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Research Article

In-vitro Antimicrobial Potential of Methanolic Extract Along with Phytochemical Investigation of *Swertia chirata*

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Abstract

Swertia chirata is an Ayurvedic therapeutic plant. It is a notable analeptic herbaceous plant belongs to family Gentianaceae. *Swertia* is native to India, it mainly consists of two main principle constituents i.e., ophelic acid which is amorphous bitter principle and other is chiratin which is a glycoside it is mainly responsible for the bitter principle of *Swertia*. *Chirata* is a kind of medicinal plant whose whole plant or aerial part is typically employed to produce medicine. As of now only 135 species of *chirata* had been known. Thus, *Swertia* a traditional herb has immense curative usage, as a consequence it is enormously employed in physic to cure various malady. This research article display information relating *Swertia* geographical distribution, phytochemistry, utility, adverse effects, precautions, conservation methods as well as information regarding *Swertia chirata* as ethnomedicinal herb. In the present research, the *In-vitro* antimicrobial activity of Petroleum ether, Methanol, and aqueous fractions of *Swertia chirata* was carried out using a disc diffusion method. Gram +ve and Gram -ve bacteria and mild to average activity against certain fungi was tested. Acceptable zone of inhibition was recorded (18 mm) against *S. aureus* with the methanolic fractions. The test sample at a 400 µg disc $^{-1}$ concentration were utilize to check the microbial inhibition while Gentamycin at a concentration of 30µg disc $^{-1}$ was used as standard in the research. Amongst different fractions, methanolic fraction showed significant antimicrobial activity against gram +ve, gram -ve and fungi.

Keywords: *Swertia chirata*; Ophelic Acid; Chiratin; *In-vitro*; Antimicrobial; Antibacterial; Antifungal

Introduction

Swertia chirata a well-known medicinal herb native to India, indigenous to temperate Himalaya's region. It is a prehistoric medicinal plant first found in Europe in 18th century. Roxburgh was the first to describe the Swertia under the name of Gentiana chirayta in 1814 [1].

The bitter taste of *Swertia* is due to its various bioactive compound present in it. *chirata* is mostly found in the temperate Himalayas of North India. Occasionally *Swertia* may also referred to as felwort. It is also used to treat numerous ailments such as liver disorder, may also be used as anti -inflammatory, hypoglycemic, Hepatoprotective, anti-bacterial, wound healing and other such disease. This herbal plant is used as general ingredient in various herbal medicine [2]. The plant *Swertia chirata* is having a wide distribution and good pharmacological activities explained a below.

Geographical distribution

Swertia chirata a member of Gentianaceae family grows at an altitude of 1200-2100 meters above mean sea level. It spreads

across Himalayan belt. In Nepal it has been dispersed at an altitude of 1500-3000 meters, mostly South-west facing slopes of mixed broad-leaved forest [3].

Morphological characteristics of *Swertia Chirata*

Swertia Chirata is an erect annual plant [4].

Height	60 - 125 cm
Stem	Branching is Robust, cylindrical below 4 angled upwards containing a large pith
Leaves	usually lanceolate, 5 nerved sub - sessile
Flowers	lurid greenish yellow tinged with purple in large panicles capsules egg-shaped many sided
Seeds	sharp pointed
Diameter of seed	6 mm
Length of seed	1m long

Table 1: Morphological description.

The plant is having pinkish or sometimes whitish colored haired while the fruits are sharp pointed and this herb produces a massive number of globose, brownish and minute-seeds, flowers are hermaphrodite [1,4] taxonomically *Swertia* belongs to a different genus [5]. Generally, c*hirata* is a vertically growing herb with stem which is either orange - brown or purple color. Leaves are soft, oval and stalkless in nature. The flowers of *chirata* are tetramerous, symmetric, axillary, greenish yellow in color with a purple tinge whereas the roots are yellowish fibrous in nature. Flowers bloom after July however fruit begins to mature around October. We can see the harvesting of this herb is done just before their flowering stage. Although seeds are tiny around 300µm in diameter but marked to have broad spectrum of pharmacological properties [6].

Period of occurrence

The plant *Swertia* emerge and proliferate from seeds which are shed during October-November. It is cultivated in some parts of the Himalayan region. Seeds are tiny in size have to be sown in breeding grounds and later the seedlings can be replanted in the field [1]. Leaves are harvested at the stage of bud and flowering stage [7].

