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REVIEW ARTICLE

Comprehensive Review on Phytochemistry and Ethnomedicinal uses of *Quisqualis indica* Linn. Medicinal plant species

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ABSTRACT
Herbal medicine refers to unrefined pharmaceuticals derived from plants or vegetables, which are the source of herbal medications used to treat various disease states, frequently chronic ones, or to achieve or sustain better health. Herbal medicine uses are based on historical medicinal practices. Historical practices determine the way herbal medicines are formulated and used. Nowadays, the human population depends on herbals to cure the diseases and to choose the herbal medicine for primary action just because of low side effects. Quisqualis indica is a beautiful ornamental plant but has lots of pharmacological activity and found to be safe at various level of research. In addition to being used as a herbal remedy, Quisqualis indica Linn is an evergreen plant that is widely available. It is also frequently utilised as a visually appealing plant that doesn't need certain growing seasons. Trigonelline, L-proline, L-asparagine, quisqualic acid, rutin, and isoenzyme A and B, two types of cysteine synthase, are among the phytoconstituents identified in Quisqualis indica. Its anti-inflammatory, antipyretic, immunomodulatory, anti-staphylococcal, anthelmintic, and antiseptic qualities are attributed to these phytoconstituents. Furthermore, the present review highlights the potential of Quisqualis indica Linn to treat inflammation. To develop novel chemicals derived from plants that can be utilised to treat inflammation, more study is needed.
Keywords: *Plant, Herbal plants, Herbal medicine, Quisqualis indica Linn, Inflammation.*

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INTRODUCTION

The Pharmaceutical industry's needs, the modern social and economic context around health care, and the knowledge that researching medicinal plants utilised in traditional medicine is an effective means of developing new drugs [1]. India has a bright, rich, and diverse cultural history. This culture and heritage place a high value on health and healing. As such, a wealth of knowledge about health and healing is available to all ethnic people across the different ecosystems. Local health customs have been diluted during the previous few centuries as a result of a growing influence from mainstream culture on this body of knowledge. This great people's health culture might disappear forever if we don't swiftly create effective recording and assessment initiatives to resuscitate local health customs [2]. This country is rightfully called the "Botanical Garden of the World" and is possibly the world's largest producer of aromatic herbs. Not many significant medicinal plants are unavailable in this country. In India, more than 3000 plants are officially acknowledged to have medicinal use. Roughly 75% of the medical needs of third-world countries are believed to be met by the approximately 6000 plants that are believed to be employed in traditional, folk, and herbal medicine in India [3]. It is estimated that India has 7800 medical medicine production facilities, and that each of these facilities uses about 2000 tonnes of herbs a year [4]. Herbal medicine is the application of plants, plant parts, their water or solvent extracts, essential oils, gums, resins, exudates, or other complex compounds derived from plant components for medicinal purposes. These items can be used to treat, cure, or prevent diseases in humans or animals, or they can be used more conventionally to support various physiological systems proactively [5]. The modern

healthcare system offers a number of choices for treating both infectious and non-infectious disorders. Unfortunately, a number of these medications come with their own set of adverse effects, and most people worldwide cannot afford or obtain them because of other obstacles. As a result, more than 75% of people still use herbal treatments to treat their basic medical needs, particularly in low-income nations. [6]. Both ancient and modern societies have relied heavily on medicinal plants for medical purposes. The Indian medical system known as Ayurveda primarily treats a wide range of human ailments with plant-based formulations since these ingredients have the potential to be curative. In comparison to modern medicine, plant-based pharmaceuticals are a valuable source of therapeutic agents due to their non-toxic nature, abundant availability, and relative affordability [7].

