Phytochemical evaluation of Bharangi (*Clerodendrum serratum* Linn) roots under Konkan condition

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ABSTRACT

Bharangi (*Clerodendrum serratum* Linn) is an important medicinal plant and wild leafy vegetable. It is a deciduous shrub widely distributed more or less throughout India but mostly found in the forests of Western Ghats of India, eastern India, Sri Lanka and Malaysia. For qualitative phytochemical evaluation of Bharangi roots, the root samples were collected from eight Talukas of Ratnagiri district of Maharashtra state. The qualitative phytochemical evaluation revealed the presence of alkaloids, flavonoids, polyphenols, saponins, steroids, coumarins and cardiac glycosides in all the samples collected from eight Talukas. The present study provides evidence that root extract of *C serratum* contains medicinally important bioactive compounds that justifies the use of this plant species as traditional medicine for treatment of various diseases.

Keywords: Bharangi; phytochemical evaluation; Talukas; medicinal value

INTRODUCTION

The medicinal plants have different secondary metabolites in their parts. Due to these standards, they are broadly used in the whole world by people to cure various ailments. Research is going on to discover the security and efficacy of each and every component of the drug in different infections. The most primitive recorded evidence of the use of herbal medicine in Indian, Chinese, Egyptian, Greek, Roman and Syrian texts dates back to about 5,000 years (Samal 2016).

The ancient classical treatises of India such as Rigveda, Atharvaveda, Charak Samhita and Sushruta Samhita describe the usage of medicinal plants. This proves that the herbal medicines or the traditional medicaments have been derived from the rich traditions of ancient civilizations and scientific inheritance (Kamboj 2000).

Ayurveda is a system of medicine integrating harmoniously with the body, environment, mind and spirit and is based on no less than 7,000 plants and about 8,000 remedies, which have been codified (Patwardhan 2000). Among them, Bharangi (*Clerodendrum serratum* Linn) could be a drug broadly used in numerous disorders due to its different pharmacological activities (Kumar and Nishteswar 2013). It is commonly known as Bharangi in the Ayurvedic medicines of the Indian system and blue fountain bush, the blue-flowered glory tree or the beetle killer in English.

Bharangi is an important medicinal plant and wild leafy vegetable. It is a deciduous shrub widely distributed more or less throughout India but mostly found in the forests of Western Ghats of India (Manjunatha et al 2004), eastern India, Sri Lanka and Malaysia. The different synonyms of Bharangi indicate external morphology characters as well as pharmacological activities like Angarvall (plant will appear like red hot coal in colour when fully blossomed), Kharashaka (leaf is rough in texture), Padma (flowers look like that of lotus), Barbari (surrounds the diseases from all directions and destroys them), Baleya Shaka (mainly eaten by donkeys),

Brahmani (pure as like Brahman), Brahamanyashtika (stem like stick of Brahma or Brahman) and Hanjika (cures many diseases like Swasa, Kasa etc) are described in various Nigantus (Kumbhar and Naikare 2018). This perennial shrub grows up to 8 feet in height with a bluntly quadrangular stem; young parts are glabrous. Flowering can be seen in Bharangi in the months of August and September. The flowers are bluish to dark purple in colour, protandrous in nature and pollination occurs combinely through herkogamy and dichogamy mechanism.

The fruit of Bharangi is four-lobed, a drupe and about 6 mm long. Leaves are opposite, big up to 28 cm long but usually 12-13 cm in length, 5.5-6 cm in width, oblong or elliptic, acute, coarsely and sharply serrate and glabrous; petioles are very stout and about 6 mm long. Bharngi is being used since ancient period to alleviate various ailments. In Samhita Kala this drug was widely used for many diseases mainly for Shwasa (breathlessness), Kasa (cough), Vrana (wound), Shotha (swelling) and many Vataja disorders (neurological disorders) (Kumar and Nishteswar 2013).

In the present study, phytochemical evaluation of Bharangi roots from eight Talukas of Ratnagiri district of Maharashtra state was carried out.

MATERIAL and METHODS

Plant material collection and identification: Roots of *C serratum* were collected from the forests of 8 Talukas of Ratnagiri district of Maharashtra (Table 1). The plant material was identified by the vernacular name and then recognized and authenticated with the help of reviews of flora of the region.

