

Review of Versatile Drug: *Swertia Chirata* Buch.- Ham. Ex C.B. Clarke

Akanksha Sharma

Post Graduate Scholar

Department of Roga nidana & Vikruti Vigyan, Ch. Brahm Prakash Ayurved Charak Sansthan, New Delhi, India

Vidula Gujjarwar

Professor & Head Of Department

Department of Roga Nidan evum Vikruti Vigyana, Ch. Brahm Prakash Ayurved Charak Sansthan, Khera Dabar, Najafgarh, New Delhi, India

Corresponding Author: **Akanksha Sharma**

Abstract

Conventional medicine is the most cost-effective and readily available form of therapy within the foundation of healthcare. Medicinal plants have long been recognized as a promising resource for treating many ailments, either by traditional preparations or by extracting purified active components. In many impoverished countries, these plants sometimes serve as the sole supply of medication for the majority of the population. The herb *Swertia chirata*, which belongs to the Gentianaceae family, is a well-known medicinal herb that is native to the Himalayas and Khasi hills, and it is utilized in traditional medicine to treat a wide variety of conditions. Not only has the widespread use of this plant brought it to the brink of extinction, but market sellers have also been known to engage in adulteration. This article aims to review the current data available in various samhitas, nighantus, books, previous published articles on the habitat, morphological description, chemical constituents, their pharmacological action, therapeutic uses, substitutes and adulterants.

Keywords: *Swertia chirata*, Gentianaceae, traditional medicine, therapeutic uses, adulterants, substitutes

Introduction

Swertia chirata is one of the most therapeutically useful species of the 180 species of genus *Swertia* hence is given the prime importance out of all. *Swertia* is so named in the memory of a Dutch botanist, E. Swert. Another meaning of *Swertia* is which grows in hilly tracks. Latin name is *Swertia chirata* Buch.- Ham. Ex C.B. Clarke. It is much

known for its anti- pyretic and hepatoprotective actions, but it's role is much more than that. Be it anti- inflammatory, anti-arthritic, analgesic, ulcer protective, laxative, carminative, hemostatic, jaundice, anaemia, anti-oxidant. In other system of medicines also, it has been extensively. In unani medicine, it is used as a tonic and is widely used for joint pain, stomachic, astringent,etc. In the current article, the aim is to compile the traditional uses available in the ayurvedic texts and the studies that has been conducted to evaluate the pharmacological effects of the drug till date.

Review of literature

Latin name is *Swertia chirata* Buch.- Ham. Ex C.B. Clarke. Its synonymns are *Swertia chirayita* Roxb. ex flem Karst, *Gentiana chirayita* Roxb. ex flem and *Gentiana chirayita* wall. In ayurvedic samhitas and various nighantus, it has been mentioned by different names such as Kirata, Kiarataka, Bhunimba, Kiratatiktaka, Anaryatikta, Chiratikta, Kairata, Hema, Kandatikta, Ramsenaka, Kaidarya, Pichumanda, Nimba, Arishta, Vartwach, Chardighna, Hingu niryasa, priyadshaala, paarvata, Naryatikta, Naaditikta, Ardhatikta, Shleshmaha, Shoolapaha, Maladhvansi, Krimighna, Balakpriya, Sannipatari, Jwarnidrapaha, Atitikta, Bhuteeka, Jwarantaka, Naipali. As far as its vernacular name is concerned, it is Indian Gentian in english; Chirayata, Charyatah in hindi; Kadechirait in Marathi; Kariyatu in gujrati; Chireta in Bengali; Neelvembu, Shirat- kuch- chi in tamil; Nelabevu in kannada; Neelvem in telgu; Charaita in Punjabi; Qasabuzzarirah in arabi & farsi; Nainihabandi in perssian; Chiravata in urdu; Chirrato, Chiraita in nepal; Sekhagi in Burma.

Taxonomy

Kingdom: Plantae

Phylum: Tracheophyta

Class: Magnoliopsida

Order: Gentianales

Family: Gentianaceae

Genus: *Swertia*

Species: *chirata*

Tribe: Gentianeae

Subtribe: Swertiinae

Habitat

The plant is a small, upright, herbaceous annual or biennial that reaches a height of 0.6-1.25m (occasionally 1.5m). It is mostly found in the Himalayas, ranging from Kashmir to Bhutan, at altitudes of 4,000-10,000ft (or 1000-3000m). It may also be found on the Khasia hills in Meghalaya, at altitudes of 4000-5000ft (or 1-1.5meters). Drug is harvested during the flowering period, which typically occurs from July to September, and then it is dried. It thrives in chilly and damp environments with shaded, wet slopes and tall grasses. It favours soil conditions that are sandy, loamy, or clay-based. This plant thrives in acidic, neutral, or alkaline soil and is capable of enduring temperatures as low as -15 degrees Celsius while still maintaining growth¹. According to Bhavprakash, total 180 species of *Swertia* are found worldwide, out of

which only 37 species are found in india². Some of their names has been mentioned below. There are 3 subgenus of swertia having different species as:

