

Review

***Phlogacanthus* - An important medicinal plant of North East India: A review**

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***Phlogacanthus* (Acanthaceae) is an important group of medicinal plant found mainly in the north eastern part of India. The present article gives an account of updated information on its phytochemical and pharmacological properties and its ethno medicinal uses on account of the tale from the local people and veds. Medicinal properties of this group of plants include antipyretic, antidiabetic, coughs, colds and anti-asthma etc. Extensive research work has been done to prove its biological activities and pharmacology of its extracts. Terpenoidal glycoside, diterpene lactones and many other chemical constituents which are similar to *Adathoda zeylanica* have been isolated.**

Key words: *Phlogacanthus*, nongmangkha, terpenoid, phlogacantholide.

INTRODUCTION

Time immemorial, people used plants and herbs as medicines and for the treatment of many kinds of diseases and for healthy living. Many traditional uses of local plants and herbs for medicinal purposes have been documented and published. Enormous amount of collection of plants from different types of tribal and primitive society from different parts of the globe are available. Mankind has been continuously using the plants in one or the other way in the treatment of various ailments. In India, the sacred Vedas dating back between

3500 B.C and 800 B.C give many references of medicinal plants. One of the remotest works in traditional herbal medicine is "Virikshayurveda", compiled even before the beginning of Christian era and formed the basis of medicinal studies in ancient India. The Rig Veda, dating 3500 B.C. to 1800 B.C. seems to be the earliest record available on medicinal plants. Herbs seem to be very important component of medicine in other cultures too; Greek, African and Chinese medicines. Knowledge of herbs has been handed down from generation to

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generation for thousands of years (Brown, 1995). Herbal drugs constitute a major part in all traditional systems of medicines. Herbal medicine is a triumph of popular therapeutic diversity. Plants above all other agents have been used for medicine from time immemorial because they have fitted the immediate personal need are easily accessible and inexpensive (Mukherjee, 2008). In the recent past there has been a tremendous increase in the use of plant based health products in developing as well as developed countries resulting in an exponential growth of herbal products globally. An upward trend has been observed in the research on herbals. Herbal medicines have a strong traditional or conceptual base and the potential to be useful as drugs in terms of safety and effectiveness leads for treating different diseases. World Health Organization has made an attempt to identify all medicinal plants used globally and listed more than 20,000 species (Panday et al., 2008). According to the WHO more than 80% of the world's population relies on traditional herbal medicine for their primary health care (Vijayan et al., 2008). Plants continue to serve as possible sources for new drugs and chemicals derived from various parts of plants (Tijani et al., 2008). In recent time there has been a marked shift towards herbal cures because of the pronounced cumulative and irreversible reactions of modern drugs. However, due to over population, urbanization and continuous exploitation of these herbal reserves, the natural resources along with their related traditional knowledge are depleting day by day (Pande et al., 2007). In the present era of drug development and discovery of newer drug molecules, many plant products are evaluated on the basis of their traditional uses. In this context, we would like to bring forth an important medicinal plant of north eastern India which has been very less documented and evaluated but talking of its importance, it's a plant where every household consumes in one or other way and sacred in nature. Three species of this genus *phlogacanthus* viz. *thyrsiformis*, *pubinervius* and *curviflorus* are the main important species which is very popular in the north eastern part of the country.

TAXONOMIC CLASSIFICATION

Common name: Nongmangkha
 Family: Acanthaceae
 Genus: *Phlogacanthus*
 Species: *thyrsiformis*
 Synonyms: *Phlogacanthus thyrsiflorus*, *Justicia thyrsiformis*, *Justicia thyrsiflora*
 Vernacular name:

Manipuri: Nongmangkha
 Assamese: Banheka, Titabahak, titaphul

Garó: Ellot
 Khasi: Baskabomphang, Dieng-soh-ja-buid, dieng-soh-kajut
 Mikir: Jaogan, Rambha arong
 Nepali: Chua Lepcha: Rheeom
 Kumaun: Kaldona, Kawadoni

Common name: Red Nongmangkha
 Family: Acanthaceae
 Genus: *Phlogacanthus*
 Species: *pubinervius*
 Vernacular name:

