



Free radical-scavenging and H⁺, K⁺-ATPase inhibition activities of *Pithecellobium dulce*

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Abstract

The free radical-scavenging property and the inhibitory action on H⁺, K⁺-ATPase activity of aqueous (AEPD) and hydroalcoholic (HAEPD) fruit extracts of *Pithecellobium dulce* (PD) were screened in various *in vitro* models. HAEPD showed the greatest free radical-scavenging activity in all the experimental models. Further, HAEPD has shown a potent H⁺, K⁺-ATPase inhibitory activity and comparable to that of Omeprazole, the antiulcer drug. HPLC chromatogram of HAEPD was found to contain rich quantity of phenolic compounds and revealed the presence of flavonoids – quercitrin, rutin, kaempferol, naringin, daidzein. Thus HAEPD was found to possess a good antioxidant capacity when compared to AEPD. The study indicates that PD can be screened for antiulcer activity, since overexpression of H⁺, K⁺-ATPase results in gastric ulceration. So the free radical-scavenging and antiacid secretory activities of PD may be claimed for its traditional consumption for gastric complications.

Introduction

Pithecellobium dulce (Roxb.) Benth. (Leguminosae) is an evergreen, small to medium sized, spiny tree which grows up to 18m in height, native of tropical Asia, America and cultivated throughout the plains of India and in the Andamans. The sweet and edible fruit of the plant is consumed as refreshment food by many people in India. It is known as 'Vilayati babul' in Hindi and 'Kodukkapuli' in Tamil. The constituents of *P. dulce* fruits have been isolated and characterised (Nigam, Gupta, & Mitra, 1962). The anti-inflammatory activity due to saponin fraction of *P. dulce* fruits (Bhargvakrishna, Gupta, Mitra, & Chittranjan, 1970) were also studied. The leaves of the plant have been reported to be a folk remedy for ear ache, leprosy, peptic ulcer, tooth ache, and venereal disease. It also acts as emollient, abortifacient, anodyne and larvicidic in folk medicines (James & Wain, 1981). The bark of the plant is reported to be used as an astringent for dysentery, febrifuge and it is also useful in dermatitis and eye inflammation. The antivenomous activity of polyphenols from bark extract of *P. dulce* was also reported (Pithayanukul et al., 2005). Presence of steroids, saponins, lipids, phospholipids, glycosides, glycolipids and polysaccharides has been reported in the seeds (Nigam et al., 1997). Studies on free radical-scavenging properties (Sugumaran, Vetrichelvan, & Darlin Quine, 2008), antimycobacterial activity of afzelin (kaempferol-3-O- α -L-rhamnopyranoside) isolated from the alcoholic extracts of leaves of *P. dulce* were recently reported (Shanmugakumar, Amerjothy, & Balakrishna, 2006). The edible fruits have been consumed for gastrointestinal problems in a traditional manner. It is evident that the plant has great potentials in treating a number of ailments where the free radicals have been reported to be the major contributing factor.

Ulcer is a common global problem with increasing incidence and prevalence attributed to several factors encountered during day-to-day life, such as stress, exposure to bacterial infection and the use of non-steroidal anti-inflammatory drugs (NSAIDS). Mucosal damage, an initial step in ulcer development has been known correlated with oxidative stress by reactive oxygen species (ROS) generation and hypersecretion of HCl through H⁺, K⁺-ATPase action (Phull, Green, & Jacyna, 1995). Thus a modest approach to control ulceration may be by scavenging ROS in the stomach and inhibiting H⁺, K⁺-ATPase, a proton pump for acid secretion in the parietal cells of gastric mucosa; although several antisecretory drugs such as H⁺, K⁺-ATPase inhibitors – Omeprazole, Lansoprazole, Ranitidine, Famotidine and histamine H₂-receptor blockers are being used to control acid secretion, they produce adverse side effects on human health (Waldum, Gustafsson, Fossmark, & Qvigstad, 2005). The present study is a prime approach to evaluate the effect of fruit extracts of *P. dulce* on the free radical-scavenging activity and H⁺, K⁺-ATPase inhibition activity *in vitro*, which can throw light on the medicinal property of *P. dulce*.

This study also represents a comparative study of free radical-scavenging and H⁺, K⁺-ATPase inhibition properties between the aqueous and hydroalcoholic fruit extracts of *P. dulce*.

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Section snippets

Collection of plant materials

The fleshy fruits of the plant were collected from Kakkalur, Thiruvallur district, Chennai Tamil Nadu, India during September 2008. The plant material was duly authenticated (PARC/2008/208).

Preparation of fruit extracts

The fleshy fruits of *P. dulce* were washed thoroughly and air dried. The air dried materials were coarsely ground into homogenous powder. The aqueous extract was prepared by soaking 10g of finely powdered sample in 100ml of distilled water with continuous swirling for 2h at 60°C using an orbital shaker and

Results and discussion

The effective antioxidants from natural sources are the only alternatives to synthetic antioxidants in counteracting the free radicals mediated diseases. Recently, various phytochemicals and their effect on health, especially the suppression of free radicals have been studied. Therefore, in the present study AEPD and HAEPD in graded concentrations were tested for their free radical-scavenging activity in various *in vitro* models and H⁺, K⁺-ATPase inhibition activities in sheep parietal cells. It

Conclusion

Medicinal herbs are known to contain a variety of antioxidant principles. Phenolic antioxidants such as flavonoids, tannins, coumarins, xanthonenes and procyanidins scavenge

radicals and thus they are viewed as promising therapeutic drugs for free radical mediated pathogenesis (Lee, Suh, & Kim, 2000). The results of the present study showed that the hydroalcoholic fruit extract of *P. dulce* possesses antioxidant activity evidenced by an *in vitro* DPPH, nitric oxide, superoxide, hydroxyl

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References (30)

L.W. Aurand *et al.*

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Journal of Dairy Science (1977)

M. Bradford

[A rapid and sensitive method for the quantization of microgram quantities of protein utilizing the principle of protein–dye binding](#)

Analytical Biochemistry (1976)

C.H. Fiske *et al.*

[The colorimetric determination of phosphorus](#)

Journal of Biological Chemistry (1925)

B. Halliwell *et al.*

[DNA damage by oxygen derived species: Its mechanism and measurement in mammalian systems](#)

FEBS Letters (1991)

Y. Hamazu *et al.*

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Food Chemistry (2008)

S. Lee *et al.*

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Neuroscience Letters (2000)

S.K. Nigam *et al.*

Pithedulosides A–G, Oleanane glycosides from *Pithecellobium dulce*

Phytochemistry (1997)

P. Pithayanukul *et al.*

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Journal of Ethnopharmacology (2005)

P. Prieto *et al.*

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Analytical Biochemistry (1999)

R. Reyes-Chilpa *et al.*

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Journal of Ethnopharmacology (2006)



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...Polyphenols from bark extract of *P. dulce* was also reported for their antivenomous activity [9]. The *P. dulce* fruits have been studied for their anti-inflammatory activity due to saponin fraction, free radical scavenging, H⁺, K⁺-ATPase inhibition, gastroprotective and hepatoprotective effect [10–14]. The presence of steroids, saponins, lipids, phospholipids, glycosides, glycolipids and polysaccharides have been shown to be present in its seeds [15]....

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