

## **REVIEW ON SWERTIA CHIRATA BUCH.-HAM. EX WALL: A BITTER HERB W.S.R TO ITS PHYTOCHEMISTRY AND BIOLOGICAL ACTIVITY**

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### ABSTRACT

*Swertia chirata* Buch.-Ham. ex wall. is a medicinal plant indigenous to temperate Himalaya. *S. chirata* has an erect, about 2-3 ft long stem, the middle portion is round, while the upper is four angled, with a prominent decurrent line at each angle. The plant is found at an altitude of 1200-3000m, from Kashmir to Bhutan and in the Khasi hills at 1200- 1500m. It can be grown in sub- temperate regions between 1500-2100m altitudes. Main Chemical constituent of *S. chirata* are Amarogentin, Swertiamarin, Mangiferin, Swechirin, Sweroside, Amaroswerin, Gentianine, Oleanolic acid, Ursolic acid, Swertanoone. Its medicinal usage is reported in Indian pharmaceutical codex, the British and the American pharmacopoeias and in different traditional systems of medicines such as the Ayurveda, Unani and Siddha. The plant is used as a bitter tonic in Ayurvedic Herbal system to cure fever and for curing various other diseases. This article briefly reviews the Taxonomy, Classical review, Botany, Distribution, Habitat, Varieties, Substitutes, Phytochemistry, Biological activity and pharmacological effects of *S. chirata*. This is an attempt to compile and document information on different aspects of *S. chirata* and highlight the need for research and development.

**Keywords:** Amarogentin, Swertiamarin, Mangiferin, Swechirin, Sweroside, Amaroswerin etc.,

### INTRODUCTION

*Swertia chirata* is known as **Chirayata** in India. In Hindi the herb is called Chiretta and in Sanskrit it is called **Bhunimba or Kirata tikata**<sup>1</sup>. This ancient herb is also sometimes known as the Nepali Neem because it is annual/binneal herb in the forests of Nepal. This

plant was introduced to Europe in 1839 and has been used widely since. This annual herb is found in the Himalayas majorly between the heights of 1200 to 1500 meters and grows up to the height of 1.5 meters<sup>2</sup>. Chirayata has erect stems which grows about 2-3 ft long. Its

stems are orange brown or purplish in colour and contain large continuous yellowish pith. Its root is simple, stout, short, about 7 cm long and usually half an inch thick. The tiny flowers are green-yellow in colour. The fruits are small, one-celled capsule with a transparent yellowish pericarp<sup>3</sup>. It is known to have leaves in opposite pairs which are about 10 cms in length with no stalks<sup>2</sup>. The plant contains glycoside chiratin which yields on hydrolysis. The ophidic acid in the plant is brown in color and is identified as a hyroscopic substance. This is a substance that is soluble in both water and alcohol. It contains tannin, resin and ash. *S. chirata* is a beneficial bitter tasting tonic which is used as a laxative and also an appetizer. It corrects the nutrition disorders in the body and helps in bringing normality into the system. The herb is used widely to stimulate the appetite of people suffering from anorexia and other such problems. It helps in re-

lieving acidity, nausea and biliousness. It used as a laxative, vermifuge, sedative and alterative. It has the properties to relieve cough, bronchial infections, malaria and asthma. The entire plant is used in medicines for over centuries<sup>3</sup>.

#### TAXONOMY OF SWERTIA CHIRATA<sup>4</sup>:

**Kingdom:** Plantae

**Phylum:** Tracheophyta

**Class:** Magnoliopsida

**Order:** Gentianales

**Family:** Gentianaceae

**Genus:** Swertia

**Species:** chirata

**Binomial Name:** *Swertia chirata* Buch Ham

**Synonyms<sup>5</sup>:**

*S. chirayita* (Roxb. Ex Flem.) Karst

*S. tongluensis* Burkill.

*Gentiana chirayata* Roxb. Ex. Flem.

*Ophelia chirata* Griseb.

**Table 1:** Shows Synonyms Of Chirayata As Mentioned In Ayurvedic Texts With derivation<sup>1,6,7</sup>:

<i>KirataTikata</i>	The plant grows at Himalayan range which is bitter in taste.
<i>Katutikta</i>	It has bitter taste.
<i>Kandatikta</i>	Kanda means stem. Stem has tikta (Bitter) taste.
<i>Kirata</i>	Kirata means Himalaya region it present at an height of 1350-3350 m height.
<i>Bhunimba</i>	It is considered as small size nimba tree due to resemblance of tikta rasa.

**Table 2:** Shows Vernacular Names<sup>5-7</sup>:

Hindi	<i>Chirayata</i>
English	<i>Chiretta</i>
Bengali	<i>Chirata</i>
Tamil	<i>Nilavembu</i>
Punjabi	<i>Charaita</i>
Marathi	<i>Kiraita</i>
Gujarati	<i>Kariyatam</i>
Kannada	<i>Nilavebu</i>
Malayalam	<i>Nilavippa</i>

#### HABITAT:

INDIA: Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Arunachal Pradesh, Meghalaya and Sikkim between altitudinal ranges of 1400 – 3270 m.