Subgenus 1: Ophelia

Swertia purpurascens	Swertia paniculata	Swertia griffithi
Swertia dialata	Swertia tetragona	Swertia cordata
Swertia bimaculata	Swertia macrosperma	Swertia racemosa
Swertia chirata	Swertia lurida	Swertia alata
Swertia nervosa	Swertia augustifolia	Swertia pulchella
Swertia affinis	Swertia corymbosa	Swertia
trichotoma		
Swertia decussate	Swertia zeylanica	Swertia beddomai

Subgenus 2 : Euswertia

Swertia hookeri	Swertia rex	Swertia speciosa
Swertia alternifolia	Swertia petiolata	Swertia
thomsoni		
Swertia cuneata	Swertia coerulea	

Subgenus 3: Poephilia

Swertia multicaulis

Morphological Description

Stem is yellowish-purple in color, measuring between 2 and 5 feet in length, with a surface that is cylindrical at the base and somewhat flattened on moving upwards. The leaves measure 2 by $\frac{3}{4}$ inches, with the lowest leaves frequently being somewhat bigger and occasionally having a petiole. The cauline leaves are opposite, thick, and broadly ovate/lanceolate in shape. They are sessile, elliptic, and acute, with 5 nerves and a round base. The leaves are acuminate at the apex, glabrous, and cordate or obtuse at the base. They have edges and 3-7 conspicuous lateral veins³. The Corolla has a bright green-yellow color around the base of each lobe, with two glandular depressions on each lobe that are ended by long hairs. The calyx lobes are $\frac{1}{6}$ inches and have a lanceolate shape. The corolla lobes are $\frac{1}{4}$ inches long, oblong, and acuminate, with purple veins. The glandular depressions are green, shallow, and often located toward the edge, occasionally merging together. They are accompanied by a fringe of long white or pink hairs at the top. The filaments are straight and unattached, while the anthers are elongated in shape. The shape of the object is cylindrical, and the stigmas are oblong. The capsule measures at least $\frac{1}{4}$ inches in length and has an oval shape with a sharp tip. The seeds are polyhedral and have a smooth surface, measuring $\frac{1}{50}$ inches in size. The surface is smooth, without any minute patterns. Flowering takes place throughout the months of July to August or

September, which is during the rainy season⁴. Flowers have a yellowish-green color on the surface and a purple color on the inside. They are tetramerous, meaning they have four parts, and can either droop or stand upright. The inflorescence consists of huge panicles that are either solitary and axillary or axillary with 3-5 blooms clustered in terminal clusters. Pedicles: 0.75 inches or less, primarily clustered in short bundles. Fruits have a shape that is either ovoid or ellipsoid. The seeds are abundant, tiny, round, and brown in color.

Description in samhitas and nighantus

The description of *S. chirata* is found in various texts as mentioned in table1.

Samhita & nighantu	Gana or varga
Charak samhita	Stanyashodhana ⁵ , Trishna Nigrahana ⁶ , Sheetaprashamana mahakashaya ⁷
Sushruta samhita	Aragvadhaadi gana ⁸ , Tiktaskandha ⁹
Ashtang hridya	Aragvadhaadi gana ¹⁰ , Tiktaskandha ¹¹
Nighantu Aadarash	Kiratadi varga ¹²
Shodhala Nihantu	Guduchyadi Varga ¹³
Kaideva Nighantu	Aushadhi varga ¹⁴
Madanpala Nighantu	Abhyadi varga ¹⁵
Shadras Nighantu / Abhidhana Ratnmala	Tiktadravyaskandha
Bhavprakash Nighantu	Haritakyadi varga ¹⁶
Mahaushadh Nighantu	Mahaushadhi varga ¹⁷
Priya Nighantu	Shatpushpaadi varga ¹⁸
Raj Nighantu	Prabhdradi Varga ¹⁹
Dhanvantari Nighantu	Guduchyadi Varga ²⁰

Table1: Description in samhitas & Nighantus

Guna & karma acc. to samhita & nighantu

It is mentioned in table2 below.

