Phytochemicals of Gentianaceae:
A Review of Pharmacological Properties

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ABSTRACT: Aim of the review paper is to give an enlightenment on potential phyto-constituents of Gentianaceae. Bitter principles (secoiridoid glycosides) and xanthones are widely distributed among plants belonging to the family Gentianaceae. Phytochemicals like amarogentin, bellidifolin, gentianine and swerchirin have been reported to possess significant anti-inflammatory, analgesic, anti-asthmatic, anticonvulsant, antihistaminic, antimalarial, antiamaeobic, cytotoxic, diuretic, hepatoprotective and hypoglycemic properties. Topoisomerase inhibition is significant pharmacological activity reported from amarogentin. Further investigations exploring possible use of these phytochemicals as therapeutic agents are warranted. The articles reviews certain pharmacological investigations carried out on phytochemicals reported from Gentianaceae.

KEY WORDS: phytochemicals; gentianaceae; gentian; bitter glycosides; amarogentin.

Introduction

Gentianaceae is a family of flowering plants comprising approximately 70-80 genera and 900-1200 species. The plants of the family are annual and perennial herbs or shrubs. They are native to northern temperate areas of the world (Daniel M and Sabnis SD, 1978). Plants belonging to genus Gentiana are very well-known for there pharmacological properties. They are intensely bitter and once upon a time were valuable remedy for digestive system ailments. The medicinal value is due to presence of bitter glycosides (Hostettmann-Kaldas M, et al., 1981). Several pharmacological studies were carried out on medicinal plants belonging to gentianaceae before 1930. Extensive work was carried out on gentianine, an isoprene alkaloid commonly distributed among medicinal plants belonging to gentianaceae. The alkaloid was reported to have diverse pharmacological activates ranging from anti-inflammatory to diuretic. Recently interest among potential medicinal plants of gentianaceae has been revived and significant phytochemicals like amarogentin and swerchirin have been studied for drug development [Brahamchari G, et al., 2004]. Potential phytochemicals of Gentianaceae are discussed in this article. Further, a brief introduction to chemistry, biological sources and pharmacological investigations done on phytochemicals reported from gentianaceae is presented.

Amarogentin (chirantin)

It is secoiridoid glycoside, and is the most bitter substance known. It tastes bitter even at a dilution of 1:58,000,000. It can be obtained from Gentiana lutea L. [VanHaelen-VanHaelen, 1983]. Gentiana macrophylla Pall., Gentianella alborosea (Gilig.) Fabris, Swertia chirayita (Roxb ex. Flem) Karst [Arino A et al., 1997] Swertia davidii Franch, Swertia japonica (Roem. & Schult.) Mak. [Ishimaru K et al., 1990], Swertia mussotii Franch., Swertia pseudochinenis Har. [Liu Geng Tao et al., 1959, Swertia tetrapetala Pall and Trena orientalis (Blume) L. It possesses Topoisomerase inhibition [Ray et al., 1996), chemo-preventive [Saha P and Dass, 2005) and antileishmanial properties [Ray S et al., 1996; Medda S et al., 1999].

Amaroswerin

It is a Secoiridoid glycoside obtained from Gentiana kurroo Royle.[Niioho Y et al., 2005], Swertia chirayita (Roxb ex. Flem) Karst.[Niioho Y et al., 2005] and Swertia japonica (Roem. & Schult.) Mak. [Ishimaru K et al., 1990], It has been found to be gastro-protective[Niioho Y et al., 2005].

Belledifolin

**Gentianine**

Gentianine is widely distributed in plants belonging to the family Gentianaceae. Several studies were carried out on the alkaloid in late fifties. Gentianine is a bitter, crystalline monoterpenic alkaloid. The biological sources of Gentianine include *Anthocleista procera* L. (Natarajan PN et al., 1974) and *Gentiopicroside* (Yang XF and Song CQ, 2000). Gentianine is a crystalline monoterpenic alkaloid. The biological sources of Gentianine include *Anthocleista procera* L. (Natarajan PN et al., 1974) and *Gentiopicroside* (Yang XF and Song CQ, 2000).

**It possesses anti-inflammatory** (Song Zhen Yu et al., 1958; Geng Tao et al., 1959; Kwak WJ et al., 2005), analgesic (Geng Tao et al., 1959), anti-inflammatory (Geng Tao et al., 1959), anticonvulsant (Geng Tao et al., 1959), hypotensive, antispasmodic (Bhattcharaya SK et al., 1974), sedative, diuretic (Mansoor A and Malghani MAK, 2005) antimalarial (Natarajan PN et al., 1974), antiamoebic (Geng Tao et al., 1959), antihistaminic (Geng Tao et al., 1959), (Yang XF and Song CQ, 2000).

