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Conservation strategies of endangered medicinal plant *Rauvolfia serpentina* [L.] Benth Ex. Kurz. (*Sarpagandha*)

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ABSTRACT

Rauvolfia serpentina [L.] Benth Ex. Kurz (*Sarpagandha*) is a well known medicinal plant of family Apocynaceae. Various ancient Indian medical epics describe medicinal properties of this plant in plenty. *Sarpagandha* is found in lower areas of tropical Himalayas from western parts of India to the far-east and near the western coast as well as Andaman and Nicobar Islands. The medicinal qualities of *Sarpagandha* are mainly found in the roots of the plant. The roots of *Sarpagandha* are not only nutritious, but very effective in curing flu and work as uterus stimulant and good antidote. The juice or extract of *Sarpagandha* roots is very effective in curing high blood pressure. In modern system of healing, the medicines made of *Sarpagandha* roots are used to cure a number of diseases. Apart from ancient Indian systems of medicines, Sarpagandha is also used in Unani, Siddha; of this plant due to various reasons and discusses about the conservation strategies for preserving this medicinal plant. Homoeopathy and as well as Allopathic system of medicine. The present paper brings in view the medicinal utility of Sarpagandha. It also reveals the causes of reduction

INTRODUCTION

Sarpagandha is a small, bright, under shrub perennial plant with zigzag roots up to 18-20 inches long that go deep in the soil. The bark of the roots is dull yellow in colour while the bark of the tree is yellow in colour. Leaves are dark green on the upside and light shaded on the downside that are bunched, 3-7 inches long with arranged in whorled manner. Flowers in general, appear in winter season in months of November and December. Flowers bisexual, interminal or auxiliary umbellate cymes, white with pale purple shaped. Fruits are seeded, small, fleshy and jointed in one or two. Raw fruits are green that turn violet to black when get ripe. The botanical name of *Sarpagandha* is *Rauvolfia Serpentina* or *Ophioxylon serpentinum*. It is the member of dicot family Apocynaceae. In English, it is known as Serpentine. Sarpagandha is its name in Sanskrit, while in Hindi it is known by several names such as *Chhota* Chand*,* Dhawal *Barua, Nakul kand, Rasnamed* etc. (Prajapati et al. 2007, Agnihotri, 2011, 2013).

Sarpagandha is found in lower areas of tropical Himalayas from western parts of India to Sikkim in the far-east as well as in Assam. In Indian subcontinent, it is found near the western coast as well as Andaman and Nicobar Islands. In Asia, apart from India, it is also found in Sri Lanka, Myanmar, Malaysia, Indonesia, China and Japan. Besides, it is found in Central and Southern America and African continent. Maximum numbers of species prevail in continents of Africa and Southern America.

In general, *Sarpagandha* grows plenty in fossil rich Sandy loam and clayey loam soil that have ph values between 6.5 and 3.5. It is generally found in tropical and subtropical climates where it rains heavily between the months of June and August. A temperature of 10° to 38 is the most favourable for the growth of *Sarpagandha*. Humid and damp areas are favourable for *Sarpagandha*. However, it is sensitive to collective

water. Leaves of *Sarpagandha* often fall in winters (dry climate) in northern India (Thakur, 1989, Prajapati, 2002; Kamboj, 2005).

HISTORY

Sarpagandha was described by Great ancient Indian Ayurvedacharya Charka (1000-800 BC) by its Sanskrit name as an antidote for snakebites and insect bites (Charak samhita, 2011, Sharma, 2006). Several stories are also attached with *Sarpagandha*. According to one such story, a mongoose acquires energy by sucking the juice of *Sarpagandha* leaves before a duel with a Cobra snake. One more story says that after snakebite, rubbing the paste of fresh *Sarpagandha* leaves on feet gives a huge relief. According to another story, a mad man can get rid of madness by oral consumption of *Sarpagandha* roots. That's why in India, *Sarpagandha* is also known as a medicine for the mad. There are also many a notions about its name. One such notion says, this plant is named *Sarpagandha* because snakes run away if it gets the smell (*Gandha*) of this plant. Another notion says that zigzag shape of its roots earned it the name *Sarpagandha*. However, both of these notions are wrong and baseless. In fact, the plant is named *Sarpagandha* because it was basically used as an antidote in snakebite in ancient times. Plumiers, a French botanist named this plant as *Rauvolfia Serpentina* in the honour of Leonard Rauvolf, the great German Physician, Botanist, traveller and writer of 16th century.