Samhita& nighantu	Guna & karma
Charaka Samhita	It is mentioned in the treatment of Raktapitta, Shotha (Hanyat tridosham chirajam ch shopham), has stanyashodhan property.
Sushruta Samhita	It is mentioned in treatment for Dushtavrana, shleshma- abhishyanda.
Haarita Samhita	Used in management of nausea and vomiting in pregnancy
Ayurvedic Pharmacopoeia of India	Laghu – ruksha guna, tikta rasa, katu vipaka, sheeta veerya; it is jwaraghna, kapha-pittahara, rakta shodhaka, vranashodhaka, saraka, trishna hara; used in shotha, daha, krimi roga, kandu, kushtha, meha ²¹ .
Nighantu Aadarash	Pachaka, Mridurechaka, krimighna, jwarghna, increases appetite, improves digestion; used in aadhmana, disorders caused by mandagni, amlapitta, angdaha; in dhatu vaishmya, it acts as rasayana and rechaka.
Shodhala Nihantu	In Pittajwarahara gana, this drug is mentioned at first place; Vatala, ruksha guna, kapha-pitta-jwar hara; mentioned as para (best) for Jadyata, Nidra, Krimi and Sannipata harana
Kaideva Nighantu	Laghu- ruksha guna, tikta rasa, kapha- pitta nashaka; Used in aruchi, shopha, trishna, daha and jwara.
Madanpala Nighantu	Used in Jwara
Bhavprakash Nighantu	Acts as Deepana, pachana, tiktapaushtika, jwarahara, dahaprashamana, pitta virechaka, krimighna; used in agnimandya, shaithilya pradhana kupachana, aadhmana, amlapitta, yakrit vikara, Shotha, pandu, kamla, vrana, shwasa
Mahaushadh Nighantu	It acts as deepana, pachana, dahashamaka, Saaraka and specifically, jwaranashaka. It is Sannipatajwara hara; used in jwara, kasa, trishna shotha, kushtha, vrana, krimi;
Priya Nighantu	Mentioned as prime drug in all tikta dravyas; best for jwara, krimi, kushtha, daha, vranadi vyadhi.
Raj Nighantu	Tikta rasa, Vatala, Kapaha-pitta jwara hara, heals vrana, used in kushtha, kandu and atishopha avastha; mentioned as pathya
Dhanvantari Nighantu	laghu guna, Tikta rasa, Shleshma-ptta-rakta vikara hara; used in shophadi, kasa, trishna, jwara, amadosha

Table 2: Guna & Karma of Swertia chirata

Phytochemical constituents and their actions

Various phytochemical constituents identified in S.chirata and their actions has been explained in table3.

Phytochemical constituents	Pharmacological actions

Amarogentin (C ₂₉ H ₃₀ O ₁₃)	<ul style="list-style-type: none"> • This is the reason for the bitterness of plant even at 1: 58,00,000 dilution²² • Acts as gastro protective²³, has immune modulatory effect by attenuating proinflammatory mediators²⁴, hepatoprotective²⁵
Swetiamarin (C ₁₆ H ₂₂ O ₁₀)	<ul style="list-style-type: none"> • acts as an anti- inflammatory compound by decreasing release of proinflammatory cytokines(IL-1, IL-6, TNF); proangiogenic enzymes(MMPs, iNOS, PGE₂, PPARγ and CoX-2) and also increased anti- inflammatory proteins(IL-10, IL-4) levels²⁶. • anti-arthritic, anti- rheumatic activities by modulating NF-kB/ IκB and JAK₂/ STAT₃ signaling. • anti- osteoclastogenic activity by reducing levels of TRAP, RANK levels and significantly increases OPG level both in vivo and in vitro²⁷. • anti atherosclerotic, cardioprotective, anti- cholinergic, CNS depressant, anti- lipidemic²⁸,hepatoprotective, free radical scavenging and immune modulatory²⁹
Swerchirin	<ul style="list-style-type: none"> • act as pro-hematopoetic by stimulating hematopoetic stem cells proliferation in bone marrow and enhancing reconstitution of hematopoiesis³⁰. • chemoprotective, hepatoprotective, hypoglycaemic, anti-inflammatory.
Sweroside (C ₁₆ H ₂₂ O ₉)	<ul style="list-style-type: none"> • used in the management of osteoporosis by inducing human osteoblasts differentiation³¹. • Acts as hepatoprotective³².
Amaroswerin	<ul style="list-style-type: none"> • Gastroprotective³³ • Hepatoprotective³⁴ • Anti-inflammatory³⁵
Mangiferin (C ₁₉ H ₁₈ O ₁₁) (Xanthone Derivative)	<ul style="list-style-type: none"> • Also known as Chinomine, Alpizarin • anti-oxidant, anti- proliferative. • anti-inflammatory, anti-arthritic³⁶. • Immuno-modulatory, nervine tonic. • Shows pharmacological activities against arthritis, hepatitis, cardiac and mental disorders³⁷.
Oleanolic acid (C ₃₀ H ₄₈ O ₃)	<ul style="list-style-type: none"> • anti-oxidant³⁸ • anti- inflammatory
Swertianin, β - Amyrin (C ₃₀ H ₅₀ O)	<ul style="list-style-type: none"> • anti-inflammatory
Swertanone	<ul style="list-style-type: none"> • anti-inflammatory, gastroprotective

