



Ecdysterone and Antioxidants in Purslane (*Portulaca oleracea* Linn.)

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Abstract

Purslane (*Portulaca oleracea* Linn.), a common weed of great importance as a nutraceutical, was studied for its steroids and phenolics. The methanolic extract is found to contain up to 0.532 mg (in 100g of dry powder) of ecdysterone, in addition to sitosterol. Quercetin was present in traces and the phenolic acids present were vanillic and syringic acids. Both betacyanins and betaxanthins also were located. The discovery of appreciable amount of the anabolic steroid ecdysterone having a number of pharmacologically significant properties in elevating the status of purslane as a nutraceutical of great potential is discussed.

Keywords: Purslane, *Portulaca oleracea*, Ecdysterone, Vanillic acid, Syringic acid

Contents

1. Introduction	137
2. Experimental	138
3. Results and discussion	138
4. Conclusion	139
5. References	139

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1. Introduction

Purslane (*Portulaca oleracea* Linn.) is a prostrate/erect succulent herb with branchlets green/purplish, subopposite/alternate spatulate fleshy leaves, bright yellow flowers (sepals two, stamens many) crowded at the tips of branches and an ovoid circumscissile capsule enclosing many black concentrically striate granulate curved seeds. It is a pantropical weed occurring in cultivated fields, waste lands and roadsides. In the West, purslane is described as a "Power food of the future" because of its high nutritive and antioxidant properties [1] and in the United States, it is grown as a speciality vegetable and available as a salad in health food stores. Tender stems and leaves can be eaten raw, cooked, or pickled. The leaves of purslane can be frozen or dried and stored in jars for year-round usage. Purslane soup is a highly nutritional supplement. In ancient Egypt, this plant was used to treat heart disease and heart failure. Since the time of Hippocrates, purslane has been widely used in Europe for its cathartic (activates bowel evacuation), anthelmintic (anti-parasitic) and diuretic properties.

Presently purslane is used in the treatment of burns and trauma; headaches; stomach, intestinal and liver ailments; cough; shortness of breath and arthritis, as a purgative, cardiac tonic, an emollient, a muscle relaxant, an anti-helminthic, an anti-inflammant, an anti-scorbutic, a cathartic, and a diuretic. James Duke, the author of "Green Pharmacy", recommends a soup of this plant everyday to keep the heart healthy and to prevent heart attack. A lot of work had been done on the phytochemistry of this plant. The whole plant, especially leaves, is exceptionally rich in

antioxidant vitamins A (1320 IU/100 g, provides 44% of RDA- one of the highest among green leafy Vegetables), C and D[1]. Leaves of purslane contain more omega-3 fatty acids (..linolenic acid) than any other leafy vegetable plant. 100 grams of fresh purslane leaves provide about 350 mg of ..linolenic acid, 12.2 mg of alpha-tocopherol, 26.6 mg of ascorbic acid, 1.9 mg of beta-carotene, and 14.8 mg of glutathione [2]. Another important chemical found is Melatonin, 10 to 20 times more than any other fruit or vegetable[3]. Also present are betacyanins and oxalic acid. It is also rich in minerals such as magnesium (amounts to about 2% d.w.), calcium and potassium [4]. Recently, sitosterol, sitosterol-glucoside and N,N'- dicyclohexylurea have been isolated[5]. In the present work, the whole plant is studied for the presence of steroids and phenolics.

2. Materials and methods

The plant material was collected from M.S University campus and authenticated by comparing with the herbarium specimens present in BARO, Department of Botany, M.S University, Vadodara. Voucher specimens are deposited in the same Herbarium BARO. Steroidal fractions were extracted in methanol and HPLC analysis was done in SCHIMADZU LC20AT instrument fitted with SPD20A Diode array detector and Class VP Chromatography Workstation at the Department of Botany of the Maharaja Sayajirao University of Baroda, Vadodara. For RP-HPLC, Grace Smart RP C1 Colum (250x4.6mm, 5 μ) using a mobile phase of acetonitrile: water (80:20, v/v), flow rate was 1mL/min, and the peak was detected at 242nm. Mode of elution was isocratic. Standard steroids including ecdysterone, kindly provided by Dr.A.Banerji, Distinguished Professor, Mata Amritamai Institute of Biotechnology, Kollam, were used for the identification of these compounds. Standard methods [6,7,8] were followed for the analysis of flavonoids and phenolic acids and the identities were confirmed by co-chromatography with authentic samples.

