

The Identity and Distribution of *Curcuma zanthorrhiza* Roxb. (Zingiberaceae)

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Abstract

Curcuma zanthorrhiza Roxb., a widely distributed and utilized Asian species, has been misidentified in India for over 100 years. A description and colour plate of *Curcuma zanthorrhiza* are provided, with additional notes on *C. zedoaria* (Christm.) Roscoe and *C. aromatica* Salisb., which are two common misidentifications of *C. zanthorrhiza* in India. It is postulated that it is of South Indian origin and has been widely distributed by the Srivijaya civilisation that spread through SE Asia long before Western domination.

Introduction

Skornicková and Sabu (2005) provided a general introduction to the genus *Curcuma* and pointed out that the identities of many *Curcuma* species described in earlier taxonomic publications from India, including those commonly used and cultivated, are still very often unclear. One such case is discussed here in detail.

A large, handsome *Curcuma* species is widely grown in South India. It has a red patch along the midrib of the leaves that penetrates to the lower surface, a lateral inflorescence, a large branched rhizome and root tubers, which are deep orange colour inside. Resembling true turmeric (*C. longa* L.) in its orange rhizome, this is one of the most common *Curcuma* species used by local women as a face rub, medicine and sometimes also as a substitute for true turmeric.

This species is mostly referred to in both old literature and in recent Indian floras as *Curcuma zedoaria* (Christm.) Roscoe or as *C. aromatica* Salisb. Further investigation shows that descriptions of *C. zedoaria* and *C. aromatica* in the Indian literature are often confusing and misleading. These publications usually contain either a very short description based on earlier works with not many details particularly of diagnostic characters, or else they are obscure and do not match the original descriptions of either species. Descriptions of these two species in Indian floras fit our plant, however, or share a combination of characters appropriate for *C. zedoaria* and *C.*

aromatica. After critical examination of fresh flowering material, it was clear that the plant we have collected several times from different and quite distant localities was neither *C. zedoaria* (Christm.) Roscoe nor *C. aromatica* Salisb., but *C. zanthorrhiza* Roxb. and that there is a need to clarify the distinction between these three species.

***Curcuma zanthorrhiza* Roxb.**

The name *Curcuma zanthorrhiza* first appeared as a *nomen nudum* in Roxburgh's *Hortus Benghalensis* (1814). A few years later Roxburgh described it from cultivated material in the Calcutta Botanical Garden, which had been donated in 1798 by C. Smith from Amboina (nowadays called Ambon) and which flowered for the first time in April and May 1810 (Roxburgh, 1820). The main character that caught Roxburgh's attention was the deep yellow internal colour not only of the branched rhizome, but particularly of the root tubers. Usually, root tubers in *Curcuma* species are either pure white or creamy or yellowish and much lighter in colour than the central part of the rhizome and branches. Another prominent character mentioned in Roxburgh's original description is '*leaves broad lanceolar, and oblong; there is a narrow purple cloud down the middle of them, which penetrates to the underside.*'

Roxburgh (1820) in his original description did not cite any herbarium material. As explained by Forman (1997), the main difficulty in typification of Roxburgh's species lies in locating original material. Roxburgh apparently did not keep his own personal set and his collections can be found in at least 16 herbaria. Moreover, in many cases original labels have been discarded and replaced by newly written ones and, owing to lack of direct evidence, such sheets are less desirable for typification. Yet, for most of the species described by Roxburgh in *Flora Indica* there are fine life-size colour drawings, which usually also depict details of dissected flowers. Their importance has been emphasized by Sealy (1957) and further elaborated by Forman (1997) who concluded that in many cases the Roxburgh drawing is far superior to a corresponding specimen. This is particularly true for gingers considering the difficulties in preparing good and valuable specimens and the particular importance of the colours of various parts of *Curcuma* species (e.g. colour of rhizome, flower parts), which cannot be well preserved in herbarium specimens.

Recently, Newman *et al.* (2004) cited the type for *C. zanthorrhiza* as 'Icones Roxburghianae 2003 (CAL). However, there are two copies of the drawing No. 2003 available, one at K and one at CAL (Sealy, 1957; Sanjappa, 1994) and *Flora Indica* drawings have never been officially

published. Thus, one of them should be selected as the lectotype. We have been granted permission to access the *Icones Roxburghianae* at K only, leaving us unable to verify the presence and identity of a presumably identical CAL icon of *C. zanthorrhiza*.

