

Therapeutic Uses of *Allamanda Cathartica* Linn. With A Note on Its Pharmacological Actions: a Review

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ABSTRACT

Allamanda cathartica L. (Apocynaceae) is also known as Alamanda big flower or thimble lady. Is one of the most studied species of the *Allamanda* genus and often it is found in tropical and subtropical regions as an ornamental shrub in gardens. Studies have indicated the potential anti-inflammatory, laxative, antioxidant, antibacterial, antifungal and invitro hepatoprotective properties of *Allamanda* flower extracts. In traditional medicine an infusion of the bark and leaves is used as a purgative. The leaf extract has displayed anti-inflammatory, antifertility potency in male, antimicrobial activity against multiple drug resistant clinical pathogen and also found to exhibit antioxidant activity, membrane stabilizing property and healing activities. This paper reports on its pharmacognostic properties such as anti-inflammatory, antioxidant, wound healing, antidermatophytic, antifertility, hepatoprotective, membrane stabilizing, thrombolytic, antibacterial and antifungal activities of *Allamanda cathartica* linn.

Keywords: *Allamanda cathartica*, Anti-inflammatory, antioxidant, antifertility, thrombolytic.

INTRODUCTION

Plants have been the major source of drugs in medicine and other ancient systems in the world. Herbalism is a traditional medicine or folk medicine practice based on the use of plants and plant extracts¹. Charaka Samhita and Sushrusa Samhita give extensive description on various medicinal herbs. The medicinal plants are rich in secondary metabolites (which are potential sources of drugs) and essential oils of therapeutic importance. The important advantages claimed for therapeutic uses of medicinal plants in various ailments are their safety besides being economical, effective and their easy availability².

In traditional systems of medicine the Indian medicinal plants have been used in successful management of various disease conditions like bronchial asthma, chronic fever, cold, cough, malaria, dysentery, convulsions, diabetes, diarrhea, arthritis, emetic syndrome, skin diseases, insect bite and in treatment of gastric, hepatic, cardiovascular and immunological disorders³⁻⁵.

Recently, a number of studies have been carried out on the phytochemistry of plants across the world. Ornamental flowers of the family Apocynaceae were selected for phytochemical screening in this study. The family Apocynaceae

consists of about 250 genera and 2000 species of tropical trees, shrubs, and vines⁶. Characteristic features of the family are that almost all species produce milky sap, leaves are simple, opposite, or whorled; flowers are large, colourful, and slightly fragrant with five contorted lobes; and fruits are in pairs⁶. Various species of this family have a range of traditional uses. Several species are also widely grown for ornamental purposes. The family Apocynaceae consists of several important medicinal plants with wide range of biological activities and interesting phytochemical constituents.^{7,8}

Allamanda cathartica linn. (Apocynaceae) is one of the most studied species of the *Allamanda* genus. This species is popularly known as *Allamanda* big flower or thimble lady⁹ and often it is found in tropical and subtropical regions as an ornamental shrub in gardens¹⁰. This evergreen, spreading and climbing vine is covered with vivid flowers in the warm months. Lavender-red, trumpet shaped flowers explode into bloom during the warm months and cover the vine in vibrant color. The spiny, yellow green fruit follows and can be seen on the plant simultaneously with the spectacular blooms. The dark green, glossy leaves are produced on slender, green, twining stems which become woody with age. Blooming during the warm

months of the year, *Allamanda* should only be planted in frost-free locations, although it could be grown as an annual in colder climates due to its rapid growth rate. Requiring full sun locations for best flowering (some flowers are produced in

locations receiving only 3 to 4 hours of sun), *Allamanda* is tolerant of various soil types and requires only moderate moisture. Regular, light fertilization during the growing season helps promote growth and flowering.



THERAPEUTIC USES

In traditional systems of medicine, different parts (leaves, stem, flower, root, and even whole plant) of *Allamanda cathartica* Linn (Golden trumpet wine) have been using to treat different disease states. Studies have indicated the potential anti-inflammatory and antioxidant properties of *Allamanda* flower extracts¹¹. In traditional medicine, an infusion of the bark and leaves is used as a purgative¹¹. The leaf extract has displayed anti-inflammatory and healing activities^{11,12}. Phytochemical studies of flowers have reported the isolation of iridoid, plumieride, flavonoids such as rutin and sugars^{11,13}. Iridoids are secondary metabolites with potential therapeutic applications^{14,15}. Plumieride is the major compound of the extracts from flowers of *A. cathartica* with potential anti-inflammatory and antihyper nociceptive activities in models of