CHINA; TIBET; NEPAL and BHUTAN.

It occurs sporadically in subtropical and temperate forests, in open forest margins, cool and moist places or in shady moist slopes among tall grasses. The major threats to the wild pop-

ulation of this plant species are loss of habitat and harvesting of the plant for medicinal uses.

#### DIFFERENT VARIETIES<sup>6</sup>:

**Kiratatika** and **Kalamegha** are two varieties viz., *S. chirata* and *A. paniculata*.

*Narhari Pandit* quoted two varieties viz., **Kiratatika** and **Naipala Nimba**. The second variety also appears as a Himalayan species.

#### SUBSTITUTE<sup>1</sup>:

In the absence of a desired first choice medicinal herb, classical Ayurveda recommends

use of a functionally similar substitute. Here we report substitutions of *S. chirata*-

1. *Swertia purpurascens* Wall.
  2. *S. decussata* Nimmo
  3. *S. chinensis* Franchet
  4. *S. paniculata* Wall
  5. *S. perennis* Linn.
  6. *S. lawii* Burkill
  7. *S. affinis* C. B. Clarke
  8. *Exacum bicolor* Roxb.
  9. *Exacum tetragonum* Roxb.
  10. *Erythraea roxburghii* G. Don
  11. *Enicostemma littorale* Blume
- All belongs to Gentianaceae family.

#### Table 3: CLASSIFICATION IN AYURVEDA:

<i>Charak Samhita</i>	<i>Stanyashodhan mahakashaye</i> <sup>8</sup> , <i>Trsnanigrahana mahakashaye</i> <sup>9</sup> and <i>in tikta skandha</i> <sup>10</sup> .
<i>Susurut Samhita</i>	<i>Aragvadhadi gana</i> <sup>11</sup>
<i>Acharya Vagbhat</i>	<i>Aragvadhadi gana</i> <sup>12</sup>
<i>Nighantu Adarsh</i>	<i>Kiratadi Varga</i> <sup>13</sup>
<i>ShodhalNighantu</i>	<i>Guduchyadi varga</i> <sup>14</sup>
<i>KaidevNighantu</i>	<i>Aoushdhi varga</i> <sup>15</sup> .
<i>MadanpalNighantu</i>	<i>Abhyadi Varga</i> <sup>16</sup>
<i>Abhidhaanratnamala</i>	<i>Tiktadravyasakandha</i> <sup>17</sup> .
<i>BhavprakashNigantu</i>	<i>Haritkayadi Varga</i> <sup>1</sup>
<i>MahaaushadhNighantu</i>	<i>Mahaaushadhi varga</i> <sup>18</sup> .
<i>Priyanighantu</i>	<i>Satpushpadi Varga</i> <sup>19</sup>

#### PHYTOCHEMISTRY & BIOLOGICAL ACTIVITY:

**Table 4:** Shows important bioactive compounds isolated from *Swertia chirata* and their Biological activities.<sup>20</sup>

S.NO.	PHYTOCHEMICALS	BIOLOGICAL ACTIVITY
1.	Amarogentin	Antileishmanial, Topoisomerase inhibitor, Anticancer, Anti-diabetic, Gastroprotective.
2.	Swertiamarin	CNS depressant, Anticholinergic, Anticancer, Anti-hepatitis, Antibacterial, Cardio-protective, anti-atherosclerotic, anti-diabetic Anti-arthritis.
3.	Mangiferin	Anti viral, Immunomodulatory, antitumor, anti-HIV, Antioxidant, Chemopreventive, Antiinflammatory, Hypoglycemic, Anti-diabetic, Antiatherosclerotic, Anti-parkinson.
4.	Swerchirin	Hypoglycemic, Hepatoprotective, pro-heamatopoietic, Blood glucose lowering activity, Chemopreventive.

5.	Sweroside	Antibacterial, Hepatoprotective, Hyperpigmentation, Osteoporosis
6.	Amaroswerin	Gastroprotective
7.	Gentianine	Antipsychotic, Antimalarial
8.	Oleanolic acid	Antimicrobial, Antitumor, Antiinflammatory, antioxidant
9.	Ursolic acid	Antimicrobial, Antitumor
10.	Swertanone	Antiinflammatory
11.	Syringaresinol	Hepatoprotective
12.	Bellidifolin	Hypoglycemic
13.	Isobellidifolin	Hypoglycemic
14.	1-Hydroxy-3,5,8-trimethoxyxanthone	Antimalarial
15.	1-Hydroxy-3,7,8-trimethoxyxanthone	Spasmogenic agent, Antiulcerogenic
16.	1,5,8-trihydroxy-3-methoxyxanthone	Blood sugar lowering
17.	-Amyrin	Anti-inflammatory, Antimicrobial, antifungal.
18.	Chiratul	Anti-inflammatory

**Table 5:** shows Isolated Compounds from some substitutes of *Swertia chirata*<sup>21</sup>.

S.NO.	SUBSTITUTE	PHYTOCHEMISTRY
1.	S. paniculata	– sitosterol, ursolic acid, bellidefolin, luteolin
2.	S. perennis	1,8- Dihydroxy -3,7- Dimethoxy xanthone.
3.	S. decussata	Swertianin, 1,7,8- Trihydroxy- 3 – Methoxyxanthenes.

