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Nutraceuticals Potential of Petroselinum Crispum: A Review

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Abstract

Petroselinum crispum is a green biennial hedge plant which belongs to Apiaceae family indigenous to Europe and Western Asia. Flavonoids like apigenin, chrysoeriol and quercetin are chief components in *Petroselinum crispum* plant that decrease the oxidative damage associated with cancer, aging, atherosclerosis, ischemic damage, soreness, and neurodegenerative diseases. Leaves, seeds and roots of *Petroselinum crispum* are used as hepatoprotective, brain protective, anti-diabetic, analgesic, spasmolytic, immunosuppressant, anti-anemic, menorrhagia, anti-coagulant, anti-hyperlipidemic and many more diseases. This paper put a light on bioactive and nutraceuticals properties of *Petroselinum crispum*.

Keywords: *Petroselinum crispum*; Anti-oxidant; Bioactive compounds; Nutraceuticals

Introduction

Petroselinum crispum (Parsley) is an herbal plant which belongs to Apiaceae family indigenous to Europe and western Asia. *Petroselinum crispum* is having therapeutic potential as well as used for additives, garnishing, condiment, flavoring agents and perfume. *Petroselinum crispum* is also used in cosmetics industries mainly China, Mexico, South America, India and South-East Asia. In India it got cultivated in Jammu and Kashmir, Punjab, Uttrakhand,

Uttar Pradesh, Maharashtra and Karnataka states. *Petroselinum crispum* leaves look like coriander leaves but the taste and aroma hold opposing views. *Petroselinum crispum* contains small, dark seeds which content volatile oil [1]. In Britain, they prefer the curly leaves forms for culinary purposes and on the continent plain leaves varieties are preferred for garnishes and flavoring [2] (Figure 1) (Table 1).

Table1: Classification of Petroselinum crispum.

Rank	Scientific Name and (Common Name)
Kingdom	Planate
Division	Magnoliophyta (Flowering plants)
Super division	Spermatophyta (Seed plants)
Class	Magnoliopsida (Dicotyledons)
Order	Petroselinum crispum
Family	Apiaceae / Umbelliferae
Genus	Petroselinum J. Hill (Parsley)
Species	*Petroselinum crispum* (Mill.) Nyman ex A.W. Hill (Parsley)

Figure 1: Leaf, Seeds and Roots of *Petroselinum crispum.*

Petroselinum crispum fresh and dry leaves are rich source of phytochemical and anti-oxidant as well as its essential oils also holds important place. Many studies showed that it contains flavnoids, carotenoids, luteolin, apigenin, ascorbic acid, to cophenol and apiol are the main essential compounds. Fresh leaves helps in reducing oxidative stress in humans. It grows biennial, in the first year; it forms a rosette of tripinnate leaves 10-25cm leaflets and taproot used as a food store over winter. In second year it grows a flowering stem to 75cm tall with sparser leaves and flat topped 3-10cm diameter umbels with number of yellowish green flowers. *Petroselinum crispum* seeds are ovoid 2-3mm long with prominent style remnants at the apex. The plant dries after the maturation of seeds. *Petroselinum crispum* root is common food in eastern and Europeans cuisines used mainly in snacks as soups, stews and casseroles.

Bioactive Components

Petroselinum crispum contains many antioxidant properties, luteolin [3], flavonoid, coumarins, tocopherol, myristicin [4], essentials oils and phenolic compounds [5]. Carotenoids, vitamin-A, B and C [6,7]; minerals like iron, zinc calcium, phosphorous are also present in *Petroselinum crispum* leaves [8,9]. Furanocoumarins such as psoralen, bergapten, isoimperatorin, oxypeucedanin, xanthoxin, trioxalen and angelicin are key substances of *Petroselinum crispum*. Flavonoids like apigenin, chrysoeriol and quercetin are chief components in *Petroselinum crispum* plant that decrease the oxidative damage associated to cancer, aging, atherosclerosis, ischemic damage, soreness and neurodegenerative diseases [1,10]. *Petroselinum crispum* leaves also contain n-3 omega fatty acids like linolenic and palmitic acid [11-13].