According to a World Health Organisation (WHO) report, more than 80% of the world's population gets their primary medical treatment directly from traditional practitioners, most of whom use plant-based remedies. Additionally, it's estimated that 40% or so of the pharmaceutical industry only use medicinal herbs. Approximately 3000 plant species are known to have therapeutic qualities in India, where they are employed in traditional medical systems such as homoeopathy, Ayurveda, Unani, and Siddha. The medications are made from the entire plant or from various parts of it, such as the leaves, stem, bark, roots, flowers, seeds, etc [8]. There are numerous notable distinctions between herbal medications and well-defined synthetic drugs, specifically:

- Oftentimes, the active principles are not understood
- Although not simple, standardisation, stability, and quality control are possible;
- There are rarely well-controlled double-blind clinical and toxicological trials to demonstrate their efficacy and safety;
- Raw material quality and availability are usually difficult;
- The utilisation of empirical evidence is a crucial aspect of folk medicine;
- They possess a broad spectrum of therapeutic applications and are appropriate for long- term care;
- Unwanted side effects appear to be less common with them, though well-controlled randomised clinical trials have shown that they do occur.
- Herbal remedies often have lower costs than synthetic medications [9].

Inflammation: It is thought to be the basis of pathology since the changes observed are suggestive of harm and disease [10]. Unchecked inflammation is the primary cause of a wide range of disorders, including cancer, autoimmune diseases, cardiovascular dysfunction, allergies, and metabolic syndrome. These conditions have a significant financial impact on both individuals and society as a whole, despite the fact that our bodies use inflammation as a defence mechanism in response to potentially harmful stimuli like allergens and/or tissue damage [11].It is commonly acknowledged that inflammation serves as a protective mechanism and essential survival strategy that has been maintained throughout evolution [12]. Localised redness, swelling, discomfort, heat, and loss of function are all signs of inflammation [13]. This complex biological reaction generally results in the restoration of equilibrium. However, the inflammatory process persists, and in circumstances when harmful signal-transduction pathways are active and inflammatory mediators are released for a prolonged amount of time, a mild but permanent proinflammatory state may arise [14]. Among the useful therapies used to control and decrease inflammatory crises are steroids, nonsteroid anti-inflammatory drugs, and immunosuppressants; nevertheless, these drugs can have negative side effects [11, 14]. Inflammation is the result of the immune system identifying and eliminating harmful and foreign stimuli, which is how the healing process begins. It is possible for inflammation to be acute or persistent [15,16,17].

Acute Inflammation: Toxic chemicals, microbial invasion, or tissue damage from trauma can all cause acute inflammation. It starts rapidly, worsens swiftly, and its symptoms, which include acute pneumonia or cellulitis, can last for several days. Subacute inflammation is the state that occurs between two and six weeks after an acute episode.

Chronic Inflammation: Another name for chronic inflammation is sluggish, persistent inflammation that lasts for several months to years at a time. Generally speaking, the origin of the injury and the body's capacity to heal and overcome the damage determine the degree and consequences of chronic inflammation [18,19, 20].

Anti-inflammatory agents: Anti-inflammatory medications aim to reduce tissue damage and improve patient comfort by interfering with the mechanism of inflammation. Glucocorticoids and non-steroidal anti-inflammatory medicines (NSAIDs) are the two main families of anti-inflammatory agents. These are fundamentally different in how they function. To put it briefly, glucocorticoids work by blocking prostaglandins and proteins that are involved in inflammatory processes, such corticosteroids, which are used to treat autoimmune inflammatory response and asthma, among other conditions. Contrarily, non-

steroidal medications work by inhibiting the cyclooxygenase enzyme and are recommended for the treatment of moderate to mild pain as well as the regulation of body temperature [21].

Mechanism of Action: The central and peripheral inhibition of COX, which prevents arachidonic acid from being converted to prostaglandins E2, prostacyclins, and thromboxanes, is the primary mechanism of action of NSAIDs. COX-1 and COX-2 are two distinct types of enzymes that are linked to the effects of NSAIDs and act in distinct areas. The majority of cells, including those in foetal and amniotic fluid, have COX-1, which contributes to physiological functions like regulation and protection. Conversely, proinflammatory cytokines and inflammation stimulate COX-2 [22, 23].

