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Preliminary phytochemical screening of *Phlogacanthus thyrsiflorus* Nees: A medicinal plant

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Abstract
The traditional medicine involves the use of different plant extracts or the bioactive constituents. Study of ethnomedicine represents one of the best avenues in searching new economic plants for medicine. In keeping this view in mind, the present study was aimed at phytochemical screening of *Phlogacanthus thyrsiflorus* Nees – A medicinal plant. The results showed that many bioactive compounds are present in the flowers and leaves of *Phlogacanthus thyrsiflorus* Nees mainly tannins, flavonoids, saponins, phenols, steroids and terpenoids. Both dry flower extracts and matured leaf extracts showed equal response for presence of tannins and saponins. Based on the intensity of colour, dry flower extracts were found to contain higher amount of steroids, terpenoids, flavonoids and phenol than the dry leaf extract. The curative properties of this plant may depend mainly on these phytochemicals.

Keywords: *Phlogacanthus thyrsiflorus*, phytochemical screening, tannin, saponin, flavonoid, secondary metabolites

Introduction
Plants have the ability to synthesize a wide variety of chemical compounds that are used to perform important biological functions and to defend against attack from predators such as insects, fungi etc. Medicinal plants are commonly used in treating or preventing specific ailments or diseases and are considered to play an important role in health care.

Phlogacanthus thyrsiflorus – Nees belonging to the Acanthaceae family is an important group of medicinal plant found mainly in the north-eastern part of India. It is also found in the sub-tropical Himalayas spreading up to Bhutan, upper gangetic plains, Bihar, North Bengal, Assam, Arunachal Pradesh and Manipur at an altitude of 1200 m. *Phlogacanthus thyrsiflorus* is commonly used in various ailments by the people of north-eastern India. Flowers are antidote to pox, prevent skin disease like sore, scabies etc. The flowers are, cooked as vegetables in many communities. It also has the antimicrobial properties, been known to possess antibacterial, antifungal, anti-diabetic, anti-inflammatory, anti-cancerous, hypolipidaemic and hepatoprotective properties [1]. The leaves of this plant is boiled and taken orally for curing coughs, cold and asthma. The use of this plant in Assam for its anti-allergic effect was reported by Kalita and Bora [2], where the patients are given curry prepared from aerial portion of the plant.

Phytochemicals are chemical compounds that occur naturally in plants. These plant derived compounds are hypothesized to be responsible for much of the disease protection. Some of the most important compounds of plants are alkaloids, flavonoids, tannins and phenolic compounds. Alkaloids have a wide range of pharmacological activities including anti-malarial (e.g. quinine), antiasthma (e.g. ephedrine), anticancer (e.g. homoharringtonine) [3]. Flavonoids have various biological activities including anti-inflammatory, anti-cancer and anti-viral properties. It is one of the safest non-immunogenic drugs because they are small organic compounds which have been normally absorbed by the human body for long time [4]. Saponins have hemolytic, expectorative, anti-inflammatory and immune stimulating activity. Water soluble nature of tannins allows easy extraction and is useful in various applications in the chemical and pharmaceutical industry. They have the property to coagulate proteins and mucosal tissues by creating an insulating and protective layer that soothes irritation and pain on the skin. Herbal preparation containing tannin are used to stop local small hemorrhages, sore mouth, bronchitis, burns, scars of the skin, wounds and many others.

Knowledge of the chemical constituents of plants is desirable, because such information may be of value in disclosing new sources of such economic materials as tannins, oils, gums and precursors for the synthesis of complex chemical substances. In addition, the knowledge of the chemical constituents of plants would further be valuable in discovering the actual value of folkloric remedies [5]. Plants continue to serve as possible sources for new drugs and chemicals derived from various parts of plants.

Therefore on the basis of their traditional uses, in the present work, qualitative phytochemical analysis of edible parts of *Phlogacanthus thyrsiflorus* in different solvents was carried out.

Materials and Methods

Sample preparation

About 50 g of matured leaf and 150 g fresh flower of *Phlogacanthus thyrsiflorus* were shade dried till constant weight was achieved. Then ground to form powder by using mixer, packed in an air tight container and stored at room temperature for further analysis.

Phytochemical study

Preliminary phytochemical screening was performed according to the method followed by Chakraborty and Kalita [6]. The presence of phytoconstituents such as tannins, saponins, flavonoids, phenol, steroid and terpenoids were confirmed by the following procedure.

Test for Tannins: 1 g of powdered sample was boiled with 20 ml distilled water in water bath for 5 minutes and filtered. 1 ml of cool filtrate was mixed with 5 ml distilled water and few (2-3) drops of 10% ferric chloride.

Test for Saponins: 1 g of powdered sample was boiled with 10 ml of distilled water in a water bath for 10 mins. The mixture was filtered while hot and allowed to cool. Then 2.5 ml of filtrate was diluted to 10 ml with distilled water and shaken vigorously for 2 minutes.