Valeton (1918) and Holttum (1950) provided more detailed descriptions of *C. zanthorrhiza*. As already pointed out by Valeton (1918), Ridley in his earlier works (1899, 1907, 1909) also erred by associating *C. zedoaria* with the description and vernacular name *Temu Lawas*, both of which should undoubtedly be subsumed under *C. zanthorrhiza*. Subsequently Ridley (1924) cited *C. zanthorrhiza* with its proper vernacular name (*Temu Lawas*) as a cultivated species in the Malay Peninsula, but his description of *C. zedoaria* remained confusing. Based on the quite detailed descriptions of *C. aromatica* provided by Watt (1889) and Dymock *et al.* (1893), there is no doubt that they also misidentified *C. zanthorrhiza* for *C. aromatica* and that the English common names *Wild Turmeric*, *Yellow Zedoary* and *Cochin Turmeric* quoted by both Watt (1889) and Dymock *et al.* (1893) for *C. aromatica* are in fact common names of *C. zanthorrhiza*.

Curcuma zanthorrhiza Roxb., Fl. Ind. 1 (1820) 25. – **Type:** *Icones Roxburghianae* 2003 (lectotype K!, designated here)

Curcuma xanthorrhiza Roxb., Syn. Pl. 1 (1839) 19., *orth. var.*

C. aromatica auctt. non Salisb.: G. Watt, Dict. Econ. Products India 2 (1889) 655–658; W. Dymock, Pharmacographia Indica 6 (1893) 396–398; K.S.Manilal, Fl. Silent Valley. (1988) 311–312.

C. zedoaria auctt. non (Christm.) Rosc.: Ridley, J. Straits Branch Roy. Asiat. Soc. 32 (1899) 119; Materials for a Fl. Malay Penins. (1907) 21; Philipp. J. Sci. 4 (1909) 166; Mangaly & M. Sabu, Rheedeia 3 (1993) 168.

Rhizomatous herb to 2 m high. *Rhizome* branched, central part oblong, c. 8–10 x 6–8 cm, brownish orange outside, deep bright orange to yellow-orange inside, strongly aromatic with a carrot-like and camphoraceous smell and taste, slightly bitter, rhizome branches 5–15 cm long, 1.5–4 cm in diam., brownish-orange outside, deep yellow-orange to dark orange inside, youngest branches lighter in colour. *Root tubers* present at the end of 1–3 mm thick roots at 5–20 cm from the main rhizome or branches, elliptic, 3–8 x 1.5–3 cm, brown outside, usually with many small roots, deep yellow-orange inside, aromatic (less so than the main rhizome), bitter in taste. *Pseudostem* to 70 cm, green, composed of leaf sheaths and sheathed by 4–5 green bracts, innermost bracts as long as the pseudostem, outer ones gradually decreasing in length, *ligule* 2–3 mm, obscurely bilobed, hyaline, translucent greenish white, glabrous, hairy on the margin, hairs c. 0.3–0.5 mm; *leafy shoot* to 2 m tall. *Leaves* at the beginning of the season 1–3, later