**Gentianadine**

This is an alkaloid obtained from *Gentiana lutea* L. and *Gentiana olivieri* Griseb. [Mansoor A et al., 2000]. It possesses anti-inflammatory property and decreases arterial blood pressure(Sadridinov F and Tulyaganov N, 1972).

**Gentiacalein and gentiakochianin**

These are Xanthones derived from *Gentiana kochiana* Perr. Et Song. [Chericoni S et al., 2003] and these possess vasodilatory action [Chericoni S et al., 2003].

**Gentiopicrin**

It is a crystalline monoterpenic Gentipicoside. It is a bitter principle or glucoside widely distributed in plants of Gentianaceae. Its biological sources include *Blackstonia perfoliata* (L.) Hudson (Saboljevic A et al., 2006), *Centaurium pulchellum* (Swartz) Druce (Dijana K et al., 2003), *Gentiana kitag* (Zhao S et al., 2003) *Gentiana lutea* L. (Ozturk N et al., 2003) *Gentiana macrophylla* Pall (Zhao S et al., 2003) *Gentiana rhodantha* Rouleau & Kucyniak (Zhao S et al., 2003) *Gentiana rigescens* Franch (Zhao S et al., 2003), *Gentiana scabra* Bunge. (Zhao S et al., 2003; Liang Y et al., 2007) and *Gentiana waltonii* Burkill Mei L, 1998).

**Gentisin**

It is a tasteless yellow crystalline xanthone substance and obtained from Gentiana lutea L. (Morrimoto I et al., 1963; Nikoalaev GG et al., 2004). It is mutagenic in nature (Nikoalaev GG et al., 2004).

**Norswertianolin**

It is a Xanthon glycoside obtained from *Gentiana campestris* L. (Urbain A et al., 2004) and *Swertia davidii* Franch (Zeng GY et al., 2000). It has central nervous system depressant and tuberculostatic properties.

**Swewchirin**

Swewchirin is a medicinally important xanthone and its biological sources are *Gentianella floridea* (Grisedb) Holub (Nadinic EL et al., 1997) *Swertia calycina* Franch., *Swertia chirayita* (Roxb ex. Flem) Karst) (Purushothaman KK et al., 1973), *Swertia daviida* (Guo X-F and Chen CP, 1980) *Swertia japonica* (Roem. & Schult.) Mak. (Yamahara J et al., 1978), *Swertia marginata* Schrenk and *Trigonella foneum-graceum* L.

**Sweroside**

It is a secoiridoid glycoside obtained from *Anthocleista djalonensis* (Onocha PA et al., 2003), *Centaurium erythraea*, *Chironia baccifera* L. (Wolfender JL et al., 1993), *Gentiana lutea* L. (Ozturk N et al., 2003), *Menyanthes trofoliata* L., *Scabiosa columbiana* L., *Swertia manshurica*, *Swertia molensis* and *Tripterospermum lanceolatum* (Hayata) Haraex Satake (Chen JJ et al., 1991). It possesses antimicrobial, antifungal and cytoprotective (Ozturk N et al., 2003), mild cytotoxic[Onocha PA et al., 2003), hepatoprotective and central nervous system depressant actions (Chen JJ et al., 1991).

**Sweriamarin**

It is a Secoiridoid glycoside and reported sources include: *Anthocleista procera* L. (Koch M, 1965), *Blackstonia perfoliata* (L.) Hudson (Saboljfevic A et al., 2006), *Centaurium erythraea* Rafin., *Enicostemma littorale* (Vishwakarma SL et al., 2004), *Gentiana macrophylla* Pall (Zhao S et al., 2003) *Gentiana manshurica* kitag (Zhao S

Conclusion

From the work cited in the article it can be concluded that promising phytochemicals are widely distributed in medicinal plants of Gentianaceae. Animal research has thrown light on anti-inflammatory, analgesic, anti-asthmatic, anticonvulsant, antihistaminic, antimarial, antiamobec, cytoprotective, diuretic, hepatoprotective and hypoglycemic activities of phytochemicals. Amarogentin and swerchirin should particularly be screened for large scale clinical trials. Topoisomerase inhibition and hypoglycemic activities are of special interest.

References


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