Herbal anti-inflammatory herb benefits include: [11,14,24,25,26].

- Easier to obtain
- Cost-effective
- Maximum efficacy
- Minimal side effects

The use of natural anti-inflammatory agents in conjunction with drug therapy is therefore necessary to maximise pharmacological efficacy while minimising undesirable side effects [11, 14]

Common name: Rangoon Creeper, Drunken Sailor, Akar Dani, Akar Suloh, Dani, Ara Dani, Akar Pontianak, Red Jasmine.

Synonyms: *Combretum indicum*

CLASSIFICATION

Kingdom - Plantae
Division- Magnoliophyta
Class- Magnoliopsida
Order- Myrtales
Family- Combretaceae
Genus- Quisqualis
Species- indica

Botanical Name- *Quisqualis indica* Linn. [21,22]

Habitat and Distribution: It is an evergreen vine that grows quickly and needs strong support. In its ideal growing environment, it can grow rather out of control, although it does not need deeply anchored roots. It is widely disseminated around the world, with particular emphasis on China, the Philippines, Bangladesh, Myanmar, and Malaysia. It is currently also commonly grown as a decorative plant in most gardens in India.

1. Dispersed over the Philippines secondary woods and swamp areas.
2. Planted decoratively for their flowers.
3. Happens from India to Malaya as well.
4. Added to the majority of tropical nations [23].

Chemical constituents: It contains phytoconstituents like the alkaloid trigonelline, the amino acids L-proline and L-asparagine, the flavonoid rutin, the agonist quisqualic acid (which binds to both AMPA receptors), and the two forms of cysteine synthase, isoenzyme A and isoenzyme B (enzyme). It has also been possible to separate rutin and pelargonidin-3-glucoside from flowers. Fruits include an organic acid called cathartic acid and a sweet material called levulose. A fixed oil including linoleic, oleic, palmitic, stearic, and arachidic acids, a sterol, an anthelimintic alkaloid, and the neuroexcitatory amino acid quisqualic acid is found in seeds. [24].

Traditional uses of *Quisqualis indicum*: Root, seed, or fruit decoctions can be used as an antihelmintic to help get rid of parasitic worms or to treat diarrhoea. Gargling with fruit decoction is an additional option. The fruits are utilised to treat nephritis as well. Fever-induced discomfort can be alleviated with leaves. Rheumatism is treated with the roots. Flowers are utilised as a headache remedy. This plant's and similar species' seeds contain quisqualic acid, a substance that acts as an agonist on the brain's AMPA receptor, a kind of glutamate receptor [21, 22].

Industrial Uses: The extract is further processed to be incorporated in any dosage form such as tablets and capsules. Manufacturers of medicinal plant extracts and producers of essential oils have begun employing the most suitable extraction technologies in response to the growing global demand for herbal medicinal products, nutraceuticals, and natural health care products. The goal is to produce extracts and essential oils of defined quality with minimal batch-to-batch variations [27].

Cultivation and Collection

Quisqualis indica needs full sun and frequent watering; during the summer, it needs extra water. There aren't many distinct types of *Quisaqualis indica*, with differences in leaf size and blossom colour. Growing a plant from layers, cuttings, or root divisions is simple. In healthy soil, it grows well. It needs a sturdy

trellis to maintain its fast growth. It can also be grown on a tree or an arch. By cutting back on the long new growths, it can remain contained like a bush. The entire year round, the plant blooms profusely. The flowers are white when they first open in the evening, turning pink in the morning and deep crimson in the late afternoon. They smell nice. In Northern India, the plant produces fruit [28].

PHARMACOLOGICAL ACTIVITY

Due to the presence of numerous active constituents throughout the entire plant, *Quisqualis indica* Linn. exhibits a wide range of pharmacological activities, including anti-inflammatory, antipyretic, immunomodulatory, anti-staphylococcal, anthelmintic, and antiseptic properties. Numerous pharmacological actions of this plant are caused by a few Phytochemical elements that are medicinally active [29].