Manipuri: Nongmangkha Angangba
 Bengali: Tamropuspi Basok

Common name: Wild Nongmangkha
 Family: Acanthaceae
 Genus: *Phlogacanthus*
 Species - *curviflorus*
 Synonyms: *Justicia curviflora*
 Vernacular name: Manipuri - Lamgi Nongmangkha, Nongmangkha asinba

GEOGRAPHICAL DISTRIBUTION

These group of plants are an evergreen shrub found in the sub-tropical Himalayas spreading up to Bhutan, upper gangetic plains, Bihar, North Bengal, Assam, Arunachal and Manipur at an altitude of 1200 m (Anonymous, 1969). The plant occurs as undergrowth in moist, shady places in parts of the sub Himalayan region and in Sal forests of Assam. It is gregarious and kills the vegetation beneath it. It is often cultivated as an ornamental for its handsome, laurel-like foliage and long spikes of flowers. *P. thyrsiformis* is mainly found in the homestead garden and it is a sacred plant in the *Meitei* community of Manipur. The other two species are mainly found in the jungles and wastelands and sometimes in homestead garden also.

MORPHOLOGY

Phlogacanthus thyrsiformis (Nongmangkha)

It is an evergreen shrub grows up to 2.4 m high, branchlets quadrangular; leaves 13 to 35 cm long, oblanceolate, elliptic-oblong, acute or acuminate, entire. Flowers in terminal elongated, thyrsoid panicles, up to 30 cm long; corolla tubular, curved; orange or brick red villous. Capsule 3.8 cm long, linear-clavate (Figure 1).

Ethno medicinal uses

In Manipur, local people prefer it to Malabar Nut

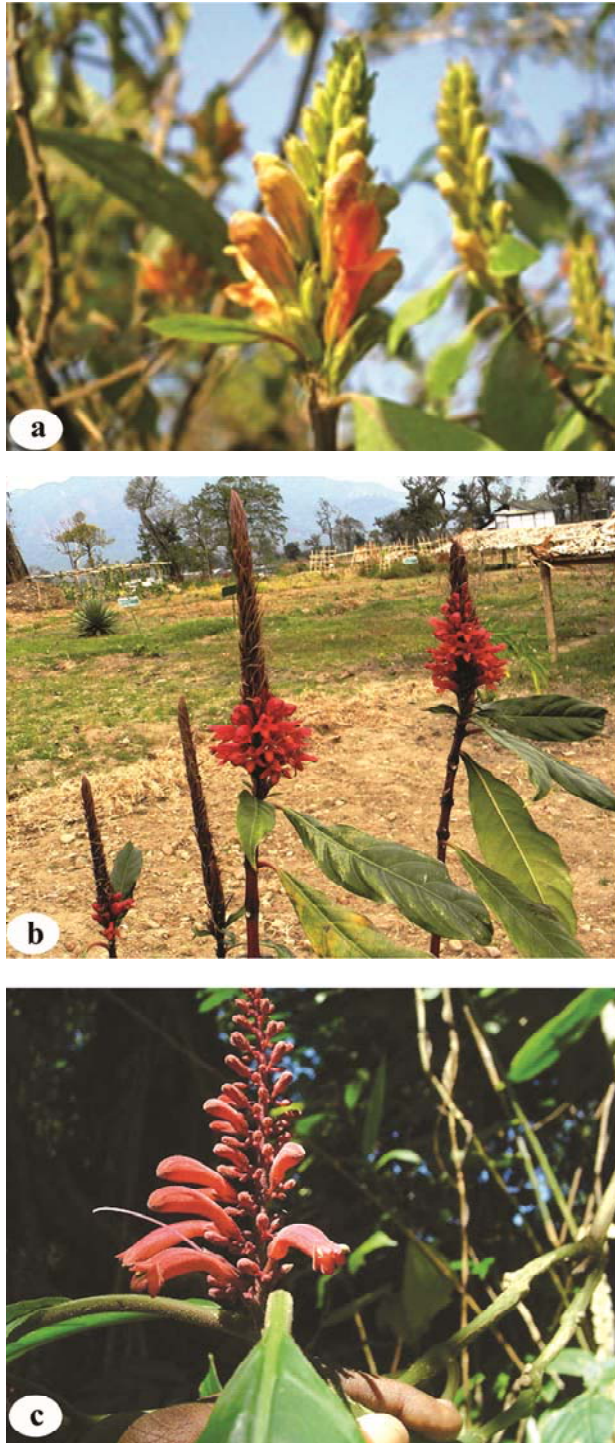


Figure 1. The three species of the genus *Phlogacanthus*. (a) *P. thyrsoformis*; (b) *P. pubinervius*, and (c) *P. curviflorus*.

