



REVIEW ARTICLE

Swertia chirata- A Wonderful HerbSaraswat^{1*}, Shweta Parihar²**ABSTRACT**

The Binomial Name is *Swertia chirata* Buch Ham. Because it grows in Nepal's forests, *S. chirata* is also known as Nepali Neem. Since the 18th century, India has used *S. chirata* as a medicinal plant, which Europe has introduced and recommended abroad. It can potentially treat anti-inflammatory, hepatoprotective, anti-bacterial, wound healing, hypoglycaemic, antioxidant, antitussive, antipyretic, anti-diabetic, anti-cancer, anti-tumor. It belongs to the Family: Gentianaceae, Genus: *Swertia*, and Species: *Chirata*. This review article contains all the relevant information regarding its morphology, microscopy, phytochemistry, plant description, taxonomy, substitutes of *S. chirata*, pharmacological activities of the plant. The review article aims to provide brief knowledge about this drug among people and researchers.

Keywords: Cultivation, Pharmacological activities, Phytochemistry, *Swertia chirata*, Taxonomy.

Indian J. Pharm. Biol. Res. (2021): <https://doi.org/10.30750/ijpbr.9.4.4>

INTRODUCTION

Plants that are used for medicinal purposes can be found all over the world. Many weeds in our surroundings are powerful medicinal plants that can help with a wide range of serious health problems. Among ancient cultures, India has long been renowned as a rich storehouse of natural treatments. *Swertia chirata* is used in lots of activity like anti-inflammatory, hepatoprotective, anti-bacterial, wound healing, hypoglycaemic, antioxidant, antitussive, antipyretic, antidiabetic, anti-cancer, anti-tumor. It is also used for heart, liver, cough, and skin diseases.¹ Generally, it is used for all types of fevers like bone fever, viral fever, common cold fever. The whole plant parts are used to cure epilepsy, hypertension, malaria, anemia, and bronchial asthma.²

PLANT DESCRIPTION

S. chirata is also known as Nepali Neem because it is found in the forest of Nepal. Europe introduced it, and they also recommend it globally; since 18 century India has been following *S. chirata* as a medicinal plant. It originated annually in the Himalayas with a height of between 1200-1400 meters and grew up to a height of 1.5 meters.³ About 40 species of *S. chirata* were revealed in India. World Health Organization revealed that 80% population of the world depends upon medicinal plants for their primary and basic health care needs.⁴

TAXONOMY OF SWERTIA CHIRATA

- **Phylum:** Tracheophyta
- **Class:** Magnoliopsida
- **Order:** Gentianales

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How to cite this article: Saraswat, Parihar S. *Swertia chirata- A Wonderful Herb*. Indian J. Pharm. Biol. Res. 2021;9(4):10-15.

Source of support: Nil

Conflict of interest: None.

Received: 10/10/2021 **Revised:** 15/12/2021 **Accepted:** 18/12/2021

Published: 31/12/2021

- **Family:** Gentianaceae
- **Genus:** *Swertia*
- **Species:** *Chirata*
- **Binomial Name:** *Swertia chirata* Buch Ham^{5,6}

PERIOD OF OCCURRENCE OF S. CHIRATA

Seed of *S. chirata* shed between the timing of October and November. Before showing the seeds in the field, they should be shown in the nursery because seeds of that herb are very small in size.⁷

SYNONYM OF S. CHIRATA

- **Hindi:** Charayatah
- **English:** Chirata

- **Urdu:** Chiarayata
- **Sanskrit:** Bhunimba, Chiratika
- **Tamil:** Nilavembu
- **Gujarati:** Chirayata
- **Marathi:** Chirayita
- **Punjabi:** Charita
- **Nepal:** Cherata⁸⁻¹⁰

MORPHOLOGY

It has 2 to 3 ft long erected, robust, cylindrical, branching stems and root is 7cm long, half an inch thick, short, and straightforward.¹¹ It has a small greenish-yellow, tinged with purple-colored flowers. Fruits are irregular oval, tiny, transparent yellowish pericarp with a one-celled capsule. Leaves are in opposite pairs, i.e., 10 cm in length with no stalks.¹²

MICROSCOPY

The parenchyma of leaves consists of many chloroplasts and shows a very small difference in mesophyll tissue. With naked eye only shows the upper epidermis cells and cruciferous type stomata found on the lower surface.¹³ Thick line cuticles lay on the stem at its early stage. Older epidermis interacts with cells that are flat and elongated.¹⁴ It has lot of small crystals in the shape of a needle. The root of *S.chirata* shows 2-4 layers of cork and 4-12 layers of the secondary cortex.¹⁵ Phloem consisting companion cells, thin-wall sieve tubes, and parenchyma phloem, whether xylem consists of tracheids cells, xylem fibers, and vessels.¹⁶

