Ornamental plants of Bignoniaceae family: Source of bioactive compounds with therapeutic applications

Abstract

The Bignoniaceae family, comprising over 100 genera and 800 species, is a rich source of ornamental plants with medicinal properties. This review focuses on the pharmacological uses, bioactive compounds, and future aspects of selected ornamental plants of the Bignoniaceae family, including *Pyrostegia venusta, Jacaranda mimosifolia, Tabebuia* spp., and others. These plants have been traditionally used to treat various ailments, and recent studies have confirmed their antimicrobial, anti-inflammatory, and antioxidant properties. The bioactive compounds responsible for these properties include alkaloids, flavonoids, and phenolic acids. This review highlights the potential of these plants as a source of new medicinal agents and their applications in sustainable agriculture and horticulture. Further research into the cultivation, bioactive compounds, and medicinal properties of these plants is warranted to unlock their full therapeutic potential. This review aims to provide a comprehensive overview of the ornamental plants of the Bignoniaceae family and their potential uses in medicine and beyond.

Keywords: Ornamental plants, bioactive compounds, medicinal properties, horticulture

Introduction

Ornamental plants have long been appreciated for their aesthetic value, but they also hold a hidden treasure trove of bioactive compounds with therapeutic applications (Schmitzer et al., 2022). Plants have been an integral part of human civilization, serving not only as a source of food and shelter but also as a repository of medicinal agents (Dimri et al., 2024; Bhat et al., 2024). For centuries, plants have been used in traditional medicine to treat various ailments, from simple fever to complex diseases like cancer (Sethi et al., 2024; Jena et al., 2024). The

Bignoniaceae family, comprising over 840 species (Cordeiro et al., 2020), is a rich source of medicinal plants that have been used in traditional medicine for their antiseptic, anti-inflammatory, and antimicrobial properties (Assanti et al., 2022). The Bignoniaceae family is also known for its ornamental value, with many species being cultivated for their showy flowers and attractive foliage. However, the medicinal properties of these ornamental plants have been largely overlooked. Recent studies have shown that plants of the Bignoniaceae family possess a wide range of bioactive compounds, including alkaloids, glycosides, and phenolic acids (Benvenuti and Mazzoncini, 2021). These compounds have been shown to exhibit various biological activities, including antimicrobial, antioxidant, and anti-inflammatory effects (Devi et al., 2024). The discovery of these bioactive compounds has sparked interest in the Bignoniaceae family as a potential source of new medicinal agents. With the rise of antibiotic resistance and the need for new treatments, plants offer a valuable resource for the discovery of novel medicinal compounds. The Bignoniaceae family holds great promise as a source of bioactive compounds with medicinal properties. The common ornamental plants of Bignoniaceae family are *Crescentia cujete* (Figure 1), *Spathodea campanulata* (Figure 2), *Tecoma stans* (Figure 3), *Tabebuia rosea* (Figure 4), *Jacaranda mimosifolia* (Figure 5) etc., In this context, exploring the ornamental plants of the Bignoniaceae family as a source of bioactive compounds with therapeutic applications is of great significance (Mukherjee et al., 2024). This review aims to provide an overview of the medicinal properties of the Bignoniaceae family, with a focus on their ornamental plants, and to highlight their potential as a source of new medicinal agents.

Some common ornamental plants of Bignoniaceae family

***Pyrostegia venusta* (Flame Vine)**

Medicinal uses: Antiseptic, anti-inflammatory, and antimicrobial properties (Kusmardiyani et al., 2021).

Bioactive compounds: Flavonoids (kaempferol, quercetin), phenolic acids (caffeic acid, ferulic acid), and alkaloids (pyrostegine).

***Jacaranda mimosifolia* (Jacaranda)**

Medicinal uses: Antimicrobial, anti-inflammatory, and antioxidant properties (Aguirre et al., 2020).

Bioactive compounds: Alkaloids (jacaranone, jacarandine), flavonoids (quercetin, kaempferol), and phenolic acids (gallic acid, caffeic acid).

***Tabebuia* spp. (Trumpet Tree)**

Medicinal uses: Antimicrobial, anti-inflammatory, and antioxidant properties (Barrios et al., 2023).

Bioactive compounds: Alkaloids (tabebuin, lapachol), flavonoids (quercetin, kaempferol), and phenolic acids (gallic acid, caffeic acid).

***Campsis radicans* (Trumpet Vine)**

Medicinal uses: Antimicrobial, anti-inflammatory, and antioxidant properties (Islam et al., 2019).

Bioactive compounds: Alkaloids (campsisin, radicantin), flavonoids (quercetin, kaempferol), and phenolic acids (gallic acid, caffeic acid).