Chiritol	<ul style="list-style-type: none"> • anti-inflammatory, gastroprotective • causes fetal resorption³⁹ • used in treatment of herpes.
Bellidifolin, Isobellidifolin and 1,5,8- trihydroxy-3-methoxyxanthone	<ul style="list-style-type: none"> • hypoglycaemic⁴⁰ • Bellidifolin also acts as anti- inflammatory⁴¹
Syringaresionol	<ul style="list-style-type: none"> • Hepatoprotective
Flavanoids	<ul style="list-style-type: none"> • anti- pyretic⁴²
Gentianine	<ul style="list-style-type: none"> • anti- inflammatory • anaesthetic⁴³
Taraxerol	<ul style="list-style-type: none"> • analgesic
Ursolic Acid (C ₃₀ H ₄₈ O ₃)	<ul style="list-style-type: none"> • anti-inflammatory • chemoprotective⁴⁴

Table 3: Phytochemical Constituents and Pharmacological actions of S.chirata

Therapeutic uses

- **Anti- inflammatory, Anti- arthritic :** Xanthone derivative (1,5- dihydroxy-3,8- dimethoxy xanthone) of *Swertia chirata* (SC-I) was tested in acute, sub-acute, and chronic male albino rats. In rats with carrageenin-induced hind paw edema and formalin-induced edema, SC-I was compared to diclofenac and found to reduce pedal edema by 57% and formalin-induced pedal edema by 58%. Rats with formalin-induced pedal edema are ideal for screening anti-arthritic and anti-inflammatory drugs because it mimics human arthritis. This study found that *Swertia chirata* effectively reduces inflammation in acute, sub-acute, and chronic rat models. This supports SC-I therapy of inflammatory illnesses including arthritis⁴⁵. A further investigation was carried out to examine the anti-inflammatory properties of the benzene extract derived from *Swertia chirata*. This effect was attributed to the presence of 1,5-dihydroxy-3,8- dimethoxy xanthone⁴⁶. A different study found that the aqueous stem extract of the drug has strong anti-inflammatory and anti-arthritic effects. This is achieved by balancing the levels of pro-inflammatory and anti-inflammatory cytokines, namely TNF- α , IL-1 β , IL-96, IL-10, and IFN- γ . These effects were shown in mice models with induced arthritis. The ethanolic root extract has demonstrated the ability to block the production of bradykinins and prostaglandins, hence exhibiting anti-inflammatory properties⁴⁷. A comparative evaluation was carried out to evaluate the anti-inflammatory effects of *Alstonia scholaris*, *Swertia chirata*, and *Swietenia macrophylla*. Both ethanolic and alcoholic extracts of these plants were tested against indomethacin. The study

concluded that the extracts of *Swietenia macrophylla* provided the highest level of protection, followed by *Swertia chirata*. This means that while *Swertia chirata* did not show the maximum level of protection, it still performed significantly better than indomethacin⁴⁸. The extract of *Swertia chirata* demonstrates anti-inflammatory and anti-arthritic properties by limiting the production of cytokines and adjusting the inflammatory processes and tissue damage associated with arthritis. Moreover, the extract reduces the absorption of substances and limits the loss of minerals from bones, hence preventing bone damage and the narrowing of joint spaces⁴⁹.

- **Anti-inflammatory and Analgesic effect:** The ethanolic root extract of *Swertia chirata* (Gentianaceae) was evaluated for its analgesic and anti-inflammatory properties. The anti-inflammatory impact was measured using the carrageenan-induced rat paw edema model. The analgesic effect was assessed in mice by the utilization of the acetic acid-induced writhing test and the radiant heat tail-flick method. In the rat foot edema model generated by carrageenan, the extract shown a substantial ($p < 0.001$) reduction in edema production at a dosage level of 400mg/kg. Additionally, it exhibited a 57.81% suppression of edema volume ($p < 0.001$) at the conclusion of a 3-hour period. In the acetic-acid induced writhing test in mice, the extract demonstrated a 41.76% ($p < 0.001$) inhibition of writhing at a dosage of 200mg/kg and a 58.29% ($p < 0.001$) inhibition at a dose of 400mg/kg. The radiant heat tail-flick technique demonstrated that the root extract resulted in a significant increase in reaction time 30 minutes after oral administration at the dosages of 200 and 400mg/kg, with increases of 43.88% ($p < 0.001$) and 64.81% ($p < 0.001$) respectively. *Swertia chirata* has proved to have clear analgesic and anti-inflammatory properties. Therefore, the outcome indicates the conventional use of *Swertia chirata* in alleviating inflammation and discomfort⁵⁰. An additional investigation documented the analgesic properties of the ethanol extract of the leaf, stem, and various fractions of *S. Chirata*. The ethanolic extract of the leaf and stem of *S. Chirata* exhibited a moderate inhibition of writhing ($p < 0.001$). The suppression of writhing was seen in comparison to the control group (Diclo sodium 25m/kg). The pet-ether fraction exhibited a significant suppression of writhing ($p < 0.001$), whereas the methanolic fraction demonstrated a moderate inhibition of writhing ($p < 0.003$)⁵¹. Also, roots acts as a effective tonic for generalised weakness, fever, joint pain.
- **Antioxidant:** The extract of *Swertia chirata* demonstrates a significant decline in levels of Superoxide Dismutase (SOD), Catalase (CAT), and Glutathione (GSH), while showing a large increase in levels of Malondialdehyde (MDA). The control substances employed were BHT and Vitamin C. These effects were similar to those of Vitamin E. This indicates the herb's potent antioxidant property⁵². The methanolic extract of *S. chirata* shown considerable antioxidant