SUBSTITUTES OF *S. CHIRATA*

All of the following are belonging to the Gentianaceae family:-

- *Swertia paniculata* Wall.
- *S. lawii* burkill.
- *S. affinis* C. B .Clarke.
- *Enicostemma littorale* Blume.
- *Exacum tetragonum* Roxb.
- *Erythraea roxburghii* G.don
- *S. purpuascens* Wall.
- *S. decussate* Nimmo.
- *S. perennis* Linn.
- *S. chinensis* Franchet.^{17,18}

CHEMICAL CONSTITUENTS

S. chirata mainly contains ophelic acid, chiratin, swertiamarin, amarogentin, sweroside, xanthone, ursolic acid, swerchirin, gentiopicrin, mangiferin.¹⁹ Amarogentin, ophelic acid, and chiratin all are bitter compounds. But the amarogentin is the bitterest component.²⁰ It also consist swertanone, bellidifolin, syringaresinol, alkaloid, and flavonoid.²¹

Swertiamarin has anticholinergic, anti-bacterial, anti and anti-depressant activity. It is a secoiridoid glycoside.²²

IMPORTANT PHARMACOLOGICAL EFFECTS

S. chirata in Ayurveda is used to treat diseases like antipyretic, anthelmintic, cathartic, asthma, leucorrhoea, analeptic, stomachic, mitigation inflammation, for relaxing pregnant women uterus and for fevers.²³ It is also used to treat ulcers, skin diseases, cough, liver and kidney infections, neurological disorders and urinogenital tract disorders, laxative, carminative, as a purifier for breast milk. It is revealed that it is also used as a tonic in the Unani system of medicine for treating various types of fever.²⁴

Fever

Chirayita mix with dhaanyaka leaves by hot infusion for immediately treating the fever.²⁵

Edema

Three dosas caused by chronic edema is destroyed by the mixture of chirayita and sunthi. This mixture was prepared by punarnava decoction for the treatment of edema.²⁶

For Purifying Breast Milk

Decoction of chirayata should purify the breast milk.^{27,28}

Intrinsic Hemorrhage

Sandal separately paste with chirayata, musta, kramuka etc., are useful for the treatment of hemorrhage disorders.²⁹

Vomiting

A mixture of equal quantities of sugar or honey with chirayata is used to inspect nausea and vomiting.³⁰

Hypoglycemic Effect

Methanolic extracts of the aerial part of *S. chirata* is used to stop the hyperglycemic situation, and it is hypothesized by the existence of flavonoids and secoiridoids.³¹

Hepatoprotective Activity

In Indian System of Medicine (Ayurveda) as a heat protectants, the combination of few other plants and extract of *S. chirata* are used commercially in the market. Methanolic extract of that herbal drug for hepatoprotective activity evaluates against galactosamine and paracetamol.³² The protective effect of herbal drug extract against hepatotoxins gives the idea for broader and non-specified protection of liver due to inducing hepatotoxicity because of different mechanisms.³³

Antioxidant Activity

Antioxidant activity shows a methanolic extract of *S. chirata* because of the influence of flavonoids and secoiridoids.

Antioxidant substrate and scavengers called free radical for the drug, which removes the poisonous effect.³⁴

Anti-inflammatory Effect

S.chirata in benzene extract showing anti-inflammatory action in the occurrence of xanthone derivatives like 1, 5-dihydroxy-3, 8-dimethoxy xanthone. It is reported that drug has less effective when compared with standard anti-inflammatory drugs in the experimental models of subacute and acute anti-inflammatory inflammation disorders.³⁵

Ulcer Preventive Activity

The ethanolic extract of *S. chirata* significantly reduced the intensity of gastric mucosal damage induced by indomethacin and necrotizing agents. It has also been reported that pretreatment of rats with ethanolic extract of *S. chirata* significantly prevented ethanol-induced gastric wall mucus depletion and restored the non-protein sulfhydryl content in the glandular stomachs.³⁶

Antileishmanial Activity

Amarogentin, a secoiridoid glycoside isolated from the plant of *S. chirata*, showed strong antileishmanial activity, in a hamster model of experimental leishmaniasis.³⁷ It has also been reported that the methanolic extract of *S chirata* is used to prevent leishmaniasis disease by the inhibition of catalytic activity of topoisomerase enzyme.³⁸

Antimalarial Activity

S. chirata was found to be reputedly effective against the malarial disease. It is reported that the whole plant extract of *S. chirata* showed antimalarial activity.³⁹