### IMPORTANT PHARMACOLOGICAL EFFECTS<sup>22</sup>:

*S. chirata* is used as antipyretic, anthelminthic, antiperiodic, cathartic and in asthma and leucorrhoea in Ayurveda and as harsh, analeptic, stomachic, mitigate inflammation, relaxing to

pregnant uterus and never ending fevers. It is a remedy for ulcers, Gastrointestinal diseases, skin diseases, cough, hiccup, liver and Kidney diseases, Neurological disorders and urinogenital tract disorders. Also used as purifier of Breast milk, and as a laxative and carminative.

**Table 6:** Shows Evaluation of the Pharmacological effects of *Swertia chirata*<sup>20</sup>

Pharmacological effects evaluated	Plant part (s) tested	Test system	<sup>a</sup> Extracting solvent	Test Organ-ism/Models	Control	Toxicity test
Antibacterial	Whole plant	<i>In vi-tro</i>	EtOH	<i>Escherichia coli</i> ATCC 26922, <i>Klebsiella pneumonia</i> ATCC 15380, <i>Pseudomonas aeruginosa</i> ATCC 25619	Ciprofloxacin	None
Antibacterial	Whole plant	<i>In vi-tro</i>	DCM; EtOH	<i>Staphylococcus aureus</i>	Kanamycin 30 µg/disc	None
Antibacterial	Stem	<i>In vi-tro</i>	EtOH	<i>Staphylococcus aureus</i>	Chloramphenicol 30 µg/disc	Brine shrimp assay-positive

Antifungal	Whole plant	<i>In vi- tro</i>	MeOH	<i>Aspegillus nig- er</i> MTCC 1881	Amphotericin	None
Antileishmanial	Whole plant	<i>In vi- tro</i>	MeOH	<i>Leishmania donova- ni</i> AG83	–	Cytotoxicity testnegative
Anthelmintic	Whole plant	<i>In vi- tro</i>	Water; MeOH	<i>Haemonchus contor- tus</i>	Levamisole 0.55 mg/ml	None
Antimalarial	Leaves/Stem	<i>In vi- tro</i>	MeOH; PE; Water; EtOH	<i>Plasmodium falcipa- rum</i> FCK 2	Parasitized red blood cells and 10 $\mu$ Ci of [ <sup>35</sup> S]- methionine	None
Anti-hepatitis B virus	Whole plant	<i>In vi- tro</i>	50% EtOH	HepG 2.2.15 cells line	Tenofovir	None
Antiinflammatory	Aerial parts	<i>In vivo</i>	Petroleum	N/A	Mice treated with vehicle or Diclo- fenac (10 mg/kg)	None
Hypoglycemic	Whole plant	<i>In vivo</i>	95% EtOH	N/A	Mice treated with vehicle	None
Antidiabetic	Whole plant	<i>In vi- tro</i>	95% EtOH; HEX	STZ- NAD(streptozotocin- nicotinamide) in- duced diabetic albi- no mice	Metformin (100 $\mu$ g/kg)	None
Antipyretic	Root	<i>In vi- tro</i>	Water	Brewer's yeast in- duced pyrexia Ty- phoid-Paratyphoid A, B vaccine in- duced Hyperexia	Paracetamol (150 mg kg <sup>-1</sup> )	None

## DISCUSSION

*Swertia chirata* or sometimes called *Chitretta* is a bitter herb from India that has many health benefits. In Ayurvedic Medicine *S. chirata* is called a *tridosha* balancing. It's bitter, hot, pungent, and dry thus making it good for most conditions. It is used by *tribals* to treat different type of fevers. It is used in the form of juice for its antipyretic activities. It is considered Vulnerable based on International Union For Conservation of Nature (IUCN) CAMP Criteria. This article gives summarize explanation on Phytochemicals of *S. chirata* and their biological activity along with phytochemistry of some substitutes which shows the functionally similar herbs have some same phyto-

chemicals. This article is a compilation of Taxonomy, Classical review, Botany, Distribution, Habitat, Varieties, Substitutes, Phytochemistry, Biological activity and pharmacological effects of *S. chirata*. *S.chirata* is used to cure many diseases as mentioned in Ayurveda have been scientifically proved by its phytochemistry & biological activity. This review article is an attempt to promote people to conserve this important medicinal herb which is extensively useful as an antipyretic herb.

## CONCLUSION

*Swertia chirata* Buch Ham is a medicinal plant indigenous to temperate Himalaya. It is known as Chirayata in India, Kirata tikata in Ayurve-

da. The plant is used as a bitter tonic in Ayurvedic Herbal system to cure various types of fever. Further research can be done to know the efficacy and mode of action of this plant in various viral fevers, Dengue, Chikungunya etc.

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