A British Rumfius wrote about this plant that, "In India and Java (Indonesia), this plant was used as an antidote for exterminating all kinds of poisons." It was orally used as decoction and externally used as a plaster made by roots and leaves. It was a precious medicine for curing snakebites that could kill the effect of even a cobra.

Rauvolfia serpentina was internally used for the treatment of fever, cholera and dysentery. The leaf juice was also used in cataract. According to Rumfius, *Sarpagandha* is the same plant which is consumed by mongooses to slay the poison of snakes after fighting with them in order to save their lives. Sir William Jones, the founder of Asiatic society of Bengal, has also described some such qualities of *Sarpagandha*. According to Williams Roxburgh, the father of modern Indian botany, the *Telinga* physicians (Vaidyas) used to treat patients with *Sarpagandha* as a cure for severe problems of fever, antidote and at the time of delivery of a child (Jain, S.K. 1991, 1999).

MEDICINAL QUALITIES

The medicinal qualities of *Sarpagandha* are mainly found in the roots of the plant. The researches done by Siddiqui and Siddiqui (1931) and Vakil (1949) helped this plant get an important place in the field of medicines. Sequentially, Muller, Schilitter and Bein (1952) discovered a base named 'Reserpine' in the roots of this plant and made *Sarpagandha* a plant of great importance internationally. More than 55 bases are found in the roots of *Sarpagandha*. About 80% bases are found in the bark of the roots. These bases, contribute to about 0.8 – 1.3% part of roots in all. Siddiqui and Siddiqui classified *Sarpagandha* bases into two groups namely (i) Ajmaline group, and (ii) Serpentine group. Ajmaline, Ajmalinine and Ajmalicine fall under the Ajmaline group. On the other hand, Serpentine and Serpentinine fall under the Serpentine group. Other bases are Reserpine, Rescinnamine, Yohimbine, Sarpagine and Raucaffricine. Reserpine is the most important of all. Thus, the Sarpagandha bases can be classified into three groups – (i) Deep-yellow coloured quaternary anhydronium bases, (ii) The intermediate strong indoline alkaloids, and (iii) Weak basic indole alkaloids. Last two of these groups are colourless (Bhatia, 1942).

Ajmaline, Serpentine and Serpentinine bases that are present in the roots of the plant stimulate the

nervous system. Serpentine is the most effective of all. All bases including these three bases and alcoholic extracts have restraining and hypnotic qualities. Some bases work as depressant for heart, veins and vaspmotor centre. Proserpine bases are more active than others. It doesn't produce a ganglionic blockade; however, it is felt that its effect of reducing hyperpiesia is due to central inhibition of sympathetic nervous system.

MEDICINAL USAGE

Medicinal qualities and usage of *Sarpagandha* has been described in plenty in ancient Indian medical epics *Charak Samhita* and *Sushruta Samhita*. It has been described as very much effective in snakebites and insect bites. Eminent Indian Chemist Late Ashima Chatterjee said that *Sarpagandha* has fascinated the whole world for its qualities that are very much effective in problems such as high blood pressure, sleeplessness and other mental problems. However, it is very disappointing that according to the Red Data Book published by International Nature and Natural Resources Organization; this plant has been kept under endangered category.

