REVIEW ON SWERTIA CHIRATA AS TRADITIONAL USES TO ITS PHYTOCHEMISTRY AND PHARMACOLOGICAL ACTIVITY

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ABSTRACT

Swertia chirata (Gentianaceae), is a popular medicinal plant native to temperate Himalaya. The plant of Swertia chirata is found at an altitude of 1200-1300m, from Bhutan to Kashmir and in the Khasi hills at 1200-1500m. It also can be grown in sub-tropical territories between 1500-2100m altitudes. Chirata has an erect and about 2-3 ft long stem. Herbal medicinal plants are necessary for about for about 80% of the world population in developed and developing countries for their basic and primary health care required owing to better tolerability, superior empathy with human body and having lesser side effects. Herbal plants are considered as rich source of phytochemical ingredients. The main chemical ingredients are Swertiamarin, Amarogentin, Swechirin, Mangiferin, Sweroside, Gentianine, Amaroswerin, Oleanolic acid, Swertanone, Ursolic acid. Phytochemical analysis divulges alkaloids, flavonoids, steroids, glycosides, triterpenoids, saponins, xanthones and ascorbic acid in all samples. Nepali S. chirata was found to have finest TLC (thin layer chromatography). People have been using traditional medicinal plants for thousand years ago. Traditional plants play a very important role in preventing and treating of human diseases. Medicinal usage of Swertia chirata is reported in Indian pharmaceutical codex, the American and the British pharmacopoeias and in the different traditional systems of medicine (Unani, Ayurveda and Siddha). Swertia chirata is commonly known as a bitter tonic in traditional system of medicine for the treatment of fever, loss of appetite, digestive disorders, diabetes, skin and various other diseases.

Keywords: Swertia chirata, swerchirin, Anti-inflammatory, Oleanolic acid, Traditional medicine.

INTRODUCTION

Since centuries, traditional medicinal plants have been used all over the world and they play an important role in preventing and treating of various diseases. Medicinal herbs have been popular in developing and developed countries due to its safety, efficacy, easily availability and lesser side effects. A lot of herbal plants have been used in traditional medicine as hepatoprotective one of them is Swertia chirata. It is an ancient herb was introduced to Europe in 1839. Sometimes it is also known as the Nepali Neem because of annual/biennial herb in the forests of Nepal. This annual herb or shrub develop in the sub-tropical region of Himalayas mostly between an altitude of 1200 to 1500 meters and grows up to the height of 1.5 meters from Bhutan to Kashmir. Swertia, a genus in family Gentianaceae was first describe by Roxburgh under the name of Gentiana chryayta in 1814. It includes a vast group of annual and perennial herbs representing about 135 species. Common ingredients of swertia species are in a number of herbal remedies. In India, 40 species of Swertia chirata are recorded. Swertia chirata has been reported as most important medicinal properties such as anti-inflammatory, hypoglycaemic, hepatoprotective, antibacterial, wound healing.
antispasmodic, antioxidant, anti-diabetic, antipyretic as well as antitussive activities. Moreover the different medicinal compounds were isolated from natural herbs effecting as anticancer, antitumor and anti AIDS etc. According to WHO 80% of world population depend on medicinal plants in developing and developed countries for their basic and primary health care needs. WHO estimate that around 170 million peoples are infected with hepatitis C solitary and 3-4 millions are newly added into the list every year. In addition, more than two billion infected by hepatitis B virus and over five million are getting infected with acute hepatitis B virus yearly. Swertia chirata is known for the bitter taste and has tremendous uses in traditional medicines. It is used as anti-microbial against gram negative and gram positive bacteria. In Unani literature all parts of the plant are used as astringent, heart tonic, liver tonic, cough, scanty-urine, melancholia, dropsy, sciatica and skin diseases. The plant is also used as a bitter tonic in gastrointestinal disorders, like dyspepsia/anorexia, it is reported that it acts as digestive, laxative and to prevent malaria, particularly useful in fever. The plant is also effective against intestinal worms, burning of the body, bronchial asthma, regulating the bowel.

