MINI REVIEW

Phytochemical and Pharmacological Aspects of *Psammosilene tunicoides* W. C. Wu et. C. Y. Wu

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*Psammosilene tunicoides* W. C. Wu et. C. Y. Wu (Caryophyllaceae) is an important medicinal plant which grows only in south-western part of China and has great medicinal value in traditional Chinese medicine to check bleeding, relieving pain and promoting blood circulation. It was also used as an important ingredient of some famous Chinese traditional medicine formulation. An attempt has been made to review the phytochemical and pharmacological work done on *Psammosilene tunicoides*.

Key Words: Review, *Psammosilene tunicoides*, Phytochemical, Pharmacological properties.

INTRODUCTION

*Psammosilene tunicoides* W. C. Wu et. C. Y. Wu (Caryophyllaceae) is the only species in the genus *Psammosilene* and grows only in southwestern part of China¹. The roots of the plant is of great medicinal value in China, widely used to check bleeding, relieving pain and promoting blood circulation in folk medicine and used as an important ingredient of some famous Chinese traditional medicine formulation such as Yunnan Baiyao². The crude saponins extracted from the roots were found to exhibit pain relieving and antiinflammatory activities¹. *P. tunicoides* is a perennial herb, with fleshy tuberous root up to 30 cm in length. Through long time's excessive and destructive collection, the resource of the plant was decreased and the existence of wild population was threatened. To protect it, the plant was listed as an endangered and national protected plant in China in 1991⁴.

Phytochemical investigations: Phytochemical investigation revealed that pentacyclic triterpenoid saponins and cyclic peptides are the major constituents in the roots of *P. tunicoides*. Pu et al.⁵,⁶ isolated two new oleanolic triterpenoid sapogenins 3β-hydroxy-12,17-diene-28-noroleane-23-al and 3β-hydroxy-12,14-diene-27-noroleane-28-nic acid, together with five known sapogenins gypsogenic acid, gypsogenin, epigypsogenin, 16-isooquilic acid and 16-isooquilic acid methylate from the acid hydrolysates of the total root saponins. Pu and Zhou⁷ isolated two new oleane type triterpenoid saponins, 28-O-β-D-glucopyranosyl-(1→3)-[β-D-glucopyranosyl-(1→6)]-β-D-glucopyranosyl 3α,16α-dihydroxy-oleanan-12-ene-23-dioic acid and 28-O-β-D-gluconopyranosyl-(1→6)-[β-D-gluconopyranosyl-(1→3)]-β-D-gluconopyranosyl 3α,16α-dihydroxy-oleanan-12-ene-23-dioic acid. Zhong et al.⁸,⁹ isolated three new oleane type triterpenoid saponins 3-O-β-D-galactotypanosyl-(1→2)-[β-D-xylotypanosyl-(1→3)]-β-D-6-O-methylglucuronopyranosyl quillaic acid, 3-O-β-D-galactopyranosyl-(1→2)-[β-D-xylotypanosyl-(1→3)]-β-D-6-O-ethylglucuronopyranosyl quillaic acid and 3-O-β-D-galactotypanosyl-(1→2)-β-D-glucuronopyranosyl gypsogenin 28-O-β-D-xylotypanosyl-(1→4)-[β-D-6-O-acetylglucuronopyranosyl-(1→3)]-α-L-rhamnopyranosyl (1→2)-β-D-fucopyranoside, two new natural oleane type triterpenoid saponins, 3-O-β-D-galactopyranosyl-(1→2)-β-D-glucuronopyranosyl gypsogenin and 3-O-β-D-galactopyranosyl-(1→2)-[β-D-xylotypanosyl-(1→3)]-β-D-glucuronopyranosyl gypsogenin, along with four known saponins 3-O-β-D-galactotypanosyl-(1→2)-β-D-6-O-methylglucuronopyranosyl quillaic acid, 3-O-β-D-galactotypanosyl-(1→2)-[β-D-xylotypanosyl-(1→3)]-β-D-glucuronopyranosyl gypsogenin 28-O-β-D-xylotypanosyl-(1→4)-[β-D-glucuronopyranosyl-(1→3)]-α-L-rhamnopyranosyl (1→2)-β-D-fucopyranoside (lobatoside I) and 3-O-β-D-galactopyranosyl-(1→2)-[β-D-xylotypanosyl-(1→3)]-β-D-glucuronopyranosyl gypsogenin 28-O-β-D-xylotypanosyl-(1→4)-[β-D-glucuronopyranosyl-(1→3)]-α-L-rhamnopyranosyl (1→2)-β-D-fucopyranoside. Deng et al.¹⁰ isolated a new oleane type triterpenoid saponin, 3-O-β-D-galactotypanosyl-(1→2)-[β-D-xylotypanosyl-(1→3)]-β-D-6-O-methylglucuronopyranosyl...
Tian et al. isolated a novel cycloheptapeptide, tunicyclin A (1), with a unique tricyclic ring peptide skeleton as shown in Fig. 1. Tunicyclin A contains an unusual amino acid residue, γ-keto-δ-aldehydyl-Glu. The γ and δ carbonyl carbons of the γ-keto-δ-aldehyde-Glu residue participate in the cyclization with the NH of leucine and valine, respectively and form a unique cycloheptapeptide backbone with a tricyclic ring system. Ding et al. isolated six new natural cyclic dipeptides, cyclo-(Pro-Val), cyclo-(Pro-Ala), cyclo-(Val-Ala), and mixtures of cyclo-(Ala-Leu) and cyclo-(Ala-Ile) and the known cyclo-(Pro-Pro). They also obtained two new cyclic octapeptides, named psammosilenins A and B, determined as cyclo-(Pro-Phe-Pro-Phe-Ala-Pro-Leu) and cyclo-(Pro-Gly-Phe-Pro-Leu-Pro-Phe-Thr-Ile). The structure of psammosilenin A was further confirmed by the synthesis.

