**A pharmacologically important plant: *“Rauwolfia Serpentine* (Sarpgandha)**

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**ABSTRACT**

 The survival of mankind is not possible without plant as they are the primary producer and play key role in surviving life from on earth. The application of plants as medicine dates back to ancient period. India has been traditionally rich in different types of medicinal plants and many useful drugs’s obtained through the screening of such plants. Since old times, people have been utilizing harbal medicines to cure disease. Around 20,000 species of different medicinal important plants are being used for therapeutic purpose world wild. The plant productconsist about 25% of the prescribed medicines in world. *Rauwolfia serpentine* is a rich source of various chemical constituents. Alkaloids identified in *rauwolfia* incorporate ajmalicine, reserpine, serpentinine, ajmaline, ajmalimine, deserpidine, indobidine, reserpiline, rescilnnamine, rescinnamidine, serpentine, and yohimbine. *Rauwolfia serpentine* holds a significant situation in the pharmaceutical world because of the presence of different alkaloids in the oleoresin part of the roots. Alkaloids of this plant have angreat therapeutic significance to treat cardiovascular disease. The finding of the present study suggested that methanol extract of *R. serpentine* could be a potential source of antioxidants and could have greater importance astherapeutically agent in preventing or slowing oxidative stress related degenerative diseases. However further studies are necessary to examine underlying mechanisms of antioxidant effect and to isolate the active compounds responsible for these pharmacological activities.

**Keywords: Sarpgandha, Antioxidant, Pharmacology, phytochemicals**

**I. INTRODUCTION**

*Rauwolfia serpentine* is an evergreen shrub, the plant is well known with local name sarpgandha, medication comprises of dried root of *rauwolfiaserpentine* (Anonymous, 2001) (syn. Ophioxylon serpentinum Linn.) (Rajalakshmy, 2013), family Apocynaceae. It is a glabrous herb or bush of around 1–2 ft in height. Leaves are in whorls 3–4, rarely opposite, ecliptic-lanceolate, or obovate acute or acuminate. They are light green to dark green in color and soft to touch. flower are in many flowered cymes (Rajalakshmy, 2013). Corolla is salver-shaped, tube cylendrical, white, or finged with red. Fruit are drupes, pea-sized, purple-black when ripe, seeds ovoid (Abegaz, 2018). Roots part are around 8–15 cm long and 0.5–2 cm in thickness subcylindrical, curved, strong, and thick and rarelybranched, externally grayish-yellow to brown with irregular longitudinal fissures (Anonymous, 2001). On breaking, it is circular with centripetal lines (Abiyot, 2019).

**II. SCIENTIFIC CLASSIFICATION**

**Kingdom**: Plantae

**Division**: Magnoliophyta

**Class**: Magnoliopsida

**Order**: Gentianales

**Family**: Apocynaceae

**Genus**: *Rauwolfia*

**Species**: *Serpentine*

**III. CHEMICAL CONSTITUENTS OF *RAUWOLFIA SERPENTINE***

*Rauwolfia serpentine* is a rich source of various chemical constituents. Alkaloids identified in *rauwolfia* incorporate ajmalicine, reserpine, serpentinine, ajmaline, ajmalimine, deserpidine, indobidine, reserpiline, rescilnnamine, rescinnamidine, serpentine, and yohimbine (Anonymous, 2001). The main alkaloid of *Rauwolfia serpentine* is reserpine. It applies antihypertensive property by depleting the catecholamine. Rescinnamine has a similar activity like reserpine however; it inhibits angiotensin-convertingenzyme (ACE) that catalysis conversion of angiotensin, resulting about andecrease of plasma angiotensin II. Ajmaline has antiarrhythmic effect by blocking the sodium channel. Serpentine has antipsychotic property because it inhibits type II topoisomerase. Yohimbine is specific alpha-adrenergic antagonist in blood vessels for the treatment of erectile brokenness. High concentration of phenols *Rauwolfia serpentine* reveals significant anti-diabetic and hypolipidemic properties, and it can be utilized as antimicrobial agent. Flavonoids of *rauwolfia serpentine* help preventing the oxidative cell damage and having anticancer, anti-inflammatory, and antioxidant property (Kumari *et al*., 2013). The presence of saponins is responsible for the hemolytic activity and cholesterol binding property (Chandrasekaran, 2004). *Rauwolfia serpentine* is additionally rich in macro and micronutrients which support its remedial properties, i.e., calcium (Ca), phosphorus (P), potassium (K), magnesium (Mg), sodium (Na), iron (Fe), and zinc (Zn) (Gogte, 2009).

