International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue 13
October 2017

A Review on Botanical aspect and Therapeutic Potential of Swertia Chirata

Reesha Ahmed*, Naeem Ahmad Khan**, Mohd. Waseem*
P.G Scholar, Department of Ilmul Advia, A.K.T.C, A.M.U, Aligarh
Professor, Department of Ilmul Advia, A.K.T.C, A.M.U, Aligarh.
dr.reeshaahmed17@gmail.com

ABSTRACT

Medicinal plants always played an important role in the health development of mankind. 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. Swertia chirata has been used in traditional and folklore medicine for the treatment of several diseases and disorders. Swertia chirata Buch-Ham (Family-Gentianaceae) is an extremely bitter in taste,erect plant about 2-3 ft long herb found in Meghalaya and Himalayan regions. 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 hepatoprotective, antibacterial, antioxidant, digestive, astringent, laxative, anti-inflammatory and anti-malarial. Thus this review encompasses the available literature on Swertia chirata. It is revealed that the plant has been used ethno-medicinally as an important therapeuticagent for a number of disease ailments and experimental studies carried out on modern scientific parameters reproves the claims of Unani medicine.

Key Words: *Swertia chirata* , Health development , Folklore medicine, Biological Activities

Introduction:

An annual erect herb of the gentian order, height 2 to 4 feet. The drug consists of the entire dried plant, including the branched stems and roots (Dey, 1973). The entire plant is collected when in flower or more commonly when the capsules are fully formed, and tied up with a slip of bamboo into flattish bundles about 3 feet long, each weighing when dry from 1.5 to 2 lbs. The stem is 0.2 to 0.3 inch in thickness, is of an orange-brown, sometimes of a dark-purplish colour; the tapering simple root, often much exceeding the stem in thickness, is 2 to 4 inches long and up to 0.5 inch thick. It is less frequently branched, but always provided with some rootlets. In stronger specimens the root is somewhat oblique or geniculate; perhaps the stem is in this case the product of a second year growth and the plant not strictly annual.

The stem consists in its lower portion of a large woody column, coated with a very thin rind and enclosing a comparatively large pith. The upper parts of the stem and branches contain a broad ring of thick-walled woody parenchyma. The numerous slender axillary and opposite branches are elongated, and thus constitute a dense umbellate panicle.They are smooth and glabrous, of greenish or brownish grey colour (Dymock *et al*., 1891)

The leaves are ovate, acuminate, cordate at the base, entire, sessile, the largest one inch or more in length, 3 to 5 or 7-nerved, the midrib being strongest (Dymock *et al*., 1891). Leaves are opposite in pairs, without stalks, pointed at tips up to 10 cm long (Bhattacharjee 2004).The flowers share the intense bitterness of the whole drugs. Flowers in cymes of a dark-brown colour with no odour. The wood of the stronger stems is devoid of the bitter principles (Dymock *et al*., 1890; Khory and Katrak, 1985). Flowers lurid greenish yellow, tinged with purple, in large panicles; capsules egg-shaped, many-sided, 0.6 mm. in diameter, sharp-pointed; seeds smooth, many-angled (Anonymous 2000; Bhattachajee and De 2005). The yellow corolla is rotate, 4-lobed, with glandular pits above the base; the calyx is one-third the length of the petals, which are about half an inch long. The one-celled bi-valved capsule contains numerous seeds (Dymock *et al*., 1891).

Fruit are bi-carpellary, superior, ovoid and pointed capsules, unicellular with numerous seeds which are about 0.27 to 0.54 mm. long and 0.16 to 0.45 mm. wide, irregularly ovoid and finely reticulate (Wallis 1985). There are several spurious kinds of chirata in the market as well. *S. angustifolia, S. decussata, S.corymbosa* and *S. pulchella* are used in the indigenous medicine in Southern India (Chopra, 2006).

