**RESEARCH ARTICLE**

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# Dietary fiber in nuts and seeds – analytical data and comparisons

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**ABSTRACT**
A lot of data about dietary fiber content in nuts and seeds are obtained. Thus information fills the Tables for the chemical composition of Bulgarian foods and is suitable for use in compiling the nutrition information for different types of foods as well as dietetic practice for studying nutrition variety of special population groups in the development of diets for different purposes.
Enzymatic-Gravimetric AOAC method 985.29 was used, which has a number of advantages such as accuracy, precision, and speed of execution to help the analyst. The method provides a basis for the correct calculation of the energy value and in the determination of nutrition claims and can be used as arbitration in research, control analyses, and for the purposes of food labeling.

**Key words:** nuts, seeds, dietary fiber, health benefits

## Introduction

In the EU, regulation 1169/2011 (EU, 2011) on the provision of food information to consumers, defines the fiber as 'carbohydrate polymers with three or more monomeric units, which are neither digested nor absorbed in the human small intestine and belong to the following categories:

-edible carbohydrate polymers naturally occurring in the food as consumed;

-edible carbohydrate polymers which have been obtained from food raw material by physical, enzymatic, or chemical means and which have a beneficial physiological effect demonstrated by generally accepted scientific evidence;

-edible synthetic carbohydrate polymers which have a beneficial physiological effect demonstrated by generally accepted scientific evidence';

Dietary fiber is often referred to as non-starch polysaccharides (NSP) fibre or as AOAC fibre. NSP fiber only includes polysaccharides of the plant cell wall components characteristic of plant foods, such as wholegrain cereals, fruits, and vegetables (FAO/WHO, 2003); (BNF, 2017).

Fibre-rich foods include:

- Wholegrain breakfast cereals, whole-wheat pasta, wholegrain bread and oats, barley and rye
- Fruit such as berries, pears, melon, and oranges
- Vegetables such as broccoli, carrots, and sweetcorn
- Peas, beans, and pulses
- Nuts and seeds
- Potatoes with skin

The European Food Safety Authority suggests that including fibre-rich foods in a healthy balanced diet can improve weight maintenance. Dietary fibre can reduce your risk of:

Cardiovascular disease (heart disease and stroke) and type 2 diabetes and colorectal cancer (BNF, 2018).

Seeds such as hemp, chia, and flax have been well-known for years for their high omega 3 content and their protein content (plus fiber!) but another seed out there comes with the same benefits and other important nutrients too (McClees, 2017).

***Pumpkin seeds***

Pumpkin seeds also have more fiber than many nuts, boosting 5 grams per 1/4 cup. This can help regulate your blood sugar, enhance regularity, and the fiber in pumpkin seeds is easier to digest than from some other sources like beans or hard-to-digest grains and nuts. Pumpkin seeds have also been linked to improving insulin regulation, which can help those with blood sugar issues or even diabetes (McClees, 2017).

*Possible health benefits of consuming pumpkin seeds*

Many studies have suggested that increasing consumption of plant foods like pumpkin seeds decreases the risk of obesity, diabetes, heart disease, and overall mortality while



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promoting a healthy complexion and hair, increased energy, and overall lower weight.

*Heart and liver health*

Pumpkin seeds are rich in omega-3 and omega-6 fatty acids, antioxidants, and fiber. This combination has benefits for both the heart and liver.

The fiber in pumpkin seeds helps lower the total amount of cholesterol in the blood and decrease the risk of heart disease (Megan, 2017).

Healthy nuts are also great sources of protein, minerals, and other life-enhancing nutrients. Scientific studies now show that different types of nuts and seeds may support factors that help prevent heart disease, weight gain, and the accumulation of LDL cholesterol.

***Walnuts***

One of the best nuts on earth, walnuts may actually support your brain function. Studies show that consumption of walnuts is related to heart health, better cognitive function, as well as the reduction of skin and bone conditions (Group, 2009).

***Sunflower seeds***

Sunflower seeds, like nearly all types of nuts and seeds, provide a healthy source of essential fatty acids; their specific fatty acids are in the form of *linoleic acid*. Additionally, sunflower seeds are also an excellent source of fiber, amino acids (especially tryptophan) which make up the building blocks of proteins, Vitamins B, phytosterols, and more (Levy, 2018).

Sunflower seeds are raw or roasted and contain many nutrients. Sunflower seeds have a high amount of protein and a moderate amount of fiber. Each of these nutrients creates a full feeling in the stomach when consumed. Fiber has additional benefits. The type in sunflower seeds is called insoluble. Insoluble fiber prevents constipation and reduces the chances of colon cancer (Kevin, 2018).

Like calories, the almonds and sunflower seeds also contain about the same amount of carbohydrates and fiber. In addition to helping control your hunger for better weight management, the fiber in the almonds and sunflower seeds may also reduce your risk for both Type 2 diabetes and cardiovascular disease (Corleone, 2017).

Despite their calories and fat content, raw pumpkin seeds make a great addition to low-carb diets and are particularly useful for snacking (most low-carb diet plans are decidedly light on good snack options).

An ounce of raw pumpkin seeds has only 4 grams of carbs. With their very high protein content, fiber, and healthy fats, carbohydrates are really not figuring into pumpkin seeds nutrition significantly (Superfood Profiles, 2018).

## Materials and Methods

The study was conducted in the period 2018-2020. Eighteen samples of nuts and seeds, offered at Bulgarian market, consumed by the Bulgarian population, were analyzed for total dietary fibers content by enzymatic-gravimetric AOAC method 985.29.

