

## Pumpkin – health benefits

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### Abstract

Plant products have been used for millennia as a medicine in human nutrition. The popularity of pumpkin consumed as both food and medicine in traditional medicine for several diseases (antidiabetic, antihypertensive, antitumor, immunomodular, antibacterial, antihypercholesterolemic, intestinal antiparasitic, anti-inflammatory, analgesic) have focused the attention of several researchers on it. Pumpkin is an important source of carotenoids, a variety of amino acids, vitamins and minerals, useful fibers, so it has a high therapeutic and health care function with great nutritional and technological potential. This review will focus on chemical composition, nutritional properties and health and medicinal benefits of the pumpkin.

**Keywords:** Pumpkin, oil seeds, carotenoids, health

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### 1. Introduction

The incidence of cardiovascular, digestive diseases, diabetes and cancer imposed the need to adopt and introduce into the human diet plant products with increased bioactive properties, which have in their composition considerable amounts of antioxidants, polyphenols, fiber, vitamins, micro- and macroelements. Among such vegetable products is pumpkin. In recent decades, has been increased the interest for the pumpkin, with more and more studies being carried out on it, which confirms the indisputable value for food and human health. [1]

Pumpkins, squashes and gourds are very important crops originated in Asia, Africa, and the Americas, were cultivated, consumed and used by humans for more than 10,000 years, and they spread all over the world: Central Europe, Eastern Europe, India, Africa [2,3,4]. They are of commercial importance all over the world, mainly in Asia. Pumpkin is a specific crop of hot areas and sensitive to cold temperatures. However, some species have also adapted to a cold and dry climate (eg.: Russia).

Consumption of pumpkins has been increased rapidly by people due to awareness regarding their health benefits [5].

Pumpkin is a seasonal crop and belongs to *Cucurbitaceae* family which include gourds, melons and squashes also [6,7,8]. It is cultivated around the world and used differently depending on the area and traditions. Sweet and aromatic, highly perishable or storable for months with little change in quality, pumpkins are, with few exceptions, prized for their delicious flesh that may be consumed crude or processed, and the seeds may be used for vegetable oil and protein [9]. It has many culinary uses either fresh or as an ingredient in pies, soups, stews and bread [10]. Pumpkin flesh is an exceptional raw material for jams, marmalades, purees [11], sterilized cans, juices, nectars, fermented beverages, pickles, chips, powders, teas, bioactive compound extracts, food dye. Pumpkin seeds, although underused, are of particular interest due to their chemical composition, therapeutic and industrial properties. They are used to produce oil, in bakery, consumed as a snack.

Pumpkin seeds are used in cosmetology to treat tapeworm. Other traditional usages include the remedy of kidney, bladder and prostate disorders [12]. The pumpkin seeds and peel are often used as animal feed, in agriculture as a soil fertilizer. Leaves may be consumed for food or medicinal purposes. The flowers of *Cucurbita pepo* are commonly consumed in Mexico and Italy in soups and other foods [9].

Pumpkins are grown mostly for their flavored flesh and seeds, which are used in human diet, in livestock food. Cucurbits are also grown for use as ornaments (eg.: for Halloween), dried gourd shells may be used as storage containers, or as musical instruments, and some are used for medicinal applications and other purposes [2,7,9].

## 2. Chemical composition and nutritional properties of pumpkin

Reviewing the literature, have been seen that pumpkin is one of the vegetables that meet the requirements of healthy nutrition. It is a tasty and valuable vegetable crop, containing a lot of biologically active compounds and outstanding for dietary qualities [13]. Interests on pumpkin are increasing due to its low in energy compared with other vegetables, and high amounts of carotenoids ( $\beta$ -carotene, lutein, lycopene) [9,14,15] polyphenols, flavonoids, pigments that are gaining importance due to their antioxidant activity, polysaccharides, pectin, and dietary fiber [4], minerals (potassium, calcium, magnesium, sodium, iron, iodine, zinc), vitamins (A, C, B<sub>1</sub>, B<sub>2</sub>, B<sub>9</sub>, PP), and other substances beneficial to health [13,16,17]. They provide ranges of sweetness, texture, color, and low calorie bulk as fresh alternatives to the proliferating array of readily available, carbohydrate rich, processed foods. Fruit water content ranges from 88 to 96%, and caloric content per 100 g fresh material ranges from 15 kcal to 46 kcal, on average [9]. The chemical composition varies according to species, variety, maturity, climate and geographic area [18].

Carotenoids, polysaccharides, pectin, proteins and peptides, para-aminobenzoic acid, sterols, polyphenols and phytochemicals such as phenolic glycosides are biologically active components, which are contained within flesh, seeds and leaves of pumpkin.