The roots of *Sarpagandha* are not only nutritious, but very effective in curing flu and work as uterus stimulant and good antidote. In India, its roots are being used as antidote for snakebites and insect bites. The tribes of Malaysia and Indonesia living in dense forests of warm-temperate regions often use *Sarpagandha* roots as cure to snakebites, insect bites and scorpion stings. In traditional system of medicines also, the roots of *Sarpagandha* are used to cure high blood pressure, flu, gastritis, dysentery, sleeplessness, ulcers and cholera. It is used with *Ishwar mool* (*Tylophora indica* L.) to cure gastritis, with *Arand* (*Ricinus communis* L.) to cure ulcer, with *Kutaj* (*Holarrhena antidysenterica*) to cure dysentery, and *mirich* (*Capsicum annum* L.) and *chirayata* (*Gentiana chirayita*) to cure flu.

The juice or extract of *Sarpagandha* roots is very effective in curing high blood pressure. The root extract is also used to cure pimples and boils. This extract is also used in order to make the delivery (to increase contraction) of a child smooth and painless. *Sarpagandha* root extract is also used to cure hysteria, epilepsy and insanity. The juice of *Sarpagandha* leaves is used for enhancing eyesight and curing psoriasis and itching. Traditionally, women use *Sarpagandha* to make their babies sleep. In modern system of healing, the medicines made of *Sarpagandha* roots are used to control high blood pressure and to cure sleeplessness. Furthermore, hypochondria and some other mental diseases are also cured by Sarpagandha. In Allopath, medicines made up of *Sarpagandha* are used to cure Neuropsychiatric, Enzynapectoris, uncontrolled activities of heart, menstrual molinimia, Menopausal syndrome etc (Murthy,1982 , Maheshwari,.2000).

REASONS OF DECREASION OF SARPAGANDHA

Since the last four decades, continuous downfall of *Sarpagandha* has brought this miraculous medicinal plant to the extinct class of herbs. A number of reasons such as overexploitation, lower reproduction capacity, reduction in crop area due to rise in population, over-usage of pesticides in agriculture, urbanization etc. are responsible for depreciation of *Sarpagandha* plants. Over exploitation of *Sarpagandha* for industrial and commercial purposes is the main cause of its downfall. The medicinal qualities of *Sarpagandha* are present in the root of the plants. Thus, to obtain roots, the whole plant has to be destroyed, because without destroying the plant, the roots cannot be obtained. This is one of the major causes of elimination of *Sarpagandha*. Due to steep rise in population, the natural habitat of *Sarpagandha* is rapidly converting into agricultural lands. Similarly, urbanization has lead to the destruction of natural habitat of *Sarpagandha* which has resulted in reduction of number of these medicinal plants. Uncontrolled use of pesticides in traditional

farming has resulted in the destruction of *Sarpagandha* plants. Very same condition occurs due to the uncontrolled usage of insecticides in agriculture. Heavy use of insecticides has resulted in the termination of useful insects which are helpful in pollen carrier insects. This leads to reduction in pollination which is very harmful for the reproduction of *Sarpagandha* plants which are entomophilies in nature. Naturally, the sub-Himalayan areas have been the repository for this plant; however, huge deforestation has lead to a vast devastation to the forest areas and *Sarpagandha* plants as well (Hussain, 1989, Agnihotri, 2013).

CONSERVATION STRATEGIES OF SARPAGANDHA

Since *Sarpagandha* is an essential medicinal plant, its conservation is the most significant need of the hour for ecological balance and its medicinal usage. Through means of "*in situ* conservation" as well as "*ex situ* conservation", the *Sarpagandha* plants can be very well conserved in our country. *In situ* conservation is very important for conserving the natural habitat of *Sarpagandha* so that shrinkage in the area of its habitat could be ceased. The natural habitats of this plant need to be converted in Gene sanctuary. *Sarpagandha* can automatically be conserved by means of conservation and restoration of its natural habitats. *Ex situ* conservation can also be very helpful in extending the areas where *Sarpagandha* could flourish. For this, the plants of *Sarpagandha* can be carried to distant places from their natural habitat and preserved. This plant can also be conserved as Gene bank and Germplasm under the process of *ex situ* conservation. To help this extremely useful medicinal plant find an ample area for habitat, modern techniques under biotechnology, such as tissue culture can also play a vital role and this is the need of the hour. In an agriculture dominant country like India, farmers need to be motivated and provided proper support for production of *Sarpagandha* at a vast level. This, on one hand will help in extending the habitat of *Sarpagandha* and on the other, will help the farmers get economic gains. The present market value of *Sarpagandha* roots is 90-100 rupees per kilogram. Seeds of the same have the market value of 2500-3000 rupees per kilogram.

