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A Minireview on Medicinal Benefits of *Melaleuca viminalis* and *Tabebuia rosea*

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

From plants, novel chemotherapy medicines can be derived. Ancient medicinal herbs were used to heal illness, and prevent epidemics. Tropical and subtropical Central and South American tree *Tabebuia rosea* is grown globally. For centuries, the tree's anti-inflammatory, analgesic, antibacterial, immune-boosting, and antioxidant qualities have treated numerous maladies. Little, bushy *Callistemon* (*Melaleuca viminalis*) has lanceolate leaves and hairy blooms. It features crimson "bottlebrush" inflorescences, thicker, leatherier leaves, and darker, fissured bark. This *Callistemon* species sheds seeds annually, unlike others. Spring and summer bottlebrushes develop multi-flower spikes. Flower pollen grows on a fine, multi-coloured thread. Filaments and pollen can tint flower spikes golden, although yellow is more typical. Each flower produces a woody fruit with many small seeds that lasts for years. *Callistemon* leaves are antioxidant, antibacterial,

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antifungal, and anti-platelet aggregation. Hence, this article briefly addresses the two medicinal plants (*Melaleuca viminalis* and *Tabebuia rosea*) in Bengaluru's Agara lake.

Keywords: Melaleuca viminalis; Agara lake; Medicinal plants; Tabebuia rosea.

1. INTRODUCTION

Plants are a profound source of potential compounds for the development of new chemotherapeutic agents. Historically, plants having therapeutic characteristics were utilized to season and preserve food. These herbs were also used to treat a range of health issues and thwart disease outbreaks [1]. The discovery of novel chemotherapeutic drugs can greatly benefit from the study of plants. These plants were also employed in the treatment of various diseases and the prevention of epidemics [2]. Tropical and subtropical Central and South American tree *Tabebuia rosea* is grown widely in Mexico, Venezuela, India and Ecuador [3]. Colourful blooms and 5-7 serrated oval or lanceolate leaves span 15–30 cm. Its trumpet-shaped, pink-to-light purple blooms and 30-centimeter-long, thin, woody capsule hold several small, winged seeds. The tree has been used to alleviate pain, fight infection, strengthen the immune system, and prevent cell damage for ages [4]. Antioxidants protect the body against oxidation [5]. Small, bushy *Callistemon* (*Melaleuca viminalis*) has lanceolate leaves and hairy flowers. It has darker, more wavy bark, larger, leatherier leaves, and bright red "bottlebrush" inflorescences. Unlike other species of *Callistemon*, produce new seed pods every year. Throughout the spring and summer, bottlebrushes send up spikes covered in flowers. Pollen from different flowers develops on a thin, iridescent thread. Golden filaments and pollen are a rare but possible occurrence on flower spires. A woody fruit containing several tiny seeds is produced by each blossom and can persist for years. Callistemon leaves can be used to combat antioxidants, bacteria, fungus, and platelet aggregation. So, this mini review provides a brief overview of both medicinal plants *Melaleuca viminalis* and *Tabebuia rosea* found at Agara lake park.

2. STUDY AREA

Agara Lake is one of Bangalore's few natural lakes. It is situated on Bangalore's Outer Ring Road, close to Koramangala and HSR Layout. The lake is approximately 98 acres in size. Agara Lake Trail, Agara Village, 1st Sector, HSR Layout, Bengaluru, Karnataka 560034, India has a latitude of 12.920063 and a longitude of 77.642886. Agara Lake is a respectable location for strolling, fish farming, and recreation with a park. Numerous trees, *Melaleuca viminalis*, and *Tabebuia rosea* plants adorn the area around the lake. These angiosperms were observed, and it was discovered that both of these plants have therapeutic qualities. Therefore, the main choice was to write succinctly about the therapeutic uses of these plants in order to draw the reader's attention to their significance and to briefly describe the important characteristics of the plants of interest.

3. *Tabebuia rosea*

Tabebuia rosea is a tree that is native to Central and South America, although it is now commonly grown in other tropical and subtropical parts of the world. It is also known as the Pink Trumpet Tree and the Rosy Trumpet Tree [4]. The *Tabebuia rosea* tree, in general, is a gorgeous ornamental tree that is highly regarded for the colourful blooms it bears as well as the lovely leaves it blooms. *Tabebuia rosea* may attain a maximum height of 30 meters, but normally achieves a height of 15 meters. Over age, the greyish-brown, smooth bark becomes rough and fissured. The leaves are palmate, complex, and deciduous. They are 15 to 30 centimeters long and have 5-7 oval or lanceolate leaflets with serrated margins. Tabebuia rosea produces trumpet-shaped blooms that range in color from pink to light purple [4,5]. They form massive clusters at branch terminals and can grow to a maximum length of 10 cm. The fruit is a 30-centimeter-long, thin, woody capsule with several minuscule, winged seeds inside. The wood of *Tabebuia rosea* is utilized for building, furniture, and other applications because to its density, weight, and hardness [6].

