

A CRITICAL REVIEW ARTICLE ON SARPAGANDHA (*Rauwolfia serpentina* Benth.)
ALONG WITH ITS PHARMACOLOGICAL ACTIONS ACTION

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ABSTRACT

Sarpagandha is used as an effective Antihypertensive and it is world's first antihypertensive drug. *Rauwolfia serpentina* contain more than 50 alkaloids. Reserpine is the principal alkaloid of *Sarpagandha*. It has a success application in antihypertensive even in smaller dose. This review represents a brief description of *Sarpagandha* about its classification in classical text as well as in modern literature with its botanical description and pharmacological actions.

KEYWORDS: *Sarpagandha*, *Rauwolfia serpentina*, Pharmacological actions.

Sarpagandha (*Rauwolfia serpentina*) has been known for its medicinal value. It is one of finest remedy that is widely used for high blood pressure and also as sedative and tranquilizing agent.

The drug comprises of many bioactive chemicals with more than 50 different alkaloids. Out of 50 alkaloids, main alkaloids present are ajmaline, ajmalicine, indobine, indobinine, ajmalimine, serpentine, serpetinine, deserpidine, reserpinine, reserpiline, rescinnamine, yohimbine and yohimbinine. Reserpine is quiet useful alkaloid of this plant. About 90% of these alkaloids are found in the tuberous roots of this plant.

Distribution

Sarpagandha belongs to the family Apocynaceae that includes 50 species, distributed worldwide in the region of the Himalayas, Indian peninsula, Burma, Indonesia and Sri Lanka and is indigenous to India, Bangladesh and other regions of Asia. *Sarpagandha* is an important medicinal plant distributed in the foot-hills of Himalayan range, up to the elevation of 1300-1400 m. and almost all over the country. It is used in traditional medicine in India, China, Africa and many other countries. It grows in India, Pakistan, Sri Lanka, Burma and Thailand. In India, it is widely distributed in the sub-Himalayan tract

from Punjab to Nepal, Sikkim and Bhutan. It is also found in the lower hills of Gangetic plains, eastern and Western Ghats and Andaman's. It is mostly found in moist deciduous forests at altitudes ranging from sea level to an altitude of 1, 200 m high. In the Deccan, it is associated with bamboo forests.

Taxonomy^[1]

Kingdom- Plantae
Class – Dicotyledons
Subclass- Gamopetalae
Series- Bicarpellate
Order- Gentianales
Family- Apocynaceae
Genus- Rauwolfia
Species- Serpentina

Classification of *sarpagandha* in ayurvedic treatise

In sushruta samhita (1000 B.C.- 5th Cent. A. D.)- This Samhita was written by Vriddha Sushruta (1000 B.C.), he was contemporary to Agnivesha. The treaties was reducted by Sushruta in 2nd Cent. A.D. and revised by Nagarjuna in 5th cent. A.D. This treaty mainly concerned with *Shalya* and *Shalakya* and firstly mentioned *Sarpagandha* in *Kalpa Sthana*

S. N.	Indication	Use/Formulation	Use	Literature Reference
1.	Sarpa visha	Eksar yoga	Int.	Su.K.5/84
2.	Mandali visha	Mandali visha Agada	Int.	Su.K.5/76

3.	Sarpa visha	<i>Rishabh Agada</i>	<i>Ext.</i>	<i>Su.K.5/68</i>
4.	Mushak visha	<i>Sarpagandhadi yoga</i>	<i>Int.</i>	<i>Su.K.7/29</i>
5.	Unamda, Apasmara, Grahadosha	<i>Sarvagraha</i> <i>Lashunadisidham sarpi</i>	<i>Int.</i>	<i>Su.U.60/47</i>