Test for Flavonoids: 1 g of the powdered sample was boiled with 10 ml of distilled water for 5 minutes and filtered while hot. Few drops of 20% NaOH solution was added to 1 ml of the cool filtrate.

Test for Phenol: Freshly prepared 1% ferric chloride and 1 ml of potassium ferrocyanide was added to 2 ml of the filtrate.

Test for steroids and terpenoids (Salkowski test): To 1 ml of filtrate, 1 ml of chloroform was added, followed by few drops of conc.H_2SO_4 acid and shaken. The sample was allowed to stand for some time.

Results

The results obtained on testing flowers and leaves of *Phlogacanthus thyrsiflorus* for secondary metabolites are presented in Table 1and Fig. 1to 5. The observation for each phytoconstituent was as follows:

Table 1: Preliminary phytochemical screening of dry flower and dry matured leaves of *Phlogacanthus thyrsiflorus.*

S. No.	Phytochemical test	Flower	Matured leaf
1.	Tannins	++	++
2.	Saponins	+	+
3.	Steroids	++	+
4.	Terpenoids	++	+
5.	Flavonoids	++	+
6.	Phenols	++	+

(Average of three samples)
++ = Presence of phytochemical (high)
+ = Presence of phytochemical (trace)

Tannins: When ferric chloride was added to the flower and leaf extract, brownish green precipitate was formed in the extract. It showed the presence of tannin (Fig. 1a and b) in both flower and leaf extract. In both flower and leaf extract the intensity of formation of brownish green colour was similar.

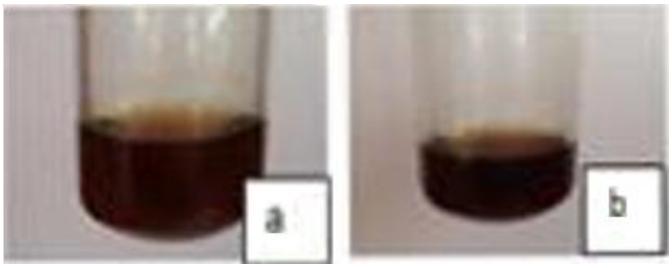

Fig 1: Formation of brownish green colour on addition of ferric chloride to extract of a) flower b) Leaf

Saponin: After addition of distilled water to the flower and leaf extract in test tube and vigorous shaking, stable persistent froth was observed, which indicated the presence of saponin (Fig.2 a and b) in both flower and leaf extract. Formation of froth in both the flower and leaf extract was similar.

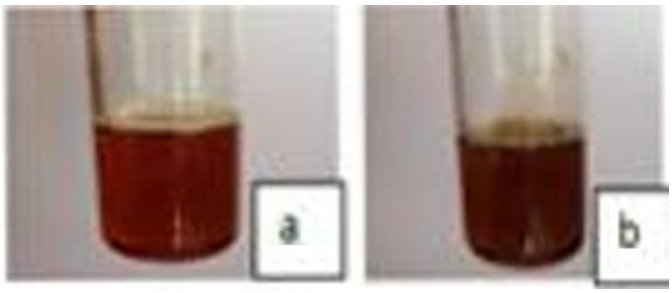

Fig 2: Formation of froth after addition of distilled water and vigorous shaking a) flower extract b) leaf extract

Flavonoid: When few drops of NaOH was added to the filtrate of flower and leaf extract, it changed into yellow and green colour respectively which on addition drops of HCl acid turned colourless. The disappearance of yellow colour from flower extract and green colour from leaf extract indicated the presence of flavonoid (Fig. 3 a and b).

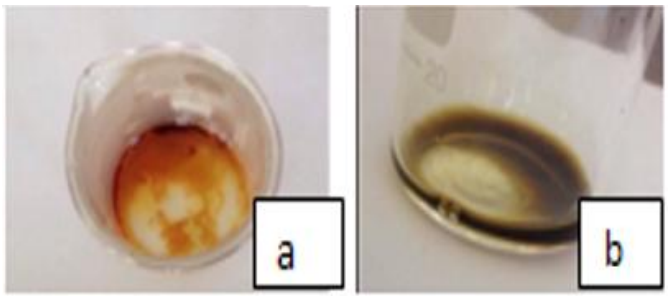

Fig 3: Changing colour form yellow to colour less a) Flower extract and green to colour less b) leaf extract on addition of HCl

Steroid and Terpenoids: To both flower and leaf filtrate was added 1 ml of chloroform. On further addition of conc. H_2SO_4 and shaking and then standing the test tube led to the formation of red colour ring at lower layer and yellow colour at the upper layer indicating the presence of steroid and terpenoid in both flower and leaf extract (Fig. 4 a and b). However, less intensity of red colour at lower and less intensity of yellow colour at upper layer in leaf filtrate indicated that only traces of steroid and terpenoid were present.

