

A Complete Profile on *Chimphila Umbellata*-Traditional Uses, Pharmacological Activities And Phytoconstituents

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Abstract

Indian medicinal plants are used as ancient style of providing helps too many ailments. Presently, variant peoples are looking on healthful plants for his or her primary health care wishes. The current review designates the morphological, ethnopharmacological aspects and active principles of *Chimaphila umbellata* Linn. Being it's a vital healthful plant in Indian medication this are supposed to vary medical specialty activities like analgesic, anti-inflammatory, antibacterial, antifungal and skin sensitizing activities. Different active constituents such as quinones, polyphenols, tannins, sterols, flavonoids, triterpenes, chimphilin, arbutin, toluquinol, renifolin, taraxerol, arbutin, isohomoarbutin, quercetin, ursolic acid, β -sitosterol and hyperoside are a unit to date according in *Chimaphila umbellata*. Well conducted biological studies area unit still required for many indications of this species. This review is useful to make interest towards *Chimaphila umbellata* and should be helpful in rising new formulations with additional therapeutic and economical worth.

Keywords: *Chimaphila umbellata*, chimphilin, arbutin, isohomoarbutin, hyperoside.

Introduction

Chimaphila umbellata commonly called as Pipsissewa or Princepine, Wintergreen, Eastern Teaberry, and Checkerberry. It belongs to the Pyloraceae family previously placed in the Ericaceae family. Its name is derived from the Greek ceima (cheima) "winter", filis (philos) "lover". Hence "winter lover", an appropriate name for a circumboreal genus of cold climate evergreen shrublets, umbellata, from the Latin, "umbrella", literally "little shadows", a reference to the flower cluster *Chimphila umbellata*. It is a small perennial flowering plant found in dry woodlands or sandy soils. It is native throughout the cool temperate. *Chimaphila umbellata* consist of four subspecies. Subspecies name and their location were mentioned in Table 1 .

Table 1: Subspecies name and their location

Subspecies Name	Location
<i>Chimaphila umbellata</i> subsp. <i>umbellata</i>	Europe, Asia
<i>Chimaphila umbellata</i> subsp. <i>acuta</i>	Southwestern North America
<i>Chimaphila umbellata</i> subsp. <i>cisatlantica</i>	Northeastern North America
<i>Chimaphila umbellata</i> subsp. <i>occidentalis</i>	Northwestern North America

Botanical Description of *Chimphila umbellata*

Chimphila umbellata grows 10–35cm tall, and has evergreen shiny, bright green, toothed leaves arranged in opposite pairs or whorls of 3-4 along the stem. Leaves have a shallowly toothed margin, where the teeth have fine hairs at their ends. The flowers are white or pink, produced in a small umbel of 4-8 together. Flowering stems bear terminal umbel-like corymbs consisting of 3-10 symmetrical, drooping flowers, 10-15mm wide [1]. There are five pink-white petals, five sepals and 10 stamens; the ovary is superior maturing to produce an erect capsule. Fruits are depressed globose capsules which often persist through winter. Flowers white, bell-like, often with a touch of pink, in 2 or 3 flower umbels. Flowering is in July, August and fruiting is in August, and September. The flowers are hermaphrodite and are pollinated by insects. *Chimphila umbellata* can grow in very acid soil it can grow in full shade or semi shade, it prefers moist soil. Botanical description and Taxonomical classification of *Chimphila umbellata* was illustrated in Table 2 & Table 3.

Table 2: Botanical description of *Chimphila umbellata*

Flower	3-10 symmetrical, drooping flowers, 10-15mm wide.
Flowering season	July, August
Flowers color	White or Pink,
Fruiting season	August, and September
Growing conditions	Very acid soil
Leaves	Green toothed leaves
Plant height	10-35cm tall
Pollination	Through Insects



Table 3: Taxonomical classification of *Chimaphila umbellata*

Kingdom	Plantae
Subkingdom	Viridaeplantae
Phylum	Tracheophyta
Sub phylum	Euphyllophytina
Infra phylum	Radiatopses
Class	Spermatopsida
Sub class	Asteridae
Super order	Ericanae
Super division	Eudicots
Division	Asterids
Subclass	Asteridae
Order	Ericales
Family	Ericaceae
Sub family	Monotropoideae
Tribe	Pyroleae
Genus	<i>Chimaphila</i>
Species	<i>umbellata</i>