VERNACULAR NAMES

English: Chirata (Indian Gentian)
Hindi: Charayatah
Urdu: Chiarayata,
Sanskrit: Anaryatikta, Bhunimba, Chiratika, Arhatika, varantaka,
Arabic: Qasabuzzarirah
Persian: Nenilawandi, Qasabuzzarirah
Panjabi: Charaita
Bengali: Chireta
Burma: Sekhagi
Marathi: Chirayita
Tamil: Nilavembu, Shirattakuchi
Telugu: Nilavembu
Kannada: Nilavebu
Malayalam: Nilaveppa
Gujarati: Chirayata
Nepal: Cherata
Deccan: Charayatah

TAXONOMICAL CLASSIFICATION

Kingdom: Plantae
Phylum: Tracheophyta
Class: Magnoliopsida
Order: Gentianales
Family: Gentianaceae
Genus: Swertia
Species: Chirata
Binomial name: Swertia chirata

PERIOD OF OCCURRENCE

The plant is quickly spreads from seed which is shed during October and November. Herbs can be cultivated in suitable localities in the temperate Himalayas. Seeds are very small in size, should be sown in nursery and seedlings transplanted later in the field.
DISTRIBUTION

It is indigenous to the mountainous districts of northern India, Temperate Himalayas at altitudes between 1,200-3,000 m from Kashmir to Bhutan and in Khasi hills in Meghalaya at 1200-1500 m\(^{19,21}\). It occurs as entire plants or as a broken piece of plant. The stem is smooth with thin readily separable bark, up to 1 m in length, externally it is yellowish or purplish brown in colour. It is cylindrical in basal region, quadrangular with ascending branches, wood of stem is porous and yellow, enclosing in the intermodal regions. Large yellowish easily separable pith is found in this plant with simple root, conical with few slender rootlets. The leaves are opposite sessile, entire ovate lanceolate; 5-7 nerved with rounded base, acuminate apex and entire margin panicles; calyx and corolla each 4-lobed, stamens 4, perigynous; ovary unilocular with two parietal placentae; style slender with recurved stigmas, fruit an ovoid yellowish brown unilocular many seeded capsule, odor is indistinct and taste is very bitter\(^{20}\).

ETHANOBOTANICAL DESCRIPTION

Macroscopic:

All parts of the *chirata* plant are useful for therapeutic purposes. It has a particular type of bright yellowish colour all over the herb in fresh sample. The surface of stem is smooth and without hairs or projections, and can be up to 1 m in length and 6 mm in diameter and yellowish-brown to purplish in colour. The upper part of stem is slightly quadrilateral and its lower part is cylindrical; large, continuous and readily detachable yellow pith. The leaves of the plant are cauline, opposite, broad at base, smoothed surface, of a narrow oval shape tapering to a point at each end, acuminate, generally with 5-7 easily recognizable lateral veins. The flowers are tetramerous and the shapes are oval, 2-3 mm wide, with two glandular depressions near the base of each of corolla lobes. The ovary is oval shaped and pointed, having two carpels, characterized by only one loculus; fruit a capsule with several tiny reticulated seed around 0.25 mm in length and 0.16 mm to 0.45 mm in breadth with irregular oval shape\(^{21,24}\).

Microscopic:

The inner tissue (parenchyma) of leaves contain many chloroplasts, and it shows very little differentiation of the mesophyll tissue. The epidermis is single layered and covered outwardly with a thick-lined cuticle which is more distinctly developed on the upper surface than on the lower one. By looking through naked eye it shows the upper epidermis cells have straight walls and are larger than the lower epidermis cells which show sinus outline. Stomata are of cruciferous type and found only on the lower surface. If we transect the stem it illustrates single layered epidermis, externally covered with a thick-lined cuticle present in the stem in its early age, and in older epidermis it remains intact but cells become flattened and tangentially elongated, four ribs also consists of an epidermis and parenchymatous cortical cells; endodermis distinct, showing anticlinal or periclinal walls. Very small needle-shaped crystals are also present in large quantity; cells are cortical, and in some cortical cells resin along with small drops of oil are present as dark brown mass. Roots if transected show 2-4 layers of cork; secondary cortex represented by 4-12 layers of parenchymatous cells which are thick-walled. Few of them showing radial wall formation, tangentially elongated with sinuous walls. The secondary phloem constituted of companion cells, thin-walled strands of sieve tubes and phloem parenchyma; secondary xylem composed of tracheids cells, vessels and xylem fibres\(^{21,24}\).
Distribution of *Swertia chirata*. The shaded area represents the natural habitat of *Swertia chirata* in the Himalayan Region.  

