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Review Article

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### A Review on Phytochemistry and Biological Assays of *Rauvolfia Serpentina* (L). Benth. ex Kurz.

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#### ABSTRACT

*Rauvolfia serpentina* is an important medicinal plant with a myriad of pharmacological activities. The plant is famous for curing various ailments due to the presence of alkaloids, carbohydrates, flavonoids, glycosides, phlobatannins, phenols, resins, saponins sterols, tannins and terpenes. Various parts of the plant are constantly used by several ethnic communities and traditional ayurvedic healers since centuries. In this respect, a review on phytochemistry and biological assays of the plant was done.

**Keywords:** Rauvolfia Serpentina, Phytochemistry, Diseases.

#### ARTICLE INFO

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#### 1. Introduction

*Rauvolfia serpentina* (Family Apocynaceae) is a small, woody, perennial medicinal shrub bearing white or pinkish flowers and tuberous root with pale brown cork and elliptic to lanceolate or obovate leaves in whorls of three (Sihag International Journal of Chemistry and Pharmaceutical Sciences

and Wadhwa, 2011). The plant is common in habitats of tropical and subtropical regions. Common names of the plant includes Sarpagandha, Chandrabagha, Snake root plant, Chotachand, Chandrika and Harkaya etc. (Mallick *et*

al., 2012). The medicinal importance of the plant parts like roots, leaves and juice are well recognized from time immemorial and the indigenous healers are utilizing the potential of the plant across the world. The use of the plant in Indian Ayurvedic medical system for the treatment of various ailments was also recorded even in ancient times. The use of the plant for curing hypertension, insomnia, mental agitation, gastrointestinal disorders, excitement, epilepsy, traumas, anxiety, excitement, schizophrenia, sedative insomnia and insanity in Ayurvedic system of medicine was well established (Kirtikar and Basu, 1993; Fabricant and Farnsworth, 2001; Kala, 2005; Meena *et al.*, 2009).

The therapeutic usefulness of *Rauvolfia serpentina* has been mentioned in 'Sushruta samhita' as one that lowers heart rate and induces sleep, beneficial in colic pain, fever and parasitic infections. *Bhavpraksha* said that this plant counter venom of snakes, scorpion and other insect bites and fast healing of wounds. The roots of the plant are used for curing hypertension-associated headache, dizziness, menorrhagia, oligomenorrhagia and dysmenorrhagia like abnormalities in Siddha system of medicine. The effects of Homeopathic drug developed from the plant on blood pressure, heart rate, serum biochemical parameters, oxidative stress indices and expression levels of antioxidant defense enzymes and the ability of the plant to reduce systolic blood pressure was thoroughly investigated (Kumar *et al.*, 2016).

### Morphological Features

*Rauvolfia serpentina* is an evergreen, a small, woody, perennial medicinal shrub bearing white or pinkish flowers. Its roots are tuberous with pale brown cork. The Leaves of the plant are in whorls of three, elliptic to lanceolate or obovate, bright green above and below pale green and thin. *Serpentina*. Its flowers are in irregular corymbose cymes, white, often tinged with violet. The flowering time is from March to May in Indian conditions. Its fruits are Drupe, single or didymous, shining black, the inflorescence with red pedicels and calyx and white corolla (Sihag and Wadhwa, 2011).

## 2. Phytochemistry

The major alkaloid present is Reserpine which varies from 1.7 to 3.0 %. The root barks has more than 90% of the total alkaloids in roots. The minor alkaloids present in the plant are Ajmaline, Ajmalimine, Ajmalicine, Deserpidine, Indobine, Indobinine, Reserpine, Reserpiline, Rescinnamine, Rescinnamidine, Yohimbine, Serpentine, Serpentinine, Isoajmaline, Chandrine, Rauwolfinine, Renoxidine, Rescin-Namine, Reserpinine, Sarpagine, Tetraphyllicine, coryanthine, neo-ajmaline, papaverine, raubasine, rauwolscine, rescinnamine, serpinine and deserpidine and 3-Epi-A-Yohimbine (Khare *et al.*, 2007 and Kokate *et al.*, 2008). The root contains ophioxilin, resin, starch and wax (Brinker, 1996). The percentage of alkaloid depends solely on geographical region from where the plant is collected and also the season of collection. Besides, it contains steroids -methyl-5- androsten-3- -ol, -sitosterol and it's dehydro derivative. Also reported International Journal of Chemistry and Pharmaceutical Sciences

phytochemicals include 1,2- di- hydrouomilenine reductase, serpoterpene, yohambaoid, monoterpenoid and indole alkaloid (Rathi *et al.*, 2013).

## 3. Serpentina – The wonder plant

*Rauvolfia* has a torrent of potentials and is mainly used for the treatment of various central nervous system disorders associated with psychosis, schizophrenia, insanity, insomnia, and epilepsy. Furthermore, the use of the plant for the treatment of gasrointestinal disorders, hypertension, snake, insect and animal bites, mental illness, circulatory disorders, pneumonia, malaria, skin diseases, respiratory illness, eye, spleen diseases and ethnoveterinary treatment are well reported from all over the world (Dey and De, 2010; Dey and De, 2011). Moreover, the root was believed to stimulate uterine contraction and recommended for use in child-birth in difficult cases. The antibacterial, antifungal, antilipidemic, antioxidant potentials of the plant are also studied thoroughly by several researchers.