to 8; *petiole* 5–20 cm (first leaves almost sessile), winged on both sides, glabrous; *lamina* oblong-lanceolate to elliptic-lanceolate, the very first leaves more elliptic, c. 30–100 x 10–28 cm, glabrous on both surfaces, adaxially deep green with red patch along both sides of midrib, particularly conspicuous in young leaves, fading with age, abaxially lighter green, the red patch is also lighter but usually visible; midrib glabrous, green to reddish on the upper side, green below; margin translucent white, c. 0.7–1 mm wide, glabrous; tip acuminate, 2–3 cm, slightly hairy; base attenuate, decurrent. *Inflorescence* invariably lateral, arising together with the leaves or shortly before. Peduncle 10–30 cm, 0.8–2 cm diam. (without scales), green, glabrous, sheathed by 4–6 green, glabrous sterile bracts, innermost bract longest, outer ones gradually smaller. *Spike* c. 15–25 (–30) x 8–14 cm. *Coma* present, forming upper third of inflorescence length, coma bracts oblong-elliptic, c. 10–17, 6.5–8.5 x 2.5–4 cm, pink to deep reddish-pink, shortly hairy on both surfaces, hairs 0.1–0.2 mm long, tip slightly mucronate, hairy, lower coma bracts sometimes fertile, upper ones sterile. *Fertile bracts* roundish-oblong, 5–6 x 4–5 cm, green, tips tinged with pink, almost glabrous, connate to one another in the lower third. *Cincinni* with 5–7 flowers. *Bracteoles* one per flower, ovate, boat-shaped, c. 3.5 x 2 cm to 1.5 x 0.7 cm (outer one larger, inner ones are gradually smaller), translucent white, glabrous, but the tip, upper part and margins sparsely hairy. *Flowers* 5–6 cm, as long as the bracts. *Calyx* 10–11 mm long, translucent white sometimes with a slight pink tinge, sparsely hairy, unilaterally split for 4–5 mm, apex with 3 teeth. *Corolla tube* 3–3.8 cm long, outside light yellow in the lower part with a light pink tinge in the upper part, glabrous, inside yellow, constricted c. 2.3 cm above the ovary, constriction densely hairy; *dorsal corolla lobe* 1.5–2.1 x 1.3–2 cm, triangular ovate, concave, glabrous, light pink or pink, apex mucronate, mucro 2–3 mm, lighter in colour, hairy, hairs 0.2–0.3 mm; *lateral corolla lobes* 1.5–1.8 x 1.5–1.7 cm, triangular with a rounded slightly concave tip, glabrous, light pink to pink, usually slightly overlapping each other at the base. *Lateral staminodes* obovate, 1.3–1.5 x 0.9–1.1 cm, light yellow, glandular hairs present on the raised middle portion. *Labellum* 1.7–2 x 1.8–2 cm, obscurely trilobed, lateral lobes folding upwards, emarginate, split c. 3 mm, light yellow at the periphery, deep yellow in the centre (golden median band). *Anther* spurred, glandular hairs present on the sides and back part of the anther, anther thecae 3.5–4 mm long, white; filament 4–5 mm long, light yellow, 3.5–4.5 mm at base, 2.5–3

Plate 1. *Curcuma zanthorrhiza* Roxb. 1. Midrib of leaf (adaxially); 2. Midrib (cross section); 3. Midrib of leaf (abaxially); 4. Inflorescence; 5. Habit; 6. Flower in open fertile bract; 7. Dissected flower; 8. Anther (front view); 9. Anther (side view); 10. Ovary and epigynous glands, cross section of ovary in upper left corner. ('kornikov' 73302 & 84107) Photo J. Škorníčková.



mm at the top. *Anther spurs* 3–4 mm long. *Stigma* white, ciliate, exserted from thecae by c. 1 mm. *Epigynous glands* two, light yellow, 4–5 mm long, 0.9–1 mm diam. *Ovary* 4–5 x 3–4 mm, trilocular, hairy, hairs c. 0.3 mm. *Fruits* not seen.

