

SHORT COMMUNICATION

Cardiocrinum giganteum (Wall.) Makino: a lesser-known traditional medicinal plant from Shi Yomi district of Arunachal Pradesh, India

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Abstract

Cardiocrinum giganteum (Wall.) Makino is a bulbous temperate giant lily species belonging to Liliaceae family and found growing at an altitude of 1500–3000 meters from MSL. It is reported as native to Eastern Himalayas including Sikkim, Bhutan and Arunachal Himalayan Region of India and extended to up to South East China and Tibet. It is also found in the Central Himalayas mainly in Uttarakhand, where it is considered as an ornamental plant. However, the plant has ethnobotanical significance in Arunachal Himalayan Region and have significant ethnopharmacological relevance. The present study aimed to explore the ethnobotanical uses of *C. giganteum* by the indigenous tribes of the Shi Yomi district of Arunachal Pradesh, India. Ethnobotanical field interview was conducted over a period of three years (2019–2022) using participant observation and semi-structured interview methods in Shi-Yomi district of Arunachal Pradesh, covering 18 villages and 94 key informants. This was followed by a systematic documentation of the traditional utilization knowledge of *C. giganteum*, collection of voucher specimens and quantitative evaluation of ethnobotanical information. The Relative Frequency of Citation (RFC) was used to determine the local significance of *C. giganteum*. This study revealed RFC value of *C. giganteum* to be 0.44, and the highest informant citations were recorded under food category. The matured seeds and stems were reported to be used in decoration and flute making. The bulb of *C. giganteum* was found to be used as a vegetable while the root paste was used for fixing the fractured bones. The bulb of *C. giganteum* was found to be consumed by the pregnant women which is believed to enhance the fetus development and have been reported as ethnobotanical novelty in present study. Although there are a few scientific reports available to date on the phytochemical and pharmacological profile of the bulb and seeds, however, there is no validation of its uses against fractured bone. Practical applications of other traditional uses of *C. giganteum* other than as food were found to be declining among the local communities of the Shi-Yomi district. At this juncture, our findings would provide a framework for reviving the diminishing traditional utilization knowledge.

Keywords: *Cardiocrinum*; Giant Himalayan Lily; Traditional Uses; Bone Fracture; Shi Yomi District; Arunachal Pradesh

1. Introduction

Cardiocrinum (Endl.) Lindl. was originally described as one of the five sections of *Lilium* in 1836 by Endlicher (Endlicher, 1836). Later the genus *Cardiocrinum* was first described in 1846 (Shu et al., 2000). *Cardiocrinum* has three species viz. *C. giganteum* and *C. cathayanum* both available in China and *C. cordatum* is reported to be available in North-East Asia like Japan and Russia. *Cardiocrinum giganteum* is the largest species attaining 3.5 m height (Figure 1A) and are also found Himalaya and Myanmar as well [(Liang and Tamura (2000) in Wu & Haven (Ed.), FOC Vol. 24, pp-134-135)]. *Cardiocrinum giganteum* (Wall.) Makino, also known as Giant Himalayan Lily is a bulbous plant species of Liliaceae family. *C. giganteum* grows in temperate biome and its native range extends from Himalaya to Central China. *C. giganteum* has two varieties: *C. giganteum* var. *giganteum*, and *C. giganteum* var. *yunnanense* (Phartyal et al., 2012). *C. giganteum* var. *giganteum* is 3 metres tall, the outer part of the flower greenish and the inside streaked with purple and found in Assam, Sikkim (India), Bhutan, Myanmar, Nepal and Tibet.

Cardiocrinum giganteum var. *yunnanense* is 1–2 meters tall, the outer part of the flower white and the inside streaked with purplish and found distributed in Chinese provinces, namely, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Shaanxi,

Sichian, Yunnan, and Myanmar. The flowers are bisexual, flowering in May to July (Liang and Tamura, 2000). The yellowish anthers of few flowers are of equal height to the stigma or higher, making them suitable for self-pollination (Figure 1C and 1D). The fruiting (Figure 1E and F) occurs from August to October. The tepals are white and oblanceolate, with brown or red streaks *C. giganteum* var. *yunnanense* is 1–2 meters tall, the outer part of the flower white and the inside streaked with purplish and found distributed in Chinese provinces, namely inside the tube and greenish outside. The leaves are broadly cordate and stems are glabrous and hollow (Gogoi, 2010; Guan et al., 2013).

Cardiocrinum giganteum has been previously reported by some workers to be used as food (Cheng et al., 2022) and medicine (Lee et al., 2008; Rana and Samant, 2011; Tamang et al., 2017; Lata, 2020). The *C. giganteum* was first reported in 2020 from Arunachal Pradesh as a minor economic crop from the Dibang Valley district by Rathi et al (2020). This report came after a gap of 184 years from its actual discovery made by Endlicher (1836). Since then, there has been no report from other regions of the state. Therefore, it calls for the need of more exploration on the genus *Cardiocrinum* and on the traditional use of the plant by the indigenous tribes of the state.



Figure 1A. *Cardiocrinum giganteum* (Wall.) Makino (Liliaceae), known as Giant Himalayan Lily collected from Shi Yomi, Arunachal Pradesh; 1B. Hollow stem of *C. giganteum* used for making flutes; 1C: Flower of *C. giganteum* (Wall.) Makino; 1D. Photo showing the long filaments (anthers attaining equal height as that of stigma facilitating self-pollination) of *C. giganteum* flower; 1E. Matured fruits; 1F: Seeds with translucent wings dehisced from matured fruits.