Several researchers wrote on the medicinal properties of these biologically active components such as: antibacterial, anti-fatigue [19], immunomodulatory, antiinflammatory, antimutagenic, antineoplastic, antiaging, cardioprotective, antihelminthic, hepatoprotection, anticancer properties [19,20], anti-obesity properties, hypocholesterolaemic and antioxidant, hypoglycaemic properties for patients, who present with diabetes mellitus and cardiovascular disease [12,13,17,20,21]. The pumpkin polysaccharides have a good ability to scavenge free radicals and can be used as antioxidant within a certain concentration range [22], the capacity to increase serum levels of insulin and reduce blood glucose, showing potential use in the control of diabetes [12,23].

Through the high content of antioxidants, fibers and minerals [4], the pumpkin is recommended for the treatment of digestive disorders and intestinal disorders [24]. Being a fiber-rich food, the pumpkin is used in constipation treatment [25]. Recent studies show that anticancerigenic activity is due to the content of cucurmosin. Cucurmosin is a novel type 1 ribosome-inactivating protein (RIP) isolated from fleshy part of pumpkin. Due to its cytotoxicity, cucurmosin can inhibit tumor cell proliferation through induction of apoptosis on tumor cells, but the specific mechanism is still unclear [19,20,26].

One of the most important quality traits of pumpkin is biological activity, and especially its antioxidative activity due to carotenes content. Carotenoids are red, orange or yellow fat-soluble plant pigments [15], with different stabilities influenced by individual molecular structure and matrix environments [27], that protect cells against the damaging effects of reactive oxygen species. Some carotenes ( $\beta$ -carotene and  $\alpha$ -carotene) are converted into the vitamin A [28]. Of the 600 carotenoids that have been identified, about 30 to 50 are believed to have vitamin A activity. Both alpha-carotene and beta-carotene are protective against liver and lung cancer. Supposedly, pumpkin is used in combination with fats, which facilitate the absorption of carotenoids because these are fat-soluble [15]. Also, a high intake of carotenoids from the diet reduces a risk of degenerative and cardiovascular diseases, cataracts, macular degeneration as well as certain types of carcinomas [29].

The pumpkin is grown for its edible seeds, also. Seeds vary in size depending upon specie, variety and type, but generally they are large, abundant and edible [28]. The edible seeds are flat, oval and of diverse colors [12]. In many countries (Americas, Central Europe, Asia, Middle East, Eastern Europe) pumpkin/squash seeds, fried in oil and salted, are sold and consumed, much like peanuts or sunflowers seeds, and hold the highest food and nutritional value. Pumpkin seeds are gaining momentum in the snack food industry as a healthy alternative to other fried snacks. The kernels of pumpkin seeds have been utilized as flavor enhancers in gravies and soups, yoghurts, creams, sauces, in dressings, and used in cooking, baking in bakery and ground meat formulations as a nutritious supplement and a functional agent [28,30]. Fluted pumpkin seed flours were used as protein supplements in a variety of local foods. In vitro protein digestibility of bread improved when pumpkin seed proteins were added.

Pumpkin seeds are an excellent source of unsaturated fatty acids, fibers, and minerals, are rich in proteins and biologically active substances, including essential and nonessential amino acids, tocopherols, carotenoids (especially  $\beta$ -carotene and lutein), and other compounds considered to exhibit valuable dietetic and medicinal properties [1,12,23]. The seeds have around 22–64% lipids in their composition, these lipids being rich in mono- and polyunsaturated fatty acids, such as oleic, linoleic and linolenic acids [1,4]. The four fatty acids presented in significant quantities are palmitic, stearic, oleic, and linoleic acids. The seed flesh is nutty in taste and is rich in protein, minerals (potassium, phosphorus, magnesium, calcium, sodium, manganese, iron, zinc, and copper), carotenoids, b-carotene, and g-tocopherol. and these elements make pumpkin seed valuable for food supplements [1,4,30]. Vitamin E or g-tocopherol content is particularly high [12]. Also, nitrogen-containing compounds (Cucurbitacin B and E, cucurbitin), and glucosides (saponins) are present in the seeds [12,23].

Pumpkin seeds are used to extract oil, which is used for cooking [1] and cosmetics. Pumpkin seed for oil extraction are widely grows in the southern regions of Austria (Styria province) and the adjacent regions in Slovenia and Hungary [28,30]. The pumpkin seeds have oil content of 11 to 31%, of which 73.1 to 80.5% is total unsaturated fatty acid [12,31]. It also contains remarkable

bioactives such as triterpenoids, sesquiterpenoids, tetraterpenoids (carotenoids), tocopherols, polyphenols, saponins, and cucurbitacins. Triterpenes are show cytotoxic properties against tumor cells, and are use to prevent and treat cancer and other related diseases. The seeds and its oils have been used to treat enlarged prostate gland [28].