Specimens examined: **AFRICA:** Congo, Eala, 1930, *Corbisier* 980 (K); **MADAGASCAR:** II. 1880, *Hildebrant* 3348 (BM); **CHINA:** Fokien, 7. VII. 1909, *Dunn* 3547 (K); Wai-yeung, III. 1932, *Tsui* 98 (K); **INDIA:** Kerala: Kasargod District: Nilesghwar, 12.V.1982, *V.J.Nair* 73856 (CAL, MH); Cannanore District: Peria R.F., 17.IV.1966, *J.L.Ellis* 27113 (MH); Waynad District: Sulthan Bathery, Beenachi Estate, 14.V.2003, *Škorničková* 84126 (CALI, SING); Pallakad District: Silent Valley, *Sivarajan* SV 10565 (CALI); Pallakad, 10.VI.1983, *sine coll.* (*J.K. Mangaly?*) CU 10364 (CALI); Palai, 10.VI.1983, *J.K. Mangaly* CU 10365 (E); Idukki District: Kulamavu, 23.IX.2003, *Škorničková* 84166 (CALI); Nadukani, 23.IX.2003, *Škorničková* 84172 (CALI); Kollam District: Dahli, 23.IV.2003, *Škorničková* 84107 (CALI, SING); Kottayam District, Vazhoor East, 8.IV.2002, *Prasanthkumar* 86111 (CALI); Pathanamthitta District, Sabarigiri, 25.I.1984, *M. Sabu* CU37315 (CALI); Pamba, Sabarimala R.F., 24.IV.1984, *Vajravelu* 83580 (MH); Andaman Islands: Rangat District, Amkunj near Bakultala, 17.V.2002, *Škorničková* 73302 (CALI, SING); Jharkand: West Singbhum District, Khutpani, 5.VII.2003, *Škorničková* 73420 (CALI, SING); *sine loc:* Herb. Hort. Bot. Calcuttensis, *sine dat.*, *Acc. No.* MH 72400 (MH); Hortus Botanicus Calcuttensis, *sine dat.*, *Acc. No.* CAL 467008 (CAL); *sine col. et dat.* *Acc. No.* CAL 466954 (CAL); *sine col. et dat.*, *No.* 1612 (DD); presented 1871, *Wight s.n.* (MH); *sine dat.*, *Wight s.n.* (E); **SRI LANKA:** Gangaruwa, 22. VII. 1924, *Siwa* 167 (PDA); **CAMBODIA:** Koh Kong, 3. I. 2000, *Meng Monyrak* 115 (K); **MALAY PENINSULA:** Johore, 21.V. 1954, *Sinclair* 8079 (E); Johore, 21.V. 1954, *Sinclair* 40295 (BM, E, K); **SARAWAK:** Lubok Antu, 29. X. 1993, *Christensen* 1353 (K); Lundu, 19.IX. 1955, *Purseglove & Shah* P 4584 (K, SING); **JAVA:** Buitenzorg, *sine coll.*, *Col. No.* 42 (BO); West Java, VII. 2000, *M. Ardiyani* 29 MA (E); **SOUTH KALIMANTAN:** 8. XI. 1996, *Kessler et al.* PK1755 (K); **PHILIPPINES:** Mindoro: Mansalay, IV. 1903, *Merril* 908 (K); Luzon: San Francisco del Monte, *Loher* 682 (K); VI. 1904, *Loher* 7003; 3. V. 1908, *Elmer* 7003 (K); V. 1905, *Whitford* 1267 (K); Manila, 17. V. 1890, *Loher* 683 (K); **ORIGIN UNKNOWN:** 30. VII. 1999, *M. Ardiyani* 80 MA (E); 26. XI. 1978; *H.S. McKee* 36132 (E).

Flowering: In India, April and May.

Distribution and habitat: Common in South West India where it grows in

the edges of secondary forests or in the undergrowth. It is common in semi-wild conditions e.g., teak plantations, coconut groves, along roadsides and rarely also in high altitude grasslands (c. 1000 m a.s.l.), which suggests it is native in South India.

We have collected it also in the Andaman Islands from the garden of a Bengali family. It was certainly cultivated but its origin was obscure. Either it was brought from Bengal by their ancestors or other settlers, who came to the Andamans from South India, may have brought it. One recent collection was from a garden in Jharkhand, Central India, where this *Curcuma* plant is cultivated as a substitute for turmeric, *C. longa*. This is probably a recent introduction.

It is interesting to note that in India up to 1845 *C. zanthorrhiza* Roxb. was recorded only as cultivated in the East India Company's Botanical Garden in Calcutta from an introduction from Ambon (Roxburgh, 1814; Voigt, 1845). Thus, even though most probably native, widely distributed, naturalized, cultivated and commonly used in South India for centuries, *C. zanthorrhiza* is here recorded for the first time from India.

Since Roxburgh's time, *Curcuma zanthorrhiza* has been reported from Java (Valeton, 1918), Peninsular Malaysia (Holtum, 1950), Vietnam (Hô, 1993), Thailand (Larsen, 1996), the Philippines (Madulid, 1996) and China (Wu and Larsen, 2000). It is therefore not surprising that a species so widely distributed and frequently cultivated all over Asia occurs in India.