HISTORY:

Kirayat has long been an important article of the Hindu Materia Media. It is mentioned by Susruta and other Sanskrit writers under the name of Kirata-tikta, which means the bitter plant of the Kiratas, an outcaste race of mountaineers in the North of India. It is also called Anarya-tikta, “The bitter plant of the Non-Aryans”. Another Sanskrit name is Bhununba, “ground-nim”. The herb is much esteemed by the Hindu Physicians on account of its tonic, anthelmintic and febrifuge properties, and is prescribed in masked forms of malarial fever in which the chief symptoms are dyspepsia (Dymock *et al*. 1891). It has long been used by the Hindu Physicians but was not introduced into European medicine till about 1830 (Greenish 1999). Mahometan writers upon Indian drugs have identified Chirata with the Kasab-ed-darira of the Arabs, and Calamus aromaticus of *Dioscorides*.

Guibourt was also of the same opinion, but Pee and Royle dissent from it. (Dymock *et al*., 1891).

The plant was first described by Roxburgh under the name of *Gentiana Chirayita* in 1814. Ainslie remarks that it appears to be much used in Bengal; it was probably rather a scarce drug in Southern India in his time, as he says little about it. In England it began to attract attention about the year 1829; and in 1839 was introduced into the Edinburgh Pharmacopoeia. It is now official in the British and Indian Pharmacopoeias, and is generally accepted as a valuable bitter tonic. The Mohammedan physicians also use it extensively (Dymock *et al*., 1891, Dey 1973; Chopra,1958). The true drug is frequently confused in India with the creat, Andrographis paniculata (q.v.) which is sometimes known as Indian Chirata (Dey 1973).

Vernacular Names:

Sanskrit	Karattakat, Sorashya chiraita, Kirata-tikta, Anarya tikta, Bhu-nimba, Kuch-chi, Ardhatikta, Chiratika, Chiratikta, Haima, Jvarantaka, Kairata, Kanditiktaka, Kiranta, Kirataka, Naditikta, Naipala, Nepalanimba, Nidrari, Ramasenaka, Sannipatha, Sutiktaka, Trinanimba,Viktaka, Jwaranthakah.
Bengali	Chireta, Chirata, Kalapnath, Kalamegh,Chirayita, Mahatita.
Bombay	Chiraita, Chirata, Kalapnath, Kalamegh, Kiraita.
English	Chirayit, Bitter stick, Chiretta, Chirata (Indian Gentian)
Gujarati	Kirayat, Chirata, Kalapnath, Kalamegh, Chirayita, Chirayata, Charayatah.
Hindi	Kirayat, Charayatah, Chirata, Kalapnath, Kalamegh, Chirayita, Chiraita.
Malayalam	Nila-veppa, Kiriyattu.
Marathi	Kirait, Chirata, Kalapnath, Kalamegh, Chirayita, Kirayat
Nepal	Cherata.
Tamil	Nila-vembu, Nila-vembu, Shirat, Shirat-kuch-chi, Nila-vembu, Shirattakuchi.
Telugu	Nela-vemu, Nila vembu, Neelavemu, Neelaveru, Nila-vemu.

Urdu	Chiraita, Chiarayata.
Cannada	Nelabevu, Nila bevu.
Arabic	Qasabuzzarirah, Kasab-ud-daura, Qasbul bawa, Kasbuzarira.
Persian	Dowa-i-pechish, Nenilawandi,Qasabuzzarirah, Nainihabandi.
Sindhi	Bhadgand.
Rajasthani	Chirpotan.
Trade Name	Chirayita.
Latin	Chirata, *Swertia chiarat*
Burma	Tou-kha-kyi, Sekhagi
Dutch	Kreat, Charayatah
Patna	Cherayta
Deccan	Charayatah
Dymock *et al*., 1890; Lubhaya, 1977; Dey, 1973; Khory and Katrak, 1985; Nabi, 2007, Chopra, 2006; Anonymous, 2000; Kirtikar and Basu, 1996; Nadkarni, 1954; Anonymous 2002; Sharma, 2003; Anonymous, 1992; Anonymous, 2011; Anonymous,2003; Daljeet, 1973; Hakeem, 2002	