Preparation of sample: The collected roots were rinsed to remove residues of soil and dust and shade-dried for one week. Completely dried roots were powdered using mixture grinder and stored in the air tight container for further use.

Table 1. Locations of sample collection

Location	GPS location
Dapoli	17.74855° N, 073.18118° E
Dabhol	17.588336° N, 073.175269° E
Khed	17.71263° N, 073.40504° E
Mandangad	17.986698° N, 073.264234° E
Chiplun	17.535821° N, 073.517699° E
Sangmeshwar	17.182843° N, 073.548945° E
Ratnagiri	16.982974° N, 073.327025° E
Lanja	16.854718° N, 073.541518° E

Extraction: Extraction was carried out at Government College of Pharmacy, Karad, District Satara, Maharashtra. Dried and ground plant materials were extracted separately, macerated with ethanol, allowed to stand for 24 h and filtered with Whatman filter paper. The mixture was filtered and concentrated under reduced pressure at 40°C. The extracts thus obtained were stored in a refrigerator at –4°C.

Preliminary phytochemical screening of secondary metabolites: Crude extracts were phytochemically evaluated to determine the presence of alkaloids, flavonoids, anthocyanins, polyphenols, catechin tannin, saponins, steroids, gallic tannins, resins, coumarins, cardiac glycosides and quinones according to standard methods. Any change of colours or the precipitate formation was used as characteristic of positive reaction to these tests.

Preliminary phytochemical screening

Test for alkaloids (Mayer's test): To a few ml of filtrate, a drop or two Mayer's reagent were added by the side of the test tube. A white or creamy precipitate confirmed the test as positive (Harborne 1998).

Test for flavonoids (NaOH test): Few drops of sodium hydroxide solution were added to 2-3 ml of extract in a test tube. Formation of intense yellow colour that became colourless on addition of few drops of dilute HCl indicated the presence of flavonoids (Khandelwal 2008).

Test for anthocyanins (HCl test): The presence of anthocyanins was demonstrated by adding 2 ml of the plant extract to 2 ml of 2N HCl. The appearance of a pink-red colour that turned purplish blue after addition of ammonia indicated the presence anthocyanins (Obouayeba et al 2015, Savithramma et al 2011).

Test for polyphenols (ferric chloride test): One ml of extract was added to 2 ml of 5 per cent neutral ferric chloride solution; the dark blue (greenish) colouring indicated the presence of phenolic compounds (Raaman 2006, Tiwari et al 2011).

Test for catechin tannins: Tannins were highlighted using Stisany's reagent. Five ml of plant extract was

evaporated to dryness and 15 ml of Stisany'sreagent [formalin 30% concentrated HCl (2/1, v/v)] was added to it. The mixture was kept in a water bath at 80°C for 30 min. After cooling under a stream of water, observation of large flake precipitate characterized catechin tannins (Obouayeba et al 2015).

Test for gallic tannins (lead acetate test): A few drops of 10 per cent lead acetate solution were added to 5 ml of extract. Formation of yellow or red precipitate indicated the presence of gallic tannins (Trease and Evans 1984).

Test for saponins (foam test): One ml extract was diluted with 20 ml of distilled water and shaken in a graduated cylinder for 15 minutes. One cm layer of foam indicated the presence of saponins (Das et al 2014).

Test for steroids (Lieberman-Buchard test): One ml of anhydrous acetic acid and 3 drops of concentrated sulfuric acid were added to two ml of extract dissolved in isopropyl alcohol. After 5 min, a blue-green colour middle layer was indicative of sterols but pink, red, magenta or violet colour revealed the presence of terpenoids (Maria et al 2018).

Test for resins (acetic anhydride test): One ml of solvent extract was treated with few drops of acetic anhydride solution followed by 1 ml of concentrated H_2SO_4. Resins gave colouration ranging from orange to yellow as also reported by Kumar et al (2013) and Singh and Kumar (2017).

Test for coumarins (ferric chloride test): Few drops of alcoholic $FeCl_3$ were added to concentrated extract. Appearance of dark green colour turned into yellow colour after some time on addition of concentrated HNO_3 that indicated the presence of coumarins (Bhatt 2019).

