

## Short Communication

# Monograph of *Apium graveolens* Linn.

H. M. Asif<sup>1,2</sup>, M. Akram<sup>2\*</sup>, Khan Usmanghani<sup>2</sup>, Naveed Akhtar<sup>1</sup>, Pervaiz A. Shah<sup>3</sup>, M. Uzair<sup>4</sup>,  
Memona Ramzan<sup>5</sup>, S. M. Ali Shah<sup>1</sup> and Riazur Rehman<sup>1</sup>

<sup>1</sup>College of Conventional Medicine, Faculty of Pharmacy and Alternative Medicine, The Islamia University of Bahawalpur, Pakistan.

<sup>2</sup>Department of Basic Medical Sciences, Faculty of Eastern Medicine, Hamdard University Karachi, Pakistan.

<sup>3</sup>University College of Pharmacy, Punjab University, Lahore, Pakistan.

<sup>4</sup>Faculty of Pharmacy, Bahauddin Zakariya University, Multan, Pakistan.

<sup>5</sup>Department of Chemistry, The Islamia University of Bahawalpur, Pakistan.

Accepted 23 February, 2011

***Apium graveolens* has been used in Unani system of medicine as anti-inflammatory, uricosuric, diuretic and to treat rheumatism besides other ailments. The description, active constituents, medical uses *A. graveolens* are described herewith.**

**Key words:** *Apium graveolens*, active constituents, medicinal activity.

## INTRODUCTION

*Apium graveolens* Linn. (Apiaceae) is commonly known as Celery (Norman et al., 2001). In India Celery plant is native in Punjab, Himachal Pradesh and Uttar Pradesh states. It is commonly found in foot hills of Himalayas (Pullaiah, 2006; Nadkarni and Nadkarni, 1976; Singh et al., 1995). It is an erect, annual or biennial herb. The roots are numerous, succulent and well developed. The stem branches are angular or fistular, and are conspicuously jointed. The leaves are oblong to obovate, pinnate or trifoliate. The leaflets are ovate to sub-orbicular and 3-lobed. The flowers are white or greenish white and very small. The fruit is a schizocarp consisting of two mericarps, sub-orbicular to ellipsoid, greyish brown to brown with pale ridges, aromatic and slightly bitter. The seed and flowering shoots are shown in Figures 1 and 2 (Teng et al., 1985).

## *Apium graveolens* Linn.

Tibbi name:	Ajmud, Krafs
English name:	Celery
Botanical name:	<i>Apium graveolens</i>
Family:	Umbelliferae
Synonym:	<i>Apium petroselinum</i> Linn

Part used: Seeds

## Objective

To review the published literature on *A. graveolens*

## METHODOLOGY

Relevant articles were searched using the terms *A. graveolens*, active constituents, medicinal and pharmacological activity.

## Active constituents

Isoimperatorin, isoquercitrin, linoleic acid, magnesium, p-cymene, phosphorus, guaiacol, silicon, terpinene-4-ol, 3-N-butyl-phthalide, umbelliferone, Vitamin A, C, B, apiol, zinc. Volatile oil, containing d-limonene, with a-selinene, santalol, a and b eudesmol, dihydrocarvone. Phthalides, ligustilide, sedanolide, and sedanenolide, bergapten, isopimpinellin, apiumoside and celeroside (Garg et al., 1980). 3-butyl-4,5-dihydrophthalide, coumarins (seselin, osthenol, apigravin, celerin), furanocoumarins (including bergapten), flavonoids (apigenin, apiin), phenolic compounds, choline and unidentified alkaloids. The essential oil contains daltimonene, various sesquiterpene. Celery is rich in beta-carotene and folic acid.

## Celery leaves

It consist of moisture 88.0%, protein 6.3%, fat 0.6%, minerals 2.1%,

\*Corresponding author. E-mail: makram\_0451@hotmail.com.  
Tel: 92-021-6440083. Fax: 92-021-6440079.



Figure 1. Flowering shoots.



Figure 2. *A. graveolens* seeds.

fiber 1.4% and carbohydrates 1.6% per 100 g. Its mineral and vitamin contents are calcium, phosphorous, iron, carotene, riboflavin, niacin and vitamin C (Blish et al., 1972).

### Medical uses

Aperient, carminative; uricosuric; Antispasmodic; diuretic, emmenagogue, galactagogue, nervine, stimulant, tonic. Celery is said to promote the elimination of uric acid. It is an aromatic bitter tonic herb that reduces blood pressure, relieves indigestion, stimulates the uterus and act as anti-inflammatory (Leung et al., 1980). The ripe seeds, herb and root are uricosuric, nervine, stimulant and tonic (Zheng et al., 1993; Ko, 1991). An essential oil obtained from the plant has a calming effect on the central nervous system. Some of its constituents have antispasmodic, sedative and anticonvulsant actions. It has been shown to be of value in treating high blood pressure (Bisset et al., 1994). It is used in treating rheumatism and kidney complaints (Yan et al., 1998). It is considered one of the most alkaline of foods. It has a special affinity for the stomach, kidneys, and liver and helps to neutralize acids in the body. Celery seed is most often taken to aid in the maintenance of healthy joints. It is said to be useful to reduce the degeneration of body joints that commonly occurs with age and can also ease joint discomfort that occurs due to inflammation and is, in fact, mainly used for the relief