Ashtang sangrah (6th Cent. A. D.)- Ashtang Sangraha was written by Maharshi Vriddha Vagbhata. He has mentioned Sarpagandha once in Sutra Sthana and 19

times in Uttara tantra in various formulations as tabulated below-

S. N.	Indication	Use/Formulation	Use	Literature Reference
1.	Jeerna jwara	<i>Nakulyadi taila</i>	<i>Ext.</i>	<i>A.S.Su. 2/84</i>
2.	Skanda Graha	<i>Sarpsughadhadi Lepa</i>	<i>Ext.</i>	<i>A.S.U.6/3</i>
3.	Vishakha Graha	<i>Sarpsugandhadi Agada</i>	<i>Ext.</i>	<i>A.S.U.6/18</i>
4.	Negmesha Graha	<i>Sarpsugandhadi Dhoopa</i>	<i>Ext.</i>	<i>A.S.U.6/24</i>
5.	Sheeta Putana	<i>Sarpsugandhadi taila</i>	<i>Ext.</i>	<i>A.S.U.6/24</i>
6.	Bhoota Pratisheda	<i>Sarpagandhadi Ghrita</i>	<i>Ext./Int.</i>	<i>A.S.U.8/3</i>
7.	Unmada	<i>Mahapaishachik Ghrita</i>	<i>Int.</i>	<i>A.S.U.9/31</i>
8.	Apasmara	<i>Nakuli Lepa-Dhoopa</i>	<i>Int./Ext.</i>	<i>A.S.U.10/52</i>
9.	Karna Roga	<i>Sugandha Lepa</i>	<i>Ext.</i>	<i>A.S.U.22/51</i>
10.	Visha pratisheda	<i>Sanjeevana agada</i>	<i>Int./Ext.</i>	<i>A.S.U. 40/59</i>
11.	Visha pratisheda	<i>Gandhahasti agada</i>	<i>Int./Ext.</i>	<i>A.S.U. 40/94</i>
12.	Visha pratisheda	<i>Nakulyadi ghrita</i>	<i>Int.</i>	<i>A.S.U. 40/127</i>
13.	Keeta visha Pratisheda	<i>Nakulyadi Agada</i>	<i>Int.</i>	<i>A.S.U. 43/57</i>
14.	Keeta visha Pratisheda	<i>Nakulyadi Lepa</i>	<i>Ext.</i>	<i>A.S.U. 43/82</i>
15.	Loota visha Pratisheda	<i>Sarpagandhadi Lepa</i>	<i>Ext.</i>	<i>A.S.U. 44/43</i>
16.	Loota visha Pratisheda	<i>Sarpagandhadi Agada</i>	<i>Int.</i>	<i>A.S.U. 44/62</i>
17.	Loota visha Pratisheda	<i>Sarvakarmika Agada</i>	<i>Int.</i>	<i>A.S.U. 44/75</i>
18.	Loota visha Pratisheda	<i>Gandhanakulyadi Lepa</i>	<i>Ext./Int.</i>	<i>A.S.U. 44/77</i>
19.	Loota visha	<i>Nakulyadi Agada</i>	<i>Ext./Int.</i>	<i>A.S.U. 44/75</i>
20.	Mushika Alarka Visha	<i>Sarpagandhadi Kwatha</i>	<i>Int.</i>	<i>A.S.U. 46/74</i>

Ashtang hridaya (7th Cent. A.D.)- It was composed by Acharya Vagbhata. He has mentioned Sarpagandha 2

times in Chikitsa Sthana and 6 times in Uttara Sthana as tabulated below-

S. N.	Indication	Use/Formulation	Use	Literature Reference
1.	Sheeta Jwara	<i>Sheeta jwaranashak Aushadh</i>	<i>Ext.</i>	<i>A.H.Chi.1/139</i>
2.	Gulma	<i>Kshara Agada</i>	<i>Int.</i>	<i>A.H.Chi.14/104</i>
3.	Graha Roga	<i>Grahabhootanashak</i> <i>Hingwadi Yoga</i>	<i>Int./Ext.</i>	<i>A.H.U.5/3</i>
4.	Unmada	<i>Mahapaishachik Ghrita</i>	<i>Int.</i>	<i>A.H.U.6/35</i>
5.	Apachi	<i>Sarpagandhadi Lepa</i>	<i>Ext.</i>	<i>A.H.U.30/15</i>
6.	Krishna sarpadansha chikitsa	<i>Sarpagandhadi Lepa</i>	<i>Ext.</i>	<i>A.H.U.36/58</i>
7.	Sarpa Visha	<i>Nakulyadi Agada</i>	<i>Int.</i>	<i>A.H.U.36/61</i>
8.	Loota Visha	<i>Pittapradhan Makadi</i> <i>vishanashak Agada</i>	<i>Int./Ext.</i>	<i>A.H.U.37/85</i>

