

Ethnomedicinal utilization of *Rauwolfia serpentina* (L.) Benth. ex Kurz.

Manish Maan¹, Bhawna Pant²

¹Doon School of Modern Agriculture and Forestry, DBS Global University, Dehradun, Uttarakhand, India

²DBS School of Pharmacy and Research, DBS Global University, Dehradun, Uttarakhand, India

Email: manishmaan@dgu.ac.in

ABSTRACT

Plants have evolved to produce a diverse range of secondary metabolites which have been utilized as a source of remedial agents. The various parts of *Rauwolfia serpentina*, i.e., barks, leaves, roots, and rhizomes are used in Ayurvedic medicines for centuries, for curing several diseases such as mental agitation, epilepsy, high pressure, anxiety, excitement, traumas, eight schizophrenic disorder, insomnia, and psychopathy. This plant is been used as an effective drug in the modern medical world. Due to the presence of alkaloids, carbohydrates, flavonoids, glycosides, phlobatannins, phenols, resins, saponins, sterols, tannins, and terpenes it accustomed cure variety of diseases. The present review is focus on the use of *Rauwolfia serpentina* in the treatment of different ailments by the tribe communities or the aboriginals as an ethnomedicine.

Key words: Remedial agents, Alkaloids, Ayurvedic Medicine, Metabolites, diseases.

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Introduction

Ethnomedicines have been the first line of defense in maintaining health and combating diseases since ancient times. Plants especially the medicinal herbs acts as general health marker of the ecosystem. These plants possess several properties which are important from medicinal and clinical point of view^{1, 2}. Chemical principles and active ingredients have been isolated for the development of new drugs from medicinal plants which can then be formulated in various dosage forms³. Medicinal herbs and spices have appreciated a rich custom of utilization for their flavor improvement qualities and for their therapeutic properties⁴ (Table 2). Indian traditional medicine system such as Ayurveda, Siddha and Unani are growing at a faster rate in recent years⁵ because plant-derived medicines have proven to be healthier and do not cause as many side effects as those derived from chemicals⁶. However, a problem with traditional medicine formulations is the lack of adequate knowledge and information about the various types of plants commonly used as ingredients and their methods of use⁷ (Table 3). World Health Organization (WHO) review estimates that almost 80 % of world's population depends on traditional medicines⁸.

Rauwolfia serpentina (L.) Benth. Ex Kurz is a plant of family Apocynaceae. Genus *Rauwolfia*, belonging to the family Apocynaceae (Table 1), comprises more than 80 species, which are distributed in tropical climatic conditions⁹. It is known by a variety of classical names like Sarpagandha, Chotachand, Chandrabhaga, Harkaichanda, Nai etc. *Rauwolfia serpentina* is identified as a critically

endangered species¹⁰. Due to high demand and unavailability, the roots of *Rauwolfia serpentina* are usually adulterated with other species like *Ophiorrhiza mungos*, white-flowered and red-flowered *Clerodendrum* species and *Tabernaemontana divaricata*¹¹.

Morphology and Distribution

Rauwolfia serpentina is an evergreen plant, perennial, glabrous erect under shrub grows up to a height of 60 cm, usually 30 to 40 cm. Roots are tuberous, with pale brown cork, zigzag with irregular nodes, 30 cm. Long. Leaves are elliptical or lanceolate shaped, usually occurred in whorls of 3 to 5 leaflets together, bright green above, pale green below, tip acute or acuminate, base tapering and slender and petioles long and 7-10 cm long and 3.5-5.0 cm wide¹². Flowers bisexual, white often, have violet colored tinge. They occur in many flowered irregular cymose cymes. Peduncles are long but pedicels stout. The most important plant parts to be used are roots and leaves. Roots are bitter in taste with external colour greyish yellow to brown and internal colour is whitish grey, surface is slightly wrinkled and rough with coarse longitudinal markings¹³. Besides India *R. serpentina* recorded as the native plant for the moist deciduous forests of Southeast Asian countries such as Bangladesh, Bhutan, Malaysia, Myanmar and Sri Lanka. In India, this species grows between the elevation of 1300 to 1400 m in the foot hills of Himalaya, Punjab, Assam, Meghalaya, Sikkim, J&K, Uttarakhand, Western Ghats and Andaman¹⁴.