The importance of Sarpagandha plants is now being understood by a large number of people and thus farmers are becoming more and more aware about it. They are becoming interested towards farming of this plant. Several traditional healers are also cultivating it for their self usage as per their professional use. A number of environmentalists are also planting Sarpagandha in various places like gardens, parks and lawns.

Endangering of a medicinal plant like *Sarpagandha* in India is a matter of extreme concern because this plant is not only used as a medicine in traditional system of medicines, but also in allopath. Hence, under the theory of nourished development, the conservation of this invaluable property of India is the most important in present times. This will not only help preserve the biodiversity but also keep the benefits of *Sarpagandha* available for the descendants in future.

REFERENCES

Agnihotri Nikhil (2011). Soil Plant Relationship as influenced by *Azolla* as organic compost, Ph.D. Thesis, C.S.J.M. University, Kanpur.

Agnihotri Nikhil (2014). Conservation Strategies of Medicinal Flora in India. Anthropecology And Applied Biodiversity: Ecology as affected by human and Biodiversity. Ed.: A.K. Dwivedi. Publiser: OmniScriptum GmbH & Co. KG Saarbücken, Germany. ISBN: 978-3-659-22189-7.

Bhatia B.B. (1942). On the Use of *Rauwolfia serpentina* in High Blood Pressure. Journal of Indian Medical

Association (1942): (XI), 9, 262]
Charak Samhita (2011). Chaukhambha Sanskrit Sansthan, Varanasi.
Hussain Akthar (1992) Dictionary of Indian medicinal plants CIMAP Lucknow.
Jain S.K. (1999). Dictionary of Ethnoveterinary plants of India. Deep publications, New Delhi.
Jain S.K. (1991).Dictionary of Indian folk medicines and Ethnobotany. Deep publications, New Delhi.
Kamboj V.P. (2005). Traditional Medicines: An opportunity for India. 75th Annual Session of National Academy of Sciences India Pondicherry. Dec 8-9, pp 1-15.
Murthy N. (1982). Ayurvedic cures for common diseases Orient Paper backs New Delhi.
Moss N.S. (1987). Ayurvedic flora Medica. Vaidyasarathy press Kottaiyam.
Mueller J.M., Schilitter E. And Bein H.J. (1952). Reserpin, der Sedative Wirkstoffaus Rauvolfia serpentina Benth. Experientia 1952;8:338-249
Maheshwari J.K. (2000). Ethnobotany and medicinal Plants of India subcontinent. Scientific Publishers Jodhpur.
Nayer M.P. (1989). Economic Plants of India. Botanical Survey of India. Calcutta.
Pandey, B.P. (2006). Economic Botany, S. Chand & Sons, New Delhi.
Prajapati, N.D., Purohit, S.S.; Sharma, A.K. and Kumar Tarun (2007). A Hand Book of Medicinal Plants. Agrobios (India), Jodhpur.
Prajapati, N.D. (2002). Jadi Butiyo Ki Saral Kheti. Rajasthan agroforestry Cooperation, Jodhpur.
Sharma, P.V. (2006). Dravya Guna Vigyan, Chaukhambha Sanskrit Sansthan, Varanasi.
Sushruta Samhita (2011). Chaukhambha Sanskrit Sansthan, Varanasi.
Siddiqui S. and Siddiqui R.H. (1931). Chemical Examination of the Roots of R. Serpentina Benth. J. Indian Chem. Soc. 8, 667-680.
Thakur, R.S. (1989). Major Medicinal Plants of India. CIMAP, Lucknow.
Vakil, R.J. (1949). A Clinical Trial of *Rauvolfia serpentina* in Essential Hypertension. British Heart Journal. 351-355.