



Research article

An update on biological activities of medicinal plant *Ipomoea quamoclit* L.

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Abstract: *Ipomoea quamoclit* belonging to Convolvulaceae family is an annual, herbaceous plant, commonly known as mayil manikkam, akasamulla, kunjatala, tarulata, kamalata, getphul in India and distributed throughout the tropical areas of the world. *Ipomoea quamoclit* is used as folk medicine around the world for various illnesses. This paper reviews the important biological activities of *I. quamoclit* reported over the last few decades. These include antioxidant activity, antimicrobial activity, anticancer activity, antidiabetic activity as well as insecticidal activity. These studies reveal that *I. quamoclit* have various biological activities; hence, it is encouraging to find its new therapeutic uses.

Keywords: *Ipomoea quamoclit* - Folk medicine - Biological activities - Therapeutic uses.

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INTRODUCTION

Since the initiation of human civilization plants play a major role for the survival and development of human beings. Plants have been used for several years as a prime natural source of traditional medicine and alternative medicine all over the world to treat various diseases (Razali *et al.* 2008, Huang *et al.* 2014, Mehra *et al.* 2014, Truyen *et al.* 2015). This practice has been in existence since prehistoric times (Mittal *et al.* 2014). Traditional Chinese medicines of China; Ayurvedic, Siddha, Unani medicine system of Indian subcontinent and so many other systems are present in other countries of the globe (Ishtiaq *et al.* 2012, Kaur 2015). Atharvaveda (~1000 BC), Charak Samhita (~700 BC) and Sushruta Samhita (~200 BC) are the major manuscripts which give elaborate description of about 1200 herbs (Jain *et al.* 2014, Bajpai *et al.* 2016).

In a report by the World Health Organization (WHO), approximately 80% of the world's population for their primary health care currently depends on traditional herbal medicine (Verma & Singh 2008, Hiremath & Taranath 2013). Search of complementary and alternative plant derived medicine has gained gradually importance in the recent decade due to the less or no side effects and health hazards of the chemically synthesized drugs (Sibanda & Okoh 2007, Bajpai *et al.* 2016). The therapeutic properties of these medicinal plants are due to the presence of bioactive substances such as flavonoids, alkaloids, glycosides, tannins, coumarins, vitamins and other phenolic compounds (Meng *et al.* 1999, Sinha & Paul 2014, Kumaran & Citarasu, 2015, Marcus 2016, Sen *et al.* 2016). Although, number of studies have been performed to know the bioactive substances responsible for any medicinal property of a plant, but still there are several plants and their medicinal properties for which the bioactive substances are unknown (Kumaran & Citarasu 2015). Therefore, a thorough knowledge about the traditionally utilized medicinal plants is of utmost importance for exploration of its elite bioactive components (Ghosh *et al.* 2015). The present study reviews the important biological activities of *Ipomoea quamoclit* L. for their therapeutic properties.

PLANT MATERIAL

Ipomoea quamoclit L. is a less studied medicinal plant, which is an annual, herbaceous; twining vine belongs to the family Convolvulaceae. It is commonly known as cypress vine, star glory, cardinal vine, cardinal creeper, Indian pink, hummingbird vine and cupid's flower (Chetty *et al.* 2008, Haque & Ghosh 2013). *Ipomoea quamoclit* is one of the most commonly seen plant throughout the tropics in and around of the living area from

northern South America to Mexico. In India, it is called mayil manikkam, akasamulla, kunjolata, tarulata, kamalata, getphul etc.

Plant annual or perennial herb, twining vine which grows upto a height of 1–3 m. Leaves are long (2–9 cm), pinnately lobed, each side of the leaf containing 9–19 lobes. The flowers are long (3–4 cm) with a diameter of 2 cm, five points trumpet-shaped, and can be red, pink or white. It flowers in summer and fall (Lowell & Lucansky 1990) (Fig. 1).



Figure 1. Different parts of *Ipomoea quamoclit*: **A**, Flowers; **B**, Leaf; **C**, Fruits.

ETHNOMEDICINAL USES

Ipomoea quamoclit is used as folk medicine around the world for various illnesses (Rajendran *et al.* 2007, Sajem *et al.* 2008) (Table 1). The plant is considered cooling and purgative; used in chest pain. Pounded leaves are used as remedy for bleeding piles and carbuncles (Pullaiah *et al.* 1997, Yusuf *et al.* 2009). Leaves are also used as poultices for bleeding haemorrhoids (Kumar & Akhtar 2013, Sorathia 2014). Plant found its significant use in Siddha medicine where the decoction of leaves and stems are used to treat fever, diabetes and in Thailand, it is used for snake bites and bloody cough (Khare 2007, Hasan *et al.* 2009).

Table 1. Ethnomedicinal uses of *Ipomoea quamoclit* L.

Plant species	Family	Part used	Ethnomedicinal uses
<i>Ipomoea quamoclit</i> L.	Convolvulaceae	Leaves, Root, Seeds	Treatment of physical weakness, abnormal behaviour, sinking of voice, bleeding from cuts and wounds, piles, snakebites. Used as purgative.

BIOLOGICAL ACTIVITIES

Various studies have confirmed that *Ipomoea quamoclit* exhibit a vast range of bioactivities like antioxidant activity, antimicrobial activity, anticancer activity, antidiabetic activity as well as insecticidal activity.