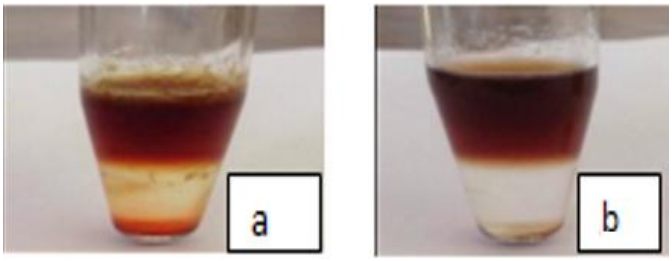

Fig 4: Appearance of red colour at lower layer and formation of yellow colour at upper layer indicated the presence of steroid and terpenoid a) flower extract b) leaf extract

Phenol: Upon addition of ferric chloride and potassium ferro cyanide to the extracts of flower and leaves, both the extracts turned into bluish green colour indicating the presence of phenol. Initial orange coloured flower extract (Fig. 5 a) turned into bluish green (Fig. 5 c). Similarly green coloured leaf extract (Fig. 5 b) turned into bluish green (Fig. 5 d). It was found that the intensity of formation of bluish green colour in flower extract was more than the formation of bluish green colour in leaf extract.

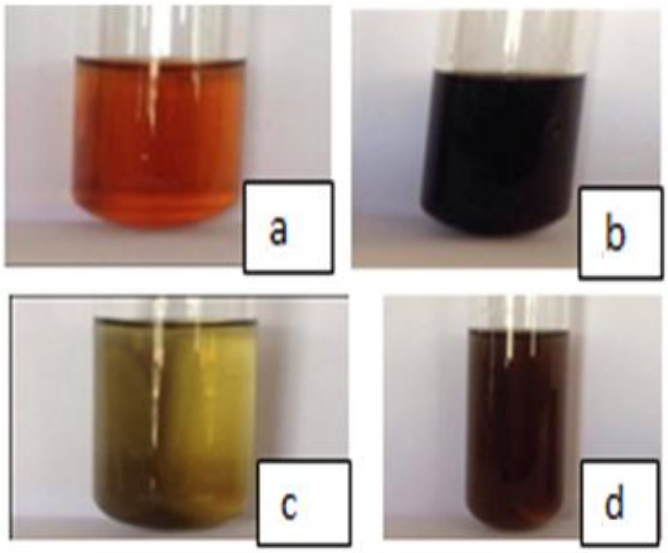

Fig 5: Initial a) orange coloured flower extract b) green coloured leaf extract which turned into bluish green colour c) flower extract and d) leaf extract on addition of ferric chloride and potassium ferrocynide

Discussion

The secondary metabolites such as tannins and saponins were observed having similar effect in both flower and matured leaf, whereas steroids, terpenoids, flavonoids and phenols were detected in higher level in flower than the matured leaf. The curative properties of medicinal plants are due to the presence of secondary metabolites in the various parts of the plant. Phenolics are secondary metabolites that are ubiquitously present in fruits. Many of the phenolics have been shown to contain high level of antioxidant activities [7]. Endogenous phenolics may also play a role inhibiting the fruit browning process. Tannins contribute to the property of astringent activity i.e. faster the healing of wounds and inflamed mucous membrane [8].

Bhumi and Savithramma [9] performed qualitative and quantitative analysis of phytochemical compounds such as protein, carbohydrates, lipids, phenols, tannins, flavonoids, saponins and alkaloids in aqueous leaf extracts of three medicinal plants *viz*., *Abrus precatorius*, *Adhatoda vasica* and *Catharanthus roseus* and confirmed their presence. Aqueous extracts of dried flowers of *Phlogacanthus thyrsiflorus* were screened to test the presence of phytochemicals [6] and presence of tannins, saponins, alkaloids, flavonoids, phenols were confirmed. Ilham *et al.* [10] isolated two labdane diterpenes and one triterpene betulin from the stem bark of *Phlogacanthus thyrsiflorus*. Ghani [11] reported that leaves of *Phlogacanthus thyrsiflorus* contain β-sitosterol, lupeol and betulin. The plant parts of *Phlogacanthus thyrsiflorus* such as flowers and leaves screened in the present study can be seen as a potential source of useful drugs.

Conclusion

Phytochemical screening of dry flower and dry matured leaf of *Phlogacanthus thyrsiflorus* were tested and presences of secondary metabolites were confirmed. Both dry flower extracts and matured leaf extracts showed equal response for presence of tannins and saponins. Dry flower extracts showed more response for presence of steroids, terpenoids, flavonoids and phenol than the dry leaf extract.

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