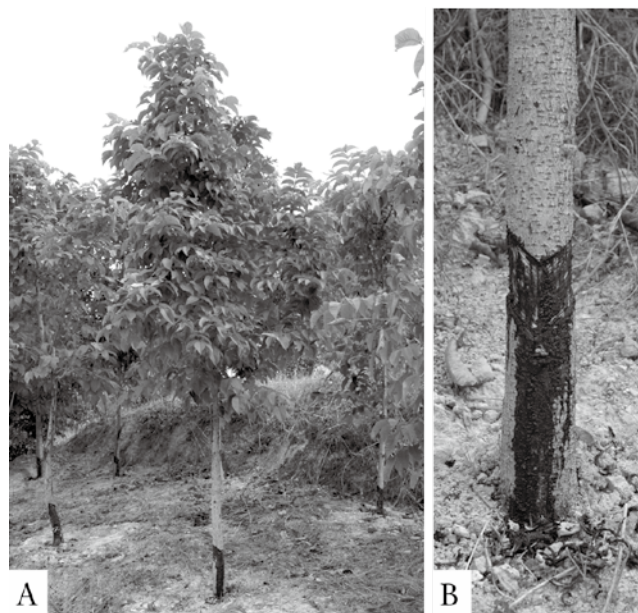


Fig. 5 Cultivated *Toxicodendron vernicifluum* at Xiaoyang Zhen (小洋鎮), Jiande Shi, Zhejiang Province (August 4, 2006). — A: Five to six years old trees each with one scar at the basal part. — B: Current year scar of lacquer collection.

Conclusion

1. Native *Toxicodendron vernicifluum* grew in the mountainous western part of Hubei Province and Benxi City of Liaoning Province, while not observed in Zhejiang Province.

2. Cultivation of *T. vernicifluum* was observed in the mountainous western part of Hubei Province and a few localities in Zhejiang Province, while there was no cultivation of the plants in Liaoning Province.

3. In the areas we visited, excepting cultivated trees, *T. vernicifluum* did not grow with other species of *Toxicodendron*, while *T. succedaneum*, *T. sylvestre*, and *T. trichocarpum* grew together within the same localities.

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