Therapeutic Potential

Traditionally *Petroselinum crispum* is used for menstrual disorder, emmenagogue, galactagogue [14] intestinal cramps, diarrhea and in opposition to head lice [15] and anti-cancer activity [16]. Due to the presence of bioactive compounds, *Petroselinum crispum* shows different pharmacological activities such hepatoprotective, brain protective, anti-diabetic analgesic and spasmolytic [17]. As well as beneficial for immunosuppressant, anti-anemic, menorrhagic, anti-coagulant, anti-hyperlipidemic, anti-hypertensive effects anti-platelet, anti-inflammatory, anti-hepatotoxic and anti-tumor [10,18]. Allergy similar to asthma [19], gastro protective, cytoprotective, laxative, estrogenic, diuretic, chronic bronchitis, dyspepsia and hypotensive [20,21] Alzheimer's disease, thrombosis and strokes [22] are also alleviated by *Petroselinum crispum*. The flavnoid myristicin contained in the plant has the properties to increase the production of estrogen which make their use relevant in menopause. Different parts of *Petroselinum crispum* plant are also used in curing diseases such as the roots are used in flatulence, cystitis. Leaves and stems are remedy for menstrual problems, cystitis, edema, kidney stones, prostatitis, cramps, indigestion, anorexia, arthritis and rheumatism [23]. Its leaf, seed and root are being used in eczema, controlling high blood pressure, strengthen the bladder, nose bleeding, hematoma, skin blemishes, ear ache, otitis, emenagogue favoring menstruation and alleviating its pains. *Petroselinum crispum* is also widely used as a galactofuge by lactating mothers to stop excessive milk production [24]. *Petroselinum crispum* root is taken as a treatment for flatulence, cystitis, and rheumatic conditions.

Anti- neurotoxicity

Petroselinum crispum has a protective effect against cadmium neurotoxicity and teratogenicity in albino mice. *Petroselinum crispum* seeds and leaves juice supplementation improves the behavior of prenatally cadmium intoxicated mice newborns and reduces neuronal aberrations in the brain caused by oxidative stress [20,25,26].

Anti-oxidant activity

Adding *Petroselinum crispum* leaves to the diet of 14 people for one week caused significant increase in antioxidant enzymes compared with their levels in the basic diet received group. Apigenin was demonstrated to be the main compound responsible for this activity *Petroselinum crispum* [27,28]. Different extracts from *Petroselinum crispum* leaves and stems exhibited antioxidant properties in various in vitro models [29-32]. Essential oil from seed showed in vitro antioxidant activity. Apiol and myristicin are two components responsible for its antioxidant activity [13].

Analgesic and spasmolytic activity

Petroselinum crispum seed hydroalcoholic extract revealed analgesic activity in mice [33]. It also reduced KCl- and CaCl2-induced contractions on rat isolated ileum dose dependently via blocking voltage-gated calcium channels [34]. Different extracts from aerial parts demonstrated antispasmodic activity on spontaneous and acetylcholine- induced contractions of rat isolated ileum [34].

Immunomodulating activity

Essential oil from *Petroselinum crispum* seed suppressed humoral and cellular immune response via inhibiting splenocytes and macrophages function [35].

Gastrointestinal activity

Ethanol extract from *Petroselinum crispum* leaves executed beneficial effects on different models of peptic ulcer in rats via its anti-secretory and cytoprotective activity [36]. Aqeoues extract from *Petroselinum hortence* seeds demonstrated laxative activity in rat by significant absorption of sodium and water and also enhancing Na- KCl2 transporter activity in the colon [37].

Genitourinary system

Methanol extract from *Petroselinum crispum* aerial part showed proliferative activity in estrogen-sensitive breast cancer cell line (MCF-7) equal to isoflavone glycosides from soybean. This estrogenic activity was related to flavone glycosides; 6"-acetylapiin and also aglicones; apigenin, diosmetin, and kaempferol. Furthermore, oral administration of the extract regenerated the uterus weight in ovariectomized mice and apiin and apigenin were responsible for this activity [38]. *Seudomonas*

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crispum oil demonstrated significant protective activity against zearalenone -induced reproductive toxicity and significantly improved testosterone level, sperm count, sperm motility and inhibited germ cells chromosomal aberrations [39]. Aqeoues extract of *Pseudomonas hortense* seeds exhibited diuretic effect and inhibited Na+-K+ ATPase activity in kidney cortex and medulla [40].