(*Adathoda vasica*) for various medicinal purposes. It is useful for curing coughs, colds and asthma and is easy to administer. Flowers are antidote to pox, prevents skin diseases like sore, scabies etc. The flowers are eaten

cooked or vegetable in many communities. It has also the antimicrobial properties (Singh and Singh, 2010). Fruits and leaves are taken after burning as a specific for fevers. In some other places, the plant is put to the same medicinal uses as *Adathoda vasica*. Curry prepared from aerial portion is given orally with rice once daily until cure (Kalita and Bora, 2008). Fruits and leaves are taken by the Karbi tribes of Assam after burning them as a specific treatment for fever (Patwari, 1992). Flowers are antidote to pox, prevents skin diseases like sore, scabies etc. It has also been used in jaundice (Khanikar, 2005). The decoction of the leaves is prescribed for fever by the 'meetei' community in Barak valley of Assam (Manabendra et al., 2010).

***Phlogacanthus pubinervius* (Red Nongmangkha)**

It is an evergreen shrub which is particularly showy in spring with its dense upright spikes of brick-red, tubular flowers. The shrub grows up to 3 m tall, with 4-angled, grey branches, and drooping leaves. Leaves are inverted lance-shaped, 15 to 25 cm long, with a base gradually narrowing into the leaf-stalk. Flowers are braod-tubular, curved, 2 to 2.5 cm long, 2-lipped, with 5 nearly equal petals. Stamens protrude out of the flowers. Sepals are 6 to 8 mm long, bristly haired, bracts 6 to 12 mm long. Bracts are prominent when the flowers are in bud. Fruit is a cylindrical 4-angled capsule, to 4 cm long (Figure 1). Red Nongmangkha is found in forests, at altitudes of 200 to 1700 m, from U.P. to Burma; Flowering: February-March.

Ethno medicinal uses

The leaves of this plant is boiled and taken orally for curing coughs, colds and asthma. The people of Manipur have traditionally been using the green leaves over the ages for the treatment of cold, cough, rheumatism and liver disorder (Singh et al., 2003). The green leaves are chopped and fried in oil and when it is half cooked some amount of water is added along with some sugar and is consumed. This preparation is called 'Suktani' in Manipuri and is a very important ingredient in feast and big parties. 'Suktani' are a good source of digestive menu.

***Phlogacanthus curviflorus* (Wild Nongmangkha)**

It is a large branched shrub, up to 3 to 4 m tall. Oppositely arranged leaves are 8 to 10 inches long. They are elliptic, pointed at both ends, sometimes somewhat toothed. Flowers are borne in upright spikes at the end of branches. Flowers are long, tube-like, reddish. The end of the tube is 2-lipped. Stamens are 2, slightly protruding out (Figure 1). Wild Nongmangkha is found in NE India.

Ethno medicinal uses

In Manipur, boiled leaf juice is used as a tea-like drink to cure cough and fever. Flowers are eaten raw or fried as tonic. In Arunachal Pradesh, pounded flowers are used as condiment.

PHYTOCHEMISTRY

Many important chemicals were isolated from the above mentioned three *Phlogacanthus* species by many researchers. Leaves, roots and flowers possess medicinal properties and contain diterpenoid and terpenoids as the main bioactive compounds.

1. Investigation on the secondary metabolites content in the leaves of *P. pubinervius* Nees. led to the isolation of a new terpenoidal glycoside, 3-O-[β -D-glucopyranosyl-(1'→2')- α -L-hamnopyranosylphlogacanthoside], 5 along with five other compounds including β -sitosterol, β -sitosterol-D-glucoside, Stigmasta-5,22-dien-7-on-3 β -ol, 19-hydroxy-phlogacantholide and (2E,7Z)-2,6-dihydroxycycloocta-2,7-dienone (Laitonjam et al., 2013).

