An Overview of Medicinal Importance of SWERTIA *CHIRAYITA*

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Abstract

Herbs orchestrate a resurgence and vegetal awakening is supervened every where in the world. Vegetal commodities currently illustrate assurance as compared to the factitious ones that are contemplate as alarming to humans and environment. Out of 2,50,000 higher plant species on this planet, more than 80,000 types are declared to have in some ways remedial importance and around 5000 species have characteristic analeptic value. Organized storage and commodious plowing of relevant medicinal plant species are thus of ample precedence. An important herb Swertia chirayita, is a medicinal plant aboriginal to clement Himalayas in India, Nepal and Bhutan. Its medicinal usage is declared in American and British pharmacopoeias, Indian Pharmaceutical codex and in different conventional systems of medicines like Ayurvedic, Unani and Sidha. Plants mainly utitize in Ayurveda can contribute organically active compounds and lead structures for the advancement of transformed subordinates with increased activeness and abate virulence. We are well enumerate as the most paramount chirayita producer and vendor based in India. The chief bioactives of Swertia are Xanthones, other active constituents of this genus are the secondary metabolites which played a momentous role in biological activities like being hepatoprotective, digestive, astringent, laxative, anti-inflammatory and anti-malarial. Hence this herb provides potent therapeutic lead compounds, which would be beneficial for mankind.

Key Words: *Swertia Chirayita* , orchestrate, Phyto-constituents, bioactives, momentous .

Overview

Medicinal plants always played a important role in the health development of mankind. In developing countries, 80% of populations are totally dependent on plants for their primary health care. Over 25% of prescribed medicines in industrialised countries derive directly or indirectly from medicinal plants. A multidisciplinary approach combining botanical, ethnobotanical, phytochemical and biological techniques led to Drug discovery from plant (Newman et.al, 2000). Plants provide us new lead molecules for the development of drugs against various pharmacological targets.

Medicines based on plants were dispensed earlier in the form of crude drugs such as tinctures, teas, powders, and other herbal formulations, which now serve as the basis of novel drug discovery. Discovery of drugs from plants has traditionally been time-consuming ,so faster methods for plant collection, bioassay screening, isolation and development of compound must be adopted (Karan et.al, 1996). Chirayita provides us new lead molecules for the development of drugs against various pharmacological targets. Plants included in this family are annual and persistent herbs or shrubs, indigenous to northern moderate stretch of the world (Daniel and Sabnis, 1978).

Swertia Chirayita is also known as Haima, kirata Tikta, Nidrari, Ramasenka, kairata in Sanskrit, in urdu language it is called Chiravata, Chireta in Bengal and in Arabic and Farsi called as Qasabuzzarirah. Chiretta is its market name (Anon, 1978 ; kirtikar and K.R ,1984).

And this herbal drug 'Chiretta' is gathered from dried plants of Swertia species. Although full-length plants of *Swertia* are medicinally important but roots are manifold paramount (Anonymous, 1976). Chiretta is available in Indian medical conformity as therapy for different kinds of disorders like diarrhea, never ending fever, anemia, liver function disorders and bronchial asthma. *Swertia chirayita* (Roxb. ex Fleming) H. Karst. is primitive to moderate Himalaya observed at an eminence of 1200–3000 m (4000 to 10,000 ft), from Kashmir to Bhutan, and in the Khasi hills at 1200–1500 m (4000 to 5000 ft)) (kirtikar and K.R ,1984;Clarke and C.B, 1885). *Swertia chirayita* has also been remarked in the biography as *Swertia chirata*, Buch-ham; *Ophelia chirata* Grisebach; *Agathotes chirayita* Don ; *Gentiana chirayita* Roxburge (Anon,1978; Kirtikar et.al,1984 ; Duke and J.A,2002; Clarke et.al 1885;Anonymous, 1976). It is distinguished by a parade of names, recommending its extensive applicability. As pinpointed by National Medicinal Plant Board, Government of India, *chirayita* is in the midst of the 32 awful pre eminenced medicinal herbs in the affluent biodiversity of Uttarakhand (India).

It is ingathered for drug industry (Bentley and Trimen, 1880). It is called as elixir and immersion in American and British pharmacopoeias (Joshi and Dhawan, 2005). *Chirayita* has an organized vend both domestic in India as well as globally and it is increasing at an estimate of 10% every year. Nepal is affluent in breed variance of *Swertia* , by virtue of enormous assortment of geomorphological aspect and plenty of contrasting environs. *Chirayita* is named in Nepal as tite, chiraito and pothi chiraito and 45% of total *chirayita* in the region of Himalaya gathered from Nepal. Currently in Nepal,more steps have been taken to ethnological studies of the species on the basis of molecular differences.