4. *Tabebuia rosea* MEDICINAL USES

Health uses for the *Tabebuia rosea* plant include its anti-inflammatory, analgesic, antimicrobial, immune-boosting, and antioxidant properties. In various regions of the world, such as Central and South America, India etc., it is believed to provide medicinal advantages, including but not limited to the following: traditional medicine has associated with the bark and leaves of *Tabebuia*

rosea as an anti-inflammatory therapy for rheumatism and inflammation [7]. There are claims that the bark and leaves of *Tabebuia rosea* possess analgesic properties, and these plant components have been used to treat pain [6,7]. In nonconventional medicinal routine, the bark and leaves of *Tabebuia rosea* have been used for centuries as a natural treatment for a comprehensive spectrum of illnesses, including skin infections, urinary tract infections, and respiratory tract infections. *Tabebuia rosea*, which is believed to have immunological properties, has been used medicinally to avert the body in avoiding infections [8]. Both the bark and leaves of *Tabebuia rosea* are antioxidant, which is a chemical that can help protect the body from oxidative stress and incursion of harmful zeitgebers. It is vital to note that *Tabebuia rosea* has been used medicinally for centuries, further research is necessary to substantiate claims made regarding its prospective health benefits and to define suitable dose levels [5,6].

It has been demonstrated that *Tabebuia* plants possess antifungal, antibacterial (against *Helicobacter pylori* and *Staphylococcus aureus*), anti-inflammatory, and antioxidant idiosyncrasies. Menadione's preventative effect on the stomach and intestines is just one of the biological functions of compounds identified from Tabebuia species, which also include benzenoids, lapachone, and lapachol [9]. Lapachone has antibacterial, antifungal, and anti-inflammatory properties in addition to other properties. The anti-inflammatory, gastroprotective, antibacterial, and antifungal properties of lapachol have been established. Bark remedies can be used to treat uterine cancer, malaria, and intestinal worms. For anaemia or constipation, consume a bark decoction [10]. Decoctions of the plant's blossoms, leaves, and roots can be used to treat fever, discomfort, loss of appetite, and sore tonsils. Lapachol, a naturally occurring organic substance from other Tabebuia species, is one of the tree's several phytochemicals. Additional medical benefits of the pink tree include antimalarial and antitrypanosomal properties, demonstrated by lapachol [10,11].

5. *Melaleuca viminalis*

Slim lanceolate 2–6 cm of foliage, with hairy blooms. Inflorescence is 5-20cm 3-6cm, terminal, brilliant red, and predominantly composed of spectacular stamens are the morphological features. The "ring" of stamens sheds together. The flowers may look "threaded" through the branches if the leaves emerge from the terminal apex of the inflorescence. Hard, woody capsules contain seeds [12]. When young, the branches of this small, bushy tree are covered with silky hairs it resembles the Weeping Willow (*Salix babylonica*) in appearance, but may be distinguished by its crimson "bottlebrush" inflorescences, thicker, leatherier leaves, and darker, fissured bark. The seeds of this species are shed annually from the capsules, unlike the vast majority of other Callistemon species where they are retained for many months. Once established, this plant is relatively drought tolerant [13]. During the spring and summer, bottlebrushes develop flower spikes comprised of several individual flowers. Inside a flower, pollen grows at the end of a filament, a thin, vibrantly coloured stem. These filaments are responsible for the flower spike's vibrant colours and distinctive 'bottlebrush' shape. Both the filaments and the pollen can give the flower spikes a brilliant golden hue, but yellow is more prevalent [14]. Each flower produces a little, woody fruit with several minute seeds. These fruit clusters form along the stem and can persist on the plant for several years. Typically, fruits remain closed for several years before releasing their seeds, however the fruits of other species open after only one. Some bottlebrushes release their fruit early in response to fire [15].

6. *Melaleuca viminalis* MEDICINAL USES

The vegetation of Australia has adapted to its harsh environment over millions of years. Some of these plants produce secondary metabolites, such as alkaloids, terpenoids, and phenolics, to protect themselves from herbivores, diseases, and environmental threats. Secondary metabolites of Australian plants offer untapped potential in medicine, agriculture, and biotechnology [12-14]. These substances possess antibacterial, anti-inflammatory, and anticancer properties, making them promising therapeutic options. These compounds might be used to produce biodegradable polymers, natural pesticides, and fertilizers. The numerous secondary metabolites of Australian plants may benefit society and the environment [16].

