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Chuwa (*Phlogacanthus thyriformis* Nees): A Non-Conventional Vegetable and Medicinal Plant of Kalimpong Hills

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ABSTRACT

Phlogacanthus thyriformis Nees is a non-conventional vegetable and medicinal plant of the Kalimpong hills of West Bengal and the Northeastern states of India, belonging to the Acanthaceae family. It is mostly found in the moist forest areas. Besides, it is also grown by local communities with minimal care. It holds an enormous amount of medicinal potential, such as anti-cancer, anti-diabetic, anti-diarrheal and anti-inflammatory and a rich nutritional profile consisting of protein, fats, phosphorus and calcium. Additionally, it plays a significant role in the tradition, culture and well-being of the communities. Despite this, the plant is underexploited, which could lead to a loss of traditional knowledge and genetic resources. Promoting scientific awareness for exploration, cultivation and conservation may result in preserving traditional knowledge, genetic resources and generating income for local communities, ultimately leading to food, nutritional and economic security of the nation.

Keywords *Phlogacanthus thyriformis*, Non-conventional vegetable, Traditional knowledge, Cultivation, Economic security.

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INTRODUCTION

Since ancient times, people have used various plants to meet their needs and support healthy living. Although diverse edible plants have potential benefits for humans, they remain largely untapped. “Non-conventional edible plants” describes a group of plants that have not been commercialized because they often require special processing techniques (Leal *et al.* 2018). This group includes cultivated, wild, native and exotic species. According to reports, about 27000 such species have been estimated, which can be cultivated for human consumption. In the current agricultural scenario, these plants are crucial in addressing the challenge of feeding a global popula-

Table 1. Taxonomic classification of *Phlogacanthus thyriformis* Nees. Phurailatpam *et al.* (2014).

Common name	Red flame-acanthus
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnolipsida
Order	Lamiales
Family	Acanthaceae
Subfamily	Acanthoideae
Genus	*Phlogacanthus*
Species	*Thyriformis*

tion, which is estimated to increase by 40% by 2050 (Behera *et al.* 2022). In regions battling hunger, these plants play a vital role in maintaining food security (Cruz-Garcia 2017).

Phlogacanthus thyriformis is a non-conventional perennial flowering vegetable and traditional medicine (Ponneganti *et al.* 2022). Commonly called as Red Flame-Acanthus, which belongs to the Acanthaceae family (Table 1). It is native to the Indian subcontinent, widely distributed throughout the tropics, sub-tropical Himalayas, West Bengal and the Northeastern region of India at an altitude of 650–1300 m above mean sea level (Ningombam and Singh 2014). This plant is commonly seen growing beside roads and in the wild. Besides being widely distributed in the wild, it is being grown with minimal care in kitchen gardens and near fields in Kalimpong hills, Sikkim and particularly in Manipur and Assam (Ningombam and Singh 2014). The people of Kalimpong hills have traditionally used this plant as a vegetable, with its flowers adding diverse sensory qualities to the regular food items. The inflorescence of this plant is consumed as a complement to other food items by the locals of Manipur, Assam and the Kalimpong district of West Bengal. The plant is considered an important source of traditional medicine and food for various communities of the Northeastern region. The *Karbi* and *Jaintia* tribes of Assam and Meghalaya burn the leaves and use them during fever (Patwari 1992, Jaiswal 2010). In Manipur, during pneumonia and dry cough, an herbal vapor therapy is performed (Ningthoujam *et al.* 2013). Additionally, this plant possesses several therapeutic benefits, such as anti-cancer, anti-diabetic, anti-diarrheal, anti-inflammatory, anti-arthritic (Table 2) and other immunomodulatory phytochemicals (Gogoi *et al.* 2013). Moreover, it has a rich nutritional profile that contains essential health-benefiting compounds such as protein, fats, calcium and phosphorus (Table 3) (Tamang *et al.* 2005), making it a well-rounded food. Despite this, the plant remains underexploited and overlooked to date, which may be due to a lack of awareness of the potential of the crop and scientific research, particularly in the areas of exploration, cultivation, conservation and management. This neglect may ultimately create a gap between man and nature, hinder traditional knowledge and contribute to genetic erosion. The review article primarily aims to provide an overview of the plant and highlight its importance to the well-being of various communities in India.

Table 2. Medicinal uses of *Phlogacanthus thyriformis* Nees.

Plant parts	Uses	Reference
Flower extracts	Anti-diabetic activity	Ahmed *et al*. (2016)
Leaves extract	Antibacterial, antioxidant and anti-inflammatory activities	Ningthoujam *et al*. (2023)
Leaves and flowers	Anti-cancer activity (induces apoptosis in cancer cells)	Chanu *et al.* (2021)
Young, mature leaves and flowers	Anti-oxidant activity	Nongthombam *et al.* (2018a)
Flowers	Anti-urolithiatic potential	Das *et al.* (2017)

Botanical description

Phlogacanthus thyriformis is an evergreen shrub that grows up to 3 to 4 meters tall (Fig. 1). The inflorescences are borne in elongated clusters called

Table 3. Nutritional values of *Phlogacanthus thyriformis* Nees (mg per 100 g) Tamang *et al.* (2005).

