

Manoharbai Shikshan Prasarak Mandal Armori's

**Rashtrapita Mahatma Gandhi Arts & Science College, Nagbhid,
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Biotechnological interventions and indole alkaloid production in *Rauvolfia serpentina*

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Abstract

Rauvolfia serpentina (L.) Benth. ex Kurz. (*Apocynaceae*), commonly known as *Sarpagandha* or Indian snakeroot, has long been used in the traditional treatment of snakebites, hypertension, and mental illness. The plant is known to produce an array of indole alkaloids such as reserpine, ajmaline, amalicine, etc. which show immense pharmacological and biomedical significance. However, owing to its poor seed viability, lesser germination rate and overexploitation for several decades for its commercially important bioactive constituents, the plant has become endangered in its natural habitat. The present review comprehensively encompasses the various biotechnological tools employed in this endangered Ayurvedic plant for its in vitro propagation, role of plant growth regulators and additives in direct and indirect regeneration, somatic embryogenesis and synthetic seed production, secondary metabolite production in vitro, and assessment of clonal fidelity using molecular markers and genetic transformation. In addition, elicitation and other methods of optimization of its indole-alkaloids are also described herewith.

Key points

- Latest literature on in vitro propagation of *Rauvolfia serpentina*
- Biotechnological production and optimization of indole alkaloids
- Clonal fidelity and transgenic studies in *R. serpentina*

Keywords *Rauvolfia serpentina* · Indole alkaloids · Reserpine · Micropropagation · Plant growth regulators · *Agrobacterium* · Hairy root culture · Synthetic seed

Introduction

Rauvolfia serpentina Benth. ex Kurz, commonly known as *Sarpagandha* or Indian snakeroot, belongs to the family *Apocynaceae*. The plant is mostly distributed in the Indian subcontinent and south-east Asia. In Ayurveda, Unani and traditional medicine, the plant was reported against snakebite, insect stings, psychological disorders, insomnia, melancholia, schizophrenia, skin diseases, high blood

pressure, circulatory disorders, hypertension, rheumatism, gastrointestinal ailments, asthma, fever, pneumonia, body pain, malaria, scabies, spleen diseases, eye diseases, AIDS, veterinary diseases, etc. (Dey and De 2010; Dey and De 2021, Pandey and Radha 2016). The important bioactive alkaloids reported from the plant are reserpine, reserpiline, rescinnamine, ajmaline, ajmalicine, deserpidine, serpinine, serpentine, serpentinine, rauvolfinine, deserpidine, vomilenine, yohimbine, picrinine, norseredamine, vinorine, seredamine, etc. (Dey and De 2010; Pandey et al. 2016). Besides, other phytochemicals such as stigmaterol (Dey and Pandey 2014a, b; Dey et al 2016) and rutin were also reported (Dey and De, 2010). The plant has also demonstrated many pharmacological attributes such as antihypertensive, antiarrhythmic, anti-inflammatory, anticancer, and antimicrobial properties (Dey and De 2010; Mukherjee et al. 2019). However, the major shortcoming in the propagation

Abhijit Dey and Debleena Roy have an equal contribution.

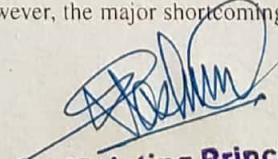
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Traditional Herbal Medicines for the Treatment against Snake Bite

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Abstract: Since prehistoric time plants has been known to use for different diseases. In India variety of medicinal plants found in different geographical and ecological conditions. So many medicinal plants are used against snake bite either singly or with combination of other plant. The present study was undertaken to recollect information regarding medicinal plants used for snake bite treatment in Deori Tehsil of Gondia district (MS). The information was obtained from Local healers, aboriginal people and local peoples from the area. The data have been compiled with emphasis on the plants, family, local name, parts used etc. 9 different plants were documented during investigation from the study area which belong to 9 different families that act as antidotes against snake bites.

Key Words: Antidote, Snake bite, Medicinal plants, Local healers.

1. INTRODUCTION:

Human being, from the history of his evolution he is dependent on the nature for his fundamental needs viz. food, shelter, cloths and medicines. This dependency led the aboriginal people to develop an exclusive system of knowledge about plants; which play several important functions in human life. These aboriginal peoples made a sustainable agriculture and natural-resource development which means the utilization, management and conservation of the natural resource base and the orientation of technological change to ensure the attainment and continued satisfaction of human needs for present and future generations [1].

Local healers are the group of people known as "Vaidya or Vaidu" (A person having traditional knowledge of medicinal plants and medicine preparation). According to the World Health Organization, most populations still rely on traditional medicines for their psychological and physical health requirements [2]. In recent past new allopathic drugs have been invented but have many side effects. The plant based medicines have no side effects on the human body. Due to the various undesirable effects of some modern-day drugs, an increasing number of people from both developed and developing countries have turned towards medicinal plants [3].

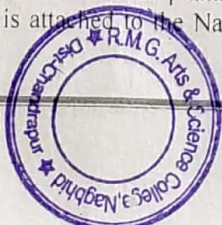
India is a developing country with the majority of its population living in the rural areas. A typical rural life of Indians includes the houses made with the mud with agriculture in the adjoining areas, herbs, shrubs and trees making the habitat more suitable for the venomous snakes. Villagers are commonly facing the problem of snake bite but these villages do not have any readily available modern medical facilities until they reach to the nearby city area. Common peoples have myth that every snake is poisonous. Of the 2,700 known species of snakes, only about 300 are venomous and rest are non-venomous. Worldwide about 30,000 to 40,000 people die annually because of snake bites. Of these, about 25,000 people die in India, mostly in rural areas [4].

Rural people are dependent on Vaidus for their therapeutic needs unless the disease is complicated. Most of the Vaidu medicinal therapy is based on crude drug where whole plant or plant part is used for treatment in the form of juice, decoction, paste or pills, the administration being either oral or topical depending on the nature of the disease. Venomous snake bites are also treated by vaidus with plants [5].

While there are so many plants reported to use against snake bite, this study concentrate on the plants used by aboriginal and local peoples of the Deori tehsil of Gondia district of Maharashtra state (India).

2. MATERIALS AND METHOD:

Investigation region: The present study was undertaken in Deori Tehsil of Gondia District. Deori Tehsil is the western most district of the Vidharbha, of the Maharashtra State. The district is situated between 21^o.04'N and 80^o.22'E. The people of the study area are basically agriculturists and most of them are having domestic animals such as cow, goat, sheep and buffalos. The area has not well supported with the veterinary doctors and hospitals. This facility is present only in the center place Deori from which the distance of different villages is nearly 4 km to 25 kms. After snake bite local healers treat the patient with locally available medicinal plants. Deori is surrounded by deep forest with large number of wild plants and animals. This area is attached to the Nagzira Tiger Reserve forest as well as Navegaon Reserve forest.



Traditional Herbal Medicines for the Treatment against Snake Bite

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