activity by scavenging free radicals DPPH and hydroxyl radicals. However, it did not show substantial activity in scavenging nitric oxide radicals. The control utilized in the study was BHA⁵³. A separate research revealed that both the acetonic and methanolic extracts of swertia chirata possess anti-oxidant activity. Furthermore, the methanolic extract was shown to have a particularly potent antioxidant function. Chen et al. utilized the reducing power and β -carotene test to investigate the antioxidant capabilities of a 70% ethanolic extract. The results showed a substantial decrease in DPPH scavenging activity levels. The extract of *S. Chirata* has the ability to suppress cytokines, which is likely owing to its scavenging of radicals that are involved in the activation of inflammatory responses⁵⁴.

- **Febrifuge and Laxative:** *S. chirata* doesn't result in constipation; instead, it promotes regular bowel movements⁵⁵. In order to assess the impact of swertia chirata on constipation, the crude extract was examined for a potential stimulatory effect on the rabbit jejunum. The extract induced gastrointestinal excitation (contraction) through the cholinergic pathway. The contractile effect was followed by relaxation at higher concentrations, which suggests the presence of a spasmolytic constituent. This elucidates the use of *Swertia chirata* in hyperactive gastrointestinal conditions, such as colic and diarrhea. It is intriguing that a plant that is used to treat two distinct digestive conditions—constipation and diarrhea—has been discovered to possess a combination of gut stimulatory and relaxant activity. Calcium channel modulation was identified as the mechanism by which these effects were mediated⁵⁶.
- **Anti- pyretic activity:** The root extract exhibits a significant antipyretic effect in animal models of rats and rabbits that have experienced hyperexia induced by typhoid, paratyphoid A and B vaccines, as well as a raised body temperature due to yeast. In both instances, the root extract induces a significant fall in body temperature, an outcome that is comparable to that of paracetamol⁵⁷.
- **Ulcer protective activity:** The ethanolic extract of swertia chirata effectively decreased the extent of stomach mucosal damage induced by indomethacin and necrotizing agents. It has been observed that rats administered with an ethanolic extract of swertia chirata showed a considerable prevention of gastric mucus membrane depletion caused by ethanol. Furthermore, it replenished the sulfhydryl level in the glandular stomach, excluding proteins⁵⁸.
- **Hypoglycemic activity:** The hypoglycemic effects of swertia chirata are attributed to the presence of flavonoids and secoiridoides in its methanolic extract⁵⁹. Another study demonstrated that the root extract of *Swertia chirata* had an antihyperglycemic effect on rodents treated with indinavir. The root extract also reduced glucose and insulin levels, which were nearly equivalent to those of standard metformin and piaglitazone⁶⁰.

- **Hepatoprotective activity:** Hepatoprotective activity of the methanolic extract of *Swertia chirata* was assessed in relation to paracetamol and galactosamine. The broader and non-specific protection of the liver owing to the induction of hepatotoxicity is suggested by the protective effect of *Swertia chirata* extract against hepatotoxins.
- Used as a bitter tonic⁶¹, febrifuge, stomachic, anti helminthic, carminative, laxative, alterative, anti-diarrhoeic, anti-periodic, purifies breast milk.
- Not merely suppresses fever but also attacks ama (toxins which have entered tissues). It is useful in oedema, burning sensation of body, acts as destroyer of ama, relieves thirst, used in rheumatic disease⁶².
- Acts as hemostatic, antiphlogestic, useful in bleeding piles, anaemia and jaundice⁶³.
- Used in whole body pain, asthma, bronchitis, vomiting during pregnancy, good for joint pain, scabies, leucoderma, urinary discharges⁶⁴.

Substitutes⁶⁵

1. *S. purpurascens* Wall.
2. *S. affinis* Clarke
3. *S. Decussate*
4. *Exacum bicolor* Roxb.
5. *S. chinensis* Franchet
6. *E. Tetraconum* Roxb.
7. *S. paniculata* Wall.
8. *Erythraea roxburghii* G. Don
9. *S. perennesis* Linn.
10. *Enicostemma littorale* Blume
11. *S. coreymbosa* Wight

These all are from gentianaceae family.