**SUSTITUTE**  
- *Swertia purpurascens* Wall.  
- *S. chinensis* Franchet.  
- *S. paniculata* Wall.  
- *S. lawii* Burkill.  
- *S. decussata* Nimmo.  
- *S. affinis* C. B. Clarke.  
- *S. perennis* Linn.  
- *Exacum bicolor* Roxb.  
- *Erythraea roxburghii* G. Don.  
- *Exacum tetragonum* Roxb.  
- *Enicostemma littorale* Blume.  
All are belong to Gentianaceae family.

**PART USED**  
The whole plant is used medicinally.  

**MIJAZ (TEMPERAMENT)**  
Hot 2⁰ Dry 2⁰  

**AFA’AL (ACTIONS)**  
- Huma-e-Muzmina (Chronic fever) 21,24,26,27,56  
- Musaffi-e-Dam (Blood purifier) 20,21,56  
- Qatil-e-Deedan-e-Ama (Anthelmintic) 24,27,56  
- Dafa-e-Humma (Antipyretic) 23,24,26,27  
- Mulayyan (Laxative) 22,24,27  
- Mufriz-i-Laban (Galaqtogogue) 24  
- Muqawwi-e-Jigar (Liver tonic) 23,27,56  
- Muqawwi-e-Qalb (Heart tonic) 23  
- Zujam (Leukodermia) 27  
- Muqawwi-e-Basar (Eye Tonic) 23  

**ISTEMALAT (THERAPEUTIC USES)**  
- Ilthab (Inflammations) 20,22,24,27,28,29,56  
- Quroooh (Ulcers) 24,27,56  
- Amraz-e-Jild (Skin diseases) 24,28,56  
- Zeenunnafas (Asthma) 24,27,56  
- Sailan-ur-Reham (Leucorrhoea) 24,27  
- Sual-e-had (Bronchitis) 24  
- Bawaseer (Piles) 24  
- Salsul Baul (Incontinence of Urine) 24  
- Istisqa (Ascitis) 24  
- Iq-un-Nisa (Sciatica) 24  
- It cures Safrawiyat (Biliousness) 24 and  
- Qai- Hamal (Vomiting in Pregnancy) 24.

**MUSLEH (CORROCTIVES)**  
Asl-us-soos (*Glycyrrhiza glabra*), Anisoon (*Pimpinella anisum*) 24, 30

**BADAL(SUBSTITUTE)**  
Masoor 31,32, Murr 33

**MIQDAR-E-KHURAK (DOSEAGE)**  
5-7g 24,30  
2-3g 32

**IMPORTANT FORMULATIONS**  
- Arq-e-murakkab Musaff-e-Khn 24,30  
- Majoone-e-Juzam 24  
- Roghan-e-Kalan 24

**PHYTOCHEMISTRY**  
- It contains chiratin and ophelic acid. Both constituents are amorphous or crystalline substances. And some other important constituents such as Xanthones, Xanthone glycoside and a flavonoid mangifiner also found. Other constituents are calcium, magnesium, iron, potassium and sodium.

