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A Review on *Averrhoa bilimbi* and *Cajanus Cajan* Flowers

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Abstract:

Tropical plants with edible fruits, *Averrhoa bilimbi* and *Cajanus Cajan*, are well known for their flowers, which have a variety of medicinal and culinary properties. *A. bilimbi* and *Cajanus Cajan* flowers will be discussed in this review along with their botanical descriptions, traditional uses, phytochemistry composition, and potential health benefits. *Averrhoa bilimbi* flowers are small, yellowish-green, and star-shaped, growing in clusters along the branches. Traditional medicine uses them to treat ailments such as coughs, skin infections, and high blood pressure. The medicinal properties and potential health benefits of *A. bilimbi* flowers can be attributed to their antioxidant and flavonoid content. The yellow, orange and red flowers of *Cajanus Cajan* are fragrant and come in different colors. *Cajanus Cajan* flowers are also valued for their antioxidant and anti-inflammatory properties, and are traditionally used to treat coughs, fever and digestive troubles. *A. bilimbi* and *Cajanus Cajan* flowers can both be used therapeutically in modern medicine. Inflammatory conditions may be alleviated by their anti-inflammatory properties, which may help prevent oxidative stress-related diseases. In addition, these flowers may be beneficial for overall health and well-being due

to their nutritional composition.

The flowers of *Averrhoa bilimbi* and *Cajanus Cajan* can be used as natural remedies and functional foods. The pharmacological activities, mechanisms of action, and traditional medicinal and culinary applications of these plants need further investigation

Keywords: *A. bilimbi*, *Cajanus Cajan*, Flower, pharmacological activity

Introduction

An important characteristic of plants is the presence of phytochemicals, also called phytonutrients, which contribute to their appearance, flavor, and ability to resist disease. A balanced diet containing these bioactive compounds has been shown to provide numerous health benefits. They are not considered essential nutrients.

In addition to flavonoids, carotenoids, phenolic acids, alkaloids, and other phytochemicals, phytochemicals include a diverse range of compounds. Each phytochemical group contains a variety of phytochemical compounds, each with a different chemical structure and biological activity.

There is evidence that phytochemicals are able to possess a variety of health-promoting properties, such as antioxidants, anti-inflammatory properties, antimicrobial properties, and anticancer properties. According to recent research, dietary phytochemicals may be beneficial to health, as a number of studies have shown that plant-based foods reduce chronic diseases such as diabetes, heart disease, and certain forms of cancer.

Averrhoa bilimbi



Figure 1: *A. bilimbi*

An *A. bilimbi* tree, also known as the *bilimbi* tree or cucumber tree, belongs to the family Oxalidaceae. In addition to its edible fruits, flavor, and potential medicinal properties, it is widely grown throughout tropical regions [1].

Typically, *bilimbi* trees grow to a height of five to ten meters, and the tree produces clusters of elongated, greenish-yellow fruit on small, slender branches. Food preparations involving these fruits include pickles, sauces, and beverages, especially in Southeast Asian cuisine, due to their sour taste.

It is also known that *A. bilimbi* has been used in traditional medicine for a long time. It has traditionally been used to treat coughs, skin infections, and high blood pressure by using the fruits, leaves, and flowers of this tree [2].

An Oxalidaceae tree species, *A. bilimbi* is commonly known as the cucumber tree or *bilimbi*. *A. bilimbi* is a tropical plant native to Indonesia that is widely cultivated for its edible fruit and medicinal properties throughout several tropical regions. There is a great deal of value in the flowers of this tree as well as the fruit of *A. bilimbi*, which is known for its sour taste and numerous culinary uses. Flowering *A. bilimbi* is characterized by small, delicate, yellowish-green blooms. A subtle fragrance is emitted by the clusters of flowers that grow along the tree's branches. Its medicinal properties are attributed to its phytochemicals, such as antioxidants, flavonoids, and phenolic compounds, which add to its modest size. *Bilimbi* flowers have been used in traditional medicine for the treatment of a variety of illnesses, including coughs, fevers, and skin infections. As a result of their antioxidant and anti-inflammatory properties, they are also valued for supporting overall health and well-being [3].

Cajanus Cajan



Figure 2: *Cajanus Cajan*

In tropical and subtropical regions of Asia and Africa, *Cajanus Cajan* is commonly known as the pigeon pea. *Cajanus Cajan* belongs to the Fabaceae family, and in many cultures, particularly in South Asia and Africa, it is cultivated for its nutritious seeds [4]. In addition to its culinary uses, *Cajanus Cajan* has also been used for centuries in traditional medicine due to its medicinal properties. A drought-resistant plant, *Cajanus Cajan* has long, compound leaves and yellow or orange flowers.