Rauwolfia serpentina in Ayurveda

The primary focus of ayurvedic treatment is to reestablish the harmony between the three

significant body frame works i.e vatta (air and space), pitta (fire) and kapha (earth and water)^{15,16,17,18}. *Rauwolfia serpentina* (Sarpagandha) is a very popular Ayurvedic herb which has been utilized in India as Ayurvedic system practices for various diseases¹⁹. *Rauwolfia serpentina* is kapha and Vatta sedative.

Properties of *Rauwolfia serpentina*²⁰

Paachansansthana- It helps in enhancing the digestion.
Rakatvehsansthana- It helps in hypertension and significantly lower down the high blood pressure.
Prajannansansthana- It maintains and improve the overall reproductive health of both male and female.
Taapkram- Helps in bring down the high body temperature during fever.
Saatmikaran- It is used as an effective anti-venom in snake bite case.
Naadisanshan- It helps in treating epilepsy and insomnia patient.

Ethnomedicinal uses of *Rauwolfia serpentina*

Scabies and skin diseases

Roots of *R. serpentina* coupled with lemon juice and boric acid are mixed well to make a paste to apply externally on wounds and infected parts of body. Fruits of datura and roots of *R. serpentina* coupled with lemon juice and boric acid re mixed to prepare paste and used externally on infected parts²¹. *R. serpentina* is used to treat urticarial patients in unani medicine²². A root paste prepared from *R. serpentina* and *A. paniculata* used by kandhas tribe of Kandhamal district of Orissa to cure itches, boils and eczema.²³

Gastrointestinal diseases

R. serpentina is used in gastrointestinal problems by the Kavirajes of Rajshahi district. Khamotis in Arunachal Pradesh chewed the roots of *R. serpentina* for stomach pain and fever²⁴. Root extract is also given to patients to cure intestinal worms and stomach pain in the rural population of Kanyakumari²⁵. In abdominal pain the mixture of the extraction of leaf and fruit of *R. serpentina* and *Ixora villosa* given to drink²⁶. Approx 10 gm of root paste mixed with a cup of water consumed early morning empty stomach to get relief from stomach pain²⁷. Tribal groups of Eastern Ghats use Cassia fistula bark along with the bark of Mango, *R. serpentina* and Piper longum for curing jaundice²⁸. (Naidu and Khasim2010. Root powder as a wormicidal given for three days to treat ulcer²⁹. Grinded root bark is consumed with cold water to cure stomach ache by the dwellers of Daitari forest range³⁰.

Asthma and Respiratory problems

The leaves and the flowers of the *R. serpentina* used to treat Asthma patients by the Kani Tribals. One teaspoon of root juice or dried root powder consumed twice in a day orally to cure respiratory problems³¹.

Head sore

Ethnic groups of Chittoor Andhra Pradesh use paste of *R. serpentina* to cure Head sore³². *R. serpentina* plant also used to treat headache by the folk practitioners of Natore and Rajshani districts, Bangladesh³³.

Malaria

A past made of roots of *R. serpentina* and back paper is used to cure malaria by the people of Garo tribes³⁴. Juice extracted from the *R. serpentina* along with the leaves of *Andrographis paniculata* and *Azadirachta indica* consumed with honey by the Khamptis of Arunachal Pradesh²⁴. Roots of *R. serpentina* are grinded with equal quantities of roots of *Cissampelos pareira* and consumed with water twice a day for 5 days to treat malaria by the Kol tribes of Orissa, India³⁶.

Snake, Insect and Animal bite

Folk medicine made of squeezed roots is tied on the snake bite to treat the snake bite by the people of Chikmagalur district of Karnataka, India. There *R. serpentina* known as Sarpagandhi³⁷. Root and leaf decoction given orally in snake bite in the rural areas of Kanyakumari district, India²⁵. Crushed roots are consumed with water for 7 days in case of dog bite by the people of Rajshahi district, Bangladesh. Kurichhayas of Kannur district, Western Ghats, Kerala, India, consume twice a day the fresh roots of *Aristolochia indica* grinding with *R. serpentina* and mixed in water against the snake bite^{39,40}.

Opacities of the eye cornea

A fresh juice of *R. serpentina*'s leaves use to treat inflammation in eyes⁴¹. Rural communities of Kanyakumari usually take juice of *R. serpentina* leaves to remove opacities of eye cornea⁴².

Diabetes mellitus

People of west Rarr and Birbhumi, West Bengal treat Biabetes mellitus through the juice of *R. serpentina* roots⁴³.

Fever

R. serpentina is used in the treatment of fever in the Kalahandi district of Orissa, India⁴⁴ and Jaunsari tribe of Garhwal Himalaya, Uttarakhand, India⁴⁵. The tribes of Chhatarpur district, Madhya Pradesh, India use fresh root juice of *R. serpentina* to bring down body temperature⁴⁶.