Anticancer Activity

The cytotoxic studies indicate that *Ipomoea quamoclit* inhibits Caco-2 (colon cancer) cell viability which is dose dependent. The IC₅₀ values estimated were >100µg/ml for ethanolic plant extract. Their findings revealed that the ethanolic extract of *Ipomoea quamoclit* has significant cytotoxic activity (Renuka & Ravishankar 2014). Ho *et al.* (2015) studied the anti-proliferative effect of the dichloromethane, methanol, hexane and ethyl acetate extracts of leaves of *Ipomoea quamoclit* on HeLa (cervix adenocarcinoma), MCF-7 (breast adenocarcinoma), CNE-1 (nasopharyngeal carcinoma), 3T3 (normal mouse fibroblast) and HT-29 (colorectal adenocarcinoma) cell lines. Among different solvent, the methanol extract of *Ipomoea quamoclit* leaf against the tested cell lines was shown to possess the highest anti-proliferative activity. The crude aqueous extracts of leaves of *Ipomoea quamoclit* studied had significant cytotoxic property on a cell line (HEP G2) and exhibited remarkable inhibitory effect on A549 cell line (Rane & Patel 2015).

Antioxidant Activity

Hydromethanol extracts of *Ipomoea quamoclit*, were evaluated for antioxidant activity using radical scavenging assay with 1,1-diphenyl-2-picrylhydrazyl (DPPH) (Hasan *et al.* 2009). Their study suggests that *Ipomoea quamoclit* extract have moderate antioxidant activity. Clarke *et al.* (2013) also studied antioxidant activity of ethanol and ethyl acetate extract of *Ipomoea quamoclit* whole plant with the 2,2-diphenyl-1-picrylhydrazyl (DPPH) and ferric reduction activity potential (FRAP). Uddin *et al.* (2013) evaluated antioxidant activity of hydro-methanol extract of *Ipomoea quamoclit* aerial part by DPPH scavenging assay and reported that *Ipomoea quamoclit* extract possess significant antioxidant activity. Renuka & Ravishankar (2014) determined antioxidant activity of ethanol extract *Ipomoea quamoclit* aerial part by four DPPH free radical scavenging activity method, reducing power method, phosphomolybdenum method and nitric oxide scavenging method. The tested *Ipomoea quamoclit* extract have strong antioxidant activity against various oxidative system *in-vitro*. They also found that the tested extract indicated the highest radical scavenging activity with the greatest amount of phenolic content. According to them antioxidative nature of the extracts might depend on their phenolics. Kumar *et al.* (2015) performed *in vitro* antioxidant activity of aqueous ethanolic extract of *Ipomoea quamoclit* whole plant by DPPH assay, superoxide anion scavenging activity assay, hydrogen peroxide scavenging assay, nitric oxide scavenging activity assay and metal chelating activity and reported that *Ipomoea quamoclit* extract exhibit significant antioxidant activity.

Antidiabetic Activity

Reddy *et al.* (2015) evaluated antidiabetic activity of the hydroalcoholic extract of whole plant by streptozotocin induced diabetic rats. Thirty days administration of hydroalcoholic extract of *Ipomoea quamoclit* whole plant exhibited a significant depletion in blood glucose levels.

Antimicrobial Activity

Ipomoea quamoclit possess antimicrobial properties. The hexane extract of *Ipomoea quamoclit* stems inhibited the bacterial growth of *Salmonella enteritidis*, *Bacillus cereus*, *Escherichia coli*, and *Staphylococcus aureus*, whereas their methanolic extract only affected the growth of *Escherichia coli*. The hexane extract of *Ipomoea quamoclit* leaves inhibited the growth of *Bacillus cereus*. The hexane extract of *Ipomoea quamoclit* flowers arrested the growth of *Staphylococcus aureus*; their methanolic extract inhibited the growth of *Bacillus cereus*, *Staphylococcus aureus* and *Salmonella enteritidis*. Their results cast *Ipomoea quamoclit* as a likely source of bioactive molecules capable of inhibit the growth of pathogenic bacteria (Moreno *et al.* 2007). Moin *et al.* (2012) evaluated antimicrobial activity of cationic protein from mature seeds of *Ipomoea quamoclit* against several pathogenic bacterial and fungal strains. Crude protein fraction from *Ipomoea quamoclit* seed exhibited significant antibacterial activity and potent minimum inhibitory concentration against tested bacterium *Bacillus subtilis*. *In vitro* screening of ethanolic extract of *Ipomoea quamoclit* exhibited species specific activity in inhibiting bacterial and fungal growth. The ethanol extract of the plant showed good activity against selected Gram positive bacteria (*Bacillus subtilis*, *Staphylococcus warneri*, *Staphylococcus aureus*) and Gram negative bacteria (*Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Pseudomonas putida*, *Proteus mirabilis*) and fungal strain (*Candida albicans*) (Renuka & Ravishankar 2014).

Insecticidal Activity

Plant extracts are one of the best alternatives of chemically synthesized insecticides and can protect the flora as well as the global environments. Proadhan *et al.* (2012) investigated effect of chloroform extract of *Ipomoea*

quamoclit whole plant on salivary gland chromosomes of house fly (*Musca domestica* L.). Dose mortality test result showed the intensity of activity of *I. quamoclit* was 911.83 ppm. The test results showed significant effects on salivary gland chromosomes.

CONCLUSION

In the present study biological activities *Ipomoea quamoclit* L., a medicinal plant found in different tropical areas of the world, has been critically reviewed. It exhibits different bio activities like antimicrobial activity, antioxidant activity, anticancer activity, antidiabetic activity as well as insecticidal activity. From this study it is concluded that *Ipomoea quamoclit* is a source of biologically active compounds and have various biological activities, hence, it is encouraging to find its new therapeutic. Due to various promising biological activities and ethnomedicinal importance, further studied should be carried out on drug development from plant extracts and constituents of the *Ipomoea quamoclit*.

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