Bhel samhita (600-100 B.C.)- Bhel Samhita was composed by Acharya Bhel. Acharya Bhel has

mentioned Sarpagandha (Nakuli) 2 times in Chikitsa Sthana as tabulated below-

S. N.	Indication	Use/Formulation	Use	Literature Reference
1.	Visham Jwara	<i>Mahapaishachik Ghrita</i>	<i>Int.</i>	<i>Bhe.Chi.2/34</i>
2.	Yakshma	<i>Kshayo unmardan Yoga</i>	<i>Int.</i>	<i>Bhe.Chi.5/</i>

Yogaratanaker (17th Cent.A.D.)-The Chikitsa Grantha "Yoga Ratnakar" was compound by Vaidya Sri

Laxmipati Ayurvedacharya. The formulations and form. indications of this Treatise are given below in tabular

S. N.	Indication	Use/Formulation	Use	Literature Reference
1.	Visha Chikitsa	Shwetadi Nasya	Int.	Y.R.U.32/9

Rasa ratna samuchaye

S. N.	Indication	Use/Formulation	Use	Literature Reference
1.	Prameha	Ramabana Rasa	Int.	R.R.S. 17/76
2.	Prameha	Sarvamehantak Rasa	Int.	R.R.S. 17/118
3.	Vatika Roga	Sparshavatari Taila	Ext.	R.R.S. 21/32
4.	Rasayana	Loha kalpa	Int.	R.R.S. 28/96

S. no.	Nighantu	Varga/Gana
1.	Dhanvantari Nighantu ^[2]	Karveeradi varga
2.	Nighantu Sesha ^[3]	Gulma kanda
3.	Shodhal Nighantu ^[4]	Karveeradi Varga
4.	Kaideva Nighantu ^[5]	Aushadhi Varga
5.	Bhavprakash Nighantu ^[6]	Haritkyadi Varga
6.	Raj Nighantu ^[7]	Mulakadi Varga
7.	Priya Nighantu ^[8]	Shatpushpadi Varga

Rogaghnata of sarpagandha in nighantu

S. N.	Roga	D.N.	K.N.	B.P.N.	R.N.	P.N.	TOTAL
1.	Vrana	-	+	+	-	-	2
2.	Krimi	+	+	+	-	+	4
3.	Sarpa visha	-	+		-	-	1
4.	Loota visha	-	+	+	-	-	2
5.	Vrishika visha	-	+	+	-	-	2
6.	Aakhu visha	+	+	+	-	-	3
7.	Jwara	-	-	+	-	+	2
8.	Shoola	-	-	-	-	+	1
9.	Unmada	-	-	-	-	+	1

Ayurvedic properties of sarpagandha in different nighantus

S. N.	Name of Nighantus	Properties of Sarpagandha				
		Rasa	Guna	Veerya	Vipaka	Doshaghana Karma
1.	K.N.	Katu, Tikta, Kashaya	-	Ushna	-	-
2.	D.N.	Katu, Tikta		Ushna	-	-
3.	B.P.N.	Tuvara, Katu, Tikta	-	Ushna	-	-
4.	M.A.N.	Katu, Tikta, Kashaya	-	Ushna	-	-
4.	P.N.	Tikta	-	Ushna	-	-

Synonyms from various nighantus

S. No.	Synonym	D.N.	N.S.	S.N.	K.N.	B.P.N.	R.N.	P.R.M.	P.N.	M.A.N.
1.	Nakuleshta				+	+				+
2.	Mahaveerya				+					
3.	Sarpasugandhika				+					
4.	Vishaghni				+					
5.	Suvaha				+					
6.	Sarpagandha	+	+	+	+		+	+	+	
7.	Chiritpatrika		+		+					