Ethnomedical information of *Chimaphila umbellata*

Chimaphila umbellata leaves were widely used by the native North American Indians in the treatment of aches and pains and to help breathing whilst hunting or carrying heavy loads. The leaves, and the oil, possess different pharmacological activities such as analgesic, anti-inflammatory, aromatic, astringent, carminative, diuretic, emmenagogue, stimulant and tonic [2]. An infusion of the leaves is used to relieve flatulence and colic. Used externally, the fresh leaves are rubefacient and internally they are of great use in cardiac and kidney diseases, chronic rheumatism and scrofula [2]. The plant, especially in the form of the essential oil, is most useful when applied externally in the treatment of acute cases of rheumatism, sciatica, myalgia, sprains, neuralgia, cellulites' and catarrh [3]. The plant used for astringent, diaphoretic, diuretic, febrifuge, rubefacient, stimulant and tonic. An infusion of the plant has been drunk in the treatment of rheumatism and colds. A poultice of the root used for treating pain. Pipsissewa was much used by many tribes of native North American Indians to induce sweating and treat fevers, including typhus [4]. An infusion is used in the treatment of various problems related to the urinary system; it is also prescribed for more serious conditions such as kidney stones and gonorrhoea. A decoction is very efficacious in the treatment of skin diseases [2]. Different parts of *Chimaphila umbellata* with ethnomedical information are stated in Table No.4.

Table 4: Ethnomedical information of *Chimaphila umbellata*

Part of the Plant	Uses	References
Fresh leaves	Rubefacient and internally they are of great use in cardiac and kidney diseases, chronic rheumatism and scrofula.	[2]
Leaves & oil	Analgesic, anti-inflammatory, aromatic, astringent, carminative, diuretic, emmenagogue, stimulant and tonic	[2]
Oil	Rheumatism, sciatica, myalgia, sprains, neuralgia and catarrh, cellulites'.	[3]
Plant	Diaphoretic, febrifuge, rubefacient	[2]
Whole plant (Decoction)	Treat skin diseases	[2]
Whole plant (Infusion)	Treat fevers, including typhus	[4]

Pharmacological Information of *Chimaphila umbellata*

Different parts of *Chimaphila umbellata* with pharmacological information are mentioned in Table 5.

Antibacterial activity of *Chimaphila umbellata*

The bactericide activity in ethanol extract of *Chimaphila umbellata* was reported by [5]. The bactericide activity of *C. umbellata* ethanol extract was studied against gram-positive organism (*Staphylococcus aureus*, *Bacillus subtilis*) and gram-negative bacteria (*Escherichia coli*, *C. albicans*). The ethanol extract was simpler against all microorganism strains tested. The bactericidal property is mainly due to the presence of chimaphilin and arbutin.

Antioxidant activity activity of *Chimaphila umbellata*

Different extracts of *Chimaphila umbellata* possesses a sturdy in vitro inhibitor activity. This study was centered on invitro activity by victimization fully completely different parameters like 2, 2-diphenyl-1-picrylhydrazyl (DPPH) assay, reducing power and in-vitro lipoid peroxidation. Results prompt that each extracts of *Chimaphila umbellata* were found to be considerably effective in scavenging DPPH [6].

Anti-inflammatory activity of *Chimaphila umbellata*

The antiinflammatory activity *Chimaphila umbellata* leaves and flowers by varied carrageenan-induced inflammation rat model was highlighted [7]. From the results it is suggested that plant extract



suppressed pro-inflammatory cytokines and reduced bladder weight in rats with surgically induced bladder outlet obstruction. This study put together disclosed the presence of some phytoconstituents like flavanoids jointly showed anti-inflammatory drug property of *Chimaphila umbellata* leaves and flowers.

Antifungal property of *Chimaphila umbellata*

By using bioassay-guided isolation it was confirmed that chimaphilin was the main antifungal constituent of *Chimaphila umbellata*, and using a chemical-genetic screening method

determined that chimiphalin interferes with cell wall, mitochondrial, transcription and other cellular functions [6].

Skin sensitizing potential of *Chimaphila umbellata*

Investigated the skin sensitizing potential of the active constituent chimaphilin on female guinea pigs was studied [8]. Using the open epicutaneous (OET) and Freund's complete adjuvant techniques (FCA), results showed that chimaphilin showed weak sensitizing potency in the OET and moderate sensitizing capacity in the FCA method. This might be due to nucleophilic attack at the 3rd carbon atom of the quinoid ring of chimaphilin.