**IV. *RAUWOLFIA SERPENTINE* IN PHARMACOLOGY**

*Rauwolfia serpentine* holds a significant situation in the pharmaceutical world because of the presence of different alkaloids in the oleoresin part of the roots. Alkaloids of this plant have angreat therapeutic significance to treat cardiovascular disease (Anitha and kumari, 2006), hypertension, hypertension, arrhythmia (Kirillova *et al*., 2001), different mental illnesses, mental scatters, bosom malignancy, human promyelocytic leukemia (Dey and De, 2010) like infections. Reserpine is the principle alkaloid that shows profoundly complex example of action mostly variety of amine focus in cerebrum. It is answerable for affecting the convergence of glycogen, acetyl choline, g-amino butyric corrosive, nucleic acids and hostile to diuretic hormone. The impacts of reserpine incorporate respiratory restraint, incitement of peristalsis, myosis, unwinding of nictating films and furthermore impacts temperature directing focus. It expands the volume and free causticity of gastric discharge (Mittal *et al*., 2012). The pitkriya container (Unani definition) contains arsol (Shamsi, 2006) which goes about as musakkin-wo-munawwim (calming and sleep inducing), Mudir (Diuretic), Musakkin-e-Asab (nervine narcotic) and mukhaddir (sedative). Its different pharmacological exercises incorporate anticholinergic, hypotensive, anticontractile, soothing, relaxant, hyperthermic, antidiuretic, sympathomimetic, sleep inducing, vasodialater, antiemetic, hostile to fibrillar action sedating operator, against arrhythmic, antifungal and nematocidal. (Dey and De, 2010; Mittal, 2012).*Rauwolfia serpentine*plant also possesses vasodilatation by bringing down circulatory strain, anti depressant and bronchial modulators (Poonam *et al.,* 2013).

**V. ECONOMIC SIGNIFICANCE OF *RAUWOLFIA SERPENTINE***

Ever increase in human population poses increase the need for food, shelter and cloth and also rise in demand for medicine. Several pharmaceutical formulations are available commercially for the treatments of disorders but they are costly, not effective and show numerous side effects. Hence, there is an urgent need for alternate, naturally available medications or herbal remedies without side effects. However, till today more than 80 % of world populations are dependent on herbal medicine. More than 800 plant species shows hypoglycaemic activity, in India, various indigenous plants are used to cure variety of disease, Herbal medicinal plants show presence ofvarious chemical substances such as alkaloids, hydrogen, carbon, nitrogen, glycosides, volatile oils, fatty acids, resins, gums and tannins that are responsible for treating various diseases. According to WHO (World Health Organization), any plant or its parts containing substance that can be used therapeutically or can be used as raw material for chemical or pharmaceutical synthesis is classified as a drug. In the present context around about 300 species of medicinal and aromatic plants are used worldwide in the pharmaceutical, food, cosmetics and fragrance industries (Chopra*et al*., 2016; Asha, 2012).*Rauwolfia serpentine*L. Benth is an important medicinal plant (woody perennial shurb) belonging to Apocynaceae family. The plant is indigenous to Indian subcontinent and south East Asian countries, commonly known with different names; Sarpagandha, Snake root plant, Chotachand, Chandrika, etc. *Rauwolfia serpentine* contains a variety of compounds with antioxidant capacity and other health benefits like treatment of diabetes, cardiovascular disease, cancer and hypertension.

The antibacterial and antifungal activities were high in petroleum ether and acetone extract of *Rauwolfia serpentine. Rauwolfia serpentine* has long being used in India for the treatment of snakebites, hypertension, high blood pressure and mental illness. Different ethnic groups use this plant to treat snake, insect and animal bite, mental illness, schizophrenia, hypertension, blood pressure, gastrointestinal diseases, circulatory disorders, pneumonia, fever, malaria, asthma, skin disease, scabies, eye diseases, spleen diseases, AIDS, rheumatism, body pain, veterinary diseases etc. this plant is also being used to prepare fermented food products. It has been stated that this plant is used as antidote against snakebite (Armando*et al*., 2015). The aqueous and methanol extracts of *Rauwolfia vomitoria* show antimicrobial activity *against Klebsiella pneumonia, Staphylococcus aureus, Enterobacter, Pseudomonas aeruginosa* and *E. coli*. The antibacterial activity is due to presence of alkaloids which confirmed by gas liquid chromatography and positive alkaloid test. *R. serpentine* contains some 50 indole alkaloids and most of the total alkaloid content present mainly in root bark. Among all the alkaloids reserpine, yohimbine, serpentine, deserpidine, ajmalicine, ajmaline, etc. are used to treat hypertension and breast cancer (Farooq *et al*., 2007). Reserpine used as natural tranquiliser was found to have several times greater hypersensitive activity than the crude plant extract. *Rauwolfia serpentine* root is reported to contain 0.7-3.0% of total alkaloids in the dry mass and the amount varies with time and source of collection (Gayatri*et al*., 2010).

The exciting developments in biotechnology are the use of plant tissue culture technique. Most of the plant raised through seeds are highly heterozygous and show great variations in growth, habit and yield and may have to be discarded because of poor quality of products for their commercial release. Likewise, majority of the plants are not amenable to vegetative propagation through cutting and grafting, thus limiting multiplication of desired cultivars. Moreover many plants propagated by vegetative means contain systemic bacteria, fungi and viruses which may affect the quality and appearance of selected items. In recent years, tissue culture has emerged as a promising technique to obtain genetically pure elite populations under *in vitro* conditions rather than have indifferent populations. Tissue culture has now become a well established technique for culturing and studying the physiological behavior of isolated plant organs, tissues, cells, protoplasts and even cell organelles under precisely controlled physical and chemical conditions. Most of the medicinal plants either do not produce seeds or seeds are too small and do not germinate in soils. Thus mass multiplication of disease free planting material is a general problem. In this regard the micropropagation holds significant promise for true to type, rapid and mass multiplication under disease free conditions. Besides, the callus derived plants exhibit huge genetic variation that could be exploited for developing superior clones/varieties particularly in vegetative propagated plant species.