Mental Disorder

Ethnomedical use of this plant as an antihypertensive and tranquilizer (Reserpine, Deserpidine and Rescinnamine) was reported by Fabricant and Farnsworth⁴⁷. The plant is used in insomnia and madness in 'Chatara' block of district Sonbhadra, Uttar Pradesh, India⁴⁸.

Ethnomedicine practitioner in Kandhas tribe, Orissa gives root powder either with honey or milk in early morning empty stomach to cure mental disorder²³. Root powder is given twice a day for two days in case

of mental depression as folk medicine in Meerut district, Uttar Pradesh⁵⁰.

Blood Pressure

R. serpentina root extract use to treat high blood pressure by drinking twice or trice in a day⁵¹. This plant has been treated as a highly prioritized medicinal plant of Barak valley, Northeast India, where leaf juice is taken as soup for curing and controlling high blood pressure⁵². Root decoction is being used for curing of blood pressure in some tribal rich district of Orissa, India⁵³. The tribes of Chhatarpur district, Madhya Pradesh, India use this plant in insomnia⁵⁴. About 5 mg root paste is taken twice daily in empty stomach for a week for the treatment of high blood pressure by the forest dwellers of the Daitari range of hills of Orissa, India⁵⁵.

AIDS

R. Serpentina is used to treat Acquired Immunodeficiency Syndrome by the medicinal practitioners in Natore and Rajshahi districts of Bangladesh.³³. *R. Serpentina* helps in the inhibiting HIV reverse transcriptase and HIV cell growth^{57, 58}.

Conclusion

Based on the reviews of the literature, *Rauwolfia serpentina* appears to be a safe and effective remedies for the diseases. Various active phytochemicals in the form of flavonoids, phytosterols, oleoresins, steroids, tannins and alkaloids play important role in curing diseases which is supported by phytochemical studies in modern medical sciences. Although roots are the major source of active phytochemical, leaves, stem, seeds, fruits and flowers are also being used by the aboriginals to cure different diseases. There is significant work required to bridge up the gap between folk medicinal utilization of *R. serpentina* and its active principles related to the treatment of different diseases. Ethnomedicinal utilization by primitive tribes should verified by further scientific experimentations and this plant can promote in herbal treatments and drug discovery.

Table 1- Taxonomy of *Rauwolfia serpentina* Benth

Kingdom	Plantae
Phylum	Tracheophytes
Subphylum	Angiospermae
Class	Magnoliopsida
Order	Gentianales
Family	Apocynaceae
Genus	<i>Rauwolfia</i>
Species	<i>serpentina</i>

Table 2- Therapeutic properties of phytochemicals of *Rauwolfia serpentina*⁵⁹

S. No	Disease name	Disease type	References
1	Fever	Infectious	44
2	Insect bite	Infectious	44
3	Anasarca	Epidermal	23
4	Dysentery	Digestive	44
5	Diabetes mellitus	Digestive	43, 59-62
6	Hypolipidemia	Digestive	60,63
7	Alzheimer's disease	Neurological	64
8	Schizophrenia	Neurological	65-68
9	Asthma	Immunological	31, 69
10	Rheumatism	Immunological	23, 65
11	AIDS	Immunological	33, 65
12	Leukemia	Immunological	70
13	Skin cancer	Immunological	65,71
14	Prostate cancer	Immunological	72,73
15	Allergy	Immunological	74, 75
16	Cancer	Immunological	71, 72, 76, 77
17	Hypertension	Circulatory	14, 65, 78-81
18	Cardiac arrhythmia	Circulatory	82-84
19	Diarrhea	Pathological	85
20	Meningitis	Pathological	86
21	Pneumonia	Pathological	56

Table 3 Ethnobotanical uses of *Rauwolfia serpentina* in India

Disease	Part used	References
Malaria	Leaves and Root	24, 36
Stomach pain	Leaves	36
Opacities of the eye cornea	Leaves	42
Dysentery	Whole plant	44
Fever	Whole plant	35
Scabies	Root	21
Itches and Eczema	Root	23
High blood pressure	Root	25, 51

Anxiety, Epilepsy	Whole plant	45, 48
Mental disorder	Root	23
Snakebite	Fruits and Seeds	25,38-40
Scorpion sting	Fruits and Seeds	23, 37
Dog bite	Roots, Fruits and Seeds	49

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