Medicinal uses and biological activities of *Argyreia speciosa* Sweet (Hawaiian Baby Woodrose) — An Overview

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*Argyreia speciosa* Sweet (Family — Convolvulaceae) is an important ‘rasayana’ herb used extensively as an adaptogen in the Ayurvedic system of medicine. It is commonly known as Hawaiian Baby Woodrose, Elephant creeper or Woolly morning glow in English and in Sanskrit, it is called as Vridhadaraka meaning ‘anti-aging’. It is a large climber growing throughout India. It has been assigned various medicinal properties by Ayurvedic Materia Medica. The root is regarded as an alternative tonic and used in cases of rheumatism and neurological disorders. A wide range of phytochemicals has been isolated from the plant and possesses various traditional and tribal uses for cure of human ailments. Pharmacological activities such as anti-oxidant, anti-inflammatory, anti-rheumatic, immunomodulatory, adaptogenic and hepatoprotective have also been reported. Adverse side effects have made the use of many modern medicines limited and it is worthwhile to explore the possibility of this drug for the treatment of liver, rheumatic and neurological complaints. This article reviews studies on medicinal uses on this important herb.

**Keywords**: *Argyreia speciosa*, *Argyreia nervosa*, Antimicrobial, Antioxidant, Adaptogenic, Elephant creeper, Hawaiian Baby Woodrose; Immunomodulation, Woolly morning glow, Vridhadaraka.

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**Introduction**

*Argyreia speciosa* Sweet syn. *Argyreia nervosa* (Burm. f.) Bojer. of Convolvulaceae family commonly known as Hawaiian Baby Woodrose is widely distributed in tropical regions of the world. It is seen throughout India up to an altitude of 500 m and grown as an ornamental plant in gardens because of its green foliage and rose purple flowers. The plant is common in Bengal, Assam, Orissa, Uttarakhad, Rajasthan, Karnataka and Kerala. It is generally found growing in slightly moist localities like river banks, edges of lakes etc. and as undergrowth in semideciduous forests. Some people consider *Ipomoea petaloidea* Choisy or *Ipomoea biloba* Forssk. as Vidhara or Vridhadaruka. However, *A. speciosa* is equated as Vridhadaraka in the Indian Materia Medica. It is an important ingredient of various formulations like Vridhadarakasma churna, Keshara paka, Amritabhallataka, Mahakamaeshwara modaka, Vridhadarukadyasama ghrita and Abhadi churna.

It is a twining woody climber, reaching up to 10 m or more in height. Young shoots are densely covered with white pubescence. Leaves are alternate, simple and long petioled, 5-15 cm long. The leaf blade is fairly large, 20-30 cm in length and 20-25 cm broad, ovate or broadly ovate-cordate. Flowers are large, showy, funnel shaped, tinted purple or pale to deep rose, regular, sub capitata, with short pedicels in axillary bracteate cymes borne on stout, Whitish and tomentose peduncles. Fruits are yellowish brown, smooth globose, indehiscent and irregularly crumbling berries, 1.2-1.8 cm in diam. containing 2 or 4 seeds embedded in a mealy pulp (Plate 1). Roots and leaves are the official parts. It can be propagated through stem cuttings (which root easily) and also by seeds.

**Phytochemical constituents**

A variety of chemicals belonging to the classes ergoline alkaloids, lipids, flavonoids, steroids and triterpenoids have been isolated from the plant. Ergoline alkaloids (0.5 to 0.9%) such as ergometrine, ergometrine, lysergic acid-α-hydroxy ethyl amide and iso-lysergic acid-α-hydroxy ethyl amide, agroclavine, chanoclavine-I, chanoclavine-II, racemic chanoclavine II, eymoclavine, festuclavine, festuclavine,
lysergene, lysergol, isolysergol, molliclavine, penniclavine, setoclavine, iso-setoclavine, ergine, isoergine were isolated from the seed. The seeds also contain caffeic acid and ethyl ester ethyl caffeinate. They are reported to be a rich source of protein. The free amino acids, viz. lysine and lutein are also reported from the plant. A steroidal glycoside, (24R)-ergost-5-en-11-oxo-3β-ol-α-D-glucopyranoside, designated as argyroside has also been isolated from the seeds. The seed has hallucinogenic effects. The principal psychoactive constituent, lysergamide (LSA) present in seeds causes psychological reactions and human consumption of seeds can be fatal. LD₅₀ of seed extract is 500 mg/kg body weight.