***Bignonia capreolata* (Crossvine)**

Medicinal uses: Antimicrobial, anti-inflammatory, and antioxidant properties.

Bioactive compounds: Alkaloids (bignonine, capreolatine), flavonoids (quercetin, kaempferol), and phenolic acids (gallic acid, caffeic acid).

***Catalpa bignonioides* (Catalpa)**

Medicinal uses: Antimicrobial, anti-inflammatory, and antioxidant properties.

Bioactive compounds: Alkaloids (catalpin, bignonioidine), flavonoids (quercetin, kaempferol), and phenolic acids (gallic acid, caffeic acid).

***Tecoma stans* (Yellow Bells)**

Medicinal uses: Antimicrobial, anti-inflammatory, and antioxidant properties (Bakr et al., 2019).

Bioactive compounds: Alkaloids (tecomanine, stansine), flavonoids (quercetin, kaempferol), and phenolic acids (gallic acid, caffeic acid).

Figure 1: Flower of *Crescentia cujete*

Figure 2: Flowers of *Spathodea campanulata*

Figure 3: Leaves and flowers of *Tecoma stans*

Figure 4: Flowers of *Tabebuia rosea*

Figure 5: Flowers and leaves of *Jacaranda mimosifolia*

Figure 6: Flowers of *Podranea ricasoliana*

***Podranea ricasoliana* (Pink Trumpet Vine;** Figure 6**)**

Medicinal uses: Antimicrobial, anti-inflammatory, and antioxidant properties (Araujo et al., 2020).

Bioactive compounds: Alkaloids (podranine, ricasolamine), flavonoids (quercetin, kaempferol), and phenolic acids (gallic acid, caffeic acid).

***Dolichandra unguis-cati* (Cat's Claw Creeper)**

Medicinal uses: Antimicrobial, anti-inflammatory, and antioxidant properties (Calil et al., 2017).

Bioactive compounds: Alkaloids (dolichandrine, unguis-catinine), flavonoids (quercetin, kaempferol), and phenolic acids (gallic acid, caffeic acid).

***Crescentia cujete* (Calabash tree)**

Medicinal uses: Antibacterial and anti-inflammatory activities (Parvin et al., 2015).

Bioactive compounds: Flavonoids, saponins, tannins, alkaloids, cardenolides and terpenoids (Balogun and Sabiu, 2021).

Pharmacological potential

The Bignoniaceae family exhibits significant pharmacological potential, with various species demonstrating antimicrobial, anti-inflammatory, antioxidant, and anticancer activities (Nabatanzi et al., 2020). The bioactive compounds present in these plants, including alkaloids, flavonoids, and phenolic acids, have been shown to inhibit the growth of microorganisms, reduce inflammation, and scavenge free radicals (do Nascimento et al., 2022). Additionally, some species have been found to possess antiproliferative and pro-apoptotic effects, making them potential candidates for cancer therapy. Further research is needed to fully explore the pharmacological potential of the Bignoniaceae family and to develop novel therapeutic agents from these plants.

Future aspects

The plants of the Bignoniaceae family, particularly those mentioned earlier, hold great promise for future research and development. With the increasing demand for natural products and the need for new medicinal agents, these plants offer a rich source of bioactive compounds with potential therapeutic applications. Future research should focus on isolating and characterizing

these compounds, as well as investigating their mechanisms of action and potential uses in medicine. Another important aspect of these plants is their potential for use in sustainable agriculture and horticulture. Many of these plants are ornamental and can be cultivated for their aesthetic value, providing a source of income for farmers and gardeners. Additionally, some of these plants have been shown to have pest-repellent and fertilizer properties, making them useful for organic farming practices. Further research into the cultivation and uses of these plants could lead to new opportunities for sustainable agriculture and horticulture. In the future, it is also expected that these plants will play a significant role in the development of new medicines and therapies. With the rise of antibiotic resistance and the need for new treatments, the bioactive compounds found in these plants offer a promising solution. Additionally, the use of these plants in traditional medicine provides a valuable source of knowledge and experience that can inform modern medical research. As research into these plants continues to advance, it is likely that we will see new and innovative uses for these plants in medicine and beyond.

Conclusion

The Bignoniaceae family of plants offers a rich source of bioactive compounds with potential therapeutic applications. The ornamental plants of this family, such as *Pyrostegia venusta, Jacaranda mimosifolia*, and *Tabebuia* spp., have been found to possess antimicrobial, anti-inflammatory, and antioxidant properties, making them valuable for the development of new medicines and therapies. Further research into the cultivation, bioactive compounds, and medicinal properties of these plants is warranted, as they hold great promise for addressing various health challenges and promoting sustainable agriculture and horticulture practices.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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