8	<i>Sugandha</i>	+	+	+	+		+			
9	<i>Nakuli</i>	+	+	+	+	+	+			+
10	<i>Gandhanakuli</i>				+	+				+
11	<i>Sarplochna</i>				+					
12	<i>Sarpanga kalika</i>				+					
13	<i>Sunanda</i>				+					
14	<i>Vishadanshtrika</i>				+					
15	<i>Mahasudha</i>				+					
16	<i>Satraki</i>				+					
17	<i>Kaamcharini</i>				+					
18	<i>Bhogigandhika</i>									
19	<i>Sarpsugandha</i>	+								+
20	<i>Virijpatrika</i>	+								
21	<i>Richagandha</i>							+		
22	<i>Raktapatrika</i>						+			
23	<i>Ishwari</i>			+			+			
24	<i>Naag gandha</i>					+	+			
25	<i>Sarpadini</i>						+			
26	<i>Vyalgandha</i>						+			
27	<i>Cheernapatrika</i>			+						
28	<i>Surasa</i>			+		+				
29	<i>Rasna</i>			+						
30	<i>Bhujangdamini</i>			+						
31	<i>Bhujangakshi</i>					+				+
32	<i>Sarpangi</i>					+				
33	<i>Vishnashini</i>					+				+
34	<i>Sarpbhuga</i>									+

Veranacular names as per API^[9]

Sanskrit- Nakuli, Candrika, Chandramarah

Bengali- Chaandar

English- Rauwolfia Root, Serpentina Root

Gujrati- Amelpodee

Hindi- Chhotaa Chaand, Dhavalbaruaa

Kannada- Sutranaabhu

Malayalam- Amalpori

Marathi- Adkai, Chandra

Oriya- Dhanbarua, Sanochado

Tamil- Sarppaganti

Telugu- Sarpgandhi

Morphology^[10] – *Sarpagandha* is a small erect shrub, grows upto 90 cm high. It has Pale bark. Leaves are 3 in one whorl, 7.5 to 18 cm long, 2.5 to 6 cm wide, lanceolate, acute or acuminate, glabrous bright green above, pale beneath, base is tapering, main nerves are 8 to 10 pairs, petiole is 8 mm long. Flowers are white, 3 to 6 mm long, bright red, bracts beneath the pedicels triangular, acute, calyx is glabrous, bright red, corolla 1 to 15 cm long, tube is slender. Fruits are drupes, single, 6 mm in diameter, becomes purplish black when ripe.

Useful part is root. Root is stout, cylindrical, some what cracked upto 20cm long and 1.8 cm in diameter the external surface is rough, longitudinally fissured and yellowish brown in colour. It bears occasional root scars. In order roots the bark becomes thick, corky and friable and constitutes a substantial part of the root. Transversely cut surface shows a thick bark enclosing a

brownish tissue having a prominent growth rings and medullary rays. On breaking root becomes short pieces and tastes very bitter.

Description of *sarpagandha* in modern literature

The indian materia medica^[11]

Habitat- A climbing shrub found in the tropical Himalayas and at moderate altitudes in Sikkim, North Bihar, Patna, Bhagalpur, Assam, Pegu and Tenasserim; Deccan Peninsula along the ghats to Travancore and Ceylon, Java and Malay Peninsula.

Action- Root is a bitter tonic and possesses well-marked sedative properties. It acts also as febrifuge.

Constituents- Root contains an alkaloid “Ophioxlin” an orange-coloured crystalline principle, resin, starch and wax “The total alkaloidal yield is 0.5%.

Five crystalline alkaloids isolated are: -

- (1) Ajmaline
- (2) Ajmalinine
- (3) Ajmalicine
- (4) Serpentine
- (5) Serpentinine

Other constituents identified are:- (a) phytosterol; (b) Oleic acid; and (c) unsaturated alcohols of formula $C_{25}H_{44}O_2$.

Indian medicinal plants^[12]

Rauwolfia serpentina Benth. Ex Kurz

Family- Apocynaceae

Habitat- The sub Himalayas tract from Punjab to Nepal, Sikkim, Bhutan, Assam, Western Ghats and the Andamans

English- Rauvolfia root, Serpentina Root, Indian Snakeroot

Folk- Chhotaa Chaand.

Action- Root- decoction is employed to increase uterine contractions and for expulsion of foetus in difficult cases. The total alkaloidal extract of the root induces bradycardia, hypotension, sedation. It finds application in hypochondria, neuropsychiatric disorders, psychosis and schizophrenia.