According to Kelkar et al, the fatty acid composition of the seed oil is as follows: palmitic (6.7%), oleic (33.2%), stearic (29.1%) behenic (6.6%), linoleic (18.2%) and linolenic acid (6.1%). The C₃₀ straight chain alcohol triacontanol was reported from its seeds. Batra and Mehta reported the presence of about 20 constituents in its seed oil. A few among them are methyl myristoleate (2.5%), methyl myristate (0.1%), methyl palmitate (12.1%), methyl linolenate (6.8%), methyl linoleate (7.6%), methyl oleate (27.5%), methyl stearate (5.6%), methyl stearate (3.4%), methyl nonadecanoate (0.7%), methyl eicosanoate (1.2%), methyl eicosanoate (1.3%) and methyl behenate (0.3%). Lauric, myristic and arachidic acids were also reported in trace quantities from the seeds.

Tetradecanyl palmitate and a disubstituted tetrahydrofuran 5, 8 oxidotetraconol-10-one were identified from the roots. The roots also contain hexadecanoyl p-hydroxy cinnamate, stigma steryl p-hydroxy cinnamate and the coumarin scopoletin. Kaempferol 7-OMe-3-sulfate was also identified from the roots. A coumarin glucoside isolated from the roots of A. speciosa has been characterized as 6-methoxy coumarin-7-O-α-D-glucopyranoside (mp 208°C) by spectral and chemical studies.

β-Sitosterol, epi-friedelinol and its acetate have been identified from the leaves. Phytochemical investigation of leaves has also yielded quercetin and kaempferol and flavone glycosides, kaempferol 3-O-L-rhamnopyranoside, 7,8,3′,4′,5′-penta hydroxy flavone 5-O-α-L-rhamnopyranoside and 7,8,3′,4′,5′-penta hydroxy flavone 5-O-β-D-glucopyranoside.

**Biological activities**

Many bioactivities such as antiulcer, antitumour, antidiabetic, hypoglycemic, hypotensive, spasmylytic, antifilarial, antimicrobial and CNS depressant were reported for different plant parts. Antiviral, antibacterial, antifungal, antifertility, diuretic, anabolic-cum-androgen like activity and aphrodisiac activities were also reported.
The root is acrid, bitter, thermogenic, sweet, alterative, emollient, digestive, aperient, purgative, carminative, aphrodisiac, nervine, alterative, diuretic, tonic, antgonorrhoeic, intellect promoting, anti-inflammatory and antirheumatic. It is useful in anorexia, loss of appetite, dyspepsia, flatulence, colic, chronic ulcer, ascites, haemorrhoids, hemiplegia, nervous weakness, neuralgic pains, cerebral disorders, synovitis and general debility. Roots act as a cardiotonic and hence useful in cardiac debility. It possesses emaciation properties due to which it is used in obesity. It is also prescribed for leucorrhoea, diabetes mellitus, infected wounds, syphilis, cough, bronchitis, pharyngitis and pulmonary tuberculosis. The root is used in gleet, gonorrhoea, strangury and chronic ulcers in Yunani system of medicine. In synovitis, the powdered root is given with milk. Methanol, benzene, chloroform and petroleum ether extracts of the root were found non toxic in the dose range of 100-750 mg/kg i.p. as observed during 72 h after administration.

The leaves are extensively used all over India for the treatment of ulcers, boils, carbuncles and tumours. The leaf is collected in the folded stage before opening and used freshly in Maharashtra; elsewhere the mature leaves are used. When leaf is applied with the ventral surface in contact with the body and bandaged, the boil, carbuncle or tumour regress and disappear. The leaves covered by a thick layer of silky hairs on the under surface afford a kind of natural impermeable piline which is used as a maturant by the natives in Bengal. The white under surface of the leaf promote maturation of boils and act as a rubefaciens in skin diseases. The leaves are emollient, vesicant, antiphlogistic and are used as local stimulant and rubefacient. The leaves hasten maturation, suppuration and are absorptive; hence externally applied as emollient poultices for boils, swellings, carbuncles, foul ulcers, wounds and externally in skin diseases. It is also externally used for ring worm infections and eczema. It is mixed with vinegar and the sap is rubbed to reduce obesity. The leaves contain a mixture of three phytosterolins which exhibit hypoglycemic and CNS depressant activities. The leaves are reported to be effective in diabetes.