Anthelmintic activity

The whole plant of *S. chirata* shows the anthelmintic influence on *Haemonchus contortus* (a parasite responsible for anemia, edema in sheep and goats). It is reported that its dose of 3 g/kg powder drug, crude aqueous extract, and methanolic extract give the sheep infected with GIT nematodes. For treating the helminthic disorder, extract of this herbal drug is used.⁴⁰

Enzyme inhibition activity

The methanolic extract of *S. chirata* stops catalytic presence of topoisomerase. Type-I DNA topoisomerase from *Leishmania* and its effect interacting with enzyme, for avoiding the complex binary formations amelogenin is used as prohibiting agent.⁴¹

Antimicrobial Screening of S.chirata

It is reported that antimicrobial screening of *S.chirata* shows that phytochemicals are present in the highest quantity in

the part of leaves, stem, and root. It indicates that it is more effective against pathogenic microorganisms.⁴²

Anti-carcinogenic activity of S.chirata

Firstly, amarogentin, a constituent of *S.chirata* is rich in anti-carcinogenic activity. It is also having cytotoxic action and anti-cancer properties.⁴³

Antipyretic activity of S.chirata

It reported that root *S.chirata* has significant antipyretic activity; it lowers the body temperature after administration of 4 hours. Swertiamarin, a chemical constituent of *S.chirata* having great antipyretic activity.⁴⁴

Haemagglutination activity of S. chirata

Hemagglutination activity of *S.chirata* is reported at high concentration, showing mild protein denaturation. It is a good blood purifier and has thrombolytic activity.⁴⁵

Anti- Proliferative activity of S. chirata

It is revealed that crude extract of root, stem, and leaf of *S.chirata* possess many components having a lot of health benefits. Due to swertiamarin, amarogentin, and mangiferin with phytochemical, the amount of alkaloid is more as expected.⁴⁶

Micropropagation of S.chirata

The micropropagation method is applied for the conservation and clonal propagation. Micropropagation is a method used for the multiplication of plants that have been genetically modified or bred through conventional plant breeding methods. It has been reported that micropropagation of *S. chirata* affects on growth regulators and shoot elongation. A number of leaves and nodes per shoot of *S.chirata* have reduced the concentration of hormones. Micropropagation is a continuous supply of plants in limited time and space for this critically endangered valuable medicinal herb, thereby ruling out the dependence on a natural source to fulfill the growing demands for the pharmaceutical industry.^{47,48}

Heavy Metal Analysis of S.chirata

It has been reported that excessive amounts of secondary metabolites and heavy metals i.e., Ca, Fe, and Mn are present *in-vitro* plantlets of *S.chirata* as compared to *in-vivo*.⁴⁹

Biotechnology Conservation of S. chirata

It revealed that *S.chirata* plays an important role in the conservation modes like *in-vitro* and *ex-situ*. It is also known that *S.chirata* is a high-altitude plant, so it is restricted in the lower altitude because seed propagation is affected by soil fertility, pH, humidity, and dormancy. For

ex-situ, conservation seeds are necessary, but population diminishing affects the seeds of this herbal drug restricted for *ex-situ* conservation.⁵⁰

Scanning Electron Microscopy and Elemental study of *S.chirata*

It has been reported that the seed of *S.chirata* shows variation in shape and size like spherical, ellipsoidal, round, rectangular, and laterally compressed. The seed also showed colored variation i.e., light brown to brownish-black.⁵¹

Synthesis of Silver Nanoparticles from *S.chirata*

It is revealed that the green synthesis of silver nanoparticles of *S.chirata* is in yellowish-brown color. The small size of particles increases the permeability of the membrane and the destruction of cells. Silver nanoparticles synthesized from the leaves of *S.chirata* have great toxicity to multi-drug resistant microorganisms.^{52,53} It is reported that *S.chirata* has good anti-bacterial against different types of a microorganism of silver Nanoparticles. It is proved that silver nanoparticles provide high anti-bacterial effects, and in the pharmaceutical industry, it is used as a source of bioactive principle.⁵⁴⁻⁶⁵

CONCLUSIONS

S.chirata has been the subject of various investigations, and pharmaceutical companies have developed this plant as a cure. Plant identification, categorization, and recording required a rigorous and systematic investigation, which could be a good technique for spreading traditional herbal medicine knowledge. The drug discussed in this research are essential in the treatment of disorders. The mode of action of bioactive Phyto-molecules present in the plant, on the other hand, is less well understood. Still, the usefulness of plants in the treatment of numerous diseases is undeniable. On the other hand, traditional drug formulations must be studied and re-standardized for the treatment of diseases utilizing new methodology and approaches. This review article contains all the relevant information regarding its morphology, microscopy, phytochemistry, plant description, taxonomy, substitutes of *S. chirata*, pharmacological activities of the plant. The review article aims to provide brief knowledge about this drug among people and researchers.

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