Adulteration⁶⁶

1. *S. augustifolia* Buch- Ham. (gentianaceae)
2. *S. alata* Royle ex D. Don (gentianaceae)
3. *Rubia cordifolia* Linn. (Rubiaceae)
4. *Andrographis paniculata* Nees. (Acanthaceae)

Conclusion

S. chirata has several potential opportunities for both traditional and modern medicine. *S. chirata* has promising promise as a natural remedy for several illnesses. This study provides a concise summary of the current knowledge on the chemical composition, medicinal applications, pharmacological effects, alternatives, and adulteration of a certain subject. Currently, there have been no

significant adverse effects or toxicity associated with *S. chirata*. However, more toxicological investigations are required to validate the safety of *S. chirata* in people.

References

1. K. P. Samanth kumar, Debjit Bhowmik, Chiranjib, Biswajit, Margret Chandira.(2010), *Swertia chirata: A traditional herb and its medicinal uses*. J. Chem. Pharm Res.,22(1): 262-266.
2. Misra Brahma Sankra ,(2010). *Vidyotini Hindi Commentary on Bhavprakasa nighantu purvakhand. Haritakyadi varga: Chapter-2; 73*.
3. Singh Mohar, Malhotra Nikhil (2021).*Himalayan Medicinal Plants: Advances in Botany, Production & Research. Swertia chirayita: Chapter-12; 223-234*.
4. Singh Mohar, Malhotra Nikhil (2021).*Himalayan Medicinal Plants: Advances in Botany, Production & Research. Swertia chirayita: Chapter-12; 234*.
5. Shastri Kasinath,Chaturvedi Gorakhnath(2018). *Vidyotini hindi commentary on Charak Samhita part-I, Sutrasthana. Shadvirechanshatashritya Adhyaya: chapter 4; pg-84*.
6. Shastri Kasinath,Chaturvedi Gorakhnath ,(2018).*Vidyotini hindi commentary on Charak Samhita part-I, Sutrasthana. Shadvirechanshatashritya Adhyaya: chapter 4; pg-87*.
7. Shastri Kasinath,Chaturvedi Gorakhnath (2018).*Vidyotini hindi commentary on Charak Samhita part-I, Sutrasthana. Shadvirechanshatashritya Adhyaya: chapter 4; pg-94*.
8. Shastri Ambikadatta(2018). *Ayurveda Tatva Sandipika part-1,Sutrasthana. Dravyasangrahnaya Adhyaya: chapter 38; pg-183*.
9. Shastri Ambikadatta (2018).*Ayurveda Tatva Sandipika part-1,Sutrasthana. Rasavisheshvigyanaya Adhyaya: chapter 42; pg205*.
10. Tripathi Brahmanand (2019). *Nirmala Hindi Commentary on Astanga Hrdayam of Shrimad Vagbhata, Sutrasthana. Shodhanadiganasangrhya Adhyaya: chapter 15; pg199*.
11. Tripathi Brahmanand (2019).*Nirmala Hindi Commentary on Astanga Hrdayam of Shrimad Vagbhata, Sutrasthana. Rasabhedhiya Adhyaya: chapter 10; pg155*.
12. Vaidya Bapalal G.(2019).*Nighantu aadarsh (uttarardh).Kiratadi varga: chapter46;pg71*.
13. Pandey Gyanendra (2009). *Acharya Sodhala's Sodhala Nighantu Text With English- Hindi Commentary. guduchyadi varga;pg4*.
14. Sharma priyavrat, Sharma guruprasad (1979).*Kaidev Nighantu (Patyapathya vibodhaka).Aushadhi varga;pg165*.
15. Misra Brahma Sankra(2010).*Vidyotini Hindi Commentary on Bhavprakasa nighantu purvakhand. Haritakyadi varga: Chapter-2;pg73*.