A valuable dietary component in regions where they are grown, pigeon pea seeds are rich in protein, fibre, vitamins, and minerals. A range of ailments, including digestive disorders, respiratory infections, and inflammation, are treated using the leaves, roots, and flowers of the *Cajanus Cajan* plant [5]. Phytochemicals found in the plant, such as flavonoids, alkaloids, and tannins, are believed to be responsible for its therapeutic effects.

There are several tropical legume species known as pigeon peas, such as *Cajanus Cajan*, which are grown for their edible seeds and green pods. The *Cajanus Cajan* plant is native to India and is extensively cultivated in subtropical and tropical regions throughout the world because of its nutritional and medicinal properties. *Cajanus Cajan* is known primarily for its seeds and pods, but it also has significant value for its flowers.

There are several shades of yellow, orange, and red in the flowers of *Cajanus Cajan*. A cluster of these flowers typically grows at the end of a branch and is fragrant. Although *Cajanus Cajan* flowers may be attractive, they contain a variety of phytochemicals, including flavonoids, polyphenols, and alkaloids that provide the flowers with their medicinal properties. Traditional medicine has used *Cajanus Cajan* flowers to treat a variety of ailments, including respiratory problems, digestion problems, and fevers [6]. The antioxidant, anti-inflammatory, and antimicrobial properties of these fruits contribute to their value as well as their ability to promote overall health and well-being.

Botanical Description and Distribution

Averrhoa bilimbi

It belongs to the Oxalidaceae family and is commonly known as the *bilimbi* tree or cucumber tree. It is characterized by its slender trunk, dense foliage, and small, oblong-shaped leaves. A small, star-shaped flower is produced by this tree and it can often be seen in a yellowish-green colour due to its shape and size. There are several tropical regions worldwide that cultivate *A. bilimbi*, although it is native to Indonesia. Gardens and orchards often contain this plant, which thrives in warm, humid climates [7]. In culinary preparations and traditional medicine, the fruit of the tree has a sour taste and is used as an ingredient.

Cajanus Cajan

Pigeon peas, or red grams, are tropical legumes that grow in an upright shrub-like manner. It produces yellow to red flowers in clusters at the ends of branches, with compound leaves that have three leaflets [8]. The *Cajanus Cajan* plant originates from India and is cultivated extensively in tropical and subtropical regions throughout the world, including Africa, Asia, and the Americas. A drought-tolerant plant with soil-enriching properties and nutritional value, it thrives in warm climates with well-drained soil [9].

Nutritional Composition and Phytochemicals

Averrhoa bilimbi

In spite of its small size, the *A. bilimbi* flower contains beneficial nutrients and phytochemicals that contribute to its medicinal properties. The nutrition data for *A. bilimbi* flowers are incomplete, but studies have found that they contain many vitamins, minerals, and bioactive compounds. In addition to flavonoids, phenolic compounds, and vitamin C, *A. bilimbi* flowers provide antioxidant protection, reducing inflammation in the body, and protecting cells from oxidative damage. They may contribute to the therapeutic effects of the flower by promoting overall health [10]. As well as regulating blood sugar levels, the flowers of *A. bilimbi* support digestion. In addition, they provide essential vitamins and minerals such as vitamins A, B complex, and E, as well as minerals such as potassium, calcium, and iron, which are all essential for good health.

Due to its bioactive compounds, *A. bilimbi* flowers have been traditionally used for treating coughs, skin infections, and high blood pressure. Phytochemically, *A. bilimbi* flowers can be used to promote health and well-being due to their nutritional composition and phytochemical profile.

Cajanus Cajan

There are many health benefits associated with *Cajanus Cajan* flowers, including their visual appeal, nutritional content, and phytochemical composition. Besides containing essential vitamins, minerals, and bioactive compounds, these flowers also promote overall health.

Vitamin C is a powerful antioxidant and improves the immune system when taken as part of a diet rich in *Cajanus Cajan* flowers. A significant amount of alkaloids, flavonoids, and polyphenols are found in *Cajanus Cajan* flowers. The bioactive compounds may help prevent chronic diseases and promote health by acting as antioxidants, anti-inflammatory, and antimicrobial agents [11].