neuropathic and inflammatory pain¹⁶. Leaves are also used as an antidote, and for relieving coughs and headaches¹⁷. It has been used as a laxative, febrifuge, as well as for the treatment of jaundice and enlarged spleen resulting from malaria. Studies have indicated the potential antibacterial, antifungal and invitro hepatoprotective properties of *Allamanda* flower extracts. It has a long history as a medicinal plant for the treatment of varied conditions such as feverish infections like gonorrhoea, dysentery and hepatitis¹⁸. The leaf extract has displayed antifertility potency in male, antimicrobial activity against multiple drug resistant clinical pathogen, and also exhibits membrane stabilizing property. The milky sap is also known to possess antibacterial and possibly anticancer properties¹⁹.

PHARMACOLOGICAL ACTIVITIES

Anti-inflammatory activity

The ethyl acetate extract (quercitrin) from the floral species *Allamanda Cathartica* Linn. was tested for its Anti-inflammatory activity. When the RBC is subjected to hypotonic stress, the release of haemoglobin from RBC is prevented by anti-inflammatory drugs; this is because of the membrane stabilization of the drugs against hypotonicity induced haemolysis. This serves as a very useful *invitro* method for assessing the anti-inflammatory activity of various compounds. The quercitrin compound has been proved to have significant anti-inflammatory activity, even at a very low concentration of 75µg. Thus, the isolated compound quercitrin was found to be very effective against the whole or any portion of an acute or chronic inflammation²⁰.

Antioxidant activity

Total antioxidant capacity (5.43 ± 0.29mM/g) of crude methanol extract of *A. cathartica* leaves is detected by using ABTS method. The ABTS radical-scavenging activity displayed chain-breaking potential and hydrogen donating ability of the plant extract to free radicals. The enzymatic antioxidants such as peroxidase (POD), superoxide dismutase(SOD) and catalase (CAT) and total phenolic contents were found to be highest in the roots of *A. cathartica*. Among antioxidants, POD is used in cosmetic products as a skin-caring constituent to remove hydrogen peroxide from the tissues. SODs can significantly reduce oxidative stress involved in various life-threatening diseases. Various toxins such as formic acid, phenols, alcohols and formaldehyde present in the body can also be oxidised by catalase. Roots of *A. cathartica* displayed comparatively higher enzymatic antioxidant potential than in other parts. The plant especially its roots can be utilized for the development of pharmaceutical herbal drugs²¹.

Wound healing activity

The aqueous extract of *Allamanda* promoted wound healing activity significantly in both Excision and incision wound models on Sprague Dawley. High rate of wound contraction, decrease in the period of epithelialization, high skin breaking strength, significant increase in the weight of the granulation tissue and hydroxyproline content were observed in animals treated with the aqueous extract of *Allamanda*. Histological studies of the granulation tissue from the *Allamanda* treated group showed the presence of a lesser number

of inflammatory cells, and increased collagen formation than the control. In both the models studied, significantly improved

Wound healing activity has been observed with the *Allamanda cathartica* leaf extract, compared to that of the reference standard and control group of animals and it may be suggested for treating various types of wounds in human beings²².

Antidermatophytic effect

Dermatophytoses (ringworm diseases) are infections of the skin by organisms termed dermatophytes. Treatment of dermatophytoses is expensive and needs long time to cure. Antidermatophytic activity of dichloromethane and methanol extracts of whole plant of *Allamanda cathartica* was evaluated. Two pathogenic dermatophytes *Trichophyto rubrum* and *Microsporum gypseum* were used that were collected from dermatophytoses patients. The dichloromethane extract was moderately active at concentration of 50 µg/disc but exhibited highly potent activity at concentration of 200 µg/disc. The methanol extract was not active against the tested fungi. Dichloromethane extract of *A. cathartica* may have antidermatophyte constituents that could be useful in ringworm diseases²³.

Antifertility effect

The oral administration of aqueous leaf extract of *A. Cathartica* (150 mg/kg body weight/day for 14, 28 and 42 days) induces infertility and changes in various male reproductive endpoints in Parkes strain mice. Histologically, testes in extract treated mice showed non uniform degenerative changes in the seminiferous. The treatment also had adverse effects on motility, viability, morphology and on number of spermatozoa in the cauda epididymidis. Fertility of the extract-treated males was also suppressed²⁴.