Afa'al *(Pharmacological Action)*

Nafe-Ziabetus (*Antidiabetic*), Musaffi-e-Dam (*Blood purifier*), Dafe-Humma (*Anti-pyretic*), Muhallil-e-Auram (*Anti-inflammatory*), Muddirr-e-Baul (*Diuretic*), Qatil-e-Deedan-e-Ama (*Anthelminthic*), Muqawwi-e-Jigar (*Tonic to liver*) Kasir-e-Riyah (*Carminative*), Mujaffif (*Descicative*), Qabiz (*Astringent*), Muqawwi-e-Meda (*Stomachic*) Antibilious, (*Qate*-e-*Safra*), Mulaiyyin (*Laxative*), Dafe Humma (*Febrifuge*), Mushtahi (*Appetizer*), Muwalliid-e-laban (*Galactagogue*), Mohallil (*Resolvent*), Muqawwi (*Tonic*), Muqawwi-e-Qalb (*Cardiotonic*). (Lubhaya, 1977; Khory and Katrak, 1985; Dey, 1973; Nabi 2007; Chopra, 2006; Bhattacharjee 2004; Kirtikar and Basu, 1996; Nadkarni, 1954; Sharma, 2003; Wallis 1985; Bhattacharjee and De, 2005; Greenish 1999; Ibn Sina,1998; Dey,1980; Anonymous, 2011; Anonymous, 2003; Hakeem, 2002; Riyazuddin,1887; Hasan,1894)

Mehle Islamal *(Medicinal Uses):*

Ishaal (*diarrhoea*), Sau-e-hazm (*Indigestion*), Nafakh-e-shikam (*Flatulence*), Zoaf-e-Ishteha (*Loss of appetite*), Atshak (*Syphillis*), Juzaam (*Leprosy*), Kharish (*Itching*), Mosami Bukhaar (*Seasonal fever*), Taqteer-ul-Baul (*Strangury*),

Amraz-e-Jigar (*Liver disorder*), Niqris (*Gout*), Scrofula (*Kanthmala*), Usrul Baul (*Dysurea*), Warm-e-Reham (*Matritis*), Wajaus-Sadar (*Chest pain*), Istisqa (*Ascites*), Humma-e-Muzmin (*Chronic Fever*), Warm-e-jigar (*Hepetitis*), Malarial Fever (*Humma Ijamia*), Weakness (*Kamzori*), Bars (*Leucoderma*), Iltehab (*Inflamation*), Qurooh (*Ulcers*), Zeeq-un-nafas (*Asthma*), Iltihab-e-Shoeb (*Bronchitis*), Sailan-ur-Reham (*Leucorrhoea*), Bawaseer (*Piles*), Qai-Hamal (*Vomiting in pregnancy*), Waja-ul-Mafasil (*Joints Pain*) , Jarb *(Scabies*) ,Su'aal (*Cough*), Junoon (*Melancholia*), Irqun nisa (*Sciatica*), Amraz-e-Jild (*Skin disease*), Indigestion (*Sue Hazm*), Fasad-e-Dam (*Blood disorder*), Istisqa-e-Zaqi (*Ascitis*), Busoor (*Dane*), Zoaf-e-ishteha (*Loss of appetite*).

(Lubhaya, 1977; Dey, 1973; Khory and Katrak, 1985, Nabi, 2007; Bhattacharjee, 2004; Kirtikar and Basu, 1996; Nadkarni 1954; Sharma, 2003; Bhattacharjee and De, 2005; Ibn Sina, 1998; Dey, 1980; Ibn Sina,1998; Anonymous, 2003; Fazalullah, 1918; Hakeem,1343; Riyazuddin,1887;Hasan, 1894)

Phytochemistry:

Among the bitter principles of the drugs, Ophelic acid, $C^{13}H^{20}O^{10}$, occurs in the largest proportion. Second bitter principle, chiratin, $C^{26}H^{48}O^{15}$ may be removed by means of tannic acid, with which it forms an insoluble compound (Dymock *et al*., 1891). Ophelic-acid, Chirtin, Chiraita, Chiratin glucoside, gum, carbonate, phosphate, magnesium, Lime, resin, carbonate, phosphate of potash, magnesia, Chiratogenin (Lubhaya, 1977; Dey, 1973; Khory and Katrak, 1985; Chopra *el al*., 1958; Nadkarni, 1954; Wallis 1985; Greenish 1999). Organic: Chiraita contains two intensely bitter principles ophelic acid and chiratin, both amorphous or indistinctly crystalline yellow substances. Tannin is absent (Anonymous, 1992). Inorganic: Calcium, magnesium, potassium, Sodium, Iron (Anonymous, 1992).1,3,5,8-Tetrahydoxy xanthone, 1,3,7,8-tetrahydroxy xanthone, 1,3,8-trihydroxy-5-methoxyxanthone, 1,5,8-trihydroxy-3-methoxyxanthone, 1,8-dihydroxy-3,5-dimethoxyxanthone (swerchirin), 1,8-dihydroxy-3,7-dimethoxyxanthone, (7-O-methyl swertianin), 1-hydroxy-3,5,8-trimethoxy xanthone, 1-hydroxy-3,7,8-trimethoxy xanthone, swertianin, sweroside, chiratanin, amarogentin, amaroswerin (Anonymous, 2011).

In general, higher quantities of swertiamarin, a secoirirdoid glycoside ((5R, 6S)-5-ethenyl-4a-hydroxy-6-[(2S, 3R, 4S, 5S, 6R)-3, 4, 5-trihydroxy-6(hydroxymethyl)oxan-2-yl] oxy-3, 4, 5, 6tetrahydropyrano [3,4-c]pyran-1-one) were found in aqueous and ethanolic extracts

of roots than in aqueous and ethanolic extracts of stem.Amarogentin (chirantin), Amaroswerin, Gentianine, Swerchirin, Swertiamarin (Sobia, 2012)

Pharmacological Activities:

Anti-microbial Activities:

(Ahirwal Laxmi *et al*. 2013) carried out antimicrobial screening of methanolic and aqueous extracts of S.chirata against 10 bacterial (*E.coli, S.aureus, B. subtilis, S. typhi, V. cholera, S. pyogens, P. mirabilis, P. alkalifaciens, B. polymyxa, P. aeruginosa*) and 3 fungal starins (*Aspergillus niger, Aspergillus flavus, cladosporium oxysporum*), results were compared with standard antibiotic drugs.

(Kabita Nayak *et al*. 2015) conducted a study to examine the effect of ethanolic and methanolic extract of leaves and stem of *Swertia chirata* against various pathogens (*S. aureus, B. sp, E. coli, K. pneumonia* and *P. aeruginosa*).

A study was done to evaluate the antibacterial property of ethanolic extract of *Swertia chirata*. Crude extraction of whole plant showed significant antimicrobial activities against some Gram-positive and Gram-negative bacteria (Lwin Lwin Nyein *etal*. 2011).

(Naqwi Raza *et al*. 2013) conducted a study in which methanolic and ethanol extract of *Swertia chirata* showed strong antibacterial potential against two bacterial species viz. *streptococcus sp*. and *E. coli*. In another study, screened rectified spirit extract of *Swertia chirata* for its antibacterial activities against 12 pathogenic bacteria, 6 Gram positive and 6 Gram negative. The results obtained were compared with those for a standard antibiotic kanamycin (Sultana Jesmin, *et al*. 2007)

A study was performed, in which aqueous and ethanolic extracts of leaves and sems of Asparagus densiflorus, Erythrina blakei, *Swertia chirata, Tinospora cordifolia and Ziziphus mauritiana* were screened for their antibacterial activity against *Enterobacter aerogenes, Clostridium perfringents* and *Salmonella typhimurium* (Jassal Prabhjot Singh *etal.*2014).

Hepatoprotective Activities

A study was conducted on different solvent fractions of the methanolic extracts of *Swertia chirata* to assess hepato-protective activity by carbon tetrachloride induced liver demage in rats (Mahmood *et al*. 2014). A study on plant extract that has shown a remarkable hepato-protective activity against paracetamol-induced hepatotoxicity as judged from the serum marker enzymes in rats (Cheeella *et al*., 2014).