Cajanus Cajan flowers have been found to contain phytochemicals that have been found to provide anti-cancer, anti-diabetic, and cardio protective properties. As well as reducing inflammation, improving digestion, and enhancing immunity, these compounds may provide additional benefits. By contributing nutritional composition and phytochemical content to a well-rounded and nutritious diet, *Cajanus Cajan* flowers can provide potential health benefits.

Traditional and Medicinal Uses

Averrhoa bilimbi

In various tropical regions where *A. bilimbi* is cultivated, the flowers have been used traditionally for medicinal purposes. Various parts of the *A. bilimbi* tree, including its flowers, can be used for treating a variety of ailments and promoting overall well-being in traditional medicine [12].

In addition to treating respiratory conditions such as coughs, colds, and bronchitis, *A. bilimbi* flowers have also been traditionally used to treat respiratory conditions. To treat respiratory symptoms and promote respiratory health, the flowers are commonly prepared as infusions or decoctions and taken orally. Also, *A. bilimbi* flowers are beneficial in treating conditions such as acne, eczema, and rashes due to their anti-inflammatory properties. Inflammation, irritation, and healing may be reduced and soothed by topical application of the flowers' extracts or poultices.

The flowers of *A. bilimbi* are known to have diuretic properties, and they have traditionally been used to promote kidney health and urine flow. Taking teas or infusions made from the flowers promotes the detoxification of the urinary system [13]. Traditionally, the flowers of *A. bilimbi* have been used in tropical regions to treat a variety of ailments and contribute to holistic health practices.

Cajanus Cajan

Pigeon peas, or *Cajanus Cajans*, are tropical legumes cultivated for their edible seeds and pods. Traditional medicine has utilized various parts of the pigeon pea plant, including its flowers, for centuries beyond its culinary use.

The medicinal properties of *Cajanus Cajan* flowers have been used extensively in traditional medicine throughout many tropical regions. A poultice, decoction, or infusion made from the flowers is often used as an herbal remedy [14]. Coughs, colds, and bronchitis can be alleviated with *Cajanus Cajan* flowers. Mucus is loosened and airways are cleared by their expectorant properties. Moreover, the flowers are used for reducing fever, easing digestion issues, and promoting overall health.

It has been discovered that *Cajanus Cajan* flowers are rich in bioactive compounds with antimicrobial, anti-inflammatory, and antioxidant properties. Pigeon pea flowers have traditionally been used for medicinal purposes due to these compounds. *Cajanus Cajan* flowers are valued for their potential health benefits in many communities, and they hold significant cultural and medicinal importance in traditional healing practices.

Antioxidant and Anti-inflammatory Properties

Averrhoa bilimbi

Phytochemicals found in *A. bilimbi* flowers, such as flavonoids, polyphenols, and vitamin C, are responsible for their antioxidant and anti-inflammatory properties. Cells are protected from oxidative damage by these bioactive compounds, which also reduce inflammation.

Chronic diseases such as cancer, cardiovascular disease, and neurodegenerative disorders are caused by free radicals, which are unstable molecules that cause cellular damage. Free radicals are neutralized by *A. bilimbi* flowers, which possess antioxidant properties. *A. bilimbi* flowers contain antioxidants that reduce the risk of disease associated with oxidative stress by scavenging free radicals.

It is also believed that *A. bilimbi* flowers exhibit anti-inflammatory properties, which may assist in alleviating inflammation in the body. Arthritis, asthma, and inflammatory bowel disease are among the health problems associated with chronic inflammation. *A. bilimbi* flowers may contribute to overall health and well-being by reducing inflammation and associated symptoms.

Cajanus cajan

Its seeds and leaves are edible, and it is commonly known as pigeon pea. Additionally, flowers of *Cajanus cajan* possess antioxidant and anti-inflammatory properties, as well as their culinary uses. Among the bioactive compounds present in *Cajanus cajan* flowers are flavonoids, phenolic acids, and tannins. Free radicals are neutralized by these compounds in the body, reducing oxidative stress and protecting the cells. *Cajanus cajan* flowers may also protect against chronic diseases such as cancer, cardio disease, and neurodegenerative diseases because of their antioxidant properties.

Cajanus cajan flowers also exhibit significant anti-inflammatory properties, which are useful in reducing inflammation in the body and alleviating symptoms associated with inflammation [15]. Research has shown that *Cajanus cajan* flowers contain bioactive compounds that inhibit inflammatory enzymes and cytokines, which modulates inflammation and promotes well-being. It may be possible to harness the antioxidant and anti-inflammatory properties of *Cajanus cajan* flowers by adding them to your diet or using them in traditional remedies. The mechanism of action of *Cajanus cajan* flowers and their potential therapeutic use in humans require further investigation.