Table 5 Pharmacological Information of *Chimaphila umbellata*

Part of the plant	Solvent used for extraction	Uses	References
Whole plant	Ethanol	Antibacterial	[5]
Whole plant	-----	Antioxidant	[6]
leaves and flowers	Methanol	Anti-inflammatory	[7]
Isolated compound(chimaphilin)	Ethanol	Antifungal	[6]
Isolated compound(chimaphilin)	-----	Skin sensitizing poteintial	[8]

Phytoconstituents Information of *Chimaphila umbellata*

Phytochemical analysis of *Chimaphila umbellata* unconcealed that it consists of assorted phytoconstituents like quinones, phenols, phenolic glycosides, polyphenols, terpenes and sterols. A neutral crystalline substance referred to as chimaphilin from *Chimaphila umbellata* was isolated [9]. A part from this many alkylated benzohydroquinones, antimicrobial toluquinol and organic compound renifolin also been reported [10-11]. Simple phenols including methyl salicylate and salicylic acid methyl ester are

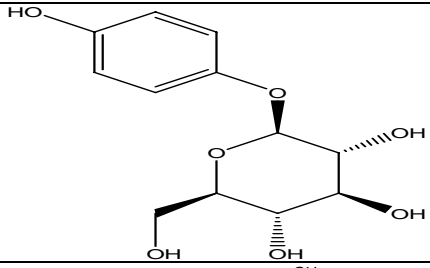
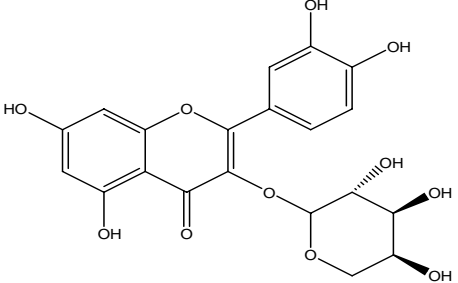
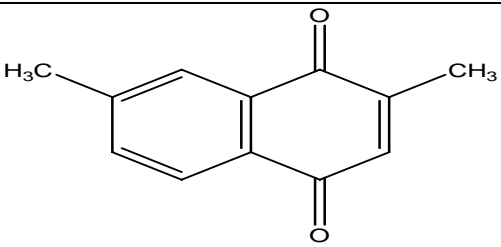
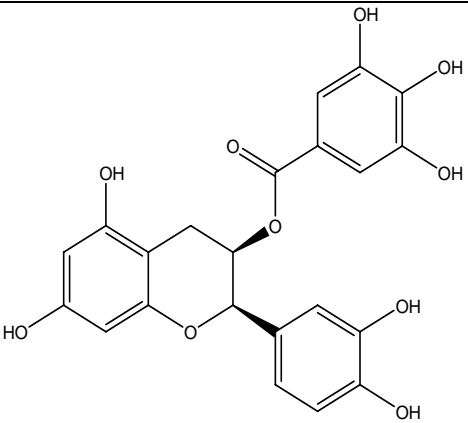

reported [10]. Leaves and flowers area unit reportedly rich in different flavonoids, as well as hyperoside, kaempferol and avicularin [10, 12]. In an exceedingly comprehensive investigation of the species, they [5] isolated the free triterpenes, taraxerol, arbutin, isohomoarbutin, quercetin, ursolic acid, and β -sitosterol. *Chimaphila umbellata* contains, starch, gum, pectin, resin, a lignan, mineral salts [9, 10] as well as the hydrocarbons nonacosane and hentriacontane [5] in a smaller quantity. Active constituents with their IUPAC names and structures are given in Table 6 and 7.

Table 6: Active constituent's information of *Chimaphila umbellata*

Plant part	Solvent used for Extraction	Use	Reference
Plant	-----	Chimaphilin	[9]
Whole plant	-----	Toluquinol, renifolin	[10,11]
Plant	-----	Arbutin, isohomoarbutin, methyl salicylate and salicylic acid methyl ester	[10]
Leaves	Ethyl acetate	Epicatechin gallate	[5]
Leaves & Flowers	Ethyl acetate	Quercetin, hyperoside, kaempferol, avicularin	[10, 12]
Plant	-----	Starch, gum, pectin, resin, a lignan, mineral salts	[9, 10]