Cardiovascular activity

Petroselinum crispum leaves decreased mean blood pressure which recorded from the carotid artery in anaesthetized rats. This effect was attenuated with muscarinic receptor antagonist. It also decreased rate and amplitude of contraction on isolated rat atria which weakened by muscarinic antagonist. These data indicate hypotensive and negative inotropic and chronotropic activity of *Petroselinum crispum* [41]. *Petroselinum crispum* leaves demonstrated strong antiplatelet aggregation effect. Aglycone flavonoids; keampferol, apigenin and cosmosiin are responsible compounds for this activity. However, it did not exert inhibition on clotting activity *in vitro* [42-44].

Antimicrobial and cytotoxic activity

Petroselinum crispum leaves and stems possess antibacterial activity on *Bacillus subtilis* and *Escherichia coli* [32]. Hot and cold water extract from *Petroselinum crispum* leaves demonstrated antibacterial activity against *Pseudomonas aeruginosa, Staphylococcus aureus and Staphylococcus pyogenes* isolated from patient with burn infection. 7 Ethanol extract of *Pseudomonas crispum* leaves inhibited the growth of Lactobacillus plantarum and Leuconostoc mesenteroides [45]. The furocoumarins isolated extract from *Petroselinum crispum* leaves demonstrated inhibitory activity against *Escherichia coli*, *Listeria monocytogenes*, *Erwinia carotovora* and *Listeria innocua* and no inhibition against *Pseudomonas fragi*. Psoralen, 8-methoxypsoralen, 5-methoxypsoralen, oxypeucedanin and isopimpinellin were among the responsible antimicrobial furocoumarins [32]. Essential oil from aerial part of *Petroselinum crispum* had no antibacterial activity against *Listeria innocua, Serratia marcescens* and *Pseudomonas fluorescens* [46]. methanol extract of parsley leaves demonstrated antimicrobial activity *Bacillus subtilis*, *Petroselinum aeruginosa*, *Staphylococcus epidermidis*, *Staphylococcus aureus and Saccharomyces cerevisiae in vitro*. Coumarins are responsible components for this property [47].

Haematology activity

Results indicates that the leaf ethanol extract of *Petroselinum crispum* was hepatotoxic and nephrotoxic at continued oral doses equal to or more than 1000mg/kg, but no obvious toxicity when used at lowers doses. Therefore, there should be caution in its administration to avoid overdosing [24].

Traditional uses and ethnobotanical reports of petroselinum crispum in different countries

Iran- Seeds and leaf: Iran- Seeds and leaf are used for- Antimicrobial, antiseptic, antispasmodic and sedative, gastrointestinal disorder and carminative, digestive, astringent, gastrotonic, inflammation, antidote, halitosis, kidney stone and amenorrhoea. Food flavor, exanthema, alphosis, macula, headcool, sniffle, otitis, antitussive, diuretic, kidney stone, hemorrhoid, gastrointestinal disorder, vision performance and dermatitis [48-53].

Iraq- leaf: Iraq- leaf is used for- curing skin disease [54].

Turkey- Leaf and Seeds: These are used for- Anticoagulant, hypertension, hyperlipidemia, hepatotoxic, diabetes and diuretic [55-57].

Morocco- leaf: It is used for Arterial hypertension, diabetes, cardiac disease, renal disease, lumbago, high blood pressure, eczema, nose bleed, amenorrhoea, dysmenorrheal and kidney stones [53-57].

Spain- Leaf: It is used for Prostatitis, diabetes, halitosis, anemia, hypertension, hyperuricaemia, constipation, odontalgy, pain and baldness [17, 58,59].

Peru- Seed: It is used for Carminative and gastritis [60,61].

Serbia- Leaf: Serbia- Leaf is used for Urinary tract disease, fluid retention and urinary tract infections [62,63].

Contraindications and safe doses of petroselinum crispum

Harmless and free of toxicity plants and foods are very less available in our time but few herbs are here to cure physical condition and it's proven by different experiments and intervention method and safe does are recommended. The drawbacks of using these solvents are representing their toxicity and therefore cannot be added to foods. Thus, the use of non-toxic solvents and solvent mixtures such as vegetable oils or micro emulsions could be beneficial to soluble the plant extracts and also for adding to foods. *Petroselinum crispum* safe doses are recommended as 2gm/kg bw/day [64-66].

Conclusion

Petroselinum crispum has been used as an herbal medication since historic period. There is a need for sustain hard work that spotlight on pre-clinical studies with *Petroselinum crispum* linking animal and human models on different diseases. This may then be as a result validated in clinical trials that will help in developing *Petroselinum crispum* as a promising therapeutic agent. Therefore, *Petroselinum crispum* and its parts could be safe and provide bioactive benefits.

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