Taxonomical classification

Kingdom	**Plantae**
Clade	Tracheophytes
Clade	Angiosperm
Clade	Eudicots
Clade	Asterids
Family	Gentianaceae
Order	Gentianales
Subtribe	Swertiinae
Genus	*Swertia*

Table a

Plant profile: [8]

Family	**Gentianaceae**
Ayurvedic name	Kiratatika
Unani name	Chirata
Hindi name	Chirayata
Trade name	Chirayata

Table b

Interchangeable identity of *Swertia*

Kiratatikta, Kiratikta, Kairat, Ramsenak, Naditikta, Jvarantak, Nidrani, Anaryatikta, Katutikta, Ophelia Chirata, Ardhatikta, Bhunimba, Chiratika, Haima, Kiranta, Kandatikta, Naipala, Nepalanimba, Nidrari, Sannipatha, Sutiktaka, trinanimba, viktaka (Sanskrit), cherata (Bengal), nilaveppa (Kerala), sekhagi [4,6].

English name for Swertia is provided below

Bitter stick, chirette, Chirayta, Indian bolonong, chirette de indes, east Indian balmony, genciana de la India, gentiana chirata, Swertia chirata yin du, gentiana chirayta, Indian gentian, Kairata, kirata [4,6].

Chemical constituents

The xanthones are the secondary metabolites of chiarata, xanthones structure and chromatographic behavior are similar to that of flavonoids. However, flavonoids are habitually bump into nature whereas xanthones establish in restricted number of families. Presence of xanthone can be estimated by HPLC technique [9-11].