### Gasrointestinal disorders

Extracts of the roots are valued for the treatment of intestinal disorders, particularly diarrhea and dysentery and also as anathematic. Mixed with other plant extracts, they have been used in the treatment of cholera, colic and fever. The antidiarrhoeal activity of leaf methanolic extract of *Rauvolfia serpentina* was reported by Ezeigbo *et al.* (2012). The use of the plant for liver pain, stomach pain and other gastrointestinal disorders are well documented (Sen *et al.*, 2008; Mollik *et al.*, 2010).

### Antihypertension

The clinical trial of *Rauvolfia serpentina* to reduce essential hypertension was started from very earlier times (Vakil, 1949). Now, it is the principal ingredient in a number of modern pharmaceutical preparations for treating hypertension. Harisaranraj *et al.* (2009) also elucidated the antihypertensive active principles from the plant. About 10 gm of root powder is taken orally twice a day for seven days to cure hypertension by the tribals in Madhya Pradesh, India (Kumar *et al.*, 2004).

### Snake, insect and animal bites

The use of the plant as an antidote against the bites of poisonous snakes and insect stings are practiced from centuries. There are many folk-lore's about this plant like the mongooses would first chew upon its leaves to gain power before combating a cobra. According to another, it's freshly ground leaves when applied to the toes could serve as an antidote for snake poison. In case of snake-bite, juice extracted from leaves taken twice a day for three days. Moreover, the plant root paste along with that of *Azadirachta indica* and black pepper seeds are made into paste and the extract is administered orally soon after bite (Sarkhel, 2013). Rahamatullah *et al.* (2010) have reported the use of the plant against snakebite by the folk medicinal practitioners in Bangladesh.

### Mental illness

The use of the plant for mental illness is an ancient idea. The Kandhas of Kandhamal district of Orissa are using the root paste either with raw milk or honey in empty stomach twice a day for 21 days to cure mental disorders (Behera *et al.*, 2006). The use of the plant for mental disorders,

nervous disorders and psychosis in folkmedicine in Karnataka was also reported (Shiddamallayya *et al.*, 2010).

#### **Pneumonia**

The use of young shoot extract of the plant for curing pneumonia in early stage was practiced by traditional healers in Nepal (Rai, 2004). Anisuzzaman *et al.* (2007) also reported similar observations.

#### **Malaria**

The use of the plant to treat malarial fever was common among tribals all around the world (Partha and Hossain, 2007; Mia *et al.*, 2009)

#### **Skin diseases**

Behera *et al.* (2006) reported the use of root paste of the plant with *A. paniculata* for itches, boils and eczema. The root paste is mixed with oil of *Cinamomum tamala* and externally applied on leucoderma in night (Sharma *et al.*, 2014)

#### **Respiratory illness**

Yusuf *et al.* (2006) and Britto and Mahesh (2007) has clearly elucidated the use of *R. serpentina* at various formulations to treat asthma and other respiratory diseases.

#### **Eye, spleen diseases**

The use of fresh leaf juices to prevent eye inflammation (Anisuzzaman *et al.*, 2007) and uses the plant to treat spleen diseases (Mia *et al.*, 2009) are recorded earlier.

#### **Ethnoveterinary treatment**

The use of the mixture of *R. serpentina* roots (20 to 30 gm) and sugar (50 to 60 gm) to treat loose motion in livestock (Singh and Sureja, 2007) and to treat for fever, stomach-ache, menstrual disorders among of livestock was also well studied (Bhattarai *et al.*, 2009).

#### **Antibacterial**

The antibacterial potential of the plant was assessed by several workers around different geographic realms. The Antibacterial activity of leaf and root extracts was assessed against *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Bacillus subtilis* and *Klebsiella pneumonia* was studied by Murthy and Narayanappa (2015). In another study Negi *et al.* (2014) enumerated the antibacterial effects of the methanol extracts of *R. serpentina* against *Salmonella typhimurium*, *Escherichia coli*, *Citrobacter freundii*, *Proteus vulgaris*, *Enterococcus faecalis* and *Staphylococcus aureus* with commendable activities.

#### **Antifungal**

The antifungal activity of *Rauwolfia serpentina* against phytopathogenic fungi such as *Alternaria alternata*, *Aspergillus flavus* and *Mucor rouxii* was well studied (Thakur *et al.*, 2015).

#### **Antilipidemic**

Qureshi and Udani, (2009) demonstrated the efficacy of root powder of *Rauwolfia* in lowering the serum levels of triglycerides, cholesterol, Low Density Lipoprotein Cholesterol (LDLC) and increasing level of high density lipoprotein (HDL).

**Antioxidant:** The presence of antioxidant supplements in the plant which reduce level of oxidative stress and slow down or prevent the development of complications associated with diseases are well studied (Azmi and Qureshi, 2013; Gupta and Gupta, 2015).

#### **Hypoglycemic potential**

Several researchers have reported the hypoglycemic potential of *R. serpentina* extracts (Azmi and Qureshi, 2013). The docking studies with *R. serpentina* alkaloids as insulin receptor activators also yields positive results (Ganugapati *et al.*, 2012).

#### **4. Conclusion**

It can be concluded that *R. serpentina* is considered as a wonder plant with a myriad of medicinal potentialities. The phytochemicals present in the plant forms basis for several allopathic, homeopathic and unani medicines. However, further researches coupled with molecular level studies are the need of the hour to cop up with the emerging disease threats.

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