Important pharmacological effects

S. chtrayita is used as antipyretic, anthelminitic, antiperiodic, cathartic and in asthma and leucorrhoea in Ayurveda and as harsh, analeptic, stomachic, mitigate inflammation, relaxing to pregnant uterus and never ending fevers (Kirtikar and Basu, 1984). 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 (Garg 1965 and Sharma 1986). Pharmacological studies on medicinal species belonging to family Gentianaceae were consummate earlier, 1930. Comprehensive work was done on an isoprene alkaloid called Gentianine, enunciate to have divergent pharmacological effects categorizing from anti-inflammatory to diuretic.

Investigated for Drug reinforcement

Important phytochemicals like Amarogentin and Swerchirin have been investigated for drug reinforcement (Brahamchari et al., 2004).

Medicinal and pharmaceutical importance

Swertia Chirayita is known for its medicinal and pharmaceutical importance. It is a filthy provenance of alkaloids and flavanoids, most of them having ample scale exercise. Their roots have considerable antipyretic and analgesic effects and a high rise therapeutic clue. It is having a large number of chemical constituents estimating more than twenty polyhydroxylated xanthones and some of these are swertinin, swerchirin, mangiferin, decussatin and isobellidifolin; a dimeric xanthone and chiratanin has also been segregated (Bhattacharya et al., 1976). Important photochemicals like Amarogentin and Swerchirin have been investigated for drug reinforcement (Brahamchari et al,. 2004). Chirayita has an authorized sedentary (India) and global market developing progressively 10% annually.

Chemical compounds residing in chirayita

Amarogentin (chirantin)

It is secoiridoid glycoside, and is the most acerbic substance found. It tastes bitter even at a dilution of 1:58,000,000 and can be procured from, *Swertia chirayita*(Roxb ex. Flem) Karst (Arino et al., 1997). It acquires Topoisomerase inhibition (Ray et al., 1996), chemo-preventive (Saha and Dass, 2005) and antileishmanial effects (Ray et al., 1996; Medda .et al., 1999).

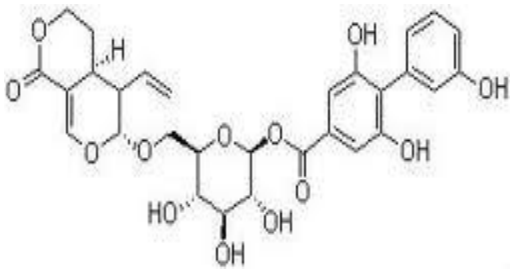

Fig. 1 : A biphenylcarboxylic acid moiety; biosynthesized by a polyketide-type pathway, with three units of acetyl-CoA and one unit of 3-hydroxybenzoyl- CoA (figure1; chemicalbook.com)

Amaroswerin

It is a Secoiridoid glycoside collected from *Swertia chirayita* and found to be gastro-shielding (Niiho et al., 2005).

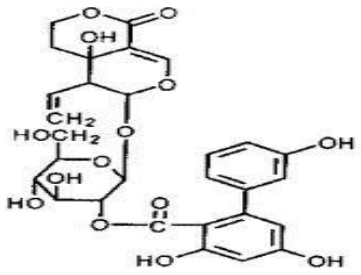

Fig. 2: An iridoidal glycoside having molecular formula $C_{29}H_{30}O_{14}$ (Figure 2 ; Plant -expert.com)

Gentianine

A sullen, translucent monoterpene alkaloid, obtained from several plant species of family Gentianaceae including *Swertia chirayita* (Purushothaman et al., 1973). It possesses anti-inflammatory, anesthetic antihistaminic ,anticonvulsant properties (Song et al., 1958; Tao et al., 1959; Kwak et al., 2005). And also having hypotensive, antipsychotic (Bhattacharya SK et al., 1974) lenitive, diuretic (Mansoor and Malghani, 2005) antimalarial ,antiamoebic and antibacterial properties(Natarajan et al., 1974). It is essential bioactive metabolites of gentiopicroside in rats. Virulency of gentianine is acheived. LD 50 for gentianine: LD50 (mice): 480mg/kg (oral); 300mg/kg (belly injection); 250-300mg/kg (IV injection) (Yang and Song , 2000).