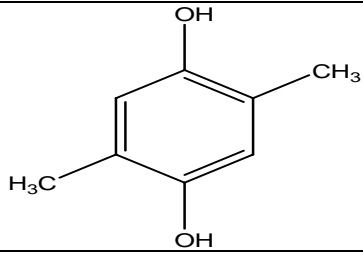
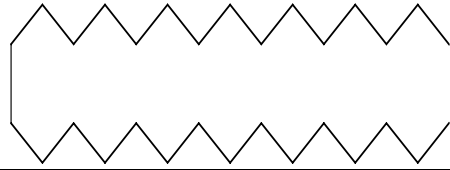
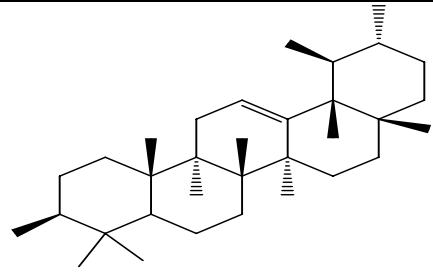
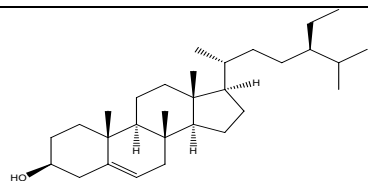
Table 7: Phytoconstituents with IUPAC names and structures

NAME	IUPAC NAME	STRUCTURE
Arbutin	(2S,3R,4S,5S,6R)-2-(4-hydroxyphenoxy)-tetrahydro-6-(hydroxymethyl)-2H-pyran-3,4,5-triol	
Avicularin	3-((3R,4S,5S)-tetrahydro-3,4,5-trihydroxy-2H-pyran-2-yloxy)-5,7-dihydroxy-2-(3,4-dihydroxyphenyl)-4H-chromen-4-one	
Chimaphlin	2,7-dimethylnaphthalene-1,4-dione	
Epi catechin gallate	(2R,3R)-3,4-dihydro-5,7-dihydroxy-2-(3,4-dihydroxyphenyl)-2H-chromen-3-yl 3,4,5-trihydroxybenzoate	
Hentriacontane	Hentriacontane	



Hyperoside	3-((2S,3S,4R,5R)-tetrahydro-3,4,5-trihydroxy-6-(hydroxymethyl)-2H-pyran-2-yloxy)-7-hydroxy-2-(3,4-dihydroxyphenyl)-5-methyl-4H-chromen-4-one	
Isohomoarbutin	(2S,3S,4S,5R,6R)-6-(4-hydroxy-2-methylphenoxy)-tetrahydro-2H-pyran-2,3,4,5-tetraol	
Kaempferol	3,5,7-trihydroxy-2-(4-hydroxyphenyl)-4H-chromen-4-one	
Methylsalicylate	2-(2-hydroxyphenyl)-2-oxoacetic acid	
Quercetin	3,5,7-trihydroxy-2-(3,4-dihydroxyphenyl)-4H-chromen-4-one	
Renifolin	(2S,3R,4S,5S,6R)-2-(1,2,3,4-tetrahydro-5-hydroxy-2,7-dimethylnaphthalen-8-yloxy)-6-ethyl-tetrahydro-2H-pyran-3,4,5-triol	
Taraxerol	1,2,3,4,4a,5,6b,7,8,8a,9,10,11,12,12a,12b,13,14,14a,14b-icosahydro-2,2,4a,6b,9,9,10,12a,14a-nonamethylpicene	



Toluquinol	2,5-dimethylbenzene-1,4-diol	
Triacotane	Triacotane	
Ursolic acid	(1S,2R,4aR,6aS,6bR,10S,12aS,12bR,14bR)-1,2,3,4,4a,5,6,6a,6b,7,8,8a,9,10,11,12,12a,12b,13,14b-icosahydro-1,2,4a,6a,6b,9,9,10,12a,12b,14b-undecamethylpicene	
β -Sitosterol	3S,8S,9S,10R,13R,14R,17R)-17-((2R,5R)-5-ethyl-6-methylheptan-2-yl)-2,3,4,7,8,9,10,11,12,13,14,15,16,17-tetradecahydro-8,10,13-trimethyl-1H-cyclopenta[a]phenanthren-3-ol	

Conclusion

The extensive literature survey exposed that *Chimaphila umbellata* is important medicinal plant with diverse ethnomedical and pharmacological spectrum. The plant shows the occurrence of many natural constituents which are answerable for wide-ranging pharmacological and medicinal properties. The evaluation needs to be carried out on *Chimaphila umbellata* in order to uses and preparation of the plant in their practical clinical applications, which can be recycled for the welfare of the mankind.

References

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Conflict of Interest

No



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