Seed is CVS (cardio-vascular system) active and spasmolytic, its extract showed hypotensive and spasmolytic properties. The hypotensive activity was due to a fraction containing three alcohols of which one was identified as ergometrine. The seeds are misused as a hallucinogenic drug. Toxic psychosis with hallucinations, disturbances of orientation and psychomotoric agitation and anxiety after the intake of seed is reported. The (psycho) pharmacological effect was due to the presence of alkaloids, lysergacidamide, lysergacidethylamide and their isomers structurally related to lysergic acid diethylamide (LSD). It caused psychic effects very different from those of LSD but similar to the effects of scopolamine.

Tribal medicine

Lodhas use the dried root powder with country liquor (3:1) in the treatment of gonorrhoea and take the root powder with cow’s milk (2:1) as cure for painful discharge of urine. Santals apply abaxial side of the leaf on boils for suppuration. Oraons use fresh leaf juice with Karanja (Pongamia pinnata Pierre) seed oil as cure for obesity and excessive accumulation of fat in the body. Some other ethnic communities give the plant extract to syphilitic patients and apply young leaf paste on small pox and give root infusion with goat milk (3:1) to male patients in the treatment of sexual disorders. In Lakhimpur, the tuber in the form of a paste is applied externally in abscess of stomach. The Palliyar tribes of Western Ghats, Tamil Nadu use roots for cure of gastrointestinal diseases.

Pharmacological studies

Sexual disorders

In a clinical trial involving male patients suffering from male sexual disorders, ‘Fortege’, an indigenous drug that contains A. speciosa as one of the main ingredients was found beneficial in conditions like erectile dysfunction, premature ejaculation, spermatorrhoea and functional impotence with no toxic effect. Another drug ‘Spemen’ consisting of several ingredients of plant materials including A. speciosa exhibited anabolic cum androgen like activity in mice.

Gastric ulceration

The ethanolic extract (50% v/v) of the flower of A. speciosa (100-200 mg/kg) when administered orally, twice daily for five days showed dose dependent ulcer protective effect. A dose of 150 mg/kg given for ten days, twice daily showed healing effect against acetic acid (50%) induced ulcer index with decreased perforations.
Anti-inflammatory and anti-arthritic

It is used in the indigenous systems of medicine for the treatment of inflammatory conditions. The ethanolic extract of roots was found to significantly inhibit paw edema induced by carrageenan and Freud’s complete adjuvant at doses of 50-200 mg/kg. In another study, Kartik et al. evaluated anti-inflammatory activity of 50% ethanolic extract of *A. speciosa* using Sprague-Dawley rats following oral administration in two different doses (100 and 200 mg/kg). Inflammation was induced using 1% carrageenan. The extract significantly showed anti-inflammatory activity at 3 hours.

Antimicrobial and phytotoxicity

The seed oil exhibited *in vitro* antibacterial and antifungal activity. It showed antiseptic activity against several Gram positive and Gram negative bacteria and phytopathogenic fungi. Hexadecanyl p-hydroxycinnamate and scopoletin isolated from roots showed high antifungal activity against *Alternaria alternata*. The phytotoxicity in terms of root growth inhibition of germinating wheat seeds was observed in both test materials. At 250 ppm concentration, the inhibition caused by hexadecanyl p-hydroxycinnamate was 79.42% and by scopoletin, 91.57%. At high concentrations (1000 ppm) the root growth of wheat was completely inhibited.