Antibacterial Activities

A study was done to evaluate the antibacterial activity of the plant *Swertia chirata*. The ethanol and methanol extract of leaves and stem of the plant were used. The test organisms used were two Gram Positive (*Staphylococcus aureus* and *Bacillus sp*.) and three Gram Negative (*Escherichia coli*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*) bacteria. As control, ethanol and methanol were used. It was found that among both the extracts, ethanol extract of both leaves and stem was more effective compared to methanol extract against the test microorganisms (Kabita, *et al*. 2015).

Analgesic and Anti-inflammatory Activities

A study was performed, in which the ethanolic root extract was chosen for pharmacological screening and analgesic and anti-inflammatory activities in animal models. In rat paw oedema model induced by carrageenin, the extract was found to reduce significantly (Das *et al*. 2012). A study was done to evaluated in vitro anti-inflammatory activities using albumin denaturation, they used aspirin as a standard drug for the study of anti-inflammatory activity (Hossain *et al*., 2012).

A study was conducted the anti-inflammatory effect of xanthone derivative (1,5-dihydroxy-3,8-dimethoxy xanthone) of *Swertia chirata* in acute, sub-acute and chronic experimental models in male albino rats. 1,5-dihydroxy-3,8-dimethoxy xanthone of *Swertia chirata* showed significant anti-inflammatory action in acute, sub-acute and chronic experimental models in rats (Shivaji *et al*., 2000).

Anti-diabetic Activities

In an experiment, 95% ethanolic extract and four other fractions of *Swertia chirata*were tested for blood sugar lowering activity in rat, significantly fall in blood sugar without influencing liver glycogen concentration in albino rats (Sekar *et al*. 1987). (Kavitha K.N.*et al*., 2013) conducted a study on aqueous extract of *Swertia chirata*, has exhibited antidiabetic activity in streptozotocin induced diabetes in rats.

Thrombolytic Activity

A study showed that thrombolytic activity using in vitro clot lysis assay method, the crude ethanol extract of *Swertia chirata* in thrombolytic test showed against the standard streptokinase. (Hossain *et al*., 2012).

Anti-cancerous Activities

(Saha *et al*., 2006) reported the anti-carcinogenic activity of *Swertia chirata* Buch, Ham. The effect of *Swertia chirata* on apoptosis and cell proliferation was also studied in mice skin exposed to DMBA. Both the crude and purified extracts significantly inhibited cell proliferation and induced apoptosis.

Anthelminthic Activities

A study was conducted by Iqbal Zafar et al 2006, in vitro and in vivo anti-helminthic activities *Swertia chirata*.

Anti-anaemic activities

In vivo study to find out the antianemic potential of *Swertia chirata* extracts on phenyl hydrazine induced anaemic in rat (Ashish Turaskar *et al.*, 2013).

Anti-pyretic Activities

A study has evaluated the aqueous extract of *Swertia chirata* for its antipyretic potential on Brewer's yeast induced pyrexia in albino rats and Typhoid- Paratyphoid A,B, vaccine induced hyperpyexia in rabbits (Bhargawa Sushil *etal*.2009)

References:

[1] Anonymous, 2000. The Wealth of India- A Dictionary of Indian Raw Materials and Industrial Products. National Institute of Science Communication, Council of Scientific &Industrial Research New Delhi, Vol.I: A-Ci.

[2] Anonymous, 2006. Qarabadeen-e-Sarkari. Centre Council Research in Unani Medicine, New Delhi, Vol.II.

[3] Anonymous ,2007. The Unani Pharmacopoeia of India", CCRUM, New Delhi, part1.Vol. II.

[4] Anonymous ,1992. Standardization of Single Drugs of Unani Medicine", CCRUM, New Delhi, Vol.II.

[5] Anonymous, 2011. Quality Standards of Indian Medicinal Plants. Medicinal Plants Unit, Indian Council of Medical Research, New Delhi, Vol.-IX.

[6] Ahirwal Laxmi, Singh Siddharth and Mehta Archana. 2011. Antimicrobial Screening of Methanol and Aqueous Extracts of Swertia. International Journal of Journal of Pharmacy and Pharmaceutical Sciences. 3(4):142-146.