Principle of the method: Duplicate samples of dried foods, fat extracted if containing > 10 % fat, are gelatinized with Termamyl (heat-stable α-amylase), and then enzymatically digested with protease and amyloglucosidase to remove protein and starch. Four volumes of ethyl alcohol are added to precipitate soluble dietary fiber. The total residue is filtered, washed with 78 % ethyl alcohol, 95 % ethyl alcohol, and acetone. After drying, the residue is weighed. One duplicate is analyzed for protein, and the other is incinerated at 525 OC and ash is determined. Total dietary

**Table 1.** *Total dietary fiber content*

| N | **Tested samples** | **Dietary fiber content, % ± SU* (AOAC 985.29)** |
|---|---|---|
| 1 | Pumpkin seeds, roasted, unpeeled, salted I | 19.47 ± 0.22 |
| 2 | Pumpkin seeds, roasted, unpeeled, salted II | 18.30 ± 0.21 |
| 3 | Pumpkin seeds, roasted, unpeeled, salted III | 14.66 ± 0.17 |
| 4 | Sunflower seeds, black, roasted, peeled, unsalted | 40.20 ± 0.45 |
| 5 | Sunflower seeds, white, roasted, peeled | 42.10 ± 0.48 |
| 6 | Sunflower seeds, peeled | 25.19 ± 0.29 |
| 7 | Peanuts, roasted, peeled, salted I | 10.02 ± 0.11 |
| 8 | Peanuts, roasted, peeled, salted II | 10.20 ± 0.12 |
| 9 | Peanuts, roasted, peeled, crocan | 10.44 ± 0.12 |
| 10 | Peanuts, roasted, peeled, garnished | 8.77 ± 0.10 |
| 11 | Peanuts, garnished - cheese /onion | 10.29 ± 0.12 |
| 12 | Peanuts, garnished - wasabi | 9.20 ± 0.10 |
| 13 | Peanuts, garnished - barbecue | 10.93 ± 0.12 |
| 14 | Peanuts, garnished - paprika | 10.53 ± 0.12 |
| 15 | Peanuts - paprika and peanuts - wasabi, mixture | 9.06 ± 0.10 |
| 16 | Peanuts, party nuts | 10.38 ± 0.12 |
| 17 | Walnuts, raw, peeled | 10.19 ± 0.12 |
| 18 | Almonds, raw, peeled | 9.70 ± 0.11 |

fiber = weight residue – weight (protein + ash).

Three parallel samples of each sample were analyzed immediately after the preparation of the analytical sample at the laboratory.

The differences in values for total fiber content are shown in Table 1 and discussed below.

## Results and Discussion

The highest content of dietary fiber is found in Sunflower seeds, white, roasted, unpeeled (42,10 %), followed by Sunflower seeds, black, roasted, unpeeled, unsalted (40,20 %) compared to Sunflower seeds, peeled, where dietary fiber amounts to 25,19 %.

However, the second place of dietary fiber content is occupied by the three types Pumpkin seeds, roasted, unpeeled, salted, respectively (19,47 %; 18,30 %; 14,66 %). Almost identical content of dietary fiber was observed in the two Peanut samples II and I, roasted, peeled, salted, respectively (10,20 %; 10,02 %). The trend continues at Peanuts, garnished - barbecue (10,93 %), followed by Peanuts, garnished - paprika 10.53%); Peanuts, roasted, peeled, crocan (10,44 %) and Peanuts, party nuts (10,38 %). The analyzed samples walnuts (10,19 %) and almonds (9,70 %) are no exception.

According to our data, peanuts, sunflower and pumpkin seeds, lead in the ranking of total fiber content (Lilienthal et al, 2005); (Palmer et al, 2007); (Gyurova, 2013). Some researchers reported similar analytical results:

- Almonds – 9,2 % (National Food Institute, 2008); 7,2 % (Norwegian Food Safety Authority, 2006);
- Chickpeas - (11,4 – 12,8)% (National Food Institute, 2008);
- Pistachios – 6,01 % (Norwegian Food Safety Authority, 2006).

The most possible differences in the fiber content in analyzed samples and results shown in Table 2 according to USDA Nutritional facts (Whitbread, 2020), could be explained by a complex of causes, such as different total fat content, the process of garnishing nuts, cultivation and farming conditions; and last but not least – variety differences of the analyzed nuts and seeds.

Roasting nuts (either dry or in oil) enhances their flavor but has little impact on their fat content. This is because nuts are physically dense and cannot absorb much oil, even if they are submerged in it. Most nuts only absorb 2 per cent of extra fats.

Salted nuts, however, are not recommended as an everyday choice due to the higher sodium content. This is particularly important if you have high blood pressure. Save salted nuts for parties and make raw and unsalted roasted nuts your everyday choice (State Government of Victoria, 2019).

## Conclusion

Wholegrain cereals, fruits, and vegetables are the preferred sources of non-starch polysaccharides (NSP). The recommended intake of fruits and vegetables and consumption of wholegrain foods is likely to provide >20 g per day of NSP (>25 g per day of total dietary fibre) (FAO/WHO, 2003); (Mann, 2007). But a variety of nuts and seeds can be included in a healthy diet.

**Table 2.** *Dietary fiber content in some seeds and nuts.*

| Product | Fiber content per 100g |
|---|---|
| Dried roasted sunflower seeds | 1.1 |
| Dry roasted peanuts | 8.4 |
| Almonds | 12.5 |
| Roasted Squash And Pumpkin Seeds (With Shells) | 18.4 |
| Walnuts | 6.7 |

As different types of nuts and seeds have slight differences in their vitamin and mineral content, eating a variety of nuts and seeds will increase your levels of various nutrients. Instead of eating a biscuit or piece of cake as a snack, try having a handful of raw or dry-roasted nuts.

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