3. Results and Discussion

The methanolic extract of purslane is found to contain up to 0.532 mg (in 100g of dry powder) of ecdysterone in addition to sitosterol. Among the phenolics, the flavonol quercetin was present in traces and the phenolic acids present were vanillic and syringic acids. Both betacyanins and betaxanthins also were located. The presence of ecdysterone, a powerful natural anabolic steroid which increases growth of muscle protein, blood cells and stamina and reduces fat, without any side effects, is highly significant that the ingestion of this vegetable improves the health of the consumer tremendously. As this steroid is found to increase lean body mass, endurance, stimulates metabolism and improves nerve function, a daily dose of purslane can surely be considered as a health food. Ecdysterone is found to exhibit a number of medicinal properties such as antidiabetic, cardioprotective, anti-inflammatory and hepatoprotective, it can be used as a nutraceutical for all these ailments too. Sitosterol also provides a number of health benefits in that it is useful in colon, breast and prostate cancer [9], replaces cholesterol and thus cholesterol lowering, and reduces hair loss.

Betalains including the reddish *betacyanins* and the yellow *betaxanthins* are potent anti-oxidants and have been found to have anti-mutagenic properties in laboratory studies. Flavonoids like quercetin are very efficient antioxidants which prevent cancer, rheumatism, thin blood and are antiageing. Phenolic acids identified from this plant also are known to possess profound curative properties. Vanillic acid is anthelmintic, anti-fatigue, anti-inflammatory, antileukemic, antiseptic and anti-sickling, while syringic acid is antioxidant, anti-peroxidant and anti-radicular. Based on the phytochemicals present Purslane is one of the richest (upto16% dry wt) in antidepressant substances like calcium, magnesium, potassium, phenylalanine, and tryptophan, all of which are known to moderate the effects of depressive brain chemicals. Therefore a cup of purslane soup counters depression.

Magnesium amounts to about 2% dry weight and this is the dose to prevent heart attack, to boost stamina, remove chronic fatigue syndrome, prevent headache and reduce blood pressure. Omega-3 fatty acids which are more than that of any other leafy vegetable plant, reduce the risk of coronary heart disease, stroke, and help prevent the development of ADHD, autism, and other developmental differences in children. Presence of large amounts of antioxidants like Vitamin A, (1320 IU/100 g, provides 44% of RDA- essential for vision, healthy mucus membranes and skin and protection from lung and oral cavity cancers). Glutathione (which reduces liver damage and eliminates toxins in the blood which damage cell and organs), melatonin (10 to 20 times more than any other source-an antioxidant that may inhibit cancer growth) and Vit. C provide all the benefits of these compounds to the consumer[10].

The present study unveils a few new pharmacologically significant chemical entities which add to the acceptability of purslane as a nutraceutical. Though in West it is in high demand, in India, though abundant and seen everywhere, it has not been able to get the attention of common man who runs after every herb of the West purported to have health benefits. It is high time the nutritionists of the country to get awakened to the potentialities of this 'Power Food'.

4. Conclusion

In the present study, purslane (*Portulaca oleracea* Linn.), a common weed of importance as a nutraceutical was found to be a rich source of ecdysterone, in addition to β -sitosterol. Quercetin was present in traces and the phenolic acids present were vanillic and syringic acids. Both betacyanins and betaxanthins also were located. The discovery of appreciable amount of the anabolic steroid ecdysterone having a number of pharmacologically significant properties elevates the status of purslane as a "Power food".

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