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**Review Article**


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# Ethnomedicinal properties of *Rauvolfia serpantina*; Indian snake root

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## Abstract

Sarpgandha botanically described as *Rauvolfia serpantina* is a famous tranquilizer and antipsychotic herb of India. It practices for the treatment of paranoid and schizophrenia as well as a substance that controls hypertensions. It is widely known medicinal plant, with uses such as a remedy for high Blood Pressure and as a sedative. But more importantly Sarpgandha is used to cure snake bites and remove toxin. It grows in lower Himalayas, the Eastern and Western Ghats and the Andaman.

*Rauvolfia serpantina* has long being used in India for the treatment of Snakebite, hypertension, blood pressure, gastrointestinal diseases, circulatory disorder, pneumonia, fever, malaria, asthma, skin diseases, scabies, eye diseases, spleen diseases, AIDS, rheumatism, body pain and veterinary diseases.

Sarpgandha is an erect evergreen shrub, merely 15 to 45 cm high. Its leaves are large, in whorls of three dark green above and pale green below. The flowers are white pinkish or red occurring in whorls. Its fruit are tiny, oval; fleshy which turn a shiny purple black when ripe. The roots of the plant are mainly used for Medicinal purposes.

**Keywords:** *Rauvolfia serpantina*, phytochemical, ethnomedicinal properties.

## Introduction

*Rauvolfia serpantina* is one of the shrubs most widely used worldwide with a long history of safe use in medicinal preparations. The root extract used to treat painful affection of bowels, diarrhea (Tona *et al.,* 1999) dysentery, choleracolic (Ghani, 1998). The roots of *Rouvolfia serpantina* have been used in the traditional Unani and Ayurvedic medicine (Andrew and Chevalier, 1996). *Rauvolfia serpantina* contains a Variety of compounds with antioxidant capacity and other health benefits like treatment of diabetes, cardiovascular disease, cancer and hypertension. The antibacterial and antifungal activities were high in petroleum ether and acetone extract of *Rouvolfia serpantina* (Horisaranraj *et al.,* 2009).

*Rauvolfia serpantina* belongs to family Apocynaceae. *Rauvolfia serpantina,* the Indian snakeroot, devil pepper, or serpantina wood, is a species of flower in the milkweed family Apocynaceae. It is native to the Indian subcontinent and East Asia. *Rauvolfia* is a perennial under shrub widely distributed in India in the Sub-Himalayan regions up to 1000 meters (3'300ft). It is the source of phytochemical reserving, The genus named to honor '*Leonhard Rauwolf* '.The genus can mainly be found in tropical regions of Africa, Asia, Latin America and various oceanic Islands. International code of nomenclature for algae, fungi, and plants stipulates that Due to its poor seed germination rate, it cannot be easily increases the number of plants, because of its high medicinal use, R. *serpantina* is becoming extinct and is now listed as an endangered species by the International Union for Conservation of Nature and Natural Resources (IUCN) (Jain *et al*., 2003; Singh *et al*., 2009; Sushila *et al*., 2013). The genus name was established by Carl Linnaeus in his 1753 book species planetarium.

## Plant description:

*Rauvolfia serpantina* is an erect small, glabrous, evergreen shrub, growing up 30 to 60 cm tall from Yellowish stock. Its leaves are large, in whorls of three dark green above and pale green below. Its fruit are tiny, oval fleshy which turn a shiny purple black when ripe. The roots of the plant are mainly used for medicinal purpose. It is a source of compounds that are used in the pharmaceutical industry, its leaves whorl 7.5 – 17.5 cm long lanceolate or oblanceolate acute or acuminate, tapering gradually into the petiole. The flowers are white or pinkish, peduncles 5.0-7.5 long pedicels and calyx red. Calyx lobes 2.5 mm lanceolate. Corolla about 1-1.3 cm long, Tube slender, inflated slightly above middle; lobes much shorter than tube and obtuse.

## Phytochemical substance:

*Rauvolfia serpantina* contains wide variety of compounds occurring naturally in the plant. They have been classified on their chemical structure and characteristics. These categories include categories carbohydrates, lipids, phenolic, terpenoids and alkaloids and other nitrogen containing compounds or secondary metabolite found in a serpentine include alkaloids, phenols, tannins and flavenoid.