Habbu et al. studied antimicrobial activity of flavonoid sulphates and different fractions of *A. speciosa* root against bacteria, fungi and *Mycobacterium tuberculosis* H37 Rv sensitive strain by *in vitro* and *in vivo* assays. Flavonoid sulphates such as quercetin 3’7 di-O methyl 3-sulphate and kaempferol 7-O methyl 3-sulphate and ethyl acetate fraction inhibited the growth of *M. tuberculosis* Rv sensitive strain at MIC values 25 and 50 µg/ml, respectively. Ethanolic fraction showed significant inhibition of Gram positive organisms with a MIC of 31.25 µg/ml. More inhibition was observed with a less MIC (2 µg/ml) for flavonoid sulphates against *Klebsiella pneumoniae*, a Gram negative organism and it is almost comparable with the standards. Chloroform fraction alone exhibited significant antifungal activity with a MIC of 100 µg/ml. A synergistic effect between flavonoid sulphates and commercially available antitubercular drugs was also reported. Ethyl acetate fraction and flavonoid sulphates exhibited least cellular toxicity to erythrocytes as compared to chloramphenicol.

Immumodulatory

The investigation by Gokhale et al. revealed that roots possess immunomodulatory activity. Oral administration of ethanolic extract at doses of 50, 100 and 200 mg/kg in mice, dose-dependently potentiated the delayed-type hypersensitivity reaction induced both by sheep red blood cells and oxazolone. It significantly enhanced the production of circulating antibody titre in mice. Chronic administration of the ethanolic extract significantly ameliorated the total white blood cell count and also restored the myelosuppressive effects induced by cyclophosphamide.

Nootropic

Aqueous extract of roots at doses of 100 and 200 mg/kg significantly improved memory and successfully reversed amnesia induced by diazepam, scopolamine and natural aging and also reduced acetyl cholinesterase level in brain homogenate indicating its potential in attenuating learning and memory deficits especially in aged mice.

Adaptogenic and antioxidant

Ethanol extract and ethyl acetate extract of roots at doses of 200 and 400 mg/kg showed strong *in vivo* antioxidant activity as revealed by decrease in levels of super oxide dismutase (SOD), catalase and peroxidase activity in liver. Ethanol fraction (100 and 200 mg/kg p.o.) and quercetin and kaempferol (25 mg/kg p.o.) from *A. speciosa* root were found to be capable of increasing the capacity to tolerate non-specific stress in experimental mice, as revealed by restoration of large number of parameters in the stress models studied. The tested doses of ethanol fraction and isolated flavonoids were able to produce significant effects in normalizing altered serum biochemical parameters and severity of ulcer in both acute and chronic stress models. Antistress activity was attributed partly to free radical scavenging activity.

Anticonvulsant

The root is regarded as an alternative tonic and useful in the diseases of nervous system. To confirm the veracity of the claim, Vyawahare and Bodhankar evaluated the anticonvulsant effect of the root extract. The mice were pretreated with different doses of extract (100, 200, 400 mg/kg) for 10 days and then, subjected to either pentylentetrazole (80 mg/kg) or maximal electroshock seizures (50 mA, 0.2 s)
treatment. The hydroalcoholic extract of A. speciosa roots at the dose of 200 and 400 mg/kg showed anticonvulsant effect in mice.

Hepatoprotective

Ethanol extract and ethyl acetate extract of A. speciosa roots at doses of 200 and 400 mg/kg showed strong hepatoprotective activity in CCl₄ induced hepatotoxicity in rats[^49].

Antifilarial

The plant extract possesses antifilarial activity against Setaria cervi in vitro. Aqueous and alcoholic extracts caused the inhibition of spontaneous movements of the whole worm and the nerve/muscle preparation of Setaria cervi, characterized by decrease in tone, amplitude and rate of contractions. The concentration required to inhibit the movements of the whole worm preparation was 150 µg/ml for the aqueous and 75 µg/ml for the alcoholic extract[^25]. Singhal and Parveen also reported antifilarial activity for alcoholic and aqueous extracts of roots[^54].

Conclusion

A. speciosa is a medicinal plant credited with innumerable medicinal qualities and used since ancient times. With its vast and diversified pharmacological potential, it has a strong future in the field of herbal medicine. The plant is well adapted to tropical and sub-tropical climate. Various formulations containing this plant are available in the market. It is right candidate for further pharmacological and phytochemical research, leading to the development of a novel therapeutic herbal drug.

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