Pumpkin seeds oil belongs to the group of very expensive and good quality edible oils. Pumpkin seed oil belongs to the group of oils of high nutritive value due to its favourable fatty acid composition and different components which have certain beneficial effects on the human organism [1].

### **3.Pumpkin health benefits**

In the last decades, the demand for new nutritionally healthy and sustainable viable foods has increased considerably. Therefore, special attention has been given to the utilization of by-products. In the case of pumpkin, all its anatomical parts are used in the human diet [31]. This is important in the current conditions of sustainable development and waste reduction.

Even the multiple health benefits of pumpkin are very popular in the consumers knowledge, this fruit is an underrated one. More and more botanical parts of pumpkin are exploited, such as flesh, seeds and husk. Health benefits are related to the main bioactive compounds, such as vitamins, carotens and fibers. All these kinds of compounds have some important benefits being involved in anti-diabetic, antifungal, antibacterial, anti-inflammatory activities and antioxidant effects [32].

The study of Sharma and Rao [33], presents the nutritional quality characteristics of pumpkin fruit during the maturation stages: young, pre-mature, mature, pre-ripened and ripened.

The results present pumpkin fruit as a rich source of carotenoids and vitamin C, besides higher amounts of sugars, starch and total proteins. The study highlights the fact that the fruits should be harvested when the fruit attain the commercial maturation stage. Cucurbita consumption helps to recovery during or after the colon and rectal cancer.

Pumpkin represents an excellent meal when you want to lose weight or to protect the skin from sun, because the native  $\beta$ -carotene and vitamin E (tocopherols) reduce skin damage, slow the aging process, reduce the risk of developing cataracts, and

prevent tumor growth. Vitamin C, E and beta-carotene have been shown to support eye health and prevent degenerative damage [34].

Pumpkin powdered pulp showed anti-diabetic activity by reducing the blood glucose with the increment of plasma insulin in alloxan-induced diabetic mice [35].

Pumpkin seeds, considered a by-product because are generally discarded during processing are very nutritive, an extraordinary source of proteins and oil. Moreover, the seeds are considered a valuable sources of minerals, dietary fiber, health-benefiting vitamins and mono-unsaturated fatty acids. Next to the sensorial aspects, pumpkin seeds are consumed for the anti-diabetic, antifungal, antibacterial, anti-inflammatory and antioxidant effects [36]. Pumpkin seed eaten fresh or roasted acts like an anthelmintic and reduce the incidence of bladder stones [37].

Pumpkin seeds are full of minerals which are recognized being involved for fighting diseases such as arthritis, inflammation, prostate cancer, from these it can be mentioned: zinc, phosphorous, magnesium, potassium and selenium [38].

Seeds are an important source for flour, which can be obtained from different types of processed seeds (fermented, germinated or roasted) as Akintade et al. [39] in 2019 presented in their study.

Essential amino acid content of the processed pumpkin seed flour was very good for all the processes. All the processes aimed to prolong the shelf life of the pumpkin seeds and to increase the bioavailability of the bioactive compounds, which are involved in anti-diabetic, antifungal, antibacterial, anti-inflammation and antioxidant mechanisms.

Pumpkin peel contains different amino acids including alanine, arginine, aspartic acid, glutamic acid, histidine, leucine, isoleucine, glycine, lysine, methionine, phenylalanine, serine, threonine, valine, and tyrosine [37].

Hepatic disorders, peptic ulcer, gastrointestinal bleeding and different types of wounds, including burn wound could be improved by pumpkin peel consumption due to its cool and wet nature [40].

The pumpkin oil is involved in children diarrhea treatment. Other benefits of pumpkin oil consumption were reported in Korea for the treatment of depression. Japanese reported a high

consumption of pumpkin seed oil, which provides vitamin E (tocopherol) in their daily diet [41].

#### 4. Conclusions

The pumpkin is one of the best vegetables that meet the requirements of healthy nutrition. It is a tasty and valuable vegetable crop, containing a lot of biologically active compounds in the flesh, in the peel and seeds being outstanding for dietary qualities.

Improperly, the pumpkins are considered a gold mine due the medicinal features which including anti-diabetic, antihypertensive, anti-tumour, immunomodulatory, antibacterial, intestinal anti-parasitic, and anti-inflammatory activities.

Due to its properties, pumpkin is considered a functional, healthy and sustainable viable food ingredient.

**Compliance with Ethics Requirements.** Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human or animal subjects (if exist) respect the specific regulation and standards.

**Acknowledgement:** This work was supported by the project "Excellence, performance and competitiveness in the Research, Development and Innovation activities at "Dunărea de Jos" University of Galati", acronym "EXPERT", financed by the Romanian Ministry of Research and Innovation in the framework of Programme 1 – Development of the national research and development system, Sub-programme 1.2 – Institutional Performance – Projects for financing excellence in Research, Development and Innovation, Contract no. 14PFE/17.10.2018."

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