In terms of the number of species individually targeted, the use of plants as medicines represents by far the biggest human use of the natural world. Plants provide the predominant ingredients of medicines in most medical traditions (Gilani*et al*., 2019). On the contrary tissue culture also induces variations in regenerated plants, which are commonly referred to as somaclonal variation. This can result in an assortment of genetically stable variations, useful in crop improvement, similar to that induced with chemical and physical mutagens. On the other hand it can also lead to chromosomal rearrangements detrimental to the plant in question. Somaclonal variation is unpredictable in nature, and can be both heritable and non heritable. The occurrence of somaclonal variation is associated with point mutations, chromosomal rearrangements and recombination, DNA methylation, altered sequence copy number,transposable elements and is reportedly influenced by the genotype, explant type, culture medium and age of the donor plants (Jain *et al*., 2003; Joshi *et al.,*2000). Depending on the plant type, the number of sub cultures is another important aspect that can lead to further variations. Many strategies are available for detecting genetic variation, including phenotypic identification and DNA analysis techniques. Phenotypic identification based on description of the morphological and physiological traits can be used, although this method requires an extensive observation of the plants until maturity. Furthermore, some changes induced by in vitro culture cannot be observed because the rearrangement of the gene or its product may not always alter its expression to such a degree that it can be visualized phenotypically. When this occurs, somaclonal variability can be evaluated by DNA analysis techniques. With the availability of different DNA based molecular markers, somaclonal variation can be accurately assessed using a combination of two or more types/class of markers (Wargovich*et al*., 2013). Random amplification of polymorphic DNA (RAPD) markers are the most commonly employed markers used to detect variations (Srivastav*et al*., 2011). RAPD markers are extensively used to assess genetic variations generated by in vitro techniques (Patwarthan*et al*., 2009). Reserpine and rescinnamine in *Rauwolfia serpentine* powders and tablets are detected by Liquid chromatographic (LC) method which uses fluorescence detection. Methanol is used as mobile phase to which a small volume of aqueous solution of pentasulphonic acid sodium salt is added to achieve desired elution characteristics. These are those enzymes which play an important role in biosynthesis pathways.

The in-vitro propagation of plant has subject with diversified way to reduce some important metabolic and anti propagation on MS medium in different concentration of growth promotes. The phytochemicals screening of the plant has done for identification of resrpine production in different parts.

Researchers are continuously being in search with new drugs and human beneficial with plant origin having are side effect. Number of Indian pharmaceutical and wealth cares working on ayurvedic and plant base compound for treating various disease, body illness and disorder for well being. Medicinal plants are natural recourses of so many neutra and nutriceuticals compound and our concern is not to determine the phytochemical value.

**VI*. IN-VITRO* ANTIOXIDANT ASSAYS**

**DPPH of methanolic extract of *R. serpentine* root & stem**

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| --- | --- | --- |
| **SOLVENT**  | **PLANT PARTS** | **% OF DPPH SCAVENGING** |
| **25%** | **50%** | **75%** | **100%** |
| **RSR** | 78.29 | 79.87 | 80.46 | 80.87 |
| **RSS** | 78.63 | 79.15 | 79.96 | 80.05 |
| **Standard** | 80.31 | 81.13 | 80.57 | 80.43 |

 Free radical scavenging ability of the extracts was tested by DPPH radical scavenging assay is hydrogen atom donating ability of the plant extractives was determined by the decolorization of methanol solution of 2,2-diphenyl-1-picrylhydrazyl (DPPH). The DPPH radical scavenging activity of test plants extracts and standard (BHT) was studied using different concentration viz. 0.25, 0.50, 0.75 and 1 mg/ml. The % radical scavenging activity was found to increase in dose dependent manner in sequence. Radical scavenging activities are very important to prevent the deleterious role of free radicals in different diseases, including cancer. DPPH free radical scavenging is an accepted mechanism for screening the antioxidant activity of plant extracts. In the DPPH assay, violet color DPPH solution is reduced to yellow colored product, diphenylpicryl hydrazine, by the addition of the extract in a concentration dependent manner. This method has been used extensively to predict antioxidant activities because of the relatively short time required for analysis. Our results revealed that the methanolic extract of Sarpgandha had a similar free radical scavenging activity when compared with standard BHT. Polyphenol contents and to copherols scavenge the DPPH radicals by their hydrogen donating ability. The results obtained in this study suggest that all the extracts from Sarpgandha showed radical scavenging activity by their electron transfer or hydrogen donating ability.

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