A number of *Rauvolfia* species are found in India: *R. beddomei* Hook. f.; *R. densiflora* Benth ex Hook. f. (Himalayas, Khasi and Aka Hills; Western and Eastern Ghats); *R. micrantha* Hook.f; known as Malabar *Rauvolfia*, (Kerela, upto an altitude of 300 m). The roots of *R. beddomei* contain ajmalicine, sarpagine and serpentine, but no reserpine. *R. densiflora* yielded 0.51% of total alkaloids (reserpine 0.01%). *R. micrantha* gave ajmalicine, raunamine, reserpiline, sarpagine, neosarpagine, in addition to reserpine.

Plants of Indian botanic garden^[13]

Roots yield tranquillizing drug. Medicinally very important, used in treatment of hypotension, as a sedative, tranquillizing agent, in many types of nervous disorders and in snake bites.

Flowering: - April-June

Database on medicinal plants used in ayurveda^[14]

Distribution – Sub-Himalayan tract from Punjab eastwards to Sub-Himalayas, Sikkim, Bhutan, Assam, lower hills of the Gangetic Plains, eastern and western Ghats, Konkan, Central India, Southern India and Andamans. Distributed in Nepal, Bangladesh, Burma, Sri Lanka, Malaya, Thailand and Java.

Parts used- Root, Leaf

Actions and uses- The roots are bitter, acrid, laxative, anthelmintic, febrifuge, thermogenic, diuretic and possess sedative properties and are useful in hypertension, strangury, fever, wounds, colic, cholera, dysentery, worm infestation, hypochondria and irritative conditions of CNS, anxiety, maniacal behavior associated with psychosis, schizophrenia, insanity, insomnia, epilepsy, giddiness, dyspepsia. The decoction of the root is used to increase uterine contractions. The juice of the leaves is useful in removal of opacities of the cornea.

Ayurvedic properties

Rasa- Tikta

Guna- Ruksha

Veerya- Ushna

Vipaka- Katu

Prabhava- Nidrajanana

Doshaghnata- kaphavatashamaka

Rogaghnata- Unmada, Apasmara, Agnimandya, Mastishkavikara, Anidra, Krimiroga, Amajavibandhashoola, Raktabharadhikya, Kashtartava, Kashtaprasava, Pralapa, Udvega, Sarpavisha, Bhutonmada, Bhrama, Balatisara, Netrashukra, visuchika, Shirahshoola.

Karma- Nidrajanana, Mastishkashamaka, Sramsana, krimighna, hridyavasada, raktabharaprashamana, Jwaraghna, Vishaghna, tandrakara, Garbhashayasankochaka, artavajanana, Amapachana. Doses- Root Powder- 3-6 gm (sedative, insanity); 1-2 gm (antihypertensive dose)

Database on medicinal plants used in ayurveda^[15]

Medicinal Parts- The medicinal part is the dried root.

Flower and Fruit- The white to pink flowers are in terminal or axillary cymes that have a diameter of 2.5 to 5 cm and are 5 to 13 cm long in main axis. The corolla tube is 11 to 19 cm long and therefore much longer than the tips, which form a plate like margin. The fruit is a bilabiate drupe, which is purple-black when ripe.

Leaves, stem and Root- The plant is erect, glabrous evergreen semi shrub 0.5 to 1m in height. The trunk is pale and unbranched.

Leaves- concentrated toward the top of the trunk and are entire- margined. They are in whorls of 3 to 5 and occasionally opposite. The leaves are 7 to 18 cm long, 2.5 to 5 cm wide, oblong- ovate or lanceolate and taper to an irregular base. The petiole is 5 to 15 cm long.

The rhizome is vertical and woody, the root is gray-brown with a wrinkled surface and is 3 to 22 mm in diameter.

Characteristics- The fresh root has a very bitter, unpleasant taste.