2. Two new diterpene lactones, phlogacantholides B (1) and C (2), and three new diterpene lactone glucosides, phlogacanthosides A (3), B (4), and C (5), together with lupeol, beta-sitosterol, betulin, beta-daucosterol, (+)-syringaresinol, and (+)-syringaresinol-4-O-beta-D-glucopyranoside, were isolated from the roots of *P. curviflorus* (Yuan et al., 2005).

3. The leaves of *P. thyrsoiflorus* contain β -sitosterol, lupeol and betulin. Other constituents of the plant are similar to those of *Adhatoda zeylanica* (Ghani, 2003). Barua et al. (1987) isolated a new diterpene glucoside, phlogacanthoside, from *P. thyrsoiflorus* and its structure has been established as phlogacantholide-A-19-O- β -D-glucopyranoside.

4. The structure and stereochemistry of phlogacantholide-A, a new diterpene lactone isolated from the leaves of *P. thyrsoiflorus* has been determined as 2 β ,15,18-trihydroxy-ent-labd-8(17),13-dien-16-oic lactone by chemical and spectroscopic means (Barua et al., 1985).

PHARMACOLOGICAL ACTIONS

Chakravarty and Kalita (2012) reported that flower extract of *P. thyrsoiflorus* possess anti hyperglycaemic effect in streptozotocin induced diabetic mice and the aqueous extract of *P. thyrsoiflorus* Nees flower has beneficial effects on blood glucose level. It has the potential to impart therapeutic effect in diabetes

Devi et al. (2012) reported that the leaf extracts of *P. thyrsoiformis* is effective against some pathogenic fungi like *Aspergillus* and *Rhizopus* species.

In an experiment for evaluating the effect of ethanol extract of leaves of *P. thyrsoiflorus* on tail flick and glacial acetic acid-induced writhing models in rats and mice, Mukherjee et al. (2009) found out that *P. thyrsoiflorus* possesses significant central and peripheral analgesic activities (Mukherjee et al., 2009).

In an experiment involving the use of botanicals for the control of RKN, *Meloidogyne incognita* Mohilal et al. (2003) found that *P. thyrsoiflorus* as a potential nematicide (Mohilal and Dhanachand, 2003).

BIOTECHNOLOGY

Hassan et al. (2011) developed an efficient protocol for shoot proliferation and plant regeneration of *P. thyrsoiflorus* Nees. (Acanthaceae), a rare medicinal shrub of Bangladesh, through *in vitro* culture using shoot tip and nodal explants. Best shoot induction was observed on MS with 1.0 mg/L BAP + 0.5 mg/L NAA, in which 84.2% of nodal explants responded to produce maximum number (12.4 \pm 0.66) of shoots per culture (Hassan et al., 2011).

Conclusion

The herbals occupied a distinct place in the life right from the primitive period till date and provided information on the use of plants or plant products and products as medicine (Saikia, 2006). The use of medicinal plants in the management of various illnesses is due to their phytochemical constituents and dates back antiquity (Chahlia, 2009). It is seen from the literature that *Phlogacanthus* is a very important group of plant for its large number of medicinal properties as well as medicinally important chemicals like terpenoidal glycoside, 3-O-[β -D-glucopyranosyl-(1'→2')- α -L-hamnopyranosylphlogacanthoside], 5 along with five other compounds including β -sitosterol, β -sitosterol-D-glucoside, Stigmasta-5,22-dien-7-on-3 β -ol, 19-hydroxy-phlogacantholide and (2E,7Z)-2,6-dihydroxycycloocta-2,7-dienone, diterpene lactones, phlogacantholides B (1) and C (2), and diterpene lactone glucosides, phlogacanthosides A (3), B (4), and C (5), together with lupeol. These plants show many pharmacological activities like antidiabetic, coughs, colds and anti-asthma, pox, prevents skin diseases like sore, scabies, jaundice, rheumatism, analgesic and antipyretic. One interesting uses of these group of plants is the honey extracted from the flowers of these plants. The honey which are extracted during the month of April to May (flowering season) are bitter in taste. Such honeys are used as medicine by the *Meetei* community in Manipur for curing cough, fever, tuberculosis. Other than the few uses we have seen here there are many traditional uses of this

group of plants which are not yet documented nor recorded. Thus, the genus *Phlogacanthus* is quite promising as a multipurpose medicinal agent so further clinical trials should be performed to prove its efficacy.

Conflict of Interest

The author(s) have not declared any conflict of interests.

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