Part of plant	Active constituents	Role
Whole plant	Chirat -16- en - 3- β -24-diol, 1, 5, 8, trihydroxy-3-methoxyxanthone -8- O β -D- glucopyranoside 1, 8- dihydroxy 3, 5-dimethoxyxamthone (Swerchirin), βsitosterol, feriedelin, swertinin, Swertinin, Swerchirin, isobellifolin, gentianin, gentiocrucin, enicoflavin, 1, 5, 8, trihydroxy -3-methoxy, 1, 3, 5, 8-tetrahydroxy, 1, 3, 7, 8-tetrahydroxy, 1, 8-dihydroxy-3, 5-dimethoxy, 1, 8-dihydroxy-3, 7-dimethoxy, 1 hydroxy 3, 5, 8 trimethoxyxanthone, 1, hydroxy-8 glucosyloxy-3, 5-dimethoxyxanthone, 1, 7-dihydroxy-3-methoxyxanthone, 1, 8-dihydroxy-3, 5-fimethoxyxanthone, 1hydroxy -3, 7-dimethoxyxanthone, 1, 7, 8, trihydroxy -3-methoxy xanthone, mangiferin, hederagenin, polyoxygenated xanthone and xanthone-O- glycosides, ursolic acid, hydroxytetramethoxyxanthone, Swertiajaposide A, 3-butyl6'O-α-L-arabinopyranosyl-βD-glucopyranoside, 7R, 7'R, 8S, 8'S-(+)-neo-olivil -4-O-β- D-glucopyranoside, methylbellidefolin, methylswertianin, swertinin, bellidifolin, norswertianin, desmethylbellidifolin, 7-epi-(m-hydroxylbenzoyl)-2'-sinapoyl-loganic acid (senburiside I), 7-epi-(m-hydroxylbenzoyl)-2'-loganic acid (swertiaside), Biphenoiside A, Biphenoiside B and 5-O-β-Glucopyranoside of bellidifolin Semburin and isosemburin, 6`O-α-Arbinopyranosylswertiamarin, 3`O-β-D-Glucopyranosylswertiamarin, 4'O-β-D-Glucopyranosylswertiamarin, 3'O-β-D-Galactopyranosylswertiamarin, 6'O-α-D-Galactopyranosylswertiamarin, 6 O-α-D-Manopyranosylswertiamarin, 6'O-β-D-Fructofuranosylpyranosylswertiamarin and 5'O-β-D-Glucopyranosylamroswerin, Swertiamarin, mangiferin, swertisin, oleanolic acid, 1, 5, 8-trihydroxy-3-methoxyxanthone, 1, 8-dihydroxy-3, 7-dimethoxyxanthone, 1, 8-dihydroxy-3, 5-dimethoxyxanthone, 1, 3, 8-trohydroxy-7-methoxyxanthone, 2, 8-dihydroxy-1, 6-dimethoxyxanthone, 1, 2, 8-trimethoxyxanthone, 1, 3, 5, 6-tetrahydroxyxanthone, 1, 8-dihydroxy-3, 7-dimethoxyxanthone, β-daucosterol, clerosterol 3-β-O-[6'O-hydrobenzene-β-D-glucoside], ursolic acid and 3 β 28-dihydroxylup-20 (29)-ene, erythrocentaurin Demethylbellidifolin, 2, 5-Dimethoxyl-1, 4-dicarboxylbenzene (VIII), 1, 5, 8-trihydroxyl-3, 4-dimethoxylxanthone (IX) and 1, 8-dihydroxyl -3-(3'-hydroxyl-butoxy) xanthone (X), 2`-O- Acetyl -4`O-transferuloylswertiamarin, 2`-O-cisferulolylswertiamarin, 2`-O-acetyl-4`-O-cis-p-coumaroylswertiamarin and 4`-O-cis-p-coumaroylswertiamarin, Norswertianolin, swertianolin and isoswertianolin, 6`-O-β-D-Glucopyranosylswetoside (Swertiapunimarin), methylswertianin, β-sitosterol, daucosterol, puniceaside A, B, C, D and E, 1, 3, 5, 8- tetrahydroxy-9`-oxo-4`-xanthyl)xanthone 2`-C-β-D-glucopyranoside, 1, 5, 8-trihydroxy-3-methoxy-7(1`-3`-6`-7`-tetrahydroxy-9`-oxo-xanthyl), xanthone 2`-C-β-D-glucopyranoside, 1-hydroxy-3, 5, 7, 8-tetramethoxy xanthone, 1, 7-hydroxy-3, 5, 7, 8-tetramethoxy xanthone, Senburiside I, Senburiside II, Senburiside IV, gentiopicroside, 7-O-[β-D-xylopyranosyl.(1-2)-β-D-xylopyranosyl] 1, 7, 8-trihydroxy-3-methoxyxanthone, 7-O-[α-L-rhamnopyrosyl-(1-2)-β-D-xylopyranosyl]-1, 7, 8-trihydroxy-3-methoxyxanthone, 8-O-β-D-glucopyranosyl-1, 3, 5, 8-tetrahydroxyxanthone, 1-O-β-D-glucopyranosyl-1-hydroxy-3, 7, 8-trimethoxyxanthone, 1-O-[β-D-xylopyranosyl, (1-6)-β-D-glucopyranosyl] 2, 3, 5-trimethoxyxanthone, 1-O-[β-D-xylopyranosyl-(1-6)-β-D-glucopyranosyl]-1-hydroxy-3, 5-dimethoxyxanthone, Angustiamarin, Angustioside, epi-eustomoside, Caffic acid disaccharide ester, bellidifolin-8-O-β-D-glucopyranoside, 1, 3, 5, 8-tetrahydroxy-7-(1', 3', 5', 8'-tetrahydroxy-2' xanthonyl) xanthone (swertiabisxanthone-I) amarogentin, Amaroswerin, methylbellidefolin, methylswertianin, desmethylbellidifolin, 5, 8-desmethylbellidifolin, 3β-hydroxylup-13(18)-ene, 3β-hydroxylup-12-ene-28-oic acid and ursolic acid.	Hepatoprotective, anti-bacterial, anti-fungal, anti-hepatotoxic, anti-leprosy, anti- inflammatory, anti-carcinogenic, hhypoglycemic, anti-diabetic, antifeedant, antihelmentic, anti-microbial, analgesic, anti-oxidant, CNS depressant, neuroprotective, mutagenicity