Action and Pharmacology

Compounds are-

Ajmalane- type: including ajmaline

Heteroyohimbane-type: including serpentinine, serpentine, raubasine, ajmalicine

Indole alkaloids (1 to 2.5%)

Sarpagan – type: including reserpine, isorauhimbine, rescinnamine, reserpine

Effects-The drug contains alkaloids of the rauwolfia type. Reserpine and other alkaloids in the root have a sympatholytic effect by releasing noradrenaline and inhibiting its resorption in the vesicles of the noradrenergic nerve ends. This results in a lowering of catecholamine, which causes a hypotensive effect. The ajmaline in the root has an antiarrhythmic effect brought about by membrane stabilization. In animal experiments a centrally generated sedative effect was demonstrated.

Indication and Usage-

Approved by Commission E.

- Hypertension
- Nervousness and Insomnia

Rauwolfia is used internally for hypertension due to vascular hypertonia. It is also useful for anxiety and tension states and other psychometric disorders.

Indian Medicine- The drug is used as an antidote for snakebites and the poisonous bites of other reptiles; also for hypertension, dysuria, fever, colic and in the treatment of wounds.

Contraindications- *Rauwolfia* is contraindicated in depression, ulceration, pheochromocytoma, pregnancy and lactation.

Indian medicinal plants^[16]

Sarpagandha root is bitter and astringent, cathartic and anthelmintic; the bark is emetic, drastic and febrifuge.

Decoction of the root is employed in labours to increase uterine contractions. In Java, it is used as an anthelmintic.

The juice of the leaves is instilled into the eyes by the natives of India and Java, as a remedy for the removal of opacities of the cornea.

Pharmacognosy^[17]

In this book Allied Drugs and Substitutes of *Rauwolfia serpentina* is mentioned.

Rauwolfia species are not limited only to South East Asia region, but also found in Africa, Central and South America, New Guinea, Hawaii, New Caledonia, Australia and far east regions. It is reported that *Rauwolfia* has about 86 different species. *Rauwolfia vomitoria* is most relevant for medicinal point of view. It is known as African *Rauwolfia* and is used as a commercial source for the preparation of reserpine. Other known species found in Africa are *Rauwolfia caffra*, *Rauwolfia cumminsii*, *Rauwolfia mombasiana*, *Rauwolfia oreogiton*, *Rauwolfia obscura*, *Rauwolfia rosea* and *Rauwolfia volkensii*. All of them contain reserpine.

Other species with reserpine content are *Rauwolfia tetraphylla* and *Rauwolfia nitida*.

Pausinystalia yohimbe, known as yohimbe bark, contains yohimbine, which is structurally related to reserpine. The root bark of *Alstonia venenata* and *Alstonia constricta* also contain reserpine. Various species of *Aspidosperma* genus contain indole alkaloids that resembles to *Rauwolfia*.

Substitute of *Rauwolfia serpentina* are *Rauwolfia tetraphylla*, *Rauwolfia densiflora* and *Rauwolfia vomitoria* (African *Rauwolfia*).

Ayurvedic drugs and their plant sources^[18]

This book is written by V.V. Sivarajan and Indira Balachandran

In this book, it describes that *Rauwolfia serpentina* is used as the source of *Sarpagandha* which is known as *Amalpori* in Kerala. *Aristolochia indica* is accepted as a different drug viz. *Isvari*, locally called Karalayam, specifically indicated for the treatment of snake-bite.

Prime ayurvedic plant drugs^[19]

In folklore, roots of *Rauwolfia serpentina* have been greatly valued for the treatment of insanity, epilepsy and related disorders. As a matter of fact, in some parts of India, this plant is called *pagle ki booti* (plant for the insane). Ayurvedic physicians also consider the plant a carminative, diuretic, laxative and an effective remedy for intestinal disorders. Decoction of root is employed to stimulate uterine contractions in cases of different deliveries.

Medicinal plants Chemistry and Properties^[20]

The roots yield about 0.7-1.5% alkaloids consisting of at least 50 compounds. These alkaloids differ in basicity, possessing weak (simple indoles) bases, strong bases (anhydronium bases) and also intermediate basicity (indoline alks.) of the principle alkaloids, reserpine, rescinnamine and deserpidine are yohimbine type possessing a pentacyclic skeleton where the fifth ring (E) is carbocyclic, whereas ajamalicine, tetrahydroreserpine, raubasine and reserpinine exhibit a heteroyohimbane skeleton- the fifth ring is heterocyclic. Serpentine, serpentine and alstonine are strongly basic anhydronium alkaloids. The other constituents of the roots are a phytosterol, fatty acids and sugars. Only reserpine-rescinnamine group of alkaloids are therapeutically important. They exhibit antihypertensive and tranquilizing action. Reserpine is used effectively against hypertension. The *Sarpagandha* root is used in cases of high blood pressure, insanity and schizophrenia. It is also used as anthelmintic, a cardiac depressant, for insomnia, epilepsy and snake bites. Decoction of the root causes uterine contractions and promotes expulsion of foetus.