Potential Therapeutic Applications

Averrhoa bilimbi

Tropical plant *A. bilimbi*, also known as *bilimbi* or cucumber tree, is cultivated for its sour-tasting fruits. Due to *A. bilimbi*'s rich phytochemical composition and traditional medicinal uses, the plant also has a wide range of potential therapeutic applications in addition to its culinary uses.

The management of diabetes may be one of the potential therapeutic applications of *A. bilimbi*. There is evidence that extracts obtained from *A. bilimbi* possess hypoglycemic properties, which help to reduce blood sugar levels and improve insulin sensitivity. A number of bioactive compounds present in the plant may be responsible for these effects. These compounds include flavonoids and polyphenols.

The antioxidant and anti-inflammatory properties of *A. bilimbi* may also contribute to its potential therapeutic benefits. Both antioxidants and anti-inflammatory compounds play an important role in health and disease prevention by protecting cells from oxidative damage.

Traditionally, *A. bilimbi* has been used to treat a variety of ailments, including high blood pressure, coughs, and skin infections. With its diverse phytochemical profile, it is believed to have

several therapeutic properties, including those related to antimicrobial activity, hepatoprotection, and cancer prevention.

It may offer a natural approach to supporting health and wellness if *A. bilimbi* is introduced to the diet or used in traditional remedies. The therapeutic potential and mechanisms of action of this compound still need to be elucidated through further research.

Cajanus cajan

1. Antioxidant Effects:

There are many antioxidants in *Cajanus cajan*, including flavonoids and phenolic compounds, which contribute to the reduction of oxidative stress on cells. A number of chronic diseases, including cardiovascular disease and cancer, may be prevented by these antioxidant properties.

2. Anti-inflammatory Properties:

Inflammatory conditions such as arthritis, asthma, and inflammatory bowel disease have been shown to benefit from the use of *Cajanus cajan*, as it contains bioactive compounds.

3. Antimicrobial Activity:

In addition to demonstrating antimicrobial activity against bacteria, viruses, and fungi, extracts of *Cajanus cajan* have also been shown to be effective against a wide variety of pathogens. Infectious diseases may be treated with the aid of this antimicrobial property.

4. Antidiabetic Effects:

Cajanus cajan appears to have potential therapeutic value for managing diabetes and related complications by regulating blood sugar levels and improving insulin sensitivity.

5. Wound Healing:

A study found that *Cajanus cajan* extracts enhanced collagen synthesis and accelerated the formation of new tissue as a means of promoting wound healing. It is possible that this substance could be used to treat cuts, burns, and other skin injuries in the future.

It is in these circumstances that *Cajanus cajan* holds promise as a natural remedy with a wide range of therapeutic applications, which warrants further investigation to investigate its full potential in modern medicine.

Future Research Directions

A. bilimbi and *Cajanus cajan* flowers have made significant progress in the understanding of their potential health benefits and applications, but further research is required to address the following areas:

Efforts should be made to elucidate the mechanisms underpinning the observed pharmacological activities of *A. bilimbi* and *Cajanus cajan* flowers in the future. The focus of this study will be on identifying the specific bioactive compounds that produce their antioxidant, anti-inflammatory, and other therapeutic effects.

The development of innovative formulation technologies, including nanoencapsulation and controlled-release membranes, may enhance the bioavailability and efficacy of flower extracts of *A. bilimbi* and *Cajanus cajan* for therapeutic purposes.

There may be convenient and palatable ways to harness the health-promoting properties of *A. bilimbi* and *Cajanus cajan* flowers through their incorporation into functional foods and nutraceuticals.

These research priorities will enable us to extend the applications of *A. bilimbi* and *Cajanus cajan* flowers in preventative and therapeutic healthcare by further exploring their potential as natural remedies.

Conclusion

As a conclusion, this review highlights the diverse potential of *A. bilimbi* and *Cajanus cajan* flowers in various aspects of human health and wellbeing. Traditional medicine and culinary practices use *A. bilimbi* flowers for their medicinal properties, including antioxidants and anti-inflammatory compounds. These findings suggest that it is important to explore the lesser-known parts of plants for their potential health-promoting properties. It is, however, necessary to conduct further studies in order to fully understand how these flowers function and their therapeutic potential. A clinical trial should be conducted in the future to validate the efficacy and safety of these drugs in humans. The *A. bilimbi* and *Cajanus cajan* flowers may be promising additions to the arsenal of natural remedies available to promote health and prevent disease.

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