Protein	7.1 mg/100 g
Fats	3.8 mg/100 g
Calcium	105.0 mg/100 g
Potassium	722.9 mg/100 g
Sodium	2.9 mg/100 g

Fig. 1. An overview of the *Phlogacanthus thyriformis* plant at the flowering stage.

thyrses, 10–30 cm long, positioned on short lateral branches or at the branch tips. The individual flowers are wide, tube-shaped and two-lipped, with a striking orange-red color and a closely hairy texture (Fig. 1). A broad, curved upward floral tube at the base, with the upper lip standing nearly erect while the lower lip spreads outward. Each flower has linear bracts 0.7 to 2 cm long and sepals that are 6 to 8 mm long, densely covered with velvety hairs. The reproductive parts include either slightly hairy or non-hairy stamens, a brown anther with whitish pollen and a glabrous style. It has deep green, broad, lanceolate, glabrous leaves, measuring 15–20 cm in length and 6–8 cm in width, tapering at both ends (Fig. 2) (Phurailatpam *et al.* 2014). The plant bears smooth fruits during April to May, a somewhat quadrangular capsule of 3 cm in length and 4 mm in width, containing approximately 10–12 seeds. The seeds are circular, highly compressed and densely hairy (Flowers of India, nd). The flowers of *Phlogacanthus* are visible from December to April (Mukherjee *et al.* 2009) and can be propagated through cuttings during the rainy seasons (Gogoi *et al.* 2013).

Origin and distribution

It is believed to be native to the subtropical Himalayan region, including areas ranging from Garhwal through Bhutan and Northeast India. This plant thrives at an altitude from around 650–1300 meters in moist, shaded environments, found beneath forest canopies, particularly in the undergrowth of sub-Himalayan forests and sal forests of Assam (Tamanna *et al.* 2024). In India, it is abundantly distributed across various zones, including the subtropical Himalayas, upper Gangetic plains, North Bengal, Assam and Manipur

Fig. 2. An overview of the leaves of *Phlogacanthus thyriformis*.

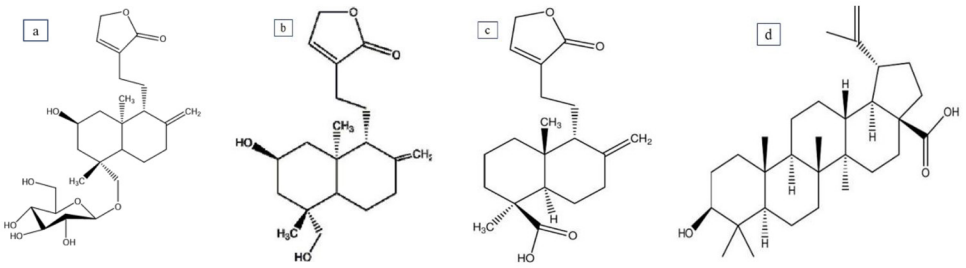

Fig. 3 (a–d). a: Phloganthoside, b: Phlogantholide-A, c: Pinusolidic acid and d: Betulin Gogoi *et al.* (2013).

(Ponneganti *et al.* 2022). The species is also present in Bangladesh and extends to parts of Northeast India, Burma, the Malaya Peninsula, Indonesia and Indo-China, including Southern China and islands such as Java and Sulawesi. The genus *Phlogacanthus* includes approximately 15–17 species found in the Indian Himalayas, the Malaya Peninsula, Burma, Indo-Chinese regions and Indonesian areas and about 10 species are found in subtropical India alone (Lakshminarasimhan *et al.* 2020, Maity and Dash 2021). It is reported that this species is widely found in the Northeastern states, with nearly five species documented in Manipur and the species are generally widely distributed throughout the Northeastern states (Goswami and Maity 2024).

Phytochemistry

Phlogacanthus is a diverse array of phytochemicals, including flavonoids, saponins and diterpene lactones like phlogantholide (Khare 2007, Singh and Singh 2010, Ponneganti *et al.* 2022). Notably, another diterpene glucoside has been isolated from the plant, named phloganthoside (Fig. 3a.), which is represented structurally as phlogantholide-A-19-O-β-d-glucopyranoside (Barua *et al.* 1985). Similarly, another diterpen phlogantholide-A (Fig. 3b) was identified from its leaves, characterized as 2β,15,18-trihydroxy-ent-labd-8 (17), 13-dien-16-oic lactone. Additionally, labdane diterpenes such as (19-hydroxy-labda-8 (17),13-diene-15,16-olide and ent-labd-8 (17),13-dien-15,16-olide-19-oic acid, known as pinusolidic acid (Fig. 3c) and the triterpene betulin (Fig. 3d), were extracted from the powdered bark (Singh and Singh 2010, Singh *et al.* 2022). Almost every part of the plant contains diverse phytochemicals, which remarkably contribute to its medicinal value.