The genus *Callistemon*, also known as bottlebrushes, belongs to the family Myrtaceae and contains approximately 34 species that are widely dispersed across the globe. *Callistemon viminalis* (weeping bottlebrush) is a small tree or shrub found worldwide, mostly in tropical Asia,

Australia, Sri Lanka, South America, and India, as well as in Egypt, where it is cultivated as an ornamental plant, and as a source of essential oil [17] *C. viminalis* is predominantly used for treating skin infections, hemorrhoids, gastroenteritis, diarrhea, and respiratory problems. The health effects of secondary metabolites like phenolic compounds make them particularly intriguing. Few studies have been conducted on *C. viminalis'* phenolic compounds, which include flavonoids, tannins, and phenolic acid. *Callistemon viminalis* essential oil is packed with antifungal, antibacterial, insecticidal, and antioxidant monoterpenoids [17].

Tea is one of the most popular drinks in the world. Included in a growing number of herbal tea recipes is callistemon, commonly referred to as weeping bottlebrush leaves (*Melaleuca viminalis*). *Callistemon* leaves have antioxidants, antibacterial, antifungal, and anti-platelet aggregation properties, to name just a few beneficial qualities [18]. All *M. viminalis* extracts have shown considerable ($p < 0.005$) cytotoxicity against the examined cancer cells. Extract of ethyl acetate consistently indicated increased cytotoxicity values. The presence of phenolics and flavonoids in the ethyl acetate fraction would have contributed to cancer cell cytotoxicity. The above investigation revealed that the precise phytochemicals responsible could not be identified [19].

Natural antioxidants reduce oxidative stress and improve health, which is an important characteristic of medicinal plants [20]. Another study discovered that the aqueous methanol extract (AME) of *C. viminalis* aerial parts contained four unique flavanol glycosides and one tannin component, in addition to fifteen known compounds, mostly flavanol, glycosides, phenolic acids, and aglycones [14,21]. In many radical scavenging experiments, the antioxidant activity of AME exhibited significant radical scavenging activity, necessitating more investigation into its cytotoxic effects on breast (MCF-7) and hepatocellular (HepG2) cancer cells [14,22]. The crystal structure of human 5-lipoxygenase (5-LOX) was utilized to undertake a comprehensive in silico research of the antioxidant mechanism of action of these medicines [21]. The binding affinity of ascorbic acid and quercetin was compared to six molecules bound at the active site. All compounds bind to the 5-LOX active site more effectively than standard drugs. In silico analysis suggest that all reported compounds will have a positive in vitro 5-LOX inhibition profile, and that some, such as compound, may be clinically developed. Docking studies and in vitro antioxidant and anticancer evaluations indicate that these compounds may be antioxidant and anticancer agents [14].

Table 1. Scientific classification of the medicinal important plant species in Agara lake of urban Bengaluru

S. No.	Nomenclature/Characteristics	*Tabebuia rosea*	*Melaleuca viminalis*
1.	Kingdom	Plantae	Plantae
2.	Clade	Tracheophytes	Tracheophytes
3.	Clade	Angiosperms	Angiosperms
4.	Clade	Eudicots	Eudicots
5.	Clade	Asterids	Rosids
6.	Order	Lamiales	Myrtales
7.	Family	Bignoniaceae	Myrtaceae
8.	Sub-Family	-	Myrtoideae
9.	Tribe	-	Melaleuceae
10.	Genus	*Tabebuia*	*Callistemon/ Melaleuca*
11.	Species	*T. rosea*	*M. viminalis*
12.	Common Name	Pink Trumpet Tree/ the Rosy Trumpet Tree.	Weeping Bottlebrush or Paperbark.
12.	Country/Region of Origin	Central and South America	Australia
13.	Plant Type	medium-sized tree	Shrub, Tree
14.	Habit/Form	deciduous	Multi-trunked/Weeping
15.	Fruit type	Long, Narrow Capsule	Capsule
16.	Fruit description	Woody capsule	Woody capsule
17.	Flower colour	pink to light purple	Red/Burgundy
18.	Flower inflorescence	trumpet-shaped	Spike
19.	Flower description	Clusters	Bright red spikes of 9-14 stamens
20.	Leaf Type	Compound & Palmate	Simple
21.	Leaf Shape	Oval/lanceolate	Elliptical
22.	Leaf Margin	serrated edges.	Entire
23.	Hair	No	No
24.	Stem	Not Aromatic	Not Aromatic

(A)

(B)

Fig. 1. (A) Pictorial representation of the morphological characteristics of *Tabebuia rosea*. (B) Pictorial representation of the morphological characteristics of *Melaleuca viminalis*

7. CONCLUSION

Melaleuca viminalis and *Tabebuia rosea* have medicinal characteristics with comparable and distinct characteristics. Both plants have antioxidant properties that can protect the body from oxidative stress and reduce the chance of developing chronic diseases. They contain anti-inflammatory properties that help ease pain and inflammation, as well as a rich heritage of use in herbal medicine to treat a number of ailments. *Melaleuca viminalis* possesses antibacterial

properties that can be used to treat bacterial and fungal diseases, but *Tabebuia rosea* possesses immune-boosting properties that may be used to cure infections. Despite the fact that these plants have similar medicinal benefits, they have diverse attributes that render them versatile for different purposes.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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