[7] Ashish Turaskar, Sachin More, Rizwan Sheikh, J.Gadhpayle, Dr. S.L.Bhongad, Vikas Shende. 2013. Antianaemic Potential of *Swertia chirata* on Phenylhydrazine Induced Reticulocytosis in rats. American Journal of Phytomedicine and Clinical Therapeutics.1(1):37-41.

[8] Bhattacharjee S. K. 2004. Handbook of Aromatic Plants", Pointer publishers, Jaipur, India.

[9] Bhattacharjee S. K. and De L. C. 2005. Medicinal Herbs and flowers" AavishkarPublishers, Distributors Jaipur, India.

[10] Chopra R. N., Chopra I. C., Handa K. L. and Kapur L. D. 2006.Indigenous Drugs of India, 3rd Edi., Academic Publishers, Bankim Chatterjee Street Kolkata.

[11] Dey K. L. 1973. The Indigenous Drugs of India. PamaPrimlane, The Chronica Botanica, 2nd Edi. New Delhi.

[12] Dey A. C. 1980. Indian Medicinal Plants: Used in Ayurvedic Preparations, Bishen Singh Mahendra Pal Singh, New Connaught Place.

[13] Dymock W., Warden C. J. H., Hooper D. 1891. Pharmacographia Indica. Kegan Paul, Trench, Trubner and Co. Ltd. London, Vol.II.

[14] FazalullahM.M. 1918. Makhzanul Mufridat maroof ba Jameul Advia" Matba Aam Mufeed Press Lucknow.

[15] Greenish, H.G 1999. Materia Medica, Edn. 3rd, Scientific Publishers (India), Jodhpur.

[16] Hakeem H. A.2002. Bustanul Mufridat Jadeed",Idara Kitabul Shifa, Darya Ganj, New Delhi.

[17] Hasan H.M.A. 1894. Makhzanul Mufridat-wa-khawasul Advia. Abul Alai Steem press, Agra.

[18] HariKumar Cheedella, Ramesh Alluri, G. Krishna Mohan. 2014. Hepato-protective Effect of Ethanolic Extract of *Swertia chirata* on Paracetamol Induced Liver Damage In Albino Rats. World Journal of Pharmacy and Pharmaceutical Sciences. 3(8):612-621.

[19] Ibn Sina .1998. Al-Qanoon Fit-Tibb", (English translation) Jamia Hamdard. New Delhi, India.

[20] IbnHubl .2005. Kitabul Mukhtarat Fit-tib.Urdu Translation CCRUM, New Delhi,Vol.II.

[21] Kabita Nayak, Mendes Sarah Vailanka and E. Sheeba, 2015. Antibacterial Activity of diierent extracts of medicinal plant *Swertia chirata*. International Journal of microbiology and applied science. 4(7): 889-897.

[22] Kavita K.N., Dattatri A.N. 2013. Experimental Evaluation of antidiabetic activity of *Swertia chirata*- Aqueous Extract. J. Pub Health Medical Research. 1(2):71-75.

[23] Kirtikar K .R. & Basu B. D. 1996. Indian Medicinal Plants. 2nd Edi. International Book Distributors, Dehradun. Vol. II.

[24] Khory, H. K. and Katrak N. N. 1985. Materia Medica of India and Therapeutics. 3rd Edi, Neeraj Publishing House Delhi.

[25] Lubhaya H.R. 1977. Goswami Bayanul Advia" Goswami pharmacy, Delhi,Vol.I.

[26] Lwin Lwin Nyein, Isma Syahril B Ismail and Nik Aiman Afiq Bin Nik Ab Rahman. 2013. Antimicrobial Efficacy of Medicinal Plant *Swertia chirata*. The Open Conference Proceeding Journal.

[27] Mohammad Shahadal Hossain, Mohammad Ehsanul Hoque Chowdhury, Sumana Das and Imtaiz Uddin Chowdhury. 2012. In-Vitro Thrombolytic and Anti-inflammatory Activity of *Swertia chirata*

Ethanolic Extract. Journal of Pharmacognosy and Phytochemistry. 1(4):99-104.