Test for cardiac glycosides (Keller-Killani test): One ml filtrate was added in 1.5 ml glacial acetic acid followed by 1 drop of 5 per cent ferric chloride and concentrated H_2SO_4 (along the side of test tube). Appearance of blue coloured solution indicated the presence of cardiac glycosides (Singh and Kumar 2017, Nanna et al 2013).

Table 2. Phytochemical screening of Bharangi roots from different locations in Ratnagiri district, Maharashtra

Phytochemical constituent	Taluka							
	Dapoli	Dabhol	Khed	Mandangad	Chiplun	Sangmeshwar	Ratnagiri	Lanja
Ethanol extract								
Alkaloids	+	+	+	+	+	+	+	+
Flavonoids	+	+	+	+	+	+	+	+
Anthocyanins	–	–	–	–	–	–	–	–
Polyphenols	+	+	+	+	+	+	+	+
Catechin tannin	–	–	–	–	–	–	–	–
Saponins	+	+	+	+	+	+	+	+
Steroids	+	+	+	+	+	+	+	+
Gallic tannins	–	+	+	+	+	–	+	–
Resins	+	+	+	+	+	+	+	+
Coumarins	+	+	+	+	+	+	+	+
Cardiac glycosides	–	+	–	+	+	–	+	+
Quinones	–	–	–	–	–	–	–	–
Aqueous extract								
Alkaloids	+	+	+	+	+	+	+	+
Flavonoids	+	+	+	+	+	+	+	+
Anthocyanins	–	–	–	–	–	–	–	–
Polyphenols	+	+	+	+	+	+	+	+
Catechin tannin	–	–	–	–	–	–	–	–
Saponins	+	+	+	+	+	+	+	+
Steroids	+	+	+	+	+	+	+	+
Gallic tannins	–	–	–	–	–	–	–	–
Resins	–	–	–	–	–	–	–	–
Coumarins	+	+	+	+	+	+	+	+
Cardiac glycosides	+	+	+	+	+	+	+	+
Quinones	–	–	–	–	–	–	–	–

+ = Present; – = Absent

Test for quinine (sulfuric acid test): One drop of concentrated sulfuric acid was added to 10 ml of each extract dissolved in isopropyl alcohol (Maria et al 2018).

RESULTS and DISCUSSION

The observations on phytochemical constituents observed through qualitative phytochemical screening of Bharangi roots from different locations are presented in Table 2.

Data show that the alkaloids, flavonoids, polyphenols, saponins, steroids and coumarins were recorded in ethanol as well as aqueous extracts of samples collected from all the Talukas under study. However, anthocyanins, catechin tannin and quinones were absent in all the samples in both the extracts. Gallic tannins were observed in the ethanol extract of the samples collected from Dabhol, Khed, Mandangad, Chiplun and Ratnagiri but not in those collected from Dapoli, Sangmeshwar and Lanja Talukas. However, in the aqueous extract no gallic tannins were recorded from the samples of any Taluka. Resins were observed in the ethanol extract of samples of all the Talukas but not in the aqueous extract. The samples from Dabhol, Mandangad, Chiplun, Ratnagiri and Lanja showed the presence and absence in Dapoli, Khed and Sangmeshwar of cardiac glycosides in the ethanol extract. However, the aqueous extract showed the presence of cardiac glycosides in the samples collected from all the eight Talukas.

The results obtained are in accordance with findings made by Sama et al (2017) in case of root extracts of Bharangi. Similar results were also obtained by Kumar and Nishteswar (2013), Prasad et al (2012) and Sanjuka et al (2019) in Bharangi.

These phytochemicals present in the roots of Bharangi have anti-oxidant, hepatoprotective, anti-cancer, anti-fungal, anti-inflammatory, analgesic, anti-nociceptive, anti-allergic and anti-cholinesterase properties (Poornima et al 2015).

CONCLUSION

The preliminary phytochemical analysis revealed the presence of alkaloids, flavonoids, polyphenols, saponins, steroids, coumarins and cardiac glycosides in all the eight samples of Bharangi, whereas, gallic tannins and resins were present in most of the samples but not in all. Anthocyanins, catechin tannin and quinones were absent in all the samples collected from eight Talukas.

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