**PHARMACOLOGICAL STUDIES**  
- Antibacterial Activity 3,9,21,27,39,47,56,57  
- Antifungal Activity 5,9,56,57  
- Antiviral Activity 3,40,56,57  
- Antioxidant Activity 3,12,21,22,27,34,37,38,45,56,57  
- Anti inflammatory Activity 3,9,21,27,50,56,57  
- Hypoglycemic Activity 3,9,18,27,35,36,51,56  
- Anti-diabetic Activity 3,12,18,39,41,42,43,44,51,57  
- Anti-malarial Activity 21,27,42,52,57  
- Hepatoprotective Activity 7,9,15,18,27,35,39,42,51,52,53,55  
- Anti-leishmanial Activity 12,39,41,43,51,57  
- Anti-carcinogenic Activity 12,18,27,35,39,40,41,42,43,51,56,57  
- Anthelmintic Activity 12,27,39,41,43,46,57  
- Anti-pyretic Activity 49,52,57  
- Antidiarrhoeal Activity 54  
- Anti HIV 3  
- CNS depressant Activity 27,57  
- Mutagenicity Activity 27  
- Anti leprosy Activity 27  
- Anti cholineric Activity 27  
- Anti-hepatitis B Virus Activity 3,56,57  
- Dyslipidemia 57  
- Gastroprotective Activity 12,39,41,42,43,51  
- Wound Healing Activity 9,42

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**Relation between important isolated chemical compounds of *Swertia chirata* and its biological activity**

<table>
<thead>
<tr>
<th>Chemical Constituent</th>
<th>Biological activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amaroswerin 3,25,56,57</td>
<td>Gastroprotective.</td>
</tr>
<tr>
<td>Swerchirin 3,25,56,57</td>
<td>Hepatoprotective, Hypoglycemic, Pro-hematopoietic, Chemo preventive, Blood</td>
</tr>
<tr>
<td>Component</td>
<td>Activity</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Ursolic acid</td>
<td>Antitumor, Antimicrobial</td>
</tr>
<tr>
<td>Sweroside</td>
<td>Hepatoprotective, Antibacterial, Hyper pigmentation, Osteoporosis, Anthelmintic</td>
</tr>
<tr>
<td>Swertanone</td>
<td>Anti-inflammatory</td>
</tr>
<tr>
<td>Gentianine</td>
<td>Antimalarial, Anti-hepatitis B virus, Antipsychotic</td>
</tr>
<tr>
<td>Bellidifolin</td>
<td>Hypoglycemic</td>
</tr>
<tr>
<td>Oleanolic acid</td>
<td>Antimicrobial, Antitumor, Anti-inflammatory, Antioxidant activity</td>
</tr>
<tr>
<td>Syringaresinol</td>
<td>Hepatoprotective</td>
</tr>
<tr>
<td>Isobellidifolin</td>
<td>Hypoglycemic</td>
</tr>
<tr>
<td>1-Hydroxy-3,7,8-Trimethoxyxanthone</td>
<td>Antiulcerogenic, Spasmogenic agent</td>
</tr>
<tr>
<td>1-Hydroxy-3,5,8-Trimethoxyxanthone</td>
<td>Antimalarial</td>
</tr>
<tr>
<td>1,5,8-trihydroxy-3-Methoxyxanthone</td>
<td>Blood sugar lowering.</td>
</tr>
<tr>
<td>Alkaloids</td>
<td>Antipyreic</td>
</tr>
<tr>
<td>Chiratol</td>
<td>Anti-inflammatory</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>Antipyreic</td>
</tr>
<tr>
<td>β-Amyrin</td>
<td>Anti-inflammatory, Antimicrobial, Antifungal</td>
</tr>
<tr>
<td>Xanthones</td>
<td>Anti-inflammatory, CNS depressant</td>
</tr>
</tbody>
</table>

CONCLUSION

Swertia chirayita is a medicinal plant belonging to the family Gentianaceae. In India, it is also known as Chirayata. The traditional plant is used as a tonic in the Unani system of medicine to cure various types of fever. Further research can be done to know the mode of action and efficacy of this plant in various type of fever. More activities have been proven scientifically and some are yet to be evaluated.

REFERENCES

56. Kumar V & Van Staden J; A Review of Swertia chirayita (Gentianaceae) as a Traditional Medicinal Plant; PMC; 2015; 6, PMC4709473.