Aerial part	(-)Syringaresinol, magniferin, 1, 5, 8-trihydroxy-3-methoxyxanthone, 1-hydroxy-3, 5, 8-trimethoxyxanthone, amarogentin, sweroside, Swerchirin, gentianine, 5-hydroxyl-methylisochroman-1-one, 7-epi- (di-m-hydroxylbenzoyl)-logenic acid (Senburiside II), 3-methoxy 1, 7, 8- trihyfroxanthone, 1, 8-dihydroxy-3, 5-dimethoxyxanthone, 1, 8-dihydroxy-3, 7-dimethoxyxanthone, 1- hydroxy-3, 5, 7, 8-tetramethoxyxanthone, bellidifolin, oleanolic acid, sitosterol, swertisin, swertiamarin, decussatin, gantiacaulein-1, 8-dihydroxy-2, 4, 6-trimethoxyxanthone, methyl swertianin, 1-hydroxy-3, 5, 7, 8-tetramethoxyxanthone, ursolic acid, mangiferin, 1-glycosyloxy-3-hydroxy-5-8-dimethoxyxanthone, 1, 8-dihydroxy-3, 5-dimethoxyxanthone, 1, 3-dihydroxy-3-methoxyxanthone, 1, 3-dihydroxy-5, 8-dimethoxyxanthone, 2-hydroxydimethyltere-phthalate 2, 3-seco 2-3-lactone, 1β, 3β-epoxy-hop-17(21)-ene-(swertialactone C), 2, 3-seco 2-3-lactone, 1β, 3β-epoxy, hop-16(swertialactone D).	Hepatoprotective
Underground/Root part	1, 8-dihydroxy-3, 5-dimwthoxyxanthone, 1, 5, 8-trihydroxy3-methoxyxanthone, 7-methoxy apigenin-6, C, β-D-glucopyranoside, flavone-C-glycoside, luteolin-6, C, β-D-glucopyranoside, bellidifolin, methyl bellidifolin, swertianolin, amarogentin, amaroswerin, 5-(3'-glucosyl)-benzoyloxygentisic acid, 2, 6-dimethoxy- 4-hydroxy-phenol-1-glucoside, 1-O-primeverosyl-3, 8-dihydroxy-5-methoxyxanthone, 1-O-gentiosyl-3, 7-dimethoxy-8-hydroxyxanthone, isobellifolin, methylbellidefolin, isoswertianin, methylswertianin and norswertianin -1-O-β-D-glucoside	Anti-asthamatic, anti-pyretic, weakness, anti-tussive, joint pain.

Table 2: The above displayed table consist of chemical constituents and the role of Swertia species.

Morphological characteristics

Seed

The seeds are flat or even with varied corner (Figure 1). For morphological characteristics of seeds 12 species of Swertia were studied by utilizing light and scanning microscopy, this study revealed that they display differences in size, color along with seed coat [12].

Figure 1

Root

Roots are pale yellow in color having length of 18.51cm with a diameter of 4.64 cm (Figure 2). They have tap root system at main and growing root to a few meters with a gushy secondary and tertiary root which are spreading across the collar region [13].

Figure 2

Stem

Stems are circular, single, erect, circular at lower region, quadrangular at upper region, the color of the upper region of stem is light green with or without purple tinge whereas the lower part is in dark green with a purple tinge. Stem contains a large circular yellow color pith (Figure 3). The main shoot of Swertia stem will arrive at third year of sowing in month of April or May [14].

Figure 3

Leaf

Leaves are wide, lanceolate, about 5.63cm in length, width is about 4.47 cm, they grow directly from stem because they lack stalk, base is acute, they might be green or purple green in color. It consists of five veins lamina. Radical leaves are wide, sub -sessile, lanceolate with 5-7 nerve. Color alters from purplish dark green to light green. The length size of radical leaves changes from 24-29 cm and breadth with 5.5 -6.4 cm. Cauline leaf is also broad, lanceolate with 5-7 nerve like radical leaves (Figure 4). They are ovate with sub -sessile at acute tip. Length varies from 9.7-17.2 cm and breadth 3.1-6.8 cm. The color of young cauline leaves have dark purplish tinge color at their lower region which will be changes to dark green at their time of maturity [15,16].

Figure 4

Flower

Flowers are 5 in number, bracteate, pedicellate, monoclines, superior, divide into symmetrical halves by any longitude, light green in color with purple streaks on the inner side (Figure 5). Filaments are alternated with uniform size of petal and stigma. Moreover, honey secreting glands are present at each lobe of the petal. Petals are four in number, sympetalous petaled, regular, divide into symmetrical halves by any longitudinal plane of axis, multilateral with valvate aestivation. The size of the petal is twice the size of calyx and the petal have greenish yellow hue also there is four division at the base. From the month of July to September flowering initiates [17].

Figure 5

Medicinal benefits of *Swertia chirata*

It can be used for various purposes as an Antipyretic, in constipation, GI disturbances, anorexia, intestinal worms, skin disorders. It also has been utilized by some people as a bitter tonic. In combination with seeds of divi-divi it has been employed for malaria malady. In addition to this it also prefers in sotha, daha, jvara, Krmiroga, kandu, kushta, Meha, Trsna, Vrana [18-20].

Pharmacological activity

It is bit effective in remedy of piles [21]. Orally used to treat seizures, hypertension, asthma, in combination with other medication for scorpion bites. During manufacturing it employed in alcoholic and non-alcoholic beverages. Also, it promotes delivery. Strong decoction of *Swertia chirata* is externally applied to all kind of inflammation. *Swertia* is applied as a poultice to paralyzed limbs and rheumatic swellings as an herbal medicine [22]. *Swertia* is used as a bitter tonic, febrifuge, anti-periodic, stomachic [23].