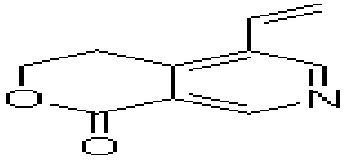

Figure 3. A pyridine alkaloid having molecular formula $C_{10}H_9NO_2$

Swerchirin

A medicinally foremost xanthone, obtained from several plants of family Gentianaceae including *Swertia chirayita;* having antimalarial, hypoglycemic (Arino A et al., 1997; Bajjpai et al., 1991;Saxena et al.,1996), hepatoprotective, pro-heamatopoitic (Ya et al., 1999) and weak chemo preventive pharmacological effects (Hirkawa et al., 1987).

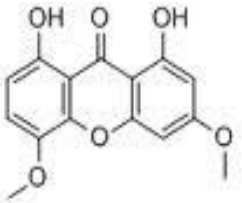

Figure4. Methylbellidifolin; 1,8- Dihyroxy- 3,5-dimethoxy-9H-xanthen-9one

Swertiamarin

A Secoiridoid glycoside obtained from *Swertia chirayita* (Roxb ex. Flem) Karst; having analgesic property (Lei *et al*., 1982).

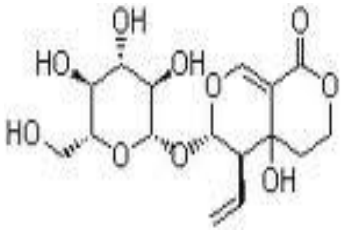

Figure 5. Swertiamaroside having molecular formula $C_{16}H_{22}O_{10}$

Xanthones

Over all Xanthones are important bioactive constituent present in the drug which shows CNS down regulation in mice and rats (Bhattacharya et al, 1976)

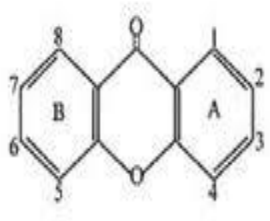

Figure 6. An organic compound having molecular formula $C_{13}H_8O_2$

Mangiferin

This compound, which is isolated from chirayita species possesses strong anti- inflammatory activity in arthritic mice, and accounted for lowering down TNF-alpha, IL-1beta, IL-6, and IFN-gamma and up regulation of IL-10 in the joint homogenates of mice (Anonymous, 2004; Kumar and Paul, 2003). It is also found to be a strong chemoprotective agent (Yoshimi et al , 2001)

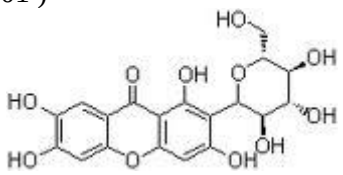

Figure 7. A natural phenol having molecular formula $C_{19}H_{18}O_{11}$

Lignan

A lignan (syringaresinol ; a negligible fraction of herb) which is hepatoprotective in nature, and the ubiquitous ß-sitosterol are also present (Chatterjee and Pakrashi , (eds.) 1995 ; Rastogi and Mehrotra 1991; Rastogi and Mehrotra 1993; Rastogi and Mehrotra 1995; Rastogi and Mehrotra 1998).

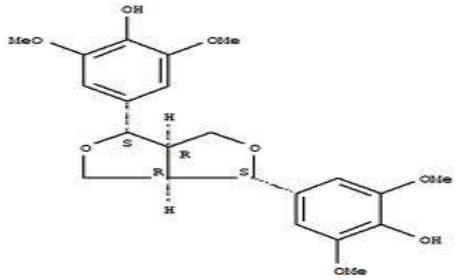

Figure 8. Linioresinol B having molecular formula C22H26O8

Triterpenoids

Chirayita also mcontains triterpenoids namely; swertanone , swertenol , episwertinol, gammacer-16-en-3ß-ol, 21-a-H-hop-22(29)- en-3ß-ol, taraxerol, oleanolic acid, ursolic acid, swerta-7, 9(11)-dien-3ß-ol, pichierenol. Among them swertanone has got the anti-inflammatory property. Taraxerol and oleanolic acid are found to be analgesic and emollient respectively. Ursolic acid has anti-inflammatory, chemoprotective and anti microbial activities. (Chatterje and Pakrashi 1995; Rastogi and Mehrotra 1991; Rastogi and Mehrotra 1993; Rastogi and Mehrotra 1995;Rastogi and Mehrotra 1998)

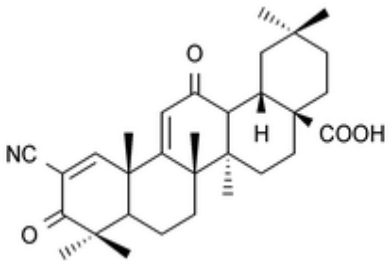

Figure 9. Isoprenoids having chemical structure 2-cyadioxooleana-1,9-dien-28- oate,CDDO,