Pharmacological effect of rauwolfia alkaloids

1. **Antihypertensive activity-** *Sarpagandha* is the most likely known to be as an antihypertensive drug due to presence of alkaloid called Reserpine. Reserpine is a major alkaloid present highest in root and leaves and also in lower part of stem.^[21] In the study of Vakil's 50 patients, 85 % patient found to be a drop in systolic blood pressure and 81% of patient found to be a drop in diastolic blood pressure.^[22]
2. **Effect of *sarpagandha* in breast cancer-** In 1960-1970 A.D. and an alleged relationship to breast cancer was arises in medical literature, in 3 case-controlled studies, so the use of *Rauwolfia* and Reserpine product was reduced,^[23] but research and analysis eliminating exclusion bias shows that there

is no role of Rauwolfia in rate of breast cancer occurred in patient,^[24] rather than causing cancer it possesses anticancer activity.^[25,26]

3. **Antipsychotic activity-** Reserpine has also used for treatment of Schizophrenia and tardive dyskinesia. It is used as febrifuge or fever relieving drug.^[27,28] A review found that in person with schizophrenia, Reserpine and chlorpromazine had similar rates of adverse effects but that Reserpine was less effective than chlorpromazine for improving a person's global state.^[29]
4. **Treatment of hysteria-** Rauwolfia is useful in treating hysteria. 1gm of powdered root can be administered thrice with milk. Treatment should be continued till a complete cure is obtained.
5. **Other uses-** The products of Rauwolfia serpentina are also useful in treatment of diseases like: Fever, malaria, eye disease, pneumonia, asthma, AIDS, headache, skin disease and spleen disorder.^[30-35]

CONCLUSION

Sarpagandha is relevant plant as well as having great medicinal use in antihypertensive drug. The use of *sarpagandha* and its alkaloids can be further investigated to provide a benefit of humanity to cure the disease. The major alkaloid of Rauwolfia serpentina, Reserpine has a great affinity for the treatment of hypertension along with other pharmacological action.