As stated in Unani medicine concoction of *Chirata* in combination of cardamom, turmeric and kutki is used for treatment of GI disturbances and *Chirata* + ginger is best antipyretic. Moreover, along with neem, manjishta and gotu kola it is utilized as a remedy for several dermatological problems [24]. Also used as anti-ulcer, mitigate swelling, neurological problems, urinogenital disorders [25]. Chemical constituents of *Swertia* like xanthones have been reported to give CNS stimulant. *Chirata's* root is helpful in checking hiccups and antiemetic alongside used in urinary complications like kidneys discomfort. To treat varied malady, it is available as polyherbal formulation in the market. Nepali *Swertia* is used as a solution for loss of appetite also this species has the finest thin layer chromatography [1]. Anti-cancer characteristic of Swertia have been declared freshly [9]. It also has the ability to be employed in hyperglycemias, leishmania, liver infection, inflammation, abdominal pain, bacterial infection [26].

The main of the present study is to carry out the research over the in vitro effect of *Swertia chirata* by testing the anti-microbial effect . The phytochemical survey reflects the presence of the constituents which help in justification of the antimicrobial activity of the plant [25].

Adverse effects

Swertia Chirata usually is used as flavoring agent but in same patient *Swertia* lead to vomiting due to its bitter taste. When employed in proper proportion it doesn't cause any harmful effects but excess use may cause vomiting effects, hypoglycemia conditions like dizziness, numbness of hand and feet etc. [27].

Precautions and warnings

Pregnancy and breast feeding: There isn't a safe profile of using it during pregnancy or at breastfeeding as a consequence avoid it during such stage [28].

Diabetes: In some diabetic patients it may lower the blood sugar level, while using it one may keep watch on its blood sugar and monitor it carefully [29].

Intestinal ulcers: It can make the condition of intestine even worse. During surgery it may interfere with blood sugar level one may often monitor or detects their sugar level on/after surgical procedures. As a piece of advice avoid consumption of *Chirata* prior two weeks scheduled surgery [30].

Conservation methods

For conserving *Swertia chirata* an endangered herb there are some methods through it can be conserved i.e., Cultivation of plant in *ex-situ* at lower altitude. Conservation by direct shoot multiplication from leaf explants. Micropropagation is also a way of conservation. Some scientist, developed a strong biotechnological *in-vitro* method for regeneration of *S. chirata* shoots by alternate method for the production of amarogentin [15,31].

Methodology

Collection of plant

The plant was collected and authenticated by Dr. Madhava Chetty, Department of Botany, Tirupati, India.

Extraction method

Extraction of Swertia is carried by the following method. During collection we have to be keen selective as only mature form of herbal plant Swertia is being employed for better extraction. After collection the ethnomedicinal herb *(Swertia chirata*) will underwent through separation and filtration process (separation from adulterant if any present and removal of impurities if any) as to get it in a pure or purified form. Afterwards the plant material will be dried under the shade, during drying be mindful that temperature should be below than 50°.After completion of drying the dried material will be milled into a coarse powder by utilizing a suitable grinder. Now the ground or milled powder underwent cold extraction by methanol and then fractionation and petroleum ether. At low temperature and pressure, the solvent can be discarded, then the part of extracted material of *chirata* extract was stored in a refrigerator and used for further research [32].

Phytochemical screening of *Swertia's* aqueous extraction

The fractions of the *Swertia* were used for checking the phytochemical screening and detection of presence of flavonoids, tannins, steroids and saponins. Their presence was even tested by qualitative analysis and by thin layer chromatography [33].

Antimicrobial screening

- **Test organism:** Both gram negative and gram positive i.e., *E. coli, Pseudomonas aeruginosa, Shigella boydii, Salmonella Para typhi, S. typhi*, *Shigella dysenteria*, *Vibrio mimicus* as well as *B. subtilis, S aureus, B. cereus* and fungal strains like *Aspergillus Niger, C. albican, S. cerevacae* were selected for research.

- **Procedure:** The antimicrobial study of *Swertia chirata* was done using diffusion disc technique for bacteria as well as fungi. Standard discs of gentamycin were used of 30µg $disc^{-1}$ and the disc containing the extracts of the *Swertia chirata* was impregnated with 400 µg $disc^{-1}$. The antimicrobial activity was measured by using the diameter of zone of inhibition which was measured in millimeter [34].

