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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 (Caryophyllaceace) 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

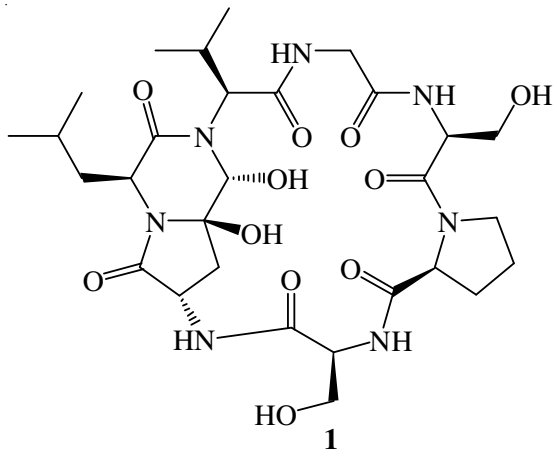
Psammosilene tunicoides W. C. Wu et. C. Y. Wu (Caryophyllaceace) is the only species in the genus *Psammosilene* and grows only in southwestern part of China[1]. The roots of the plant is of great medicinal value in China, widely used to check bleeding, relieving pain and promoting blood circulation in folk medicine and used as an important ingredient of some famous Chinese traditional medicine formulation such as Yunnan Baiyao[2]. The crude saponins extracted from the roots were found to exhibit pain reliving and antiinflammatory activities[3]. *P. tunicoides* is a perennial herb, with fleshy turbination 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 1991[4].

Phytochemical investigations: Phytochemical investigation revealed that pentacyclic tritepenoid 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-isoquillaic acid and 16-isoquillaic acid methylate from the acid hydrolytes of the total root saponins. Pu and Zhou[7] isolated two new oleanane 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-glucopyranosyl-(1→6)-[β-D-glucopyranosyl-(1→3)]-β-D-glucopyranosyl 3α,16α-dihydroxy-oleanan-12-ene-23-dioic acid. Zhong *et al.*[8,9] isolated three new oleanane type triterpenoid saponins 3-O-β-D-galactopyranosyl-(1→2)-[β-D-xylopyranosyl-(1→3)]-β-D-6-O-methylglucuronopyranosyl quillaic acid, 3-O-β-D-galactopyranosyl-(1→2)-[β-D-xylopyranosyl-(1→3)]-β-D-6-O-ethylglucuronopyranosyl quillaic acid and 3-O-β-D-galactopyranosyl-(1→2)-β-D-glucuronopyranosyl gypsogenin 28-O-β-D-xylopyranosyl-(1→4)-[β-D-6-O-acetylglucuronopyranosyl-(1→3)-α-L-rhamnopyranosyl (1→2) β-D-fucopyranoside], two new natural oleanane type triterpenoid saponins, 3-O-β-D-galactopyranosyl-(1→2)-β-D-glucuronopyranosyl gypsogenin and 3-O-β-D-galactopyranosyl-(1→2)-[β-D-xylopyranosyl-(1→3)]-β-D-glucuronopyranosyl gypsogenin, along with four known saponins 3-O-β-D-galactopyranosyl-(1→2)-β-D-6-O-methylglucuronopyranosyl quillaic acid, 3-O-β-D-galactopyranosyl-(1→2)-[β-D-xylopyranosyl-(1→3)]-β-D-glucuronopyranosyl quillaic acid, 3-O-β-D-galactopyranosyl-(1→2)-β-D-glucuronopyranosyl gypsogenin 28-O-β-D-xylopyranosyl-(1→4)-[β-D-glucuronopyranosyl-(1→3)]-α-L-rhamnopyranosyl-(1→2)-β-D-fuocopyranoside (lobatoside I) and 3-O-β-D-galactopyranosyl-(1→2)-[β-D-xylopyranosyl-(1→3)]-β-D-glucuronopyranosyl gypsogenin 28-O-β-D-xylopyranosyl-(1→4)-[β-D-glucopyranosyl-(1→3)]-α-L-rhamnopyranosyl-(1→2)-β-D-fuocopyranoside. Deng *et al.*[10] isolated a new oleanane type triterpenoid saponin, 3-O-β-D-galactopyranosyl-(1→2)-[β-D-xylopyranosyl-(1→3)]β-D-6-O-methylglucuronopyranosyl

gypsogenin and two known triterpenoid acids, 2α-hydroxyursolic acid and tomentic acid. Qin *et al.*[11] isolated the known 3-O-6'-O-methyl-β-D-glucuronopyranosyl gypsogenin. Liu *et al.*[12] isolated goyaprosaponin, soyacerebroside, tectoridin, α-spinasterol, tetracosanoic acid, β-sitosterol and daucosterol.

Tian *et al.*[13] isolated a novel cycloheptapeptide, tunicyclin A (1), with a unique tricyclic ring cyclopeptide 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[4] and valine[5], respectively and form a unique cycloheptapeptide backbone with a tricyclic ring system. Ding *et al.*[14,15] isolated six new natural cyclic dipeptides, cyclo-(-Pro-Val-), cyclo-(-Pro-Ala-), cyclo-(-Ala-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_1-Phe_1-Pro_2-Phe_2-Phe_3-Ala-Pro_3-Leu-) and cyclo-(-Pro_1-Gly-Phe_1-Val-Pro_2-Phe_2-Thr-Ile-)[16]. The structure of psammosilenin A was further confirmed by the synthesis[17].



1

Fig. 1. Structure of tunicyclin A (**1**)

Pharmacological activities: Song[3] observed analgesic effect of total saponins from *P. tunicoides*. Subchtaneous injection of total saponins from *P. tunicoides*, at a dose of 5 mg/kg, raised the paia 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.*[18] reported analgesic effect of the 70 % ethanol extract and total saponins. Xu *et al.*[19,20] found analgesic effect of decocted extract in experimental rheumatoid arthritis, which evidently pain threshold, lower the content of NO/NOS in serum, alleviate skin swelling and reduce pain degree. Wang *et al.*[21] found 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.*[22] observed antiarthritic effect and the possible mechanism of total saponins of *P. tunicoids*, which could effectively inhibit articular swelling, decrease arthritis index and regulate down the content of IL-1b and TNF-a in the inflammatory tissue soak of adjuvant-induced arthritis rats. By observing changes of the algesia threshold and contents of malondialdehyde (MDA) and cortisol in inflammatory-tisssue soak of adjuvant-induced arthritis rats. Total saponins of *P. tunicoids* inhibit algesia threshold and effectively decrease the content of malondialdehyde in inflammatory tissue soak of adjuvant-induced arthritis rats[23]. Song[3] found inhibition of total saponins on the croton oil induced inflammation of the ear in mice and the granuloma caused by cotton.

Zheng *et al.*[15] 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[3] observed inhibition of total saponins on *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Candida albicans*, *Trichophyton tonsurans*, *T. gypseum* and *Sporotrichum schenekii*.

Dahiya[17] found cytotoxicity of the synthesized cyclic peptide psammosilenin A, which possess potent cytotoxic activity against DLA and EAC cell lines with IC_{50} value of 7.93 and 17.06 uM, respectively. Furthermore, good anthelmintic 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[13].

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