REFERENCES

1. Dr. Prakash L.Hegde, Dr. Harini A, a textbook of Dravyaguna Vigyana, Chaukhambha Publications, Edition Reprint, 2019; 2: 732.
2. Dhanvantri Nighantu, e Nighantu, Collection of Ayurvedic Lexicons, CCRAS, New Delhi, Karveeradi Varga, 2012.
3. Nighantu Sesh, e Nighantu, collection of Ayurvedic Lexicons, CCRAS, New Delhi, Gulma Kanda, 2012.
4. Shodhal Nighantu, e Nighantu, collection of Ayurvedic Lexicons, CCRAS, New Delhi, Karveeradi Varga, 2012.
5. Kaidev Nighantu, e Nighantu, collection of Ayurvedic Lexicons, CCRAS, New Delhi, Aushadhi Varga, 2012.
6. K.C. Chunekar commentary on Bhavaprakasha Nighantu Published by Chaukhambha Bharati Academy, 2018; 79.
7. Raj Nighantu, e Nighantu, collection of Ayurvedic Lexicons, CCRAS, New Delhi, Moolakadi Varga, 2012.
8. Priya Vrat Sharma, Priya Nighantu, Chaukhambha subharati Prakashan, Varanasi, 2004.
9. Ayurvedic Pharmacopia of India, 1, V: 166.
10. Dr. Prakash L.Hegde, Dr. Harini A, a textbook of Dravyaguna Vigyana Chaukhambha Publications, 2019; 2: 732.
11. Dr. K.M. Nandkarni, Indian Materia Medica, vol I, edited by A.K. Nandkarni, Bombay Popular Prakashan, 1972; 1050.
12. C.P. Khare, Indian Medicinal Plants, Springer, 2007; 539.
13. H.J. Chawdhery and D.S. Pandey, Plants of Indian Botanic Garden, published by Botanical Survey of India, Kolkata, 2007; 662.
14. K.V. Billore, M.B. Yelne, T.J. Dennis, B.G. Chaudhari, Database on Medicinal Plants used in Ayurveda, Vol VII, CCRAS, 2005, p: 386.
15. PDR for Herbal Medicines, edition IV, Published by Thomson Healthcare Inc, 691.
16. K.R. Kirtikar and B.D. Basu, Indian Medicinal Plants, Vol.II, Published by International Book Distributors, 2005; 1549.
17. Dr. D.C Kokate, A.P. Purohit, S.B. Gokhale, Pharamagnosy, 43: 13 – 26.
18. V.V. Sivarajan and Indira Balachandran, Ayurvedic Drugs and their Plant sources, published by Oxford & IBH, New Delhi, 1994; 439.
19. Sukh Dev, Prime Ayurvedic Plant Drugs (A Modern Scientific Appraisal), Published by Ane Books, India, 2011; 2: 557.
20. M. Daniel, Medicinal Plants Chemistry and properties, Science publishers, USA, 2006; 23.
21. Ruyter CM, Akram M, Illahi I, Stockigt J. Investigation of the alkaloid content of Rauwolfia serpentina roots from regenerated plants. Planta med, 1991; 57(4): 328-330.
22. Vakil, RJ, A clinical trial of Rauwolfia serpentina in essential hypertension. Br Heart J, 1949; 11(4): 350-355.
23. Weiss RF. Weiss's Herbal Medicine. Nerw York, NY, Theime, 2001; 153-158.
24. Horwitz RI, Feinstein AR. Extension bias and false relationship and breast cancer, Arch Intern med, 1985; 145(10): 1873-1875.
25. Bhataria VS, Sharma JN, Gupta S, Gupta YK, Images in psychiatry, Rauwolfia Serpentina: the first herbal antipsychotic. Am J. Psychiatry, 1997; 154(7): 894.
26. Stanford JL, Martin EJ, Brinton LA, Hoover RN, Rauwolfia use and Breast cancer:a case-control study , J Natl cancer Inst, 1986; 76(5): 817-822.
27. Singh P, Singh A, Shukla Ak, et al. Somatic embryogenesis and in vitro regeneration of an endangered medicinal plant Sarpagandha (Rauwolfia serpentina L), Life Sci J, 2009; 6(3): 74-79.
28. Hoenders HJ, Bartels – Velthuis AA, Vollbehr NK, Bruggeman R, Knegeting H, de Jong J. Natural medicine for psychotic disorders: a systemic review. J. Nerv. Ment. Dis, 2018; 206(2): 81-101.
29. Nur S, Adams CE. Chlorpromazine versus reserpine for schizophrenia, Cochrane database syst Rev, 2016; 4: CD 012122.
30. Nayak S, Behera SK, Misra MK, Ethnomedico-botanical survey of Kalahandi district of orissa, Indian J. tradition know, 2004; 3(1): 72-79.

31. Anisuzzaman m. Rahman AHMM, Harunor-Rashid M, Et al. An ethnobotanical study of Madhupur, Tangali, J Appl Sci Res, 2007; 3(7): 519-530.
32. Rai SK, Medicinal plant used by meche people of Jhapa District, eastern Nepal, Our Nature, 2004; (2): 27-32.
33. Britto JD, Mahesh R. Exploration of kanitribal botanical knowledge in agasthiayamalai biosphere reserve- south India, Ethnobotany Leaflets, 2007; 11: 258-265.
34. Rahmatullah M, Jahan R, Azad AK, et al. Medicinal plant used by folk medicinal practioner in villages of Natore and Rajshahi districts, Bangladesh, Am-Eurasian J Sustain Agr, 2010; 4(2): 211-218.
35. Behera SK, Panda A, Bahera SK et al. Medicinal plant used by the Kandhas of Kandhamal districts of Orissa, Indian J Tradition Know, 2006; 5(4): 519-528.