## Alkaloids

The various alkaloids identified in *Rauvolfia* include ajmaline, ajmelimine, ajmalicine, Rescinnamine, rescinnamidine, serpentine, serpentine, and yohimbine etc. (Gawde *et al.*, 2012 and Agrawal *et al.,* 2013). The Reserpine is principal alkaloid which has got multiple clinical applications. Alkaloids are large group of organic molecules contain heterocyclic nitrogen ring, are supposed to be produced by the plant to defend against herbivores and pathogens. (Nadkarni, 2007 and Chopra *et al.*, 2009).

## Reserpine

Reserpine is a pure alkaloid extracted from the root of *R. serpentina* in 1952. It is the most prominent alkaloids are used as a natural tranquilizer (Sastri K, 2006). The antihypertensive properties of Reserpine are due to its depressant action on the Central nervous system and peripheral nervous system. It prevents the normal storage of serotonin and catecholamine and functions of Autonomous nervous system by depleting catecholamine from the adrenergic neurons. It also activates the parasympathetic system, reduction in blood pressure (antihypertensive properties), sedation and bradycardia, (Sastri K, 2004).

## Ajmaline

Ajmaline kinds of alkaloid were first isolated in 1931 by Salimuzzaman Siddiqui from the roots of *R. serpentina* plant. It is highly useful in "Brugada syndrome" and differentiating between subtypes of the disease. The Brugada syndrome is a rare autosomal dominant inherited disease. It is caused mainly by the mutation in the SCN5A gene which encodes the α-subunit of the voltage-gated Nav1.5, the cardiac sodium channel.

 

Ajmaline is a sodium channel blocker which shows instant action when injected intravenously.

## Ajmalicine

Ajmalicine, Alkaloids isolated from *Rauvolfia serpantina* plant. It having properties against blood pressure lowering and it restores normal cerebral blood flow by its action on smooth muscles, (Healy D, 1998).

## Yohimbine

Yohimbine is alkaloids mainly used in erectile dysfunction. It a selective Alfa blocker, relaxes the smooth muscles of the blood vessel wall, thereby it increases the blood flow to the penis Lowinger P, (1957) and Friedman A.P, (1955).

## Phenols

Phenols are secondary plant metabolites. Their presence prevents the growth of pest and pathogens in the plant. It shows significant antidiabetic and hypo lipidaemic properties

## Tannin and flavenoid

Tannins have astringent properties and they hasten the healing of wounds and control inflammation. Flavenoid are potent water soluble antioxidants and free radical scavengers. Thus they provide anti-inflammatory and anticancer activities. The *Rauvolfia* plant contains a large amount of macro and micronutrients. It is rich in calcium and zinc and good source of ascorbic acid, riboflavin, thiamine and niacin

## Serpentine

Serpentine, a type II topoisomerase inhibitor, exhibits antipsychotic properties.(Dassonneville *et al.,* 1999, Costa Campos *et al.,* 2004) The enzyme peroxidase (PER) is responsible for oxidation of ajmalicine to serpentine by catalyzing bisindole alkaloid localized in the vacuole (O'Connor and Maresh, 2006).

## Rescinnamine

Rescinnamine, a purified ester alkaloid of alseroxylon fraction in species of *Rauvolfia.* This was first identified in 1950's used for the treatment of hypertension as an antihypertensive agent. Rescinnamine inhibits angiotensin converting enzyme peptidyl dipeptidase that catalyzes the conversion of angiotensin I to the vasoconstrictor substance, angiotensin II which stimulates aldosterone secretion by the adrenal cortex. As angiotensin II is a vasoconstrictor used for lowering blood pressure and decreased vasopressin activity and aldosterone secretion (Kolh *et al.,* 1954).

## Deserpidine

Deserpidine is an ester alkaloid isolated from *Rauvolfia.* It is used mainly for its antipsychotic and antihypertensive properties. It can able to reduce high blood pressure by controlling nerve impulses along various nerve pathways (Varchi *et al.,* 2005).

## Saponin

Saponins are glycoside of both triterpenes and sterols and have been detected in over70 families of plants. The high content of saponin in *Rauvolfia serpantina* helps to stop the bleeding in treating wounds (Basu and Rastogi, 1967).

## Indole alkaloid

*Rauvolfia serpantina* is rich source of indole alkaloid of medicinal values which are used in the treatment of circulatory disorders (Tyler *et al.,* 1981). Root of *Rauvolfia serpantina* is mainly used in mild hypertension in combination with a diuretic agent AHFSDI. It is also used as tonic states of asthenia, snake & insect bite & for constipation, liver diseases flatulence, insomnia & rheumatism (Fransworth, 1995).