16. Tripathi Indradev (2006).With the hindi commentary and notes on Mahausadha Nighantu by pt. Aryadasa kumara singha. mahaushadi varga: chapter-1;pg37-38.
17. Sharma priyavrat (2004).Priya Nighantu along with author's hindi commentary entitled "PADMA". Shatpushpadi varga;pg100.
18. Tripathi Indradev (2016).Dravyagunaprakashika hindi commentary on Shriman haripandit virachita Raj Nighantu. Prabhadradi varga;pg266-267.
19. Ojha Jharkhande, Mishra Umapati (2018).Hindi guna-karma commentary on Dhanvantari Nighantu. guduchayadi varga;pg24.
20. Department of Ayush (1986).The Ayurvedic PharmacopoeiaOf India. Part-1. Volume-1.pg71.
21. Tabassum, Sobia & Mahmood, Sidra & Hanif, J. & Hina, M. & Uzair, Bushra. (2012). An overview of medicinal importance of swertia chirayita. Int J Appl Sci Technol. 2. 298-304.
22. Kajal, & Sinha, Sephali & Pati, Swayamprabha & Shahi, Sanyogita. (2023). Medicinal Value Of Chiraita: A Review. 158-162.
23. Lad, H., Bhatnagar, D(2016).Amelioration of oxidative and inflammatory changes by Swertia chirayita leaves in experimental arthritis. Inflammopharmacol 24, 363-375.
24. National institute Of Science Communication and Information Resources(2012).The Wealth of India A Dictionary of Indian Raw Materials & Industrial Products, First Supplement Series (Raw materials) Volume-5:R-Z.pg 171.
25. Saravanan S, Islam VI, Babu NP, Pandikumar P, Thirugnanasambantham K, Chellappandian M, Raj CS, Paulraj MG, Ignacimuthu S(2014).Swertiamarin attenuates inflammation mediators via modulating NF- κ B/I κ B and JAK2/STAT3 transcription factors in adjuvant induced arthritis. Eur J Pharm Sci.;56:70-86.
26. Hairul-Islam MI, Saravanan S, Thirugnanasambantham K, Chellappandian M, Simon Durai Raj C, Karikalan K, Gabriel Paulraj M, Ignacimuthu S(2017). Swertiamarin a natural steroid, prevent bone erosion by modulating Rankl/Rank/Opg Signaling. Int Immunopharmacol;53:114-124.
27. Khanal S, Shakya N, Thapa K, Pant DR (2015). Phytochemical investigation of crude methanol extracts of different species of Swertia from Nepal. BMC Res Notes;8:821.
28. Lad, H., Bhatnagar, D. (2016). Amelioration of oxidative and inflammatory changes by Swertia chirayita leaves in experimental arthritis. Inflammopharmacol 24, 363-375.
29. Ya BQ, Nian LC, Li C, Gen XP.(1999). Protective effect of swerchirin on hematopoiesis in ^{60}Co -irradiated mice. Phytomedicine;6(2):85-8.

30. Sun H, Li L, Zhang A, Zhang N, Lv H, Sun W, Wang X.(2013).Protective effects of sweroside on human MG-63 cells and rat osteoblasts. *Fitoterapia*;84:174-9.
31. Kumar V, Van Staden J.(2016).A Review of *Swertia chirayita* (Gentianaceae) as a Traditional Medicinal Plant. *Front Pharmacol*;6:308.
32. Niiho, Y., Yamazaki, T., Nakajima, Y. et al.(2006).Gastroprotective effects of bitter principles isolated from Gentian root and *Swertia* herb on experimentally-induced gastric lesions in rats. *J Nat Med* **60**, 82–88.
33. National institute Of Science Communication and Information Resources(2012).The Wealth of India A Dictionary of Indian Raw Materials & Industrial Products, First Supplement Series (Raw materials) Volume-5:R-Z.pg 171.
34. Karmakar, Arjun. (2016). Pharmacognostic and Conservational Overview of *Swertia chirata* Buch.- Ham. ex Wall., A Critically Endangered Himalayan Herb. *Journal of Food Science and Nutrition Therapy*. 2. 15-18. 10.17352/jfsnt.000004.
35. National institute Of Science Communication and Information Resources (2012).The Wealth of India A Dictionary of Indian Raw Materials & Industrial Products, First Supplement Series (Raw materials) Volume-5:R-Z.pg 172.
36. Khanal S, Shakya N, Thapa K, Pant DR.(2015).Phytochemical investigation of crude methanol extracts of different species of *Swertia* from Nepal. *BMC Res Notes*;8:821.
37. Naveen Kumar et al: Review On *Swertia Chirata* Buch.-Ham. Ex Wall: A Bitter Herb W.S.R To Its Phytochemistry And Biological Activity. *International Ayurvedic Medical Journal* {online} 2017 {cited September, 2017}.
38. National institute Of Science Communication and Information Resources (2012).The Wealth of India A Dictionary of Indian Raw Materials & Industrial Products, First Supplement Series (Raw materials) Volume-5:R-Z.pg 171.
39. Kajal, & Sinha, Sephali & Pati, Swayamprabha & Shahi, Sanyogita(2023). Medicinal Value Of Chiraita: A Review. 158-162.
40. Hu TY, Ju JM, Mo LH, Ma L, Hu WH, You RR, Chen XQ, Chen YY, Liu ZQ, Qiu SQ, Fan JT, Cheng BH.(2019).Anti-inflammation action of xanthones from *Swertia chirayita* by regulating COX-2/NF-κB/MAPKs/Akt signaling pathways in RAW 264.7 macrophage cells. *Phytomedicine*;55:214-221.
41. Kajal, & Sinha, Sephali & Pati, Swayamprabha & Shahi, Sanyogita. (2023). Medicinal Value Of Chiraita: A Review. 158-162.
42. Tabassum, Sobia & Mahmood, Sidra & Hanif, J. & Hina, M. & Uzair, Bushra. (2012). An overview of medicinal importance of *swertia chirayita*. *Int J Appl Sci Technol*. 2. 298-304.
43. Tabassum, Sobia & Mahmood, Sidra & Hanif, J. & Hina, M. & Uzair, Bushra. (2012). An overview of medicinal importance of *swertia chirayita*. *Int J Appl Sci Technol*. 2. 298-304.