Pentacyclic triterpenoids

A class of pentacyclic triterpenoids also belongs to this herb including ß-amyrin, friedlin, chiratenol, kairatenol,oleanolic acid, ursolic acid. Among them kairatenol is found to be hypoglycemic in nature. (Chatterjee and Pakrashi 1995; Rastogi and Mehrotra 1991; Rastogi and Mehrotra 1993; Rastogi and Mehrotra 1995; Rastogi and Mehrotra 1998) .

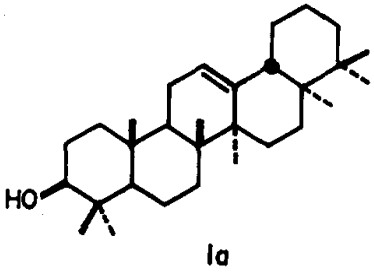

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Figure10. Kairatenol (3S,4S,5R,6R)-1,3,4,5,6,7- hexahydroxyheptan-2-On

Table 1; list of important bioactive constituents isolated from *Swertia chirayita;*

Active constituents	**Biological activities**	**References**
Amarogentin (chirantin)	Topoisomerase inhibition , chemo-preventive and antileishmanial effects .	[Ray et al., 1996), [Saha and Dass, 2005), [Ray et al., 1996; Medda et al., 1999].
Amaroswerin	Gastro-shielding [Niiho Y et al., 2005].	[Niiho et al., 2005].
Gentianine	Anti-inflammatory, anesthetic, antihistaminic , anticonvulsant properties, hypotensive , antipsychotic, lenitive, diuretic , antimalarial ,antiamoebic and antibacterial properties.	(Song Zhen Yu et al., 1958; Geng Tao et al., 1959; Kwak et al., 2005). (Bhattacharya et al., 1974), (Mansoor and Malghani MAK, 2005) , (Natarajan et al., 1974).
Swerchirin	Antimalarial, hypoglycemic, hepatoprotective, pro-heamatopoitic , and weak chemo preventive pharmacological effects .	(Arino et al., 1997), (Bajjpai et al., 1991), (Saxena et al., 1996), (Ya et al., 1999) (Hirkawa et al., 1987).
Swertiamarin	Analgesic property	(Lei *et al*., 1982).

Monetary products

Some of the Herbaceous medicaments like Ayush-64, Diabecon , Mensturyl syrup and Melicon V ointment restrain chirayita essence in variable expanse for its antipyretic, hypoglycemic, antifungal and antibacterial effects (Edwin and Chungath , 1988; Valecha et al., 2000; Mitra et al., 1996).

General caliber of *Swertia chirayita*

Pharmaceutical value of chirayita is increasing day by day. On the other hand its counter claim in pharmaceutical industry is increasing in the same speed. There are various factors like less activity and growing percentage of seeds and gentle field handling of plantlets which distress the advancement of agricultural technologies. Due to these problems, crude material for industrial use is being persistently gathered naturally.

Role of biotechnology in conservancy

Biotechnology can play an indispensable role in conservation of *chirayita* species. It can engross different modes of conservation. Farming of *chirayita* at low heights is prohibited because of several environmental factors like fertility and textures of soil, pH, humidity etc .Tissue culture technique has found to be very useful for conservancy of intimidate *Swertia chirayita* as little plant material can produce a big number of disease free propagules which can be revive in their innate environment. Systematized cultivation of the plant is important to guarantee continuous supplementation and affirmation of drug. Exercise in quality control of raw material of chiratiya is labeling of DNA markers that associate DNA finger printing data with quantitiy of selected markers. (Joshi and Chavan P, 2004). Research is still going on molecular investigation of chirayita for protection of this wild endangered specie, establishing methods for breeding in-vitro and making efforts for assuring continuous supply of its raw material.

Conclusion

Farming of this very essential and endangered medicinal species should be promoted, if we consider its high demand and importance from medicinal and pharmaceutical aspects. Standardized steps for lab growth of *chirayita* should be followed to get maximum yield and extraction of active constituents , this will directly increase foreign exchange , because herb has great demand internationally as well due to its broad-range medicinal effects. Bioactive constituents extracted from *Chirayita* have got a number of beneficial medicinal effects for different kinds of ailments, with no side effects and also they are very cost effective as compared to allopathic medicines.

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