Traditional medicine

The plant of *Phlogacanthus* has enormous therapeutic potential, often used as a stimulant, astringent, aphrodisiac, diuretic, anti-dysenteric and antipyretic (Chanu *et al.* 2021). The indigenous people of Mizoram,

Table 4. Ethnomedicinal uses of *Phlogacanthus thyriformis* in *Meetei* traditions Ningombam and Singh (2014).

Plant parts	Uses	Name of indigenous health tradition
Leaf	The well-crushed leaves extract is applied to the burned areas	Meina pokpa
Leaf	During a cold and cough, steam is inhaled from boiled leaf extract, with honey	Lok khouba
Leaf	Leaf decoction is taken as a bath to avoid or treat skin problems	Lai thokpa
Leaf	Leaf extract, along with well-crushed zinger and a little salt, is dissolved in water and taken orally during diarrhoea and dysentery	Khonghamthaba
Young shoots	The crushed mixture of young shoots, along with zinger and salt is applied during boils	Yairong

Assam have been using it as a Folk medicine which is considered to be curative against cold, cough, influenza, irregular menstruation, high blood pressure, anti-asthma, diarrhea, dysentery, constipation and burns (Phurailatpam *et al.* 2014, Deori *et al.* 2024). It is reported that almost every part of the plant has medicinal properties. The juice of the leaves is taken orally to cure colds, asthma and liver disorders (Singh *et al.* 2003, Nongthombam *et al.* 2018b). During fever, practices like the burning of leaves and fruits by the Karbi tribes of Assam have been reported (Patwari 1992, Gohain 2020). Its flowers are an antidote to pox, jaundice and found to be curable against skin diseases like sore and scabies (Khanikar 2005, Gogoi *et al.* 2013, Teerakitchotikan *et al.* 2022). Moreover, this plant is used in the indigenous health tradition in Manipur, particularly by the *Meetei* community (Table 4).

Cultural and traditional aspects

India is a country with diverse culture, religion and traditional backgrounds. In such a context, *Phlogacanthus* has been an integral part of the culture and tradition of the different communities. In Manipur, during *Meetei* rituals, when a guest visits, a special lunch is served, in addition, a special dish called *suktane* is prepared by frying the plant's leaves with sugar. It is believed that consuming *suktane* aids digestion and refreshes the taste buds (Ningombam *et al.* 2014, Devi *et al.* 2019). Likewise, in Assam, *Phlogacanthus* plays a major role in the important festivals such as *Bohag bihu* (Begum and Gogoi 2007, Koushik *et al.* 2020).

Culinary aspects

The flower of *Phlogacanthus*, along with its young inflorescence, is blanched to eliminate its bitterness. The blanched inflorescence is fried with cooked rice, a pinch of salt is added and it is served along with other food items. A dish called *tite*, enjoyed by Nepali communities in the Kalimpong hills. Additionally, the blanched inflorescences are sun-dried and preserved for the off-season. In Manipur, a dish called *bora* is made by frying a mixture of leaves and crushed dal. Another special dish, *kangshu*, is prepared by the community after mixing boiled leaves with fermented fish, chilli and salt (Devi *et al.* 2019). Similarly, some tribal communities in Assam prepare a traditional dish, *akho ata hak*, with leaves and flowers (Deori *et al.* 2024). In Arunachal Pradesh, the flower of *Phlogacanthus* is used as a condiment (Phurailatpam *et al.* 2014).

Economical aspects

Although the plant has not been widely commercialized, it still fetches a price in the local markets. In the markets of Manipur, the flowers are sold for Rs 10–15 per bundle (Ningo Ningombam and Singh 2014). Similarly, in the local market of Kalimpong district, the flowers were sold at Rs 20–30 per bundle from February to April (Bhujel *et al.* 2018). These reports suggest the potential of this plant for income generation among local people.

CONCLUSION

Phlogacanthus thyriformis is a valuable plant gifted with diverse medicinal and nutritional properties, deeply embedded in the cultural, culinary and traditional healthcare practices of Kalimpong hills and Northeastern Indian communities. Its use not only enriches local diets but also helps preserve indigenous knowledge and biodiversity. Promoting its exploration, cultivation and awareness can aid in conserving genetic diversity, strengthening food security and creating economic opportunities for local communities. Overall, the responsible use and preservation of this plant contribute significantly to ecological sustainability, community well-being and national economic resilience.

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