Anthelmintic activity: The anthelmintics properties of various *Q. indica* leaf extracts were assessed independently on adult (*Pheretima posthuman*) Indian earthworms. It was discovered that at 60 mg/ml of each, the methanolic and aqueous extracts of *Quisqualis indica* exhibited anti-helminthes efficacy[30].

Insecticidal activity : Under laboratory conditions, the antifeedant and insecticidal properties of *Q. indica* L. flowers were tested against Spodoptera litura third-instar larvae using methanolic and ethyl acetate extracts. The crude methanol extract of *Q. indica* flowers exhibited much higher antifeedant activity, according to the data [31].

Anti inflammatory activity: In both the cotton pellet granuloma model and the acetic acid-induced vascular permeability, the hydroalcoholic extract of *Quisqualis indica* exhibits anti-inflammatory properties. Polyphenols and flavonoids were detected by the phytochemical study. Through their inhibition of prostaglandin formation, the polyphenols exhibit strong anti-inflammatory properties. Therefore, the hydroalcoholic extract of *Quisqualis indica* Linn's anti-inflammatory properties can be linked to the polyphenols' suppression of bradykinin and PG production [32, 33].

Antidiarrheal activity : The leaves of *Q. indica* L. were extracted with petroleum ether and used at doses of 100 and 200 mg/kg, po, to treat experimentally induced diarrhoea. The results showed a significant ($P < 0.05$) antidiarrheal effect that was dose dependant [34].

Anticancer activity : Using chromatographic techniques, the study revealed 25 O acetyl 23, 24 dihydro cucurbitacin F as a cytotoxic ingredient from *Q. indica*. Nuclear Magnetic Resonance and Mass Spectrometry (MS) were used to understand the chemical structures. The microarray-based expression of 9706 genes was correlated with the IC50 values for miltirone of 60 National Cancer Institute cell lines [35].

Antidiabetic activity : Using alloxan-induced diabetes models, *Q. indica* flower extract was tested for its antidiabetic potential for 43 days at doses of 100, 200, and 400 mg/kg p.o. The results showed a significant reduction in blood sugar levels [36].

Immunomodulatory activity: Using the carbon clearances test and cyclophosphamide-induced myelosuppression models, the immunomodulatory action of *Q. indica* flowers has been demonstrated at doses of 100 and 150 mg/kg. It has been determined that higher doses demonstrated considerable immunomodulatory effect. As a typical medication, levamisol (50 mg/kg, po) was utilised. To cause myelosuppression, cyclophosphamide (50 mg/kg) was administered [37].

Anti-oxidant activity : By scavenging free radicals such as peroxide, hydroperoxide, or lipid peroxyl, the redox properties of the methanolic plant extract *Quisqualis indica* Linn enabled them to operate as reducing agents and so prevent the oxidative pathways that contribute to degenerative illnesses. The extract's 95% antioxidant activity can be attributed to this. The findings of this study showed that the partitionates of the methanolic extract of *Q. indica* (stem bark), especially the chloroform soluble fraction, exhibited high antioxidant activity [38].

Antipyretic Activity: The antipyretic properties of the methanolic leaf extract of the *Quisqualis indica* Linn plant were thoroughly studied in relation to the rats' pyrexia model produced by Brewer's yeast. The *Quisqualis indica* Linn plant is being promoted as a potential antipyretic plant species by the competent, potent, and comparable findings of its methanolic extract at dose levels of 100 mg/kg and 200 mg/kg [38].

CONCLUSION

The majority of people in the world today rely on herbal remedies to treat illnesses, often selecting them for their primary course of treatment due to their minimal adverse effects. Scientific investigation into the potential advantages of herbal plants is crucial for the best possible care and safety for patients. The current study has determined that *Quisqualis indica* has significant phytochemical elements with a range of pharmacological actions and has been proven safe at several research levels. There is a need for good

research in society regarding the major properties of plants which serve as the foundation of many fields of study.

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