![Structure of tunicyclin A (1)](image)

**Pharmacological activities:** Song observed analgesic effect of total saponins from *P. tunicoides*. Subcutaneous injection of total saponins from *P. tunicoides* at a dose of 5 mg/kg, raised the pain threshold significantly (*p* < 0.001) in the experiment on mouse by "Hot-Plate" method, as well as significantly lessened the frequency of "Writhing" response induced by 0.6% acetic acid in mice. Yang et al. reported analgesic effect of the 70% ethanol extract and total saponins. Liu et al. isolated gypenosides, soyasapogenol, and the known triterpenoid acids, hydroxyursolic acid and tomentic acid. Qin et al. reported anti-inflammatory effect of decocted extract remarkably elevate the level of 5-hydroxytryptamine, 5-hydroxyindoleacetic acid, 5-hydroxytryptophan in rat brain tissues, decrease the level of dopamine, norepinephrine and reduce the content of neurotransmitter in brain tissues. Wang et al. observed antiarthritic effect and the possible mechanism of total saponins of *P. tunicoides*, which could effectively inhibit articular swelling, decrease arthritides index and regulate down the content of IL-1b and TNF-a in the inflammatory tissue soaks of adjuvant-induced arthritis rats. By observing changes of the algesia threshold and contents of malondialdehyde (MDA) and cortisol in inflammatory-tissue soaks of adjuvant-induced arthritis rats. Total saponins of *P. tunicoides* inhibit algesia threshold and effectively decrease the content of malondialdehyde in inflammatory tissue soaks of adjuvant-induced arthritis rats. Song observed inhibition of total saponins on the croton oil induced inflammation of the ear in mice and the granuloma caused by cotton.

Zheng et al. observed immunomodulatory effect of total saponins on the cell immunity in mice. 60-100 mg/kg d of total saponins significantly enhance the delayed type hypersensitivity in immuno-suppressed mice (*p* < 0.01) and 20-100 mg/kg d of total saponins evidently decrease the delayed type hypersensitivity in immuno-increased mice (*p* < 0.01). 3 mg/mL of total saponins remarkably increase the secretion of IL-2 by macrophages. 20-80 mg/kg d of total saponins significantly facilitate the lymphocyte proliferation in mice, with the optimum dose at 80 mg/kg d. 20-80 mg/kg d of total saponins evidently increase the secretion of IL-2 by spleen lymphocytes after 15 days of administration, with the optimum dose at 60 mg/kg d. These observation suggested adequate dose of total saponins not only enhance but also modulate the cell immunity of mice.

Song observed inhibition of total saponins on *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Candida albicans*, *Trichophyton tonsurans*, *T. gypseum* and *Sporotrichum schenckii*.

Dahiya observed cytotoxicity of the synthesized cyclic peptide psammosilenin A, which possess potent cytotoxic activity against DLA and EAC cell lines with IC50 value of 7.93 and 17.06 uM, respectively. Furthermore, good antihelmintic activity against earthworms *M. konkanensis* and *Eudrilus* species at 1 and 2 mg/mL was also observed. Tunicyclin A (1) was evaluated in vitro for cytotoxicity against four human cancer cell lines, A549, LOVO, HL-60 and L-929, using MTT assay with DOX (doxorubicin) as a positive control, but showed no inhibitory activity against the four tested cell lines.

**REFERENCES**