2. Material and methods

2.1. Study area

Shi Yomi district of Arunachal Pradesh (Figure 2) covers around 2803.02 km² and is located within a geographical coordinate between 28°15 and 29°00 N latitude and 94°00 and 94°60 E longitude (Baruah et al., 2019). The climate is significantly impacted by the topography, which ranges from subtropical in the south to temperate and alpine in the northern region. Indigenous people of the district belong to Adi tribe which comprises of sub-tribes such as Bokar, Bori, Ramo, and Pailibo, and other tribes such as Memba and Tagin.

2.2. Collection of ethnobotanical field data

Semi-structured interviews were carried out from October 2019 to July 2022 in 18 villages, namely Heyo, Korle, Lipo, Paum, Pidi, Quying, Tato, Yapik, Dorjeeling, Irgo, Lebukar, Lhalung, Monigong, Puning, Sorangdem, Thargelling, Yorko and Yorkodom (Figure 2). A total of 94 informants were interviewed and Prior Informed Consent (PIC) was obtained from each informant prior to accessing their traditional knowledge. The plant was collected and identified as *Cardiocrinum giganteum* (Wall.) Makino using standard literature [(Liang and Tamura (2000) in Wu & Haven (Ed.), FOC Vol. 24, pp-134-135)], and the accepted names and

global distribution range were crosschecked in the POWO (plants of the world online). The voucher specimen was prepared following chemical poisoning process and submitted to the Herbarium of Arunachal University (HAU), Department of Botany, Rajiv Gandhi University, Rono Hills, Doimukh, Arunachal Pradesh, India for future reference.

2.3. Relative frequency of citation (RFC)

RFC value of *C. giganteum* was calculated to know the local significance without considering the use categories by following the suggested formula (Sujarwo and Caneva, 2015):

$$\text{RFC} = \text{FC}/\text{N}$$

Where 'FC (frequency of citation)' is the number of respondents that mentioned using the species and 'N' is the total number of respondents. This index ranges from 0, where no one mentions the plant as useful to 1, in the extremely unlikely scenario that every informant would refer to the species' use.

3. Results and discussions

Vernacular names associated with *C. giganteum* are *Oyu angeh*, *Uyi nyepo* and *Ooange*. *C. giganteum* grows in moist areas and are harvested mostly from wild by the indigenous people of Shi Yomi district of Arunachal Pradesh (Figure 1A-F). Bulbs are the only edible part of *C. giganteum*, which are prepared by cooking. The

bulbs when eaten during pregnancy, are believed to enhance health of the fetus. This could be due to the rich starch content and other healthy natural ingredients in the bulbs (Zhao et al., 2022). Paste of root is applied topically for fixing bone fracture. The same medicinal property has been reported from West Sikkim (Tamang et al., 2017) and Himachal Pradesh (Lata, 2020). The bulbs were earlier used as famine food, and the mature seeds are used for decorations and as play toys for the kids. The hollow stems were reported to be used for making flutes (Figure 1B).

Out of 94 informants, 41 informants have cited the use of *C. giganteum* bringing the value of RFC to 0.44. This shows *C. giganteum* is moderately used by the indigenous people. The citations were mostly for the food purpose. Other uses were mentioned by only few informants and mostly limited in verbal forms. Their practical applications were found to be very less. This indicates the traditional utilization knowledge of the communities on verge of disappearance. There have been reports on bulb of *C. giganteum* through study of bud induction (Xiao et al., 2018) and starch-sugar interconversion mechanism (Zhao et al., 2022). Biflavonoids isolated from seeds reported as antitussive (Shou et al., 2018) and neuroprotective effects (Zhang et al., 2019). However, reports on the phytochemistry and other pharmacological effects of *C. giganteum* are inadequate to date. The ethnomedicinal data of the present study may provide a framework for such future studies.

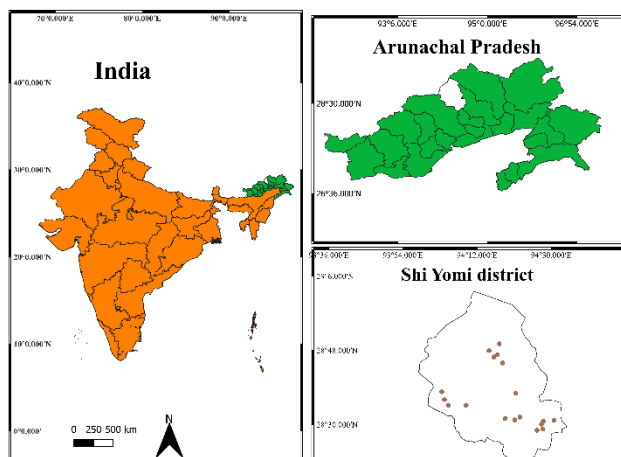


Figure 2. Map of Arunachal Pradesh in North East India showing Shi Yomi district, a collection site of *Cardiocrinum giganteum* (Wall.) Makino

4. Conclusion

Present study revealed ethnomedicinal uses of *C. giganteum* documented from the tribal communities residing in the Shi Yomi district of Arunachal Pradesh. The ethnomedicinal information regarding the enhancement of fetal development in pregnant women have been reported as ethnomedicinal novelty in this study. The findings of this study may aid in preserving and reviving the vanishing traditional utilization knowledge associated with *C. giganteum*. Once popularized based on its uses and importance, the indigenous people can cultivate and use *C. giganteum* as a cash crop in their community forest land. However, there is a need for scientific validation of the ethnomedicinal use claims made by the local communities.

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Contribution of the authors

NA: Ethnobotanical field survey, data collection, preparation of manuscript; VSA: Research design, data interpretation, editing, proof reading and communication.

Conflict of interests

The authors have no conflict of interest.

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