of symptoms of such conditions as arthritis, rheumatism and hyperuricemia. Various pharmacological activities attributed to the seed or essential oil include antispasmodic, mild sedative, and anti-inflammatory activity. The seeds and stalks are utilized as spasmolytic, carminative, anti-inflammatory, antirheumatic, sedative, hypotensive, and urinary antiseptic agent (Tsi et al., 1997). Seeds of the wild celery plant, *A. graveolens* are employed as a traditional medicine in India and other countries adopting Ayurvedic traditions for healing, being used as a tranquilizer, antispasmodic, nerve tonic, diuretic, and antirheumatic (Kapoor, 1990).

## RESULTS

### Differentiating cross-reacting allergens in the immunological analysis of celery (*A. graveolens*) by mass spectrometry

Celery is acknowledged as a major food allergen in Europe, and mandatory labeling for preprocessed foods has been implemented. In one study, sandwich celery ELISA using polyclonal anticelery antibodies for capture and detection was developed and validated. The method has an LOD of 0.5 mg/kg in buffer; however, it is applicable only for the screening of food products because of extensive cross-reactivity with potato and carrot proteins. Using nanoLC-ion-trap MS/MS, a number of proteins in the three vegetable species were identified as candidates for causing cross-reactions due to amino acid sequence homologies. Among others, a novel patatin (Sola t 1)-like protein was detected in celery and a flavin adenine dinucleotide binding domain-containing protein (Api g 5)-like protein was identified in carrot. The utility of triple-quadrupole MS/MS for specific and quantitative analysis of celery, potato, and carrot allergens was evaluated using whole protein extracts. Several unique precursor ion-to-product ion transitions were determined for each species, suggesting the feasibility of developing an MS-based screening method to specifically detect celery allergens in foods (Faeste et al., 2010).

### Pharmacological activity

The clinical study was conducted on Gouticin (Herbal coded tablet) that contains different medicinal herbs including *A. graveolens*, used as analgesic in Gouty arthritis. Study was conducted in Shifa ul Mulk Memorial Hospital, Hamdard University, Karachi. The drug was prescribed to 50 patients between ages of 35 years to 75 years. The selected drug was administered to attain a successful response to gout. Clinical study of *A. graveolens* shows that it exhibits the anti-inflammatory effects. It was concluded that Gouticin is remarkably effective for the treatment of acute gout and arthritis (Akram, 2009). In another study an herbal drug arthritin containing different medicinal herbs including *A. graveolens* was evaluated in comparison with methotrexate for the treatment of rheumatoid arthritis. Study was conducted in

Shifa ul Mulk Memorial Hospital, Hamdard University, Karachi. Herbal formulation arthritin was administered to 50 patients. Clinical study shows that arthritin exhibits the anti-inflammatory effects. It was concluded that *A. graveolens* is effective for the treatment of rheumatoid arthritis (Owais, 2009).

## DISCUSSION

Seeds of *A. graveolens* L. (Apiaceae) are used in Indian systems of medicine for the treatment of liver ailments. The antihepatotoxic effect of methanolic extracts of the seeds of this plant has been studied previously (Anubha et al., 1995). The antimicrobial activity of the essential oil of this plant was assayed *in vitro* against *Helicobacter pylori* (strain DSMZ 4867), resulting in a minimum inhibitory concentration value of 12.5 µg/ml (Luigi et al., 2010). *A. graveolens* is an ingredient of eight of the thirty-three Indian polyherbal formulations with reputed liver-protecting activity (Handa et al., 1986). *A. graveolens* is also anti-inflammatory and uricosuric (Chopra et al., 1956). *A. graveolens* is hepatoprotective (Ahmed et al., 2002). Anti-nociceptive and anti-inflammatory effects of *A. graveolens* has been studied previously (Atta et al., 1998). Celery allergy has been confirmed by a clinical study in 32 subjects previously (Ballmer et al., 2000). Apigenin has been isolated from *A. graveolens* that has vasodilatory action (Ko et al., 1991). Mosquitocidal, nematocidal and antifungal compounds from *A. graveolens* L. seeds have been reported (Momin et al., 2001; Appel and Moore, 1997), while *A. graveolens* has been prescribed for the treatment of high blood pressure (Appel et al., 1997). *A. graveolens* L. is considered as antispasmodic and carminative (Friedman et al., 1986).