Hepatoprotective activity

In this study, methanolic and aqueous extracts was prepared from flowers and roots of *Allamanda cathartica* Linn were tested to evaluate the *in vitro* hepatoprotective effect using antitubercular drugs (Isoniazid, Pyrazinamide, Rifampicin) and D (+)-Galactosamine as toxicant and silymarin as standard drug by MTT assay[(3-(4,5 dimethylthiazole -2 yl)- 2,5 diphenyltetrazolium bromide) assay. *Allamanda cathartica* Linn

flower extract at 1000µg/ml showed 81% protection followed by 125µg/ml which showed least protection i.e. 55.49%. *Allamanda cathartica* Linn roots extract at 1000 µg/ml showed 86% protection followed by 125µg/ml which showed least protection i.e. 50.24%²⁵.

Membrane stabilizing activity

The membrane stabilizing activity of the different organic and aqueous soluble materials of the methanol extract of *A. Cathartica* leaves was assessed by evaluating their ability to inhibit hypotonic solution and heat induced haemolysis of human erythrocytes. All the extractives significantly protected the lysis of human erythrocyte membrane induced by hypotonic solution and heat induced conditions, as compared to the standard acetyl salicylic acid. In hypotonic solution and heat induced conditions, the aqueous soluble fraction inhibited 69.49±0.49 and 40.00±0.75% haemolysis of RBCs, respectively as compared to 72.79 and 42.12% inhibition by acetyl salicylic acid (0.10 mg/ml), respectively. It is clearly evident from the a fore mentioned findings that the test samples of *A. Cathartica* have significant membrane stabilizing activity²⁶.

Thrombolytic Activity

Investigation with the crude methanol extract of *Allamanda cathartica* leaves and its different fractions were carried out to evaluate its possible thrombolysis activities. A quick & rapid methodology (*In-vitro* Thrombolytic model) was applied to find out their thrombolytic potential, where streptokinase and water were employed as a positive and negative controls, respectively. Among the extractives, the chloroform (CSF) and hexane (HSF) soluble fractions showed 34.51±0.669% and 32.179±0.581% clot lysis activity respectively compared to standard streptokinase which exhibited 61.5% lysis of clot. From this experiment, it can be concluded that methanolic extract and its different partitionates of *A. cathartica* leaves have got good potential as candidates for future thrombolytic agents and also they can be investigated as a possible sources of cardio protective drugs²⁷.

Antibacterial activity

The antibacterial activity of the flavonoid glycosides isolated from *Allamanda Cathartica* was evaluated using disc diffusion technique. An Agar medium 24hour cultures of *Staphylococcus aureus*, a gram positive bacteria and

Escherichia coli, a gram negative bacteria were chosen for the microbial screening of antibacterial activity. If substantial antibacterial activity is present in the testing material, a zone of inhibition appears around the test product. The activity of Quercitrin was checked with doses of 10 µg and 20 µg of the drug. It was observed that the inhibition capacity of the isolated compound increased in case of *Staphylococcus aureus*, a gram positive bacteria with an increase in dosage of the drug. The above tests were carried out using Penicillin as a standard drug. It was observed that the growth of microbial organisms was completely contained in case of gram positive bacteria. However, the effect of the isolated compound was rather less prevalent against *Escherichia coli*, a gram negative bacterium. The testing here was done with Norflaxin as the standard drug. The Quercitrin thus tested proved to be a significant antibacterial drug even at a very low concentration of 10 µg²⁸.

Antifungal activity

An antifungal activity of the extract was tested with pure strains of *Candida albicans*. The antifungal activity of the quercitrin was tested with various dosages from 200 µg to 800 µg respectively. It was practically observed that the population of the fungal organisms was maximum at the dosage of 200 µg but decreased continuously with an increase in applied dosage of the isolated compound. The population was reduced critically at the dosage level of 800 µg. Thus the isolated compound was shown to exhibit antifungal action against *C. albicans*. explicit antifungal effect was observed at 800 µg. Thus, the isolated compound Quercitrin was found to be very effective against the infected pathogens and hence they could serve as a fine secondary for antibiotics²⁸.

CONCLUSION

The ethyl acetate extracts of *Allamanda cathartica linn* showed anti-inflammatory effects similar to standard drugs. The presence of Quercitrin may be responsible for the anti-inflammatory activity. The methanol extract of the roots of *Allamanda cathartica* has significant antioxidant effect. Flower exhibit hepato protective activity. It is widely used in the treatment of wounds and also used in ringworm infections. Fertility control can be attained by aqueous extract of *Allamanda cathartica linn*. Methanolic extract of the plant also exhibits membrane stabilizing and thrombolytic activity.

Quercitrin isolated from *Allamanda cathartica* proved to be anti microbial drug and hence serve as secondary for antibiotics. Further investigations are processed to isolate and characterize the specific active components of this plant.

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