It is well accepted that the pharmacological effects of *Rauvolfia serpentina* are due to its alkaloids, especially the Reserpine, Rescinnamine group (Rand and Jurevices, 1977). Reserpine is an

 

effective indole alkaloid first isolated from *Rauvolfia serpantina* used as an antihypertensive (Anonymous, 2003).

## Traditional and Medicinal uses

### Ethnomedicinal uses:

*Rauvolfia serpantina* plants parts are mostly used for various ethnomedicinal purposes. The fresh ground leaves applied to the toes could serve as an antidote for snake poison. The fresh leaf juices are used to prevent eye inflammation. *Rauvolfia serpantina* root and leaf paste to make pills and sun dried used against malarial fever.

The roots of *Rauvolfia serpantina* plants relieved mentally challenged person by consumption of root. The root juice is used during the time of liver pain. Rural people of Kanyakumari district, India, use the decoction of roots during labor and juice of leaves for removal of opacities of the eye cornea. Roots are chewed for stomach pain and fever by Khamptis of Arunachal Pradesh, India. A paste of root and black pepper is administered for malaria **(**Dey and De, 2010). Decoction and extracts of the roots are employed to increase uterine contractions for expulsion of fetus.

*Rauvolfia serpantina* plant was found to be used very commonly by tribes indicating the authenticity of their usefulness. The inhabitants of Makassar use the petioles as an antidote for infusion. It is also useful against painful affections of bowels, diarrhea, dysentery, cholera and colic.

**High blood pressure:** The *Rauvolfia* herb is the best remedy for high Blood Pressure and it has been adapted by medical fraternity in most countries. Those alkaloids which have a direct effect on hypertension have been isolated and are widely used by the practitioners of modern medicine.

**In insanity:** The *Rauvolfia* plant is highly beneficial in treating insanity. One gram of powdered root can be taken twice a day with 250 ml of goat's milk, sweetened with sugar candy. It is unsuitable for those with a low blood pressure, depressed and hypertensive patients.

*Rauvolfia* is a well known remedy in treating insomnia because of its sedative properties. The very first dose of *Rauvolfia* enables the patient of a phlegmatic and gouty nature to go to sleep. It is non stimulating and should be given at bedtime for sound sleep. *Rauvolfia* is useful in treating hysteria. It relieves itching in urticaria.

**Prostate cancer activity:** *Rauvolfia* plant parts have been used as a traditional medicine for centuries to treat a variety of ailments including fever, general weakness, intestinal diseases, liver problems and mental disorders. Extracts from the root bark of this plant are enriched with compounds of ß-carboline alkaloid family of which the main constituent is alstonine. This compound has been reported to reduce tumour cell growth in mice inoculated with YC8 lymphoma cells or Ehrlich ascetic cells. The plant extract has antiprostate cancer activity in both *in vitro* and *in vivo* model systems which, based upon analyses of gene expression patterns of treated prostate cancer cells, may be modulated by its effects on DNA damage and cell cycle control signalling pathways (Friedman A.P, 1955).

**Snake and animal bite:** The freshly ground leaves of *Rauvolfia* applied to the toes could serve as an antidote for snake poison. The roots and leaves of this plant are crushed with milk and made into a paste and used internally and externally on the affected area in case of snakebite by the people of Bhadra wildlife sanctuary in Karnataka ((Sen *et al*., 2008 and Parinitha *et al*., 2004).

**Therapeutic Uses:** Sarpgandha has been employed therapeutically from centuries in India for the relief of various central nervous system disorders, both psychic and motor. These include anxiety states, excitement, maniacal behaviour associated with psychosis, schizophrenia, insanity, insomnia and epilepsy. Root is bitter tonic, hypnotic, sedative, specific for insanity,

 

reduces blood pressure. It is a remedy for painful affections of the bowels. Extract of roots is used for the treatment of intestinal disorders, particularly diarrhoea and dysentery. Root stimulates urine contraction and is used in child birth in difficult cases. Decoction of roots is employed in 14 labours to increase urine contractions. Leaves are bitter stimulant uterus, nutritive, antihelminthic, (Joshi, 2000).

## Conclusion

The plant of *R. Serpantina* is a treasure house of medicinal and therapeutic utilities. Its potential use as antihypertensive, ant arrhythmic, antidepressant, antioxidant and anticancer has been studied thoroughly by various researchers and traditional healers. This the time to authenticate and standardized the various ingredients found in the plant of *R. serpantina.*

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