[28] Mahmood S, Hussain S, Tabassum S, Malik F, Riaz H. 2014. Omparative phytochemical, hepatoprotective and antioxidant activities of various samples of *Swertia chirata* collected from various cities of Pakistan. Pakistan journal of pharm. Science. 27(6):1975-1983.

[29] Mst. Jesmin Sultana, Md. Tamzid Hossain Molla, M.T. Alam and Fazle Rabbi Shakil Ahmed. 2007. Investigation On Antimicrobial Activities of the Plant *Swertia chirata* Ham. Journal Life Earth Science. 2(2): 31-34.

[30] Nabi M.G. 2007. Makhzanul Mufridat wa Murakkabat Maroofba Khawasul Advia. Part-3. CCRUM, New Delhi.

[31] Nadkarni A.K. 1954. Indian Materia Medica,3rdEdi., Popular Book Depot, Bombay, Dhootapapeshwar Prakashan Ltd. Panvel, Vol.I.

[32] Prabhjot Singh Jassal, Wazbir Hussain Barlaskar, Avneet Kaur, Ankit Bhardwaj, and Loveleen Kaur. 2014. Antibacterial and Phytochemical Analysis of Ethnomedicinal Plants. Research Journal of Pharmaceutical, Biological and Chemical Science. 5(5):1203.

[33] Riyazuddin, S. 1887. Makhzan-ul-Mufridat wa murakkabat mai khwasul Advia, Electric Adulalai press, Agra.

[34] Sharma R. 2003. Medicinal Plants of India- An encyclopaedia. Daya Publishing House, Delhi.

[35] Syed Ali Raza Naqvi, Qurat-Ul-Ain, Zulfiqar Ali Khan, Zaib Hussain, Sohail Anjum Shahzad, Muhammad Yar, Abdul Ghaffar, Nasir Mahmood, Samina Kausar.2013.Antioxidant, Antibacterial and Antiproliferative Activities of Areal Parts of *Swertia chirata*(Bush Ham). Plant Extracts Using In Vitro Models. Journal of chemistry. 25(10): 5448-5452.

[36] Sreedam Chandra Das, Subrata Bhadra, Sumon Roy, Sajal Kumar Saha, Md.Saifful Islam and Sitesh Chandra Bachar. 2012. Analgesic and Anti-inflammatory Activities of Ethanolic Root Extract of *Swertia chirata* (Gentianaceae). Jordan Journal of Biological Sciences. 5(1):31-36.

[37] Saha P, Mandal S, Das A, et al. 2006. Amarogentin can reduce hyperproferation by downmregulation of COX II and upregulation of apoptosis in mouse skin cancinogenesis model, cancerlett.244:252-259.

[38] Sobia Tabassum, Sidra Mahmood, Javeria Hanif, Maryam Hina, Bushra Uzair. 2012. An Overview of Medicinal Importance of *swertia chirayita*. International Journal of

Applied Science and Technology. 2(1):298-304.

[39] Sushil Bhargava, Prakash S.RAO, Paridhi Bhargava, Shivshankar Shukla. 2009. Antipyretic Potential of *Swertia chirata* Buch Ham. Root Extract. Sci Pharm. 77 :617-623.

[40] Sekar BC, Mukherjee B, Chakarvarti RB, et al. Effect of different fractions of *Swertia chirata* on blood sugar level of albino rats. J. ethnopharamacol, 1987: 175-181.

[41] Shivaji Banerjee, Tapas Kumar sur, Suvra Mandal, Prabhash chandra das, sridhar sikdar. 2000. Assessment of the anti-inflammatory effects of *swertia chirata* in acute and chronic experimental models in male albino rats. Indian Journal of Pharmacology .32: 21-24.

[42] Wallis T.E. 1985. Text Book of Pharmacognosy, 5thEdi.,CBS Publishers and Distributors, Shahdara, Delhi.

[43] Zafar Iqbal, Muhammad Lateef, Muhammad Nisar Khan Abdul Jabbar, Muhammad Shoaib Akhtar. 2006. Anthelmintic activity of *Swertia chirata* against gastrointestinal nematodes of sheep, Fitoterapia. 77:463-465.