44. Banerjee, S. & Sur, Tapas & Mandal, SS & Das, P.C. & Sikdar, S.. (2000). Assessment of the anti-inflammatory effect of *Swertia chirata* in acute and chronic experimental models in male albino rats. *Indian Journal of Pharmacology*. 32. 21-24.
45. Das, Sreedam & Bhadra, Subrata & Roy, Sumon & Saha, Sajal & Islam, Md & Bachar, Sitesh. (2012). Analgesic and Anti-inflammatory Activities of Ethanolic Root Extract of *Swertia chirata* (Gentianaceae). *Jordan Journal of Biological Sciences*. 5. 31-36.
46. Ranajit Kumar Khalua, Rita Mondal, Souvik Tewari(2019).Comparative evaluation of anti- inflammatory activities of three Indian medicinal plants (*Alstonia scholaris* Linn, *Swertia chirata*, *Swietenia macrophylla* Linn.). *Pharma Innovation*;8(8):396-400.
47. Lad, H., Bhatnagar, D.(2016). Amelioration of oxidative and inflammatory changes by *Swertia chirayita* leaves in experimental arthritis. *Inflammopharmacol* 24, 363-375.
48. Das, Sreedam & Bhadra, Subrata & Roy, Sumon & Saha, Sajal & Islam, Md & Bachar, Sitesh. (2012). Analgesic and Anti-inflammatory Activities of Ethanolic Root Extract of *Swertia chirata* (Gentianaceae). *Jordan Journal of Biological Sciences*. 5. 31-36.
49. Alam KD, Ali MS, Mahjabeen S, Parvin S, Akbar MA, Ahamed R.(2010). Report: analgesic activities of ethanol extract of leaf, stem and their different fractions of *Swertia chirata*. *Pak J Pharm Sci.*;(4):455-7. PMID: 20884462.
50. Chen Y, Huang B, He J, Han L, Zhan Y, Wang Y(2011). In vitro and in vivo antioxidant effects of the ethanolic extract of *Swertia chirayita*. *J Ethnopharmacol.*;136(2):309-15.
51. Ahirwal, Laxmi & Singh, Siddhartha & Dubey, Manish & Bharti, Vandana & Mehta, Archana. (2014). Investigation of Antioxidant Potential of Methanolic Extract of *Swertia chirata* Buch. Ham. *European Journal of Medicinal Plants*. 4. 1345-1355.
52. Lad, H., Bhatnagar, D.(2016).Amelioration of oxidative and inflammatory changes by *Swertia chirayita* leaves in experimental arthritis. *Inflammopharmacol* 24, 363-375.
53. Kirtikar and Basu (2012).*Indian Medicinal Plants with Illustrations*, Volume7. Pg2297.
54. Kalpana Patil, Swati Dhande, Vilasrao Kadam.(2013).Therapeutic *Swertia chirata* - An Overview. *Research J. Pharmacognosy and Phytochemistry*; 5(4):199-207.
55. Kalpana Patil, Swati Dhande, Vilasrao Kadam.(2013).Therapeutic *Swertia chirata* - An Overview. *Research J. Pharmacognosy and Phytochemistry*; 5(4):199-207.

56. Mr. Shailesh. L Patwekar, Suryawanshi Arvind B, Gaikwad Manoj S, Pedewad Snehal R, Potulwar Ashwini P.(2015).Standardization of herbal drugs: An overview The Pharma Innovation Journal; 4(9): 100-104.
57. Jeganathan NS, Kannan K, Manavalan R, Vasanthi HR (2008).Standardization of a Siddha formulation Amukkara curanam by HPTLC. Afr J Tradit Complement Altern Med.;5(2):131-40.
58. Rajesh CS, Holla R, Patil V, Anand AS, Prasad HLK.(2017).Anti-hyperglycemic effect of Swertia chirata root extract on indinavir treated rats. Natl J Physiol Pharm Pharmacol;7(6):569-573.
59. Paranjpe Prakash.(2001).Indian Medicinal Plants Forgotten Healers (A guide to ayurvedic herbal medicine).Kiratatikta;Pg137-138.
60. Paranjpe Prakash.(2001). Indian Medicinal Plants Forgotten Healers (A guide to ayurvedic herbal medicine). Kiratatikta;Pg137-138.
61. Sharma Monika, Sahu Subhash (2020). Gallery of Medicinal plants (Dravyaguna Vigyan).Kiratatikta;pg342-347.
62. Kirtikar and Basu (2012).Indian Medicinal Plants with Illustrations,Volume7. Pg2297.
63. Misra Brahma Sankra.(2010).Vidyotini Hindi Commentary on Bhavprakasa nighantu purvakhand, Haritakyadi varga;74-75.
64. Misra Brahma Sankra.(2010).Vidyotini Hindi Commentary on Bhavprakasa nighantu purvakhand, Haritakyadi varga; 75.