Results

The present phytochemical work demonstrates the presence of various phytocontituents such as tannins, alkaloids, glycosides and saponins in aqueous extract while in methanol extract, tannins, glycosides, saponin and flavonoids were present, petroleum ether extract shows traces amount of Steroids.

Phytochemical constituents	Petroleum ether extract	Methanolic extract	Aqueous extract
Steroids	+	-	-
Terpenoids	-	-	-
Tannins	-	+	+
Alkaloids	-	-	+
Glycosides	-	+	+
Saponins	-	+	+
Flavonoids	-	+	-

Table 3: Phytochemical analysis of aqueous extract of *Swertia chirata.*

Antimicrobial activity

The present research which was carried for different fractions like petroleum ether, methanol, aqueous fraction of roots and shoot portion of the S*wertia Chirata* has shown signification anti- microbial activity at a dose of 400 µg $disc^{-1}$ against the gram +ve and gram -ve bacteria and moderate antifungal activity, where as other fractions showed mild to moderate antimicrobial activity which was around (6-10 mm). The results are displayed in table below.

Antibacterial activity:

Among the gram-positive bacteria, significant effect was seen against *S. Aureus* (18 mm with methanolic fraction of Root and Shoot) compared to other fractions. Methanolic fraction of Root as well as shoot had a good antimicrobial activity for *B. cereus* (15 mm of shoot, 16 mm of root) and *B. subtilis* (13 mm for shoot and 12 mm for root) (Figure 6).

Against Gram -negative bacteria, methanolic fraction of shoot as well as root reported highest inhibition against *E. coli.* The zone of Inhibition of *E. coli* was 14 mm for Methanolic fraction of shoot and 16 mm for root fraction. Methanolic fraction of shoot and root also showed moderate antimicrobial activity (9-12 mm) (Figure 7) for *Shigella boydii* (gram negative organism).

Antifungal activity

For fungi, methanolic fraction reported average activity (11 mm for methanolic fraction of shoot and 12mm) for methanolic fraction of root highest in *S. Cerevacae* (Figure 8).

Figure 6: Zone of inhibition of Gram +ve bacteria.

Figure 7: Zone of inhibition of Gram -ve Bacteria.

Figure 8: Zone of inhibition of Fungi.

Test organism	Diameter of zone of inhibition(mm)						
	Petroleum ether extract of shoot	Methanolic extract of shoot	Aqueous extract of shoot	Petroleum ether extract of root	Methanolic extract of root	Aqueous extract of root	Gentamycin
Gram +ve bacteria							
B. cereus	9	15	8	-	16	-	30
B. subtilis	8	13	6	7	12	6	29
S. aureus	8	18	6	-	18	6	33
Gram -ve bacteria							
E.coli	-	14	7	6	16	7	33
P. aeruginosa	-	12	7	6	11	8	31
S. Para typhi	8	9	-	6	10	6	28
S. Typhi	9	10	8	-	11	7	33
Shigella boydii	-	11	7	7	12	7	31
Shigella dysenteria	9	9	7	6	10	6	30
Vibrio mimicus	8	11	7	6	9	-	29
Fungi							
C. albicans	7	11	-	9	11	7	35
Aspergillus Niger	8	10	8	10	12	7	38
S. Cerevacae	7	11	10	9	12	-	33

Table 4: Antimicrobial activity of different fractions of *Swertia chirata.*

Zone of inhibition less than 5mm are not added in the above results

Discussion and Conclusion

Swertia chirata the endangered medicinal traditional herb offers many promising health benefits with bit of adverse effects. Due to its excess remedial effect. The over exploitation of *Swertia* has begun till now *Swertia* have been reported safest for human use. Due to its extinction situation, there is a need of conservation methods. Extinction is occurred due to its high demand arouse in National and International level constantly. Swertia is a medicinal plant with an abundant splendid benefit. The present research suggest that the extract contains some chemical moiety which display the antimicrobial activity and which is important for development of new herbal medicine for different infectious diseases.

Authors Contribution

All the authors have equally contributed in conceiving this research and designing of experiments; all authors have participated in the design and interpretation of the data; experiments and analysis; writing the paper and participated in the revisions of it. All authors read and approved the final manuscript.

Conflict of Interest

The authors Mohsina F.P, Dr Aamir Quazi, Dr. Faheem IP, Muskan and Sarah Priya declare that there is no conflict of interest.

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