## Conclusion

The pharmacological activities are anti-inflammatory, uricosuric, diuretic and for the treatment of rheumatoid and osteoarthritis has been documented. Although it exerts effects on liver, exhibits hepatoprotective activities and involved in gouty arthritis therapy. In conclusion *Apium graveolens* has wide range of medicinal uses and can be used either as single drug or compound drugs to treat different ailments

## REFERENCES

- Ahmed B, Alam T, Varshney M, Khan SA (2002). Hepatoprotective activity of two plants belonging to the Apiaceae and Euphorbiaceae family. *J. Ethnopharmacol.*, 79(3): 313–316.
- Akram M (2009). Clinical evaluation of herbal medicine for the treatment of hyperuricemia and gout, M. Phil Thesis, Hamdard University Karachi.
- Anubha S, Handa S (1995). Hepatoprotective activity of *Apium graveolens* and *Hygrophila auriculata* against paracetamol and thioacetamide intoxication in rats. *J. Ethnopharmacol.*, 49(3): 119-126
- Appel LJ, Moore TJ (1997). A clinical trial of the effects of dietary patterns on blood pressure. *N. Engl. J. Med.*, 336:1117-1124.
- Atta AH, Alkofahi A (1998). Anti-nociceptive and anti-inflammatory effects of some Jordanian medicinal plant extracts. *J. Ethnopharmacol.*, 60(2): 117–124.
- Ballmer WBK, Vieths S, Luttkopf D, Heuschmann P, Wuthrich B (2000). Celery allergy confirmed by double-blind, placebo-controlled food challenge: a clinical study in 32 subjects with a history of adverse reactions to celery root. *J. Allergy Clin. Immunol.*, 106(2): 373–378.
- Bisset N (1994). *Herbal Drugs and Phytopharmaceuticals* Scientific Publishers, Stuttgart.
- Blish J (1972). *Dictionary of Health Foods*. Nash Publishing, Los Angeles.
- Chopra RN, Nayarand SL (1956). *Glossary of Indian Medicinal Plants*. CSIR New Delhi, pp. 174-175.
- Faeste CK, Jonscher KR, Sit L, Klawitter J, Løvberg KE, Moen LH (2010). Differentiating cross-reacting allergens in the immunological analysis of celery (*Apium graveolens*) by mass spectrometry. *J. AOAC. Int.*, 93(2): 451-61.
- Friedman J, Yaniv Z, Dafni A, Palevitch D (1986). A preliminary classification of
- Garg SK (1980). Glucosides of *Apium graveolens*. *Planta Med.*, 38(4): 363.
- Handa SS, Sharma A, Chakraborti KK (1986). *Natural Products and Plants as Liver protecting drugs*. *Fitoterapia*, 57: 307-352
- Kapoor LD (1990). *Apium graveolens* Linn. Family: Umbelliferae, in: *Handbook of Ayurvedic Medicinal Plants*, CRC Press Inc., Boca Raton, FL. 44.
- Ko FN Huang TF, Teng CM (1991). Vasodilatory action mechanisms of apigenin isolated from *Apium graveolens* in rat thoracic aorta. *Biochim. Biophys. Acta.*, 1115(1): 69–74.
- Leung AY (1980). *Encyclopedia of Common Natural Ingredients*. New York: John Wiley.
- Momin RA, Nair MG (2001). Mosquitocidal, nematocidal, and antifungal compounds from *Apium graveolens* L. seeds. *J. Agric. Food Chem.*, 49(1): 142–145.
- Nadkarni KM, Nadkarni AK (1976). *Indian Materia Medica*. 3rd edition. Bombay: Dhoot Papeswar Prakashan Ltd., pp. 119-120.
- Norman GB, Max W (2001). *Herbal Drug and Phytopharmaceuticals, A Handbook for practice on a scientific basis with reference to German Commissioner*. Second edition. Boca Raton: Medpharm Scientific Publishers, pp. 81-82.
- Owais M (2009) clinical evaluation of herbal medicine for the treatment of rheumatoid arthritis. M. Phil. Thesis., Hamdard University, Karachi.
- Pullaiah T (2006). *Encyclopedia of World Medicinal Plants*. Vol. I. New Delhi: Regency Publications, pp. 187-188.
- Singh A, Handa SS (1995). Hepatoprotective activity of *Apium graveolens* and *Hygrophila auriculata* against paracetamol and thioacetamide intoxication in rats. *J. Ethnopharmacol.*, 49(3): 119-126
- Teng CM, Lee LG, Ko SN (1985). Inhibition of platelet aggregation by apigenin from *Apium graveolens*. *As. Pac. J. Pharmacol.*, 83: 85.
- the healing potential of medicinal plants, based on a rational analysis of an ethnopharmacological field survey among Bedouins in the Negev desert. *Israel. J. Ethnopharmacol.*, 16: 275-278.
- Tsi D (1995). Effects of aqueous celery (*Apium graveolens*) extract on lipid parameters of rats fed a high fat diet. *Planta Med.* 61:18–21.
- Tsi D, Tan BKH (1997). Cardiovascular pharmacology of 3-n-butylphthalide in spontaneously hypertensive rats. *Phytother. Res.*, 11: 576-582.
- Yan CH, Feng YP, Zhang JT (1998): Effects of dl-3-n-butylphthalide on regional cerebral blood flow in right middle cerebral artery occlusion rats. *Chung Kuo Yao Li Hsueh Pao*, 19: 117-20
- Zheng G, Kenney PM, Zhang J, Lam KT (1993). Chemoprevention of benzopyrene-induced forestomach cancer in mice by natural phthalides from celery oil. *Nutr. Cancer*, 19: 77-86.