In addition to literature records, we found specimens looking identical to *Curcuma zanthorrhiza* from different parts of Africa, Madagascar, Sri Lanka, Cambodia, and Borneo (Kalimantan). From remarks on the sheets, it is obvious that most of the material was of cultivated origin.

It is difficult to establish where *Curcuma zanthorrhiza* is native because it is so widely distributed, cultivated and naturalized for centuries all over Asia and can now be found as far away as West Africa. Yet, there might be a historical explanation. During the first centuries A.D., the Srivijaya Civilisation of the Hindu Kingdom in South India started expanding through SE Asia. Based in eastern Sumatra, they dominated the Malacca and Sunda straits, which were the two main sea routes between the Indian Ocean, China Sea and Indonesia, and controlled the trade of the region. They heavily influenced cultures in SE Asia until the 13 century A.D., when Srivijaya had lost control. It is thus not surprising that the SE Asian region was, prior to Western dominance, known as *Greater India*. There is a possibility then that *C. zanthorrhiza* originated in the southern part of the Indian subcontinent and was introduced to other countries in SE Asia, perhaps as part of the spice and medicine trade. Dymock *et al.*

(1893) say that this plant is the *Vana-haridra* of Sanskrit writers (meaning 'wild turmeric') and also mention that it is the 'turmeric-coloured zedoary of Ainslie used by the Mahometans of Southern India as valuable medicine in snake bite...' and say that it was well known to Rumphius (the Dutch botanist working in Ambon in the 17th century), who called it *Tommon bezaar* or *Tommon primum*. It was from Ambon that it was brought to Calcutta where Roxburgh published it as a valid binomial. Roxburgh did not work in South India so he did not realize it was native in there. And today we know *C. zanthorrhiza* does not occur in Central and Northern India, so he would have had no access to Indian material. This partly explains the long history of misidentifying of *C. zanthorrhiza* in South India.

Etymology & orthography: Greek: zanthos (yellow) rhizos (root or rhizome).

Curcuma zanthorrhiza* versus *C. aromatica* and *C. zedoaria

Curcuma. zanthorrhiza has for a long time been misidentified as *C. zedoaria* and *C. aromatica* in India. They are all early flowering species with a lateral inflorescence, which arises shortly before the leaves appear or simultaneously with leaves, sharing in common the pink conspicuous coma and yellow flowers. The main differences among these species are shown in Table 1.

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Table 1. Comparison of important morphological characters of *Curcuma zanthorrhiza* Roxb., *C. aromatica* Salisb. and *C. zedoaria* (Christm.) Roscoe. Main diagnostic characters are in bold.

	<i>C. zanthorrhiza</i> Roxb.	<i>C. aromatica</i> Salisb.	<i>C. zedoaria</i> (Christm.) Roscoe
<i>Main rhizome</i>	branched, inwardly deep bright orange to yellow-orange colour.	branched, inwardly cream to pale brown colour.	branched, inwardly cream to white-yellowish colour.
<i>Root tubers</i>	deep yellow-orange inside.	white inside.	white inside.
<i>Leafy shoot</i>	to 2 (-2.5 m) tall.	to 1.2 m tall.	to 1 m tall.
<i>Lamina</i>	oblong-lanceolate to elliptic-lanceolate, adaxially green with red patch along the sides of midrib, particularly conspicuous in young leaves, fading with age, protruding underneath, glabrous, abaxially lighter green and visible red patch (also lighter then on adaxial side), glabrous.	oblong-lanceolate to elliptic- lanceolate, adaxially bright green, glabrous, abaxially lighter green, densely shortly pubescent.	oblong-lanceolate to elliptic- lanceolate, adaxially green with red patch along the sides of midrib, particularly conspicuous in young leaves, fading with age, glabrous, abaxially lighter green, glabrous.
<i>Flowers</i>	5—6 cm long, as long as the bracts or slightly exerted.	5—6 cm long, longer than the bracts slightly exerted.	5—6 cm long, as long as the bracts or slightly exerted.
<i>Corolla lobes</i>	conspicuously pink to reddish.	white, sometimes with slight pinkish shade toward the tips.	nearly white or with very slight pinkish shade.

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