

An overview: health benefits, nutritional profile of Cucurbitaceae family plants (muskmelon and pumpkin) seeds and their possible usage in energy bars for athletes

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Article history:

Received: 29 March 2022

Received in revised form: 17 May 2022

Accepted: 4 November 2022

Available Online: 16 April 2024

Keywords:

Muskmelon seeds,

Pumpkin seeds,

Athletes,

Nutritious snacks

DOI:

[https://doi.org/10.26656/fr.2017.8\(2\).161](https://doi.org/10.26656/fr.2017.8(2).161)

Abstract

The motive of this review is to give knowledge about the Cucurbitaceae family plants (muskmelon and pumpkin) seeds. Around the world, athletes are health conscious and they do not get adequate time to eat a full meal. Good nutrition is essential for the health of athletes, as well as the general public. For this, energy bars are nutritious snacks that are easily available, provide nutrients and instant energy to athletes. Energy bars are different from drinks because energy bars are healthier and help to perform better, develop muscle mass, and improve the physical performance of athletes. Energy bars are made with a combination of many ingredients. Cucurbitaceae family plant seeds are necessary ingredients to be added to the energy bars for improved health and physical performance of athletes because these seeds are good in nutritional and therapeutic properties.

1. Introduction

Athletes who are preparing for significant competition must pay careful attention to nutritional diet since appropriate nutrition enhances athlete's physical performance. Today's female athletes are more sensitive to nutrition-related concerns than male athletes (Baranuskas *et al.*, 2015). The ratio of macro and micronutrients, and the timing of meals are particularly important for the performance of athletes. Athletes should take a carbohydrate-rich breakfast or snack based on the amount of allocated time, the duration, and the level of the competition. Athletes should indeed eat a minimum of 5 meals or snacks throughout the day to maintain levels of energy and provide appropriate carbohydrates for muscle development, particularly when several exercises are done (Shriver *et al.*, 2013; Smith *et al.*, 2015).

Elite athletes adore sports nutrition bars or energy bars, and many of them eat them before a workout to boost their performance. It is a widely achievable source of nutrients that helps to develop muscle mass and protect tissues in addition to giving energy (Gao *et al.*, 2021). Energy bars are popular because of their consistency, taste, accessibility, aroma, and relatively low cost. Energy bars are supplemental bars composed of high-energy ingredients that can be ingested in between meals to help reduce the consumption of meals, and increase fullness (Yadav and Bhatnagar, 2017).

Cucurbitaceae family plants produce a juicy, sweet, delicious, and attractive fruit well-known for its nutritional (especially great-quality proteins in terms of amino acid content) and therapeutic properties. About 130 genera and 800 species comprise the Cucurbitaceae family, which includes muskmelon, and pumpkin (Vishwakarma *et al.*, 2017). The nutritional content of seeds of Cucurbitaceae family plants has been neglected, seeds are frequently thrown as trash throughout fruit preparation or eating, posing an environmental risk (Akshaya *et al.*, 2018). Energy bars incorporated with Cucurbitaceae family plant seeds are more nutritious, healthy, maintain the immune system, and enhance the physical performance of athletes (Ayad *et al.*, 2020). The goal of this study is to go through the health benefits, and nutritional profile of Cucurbitaceae family plant seeds, and their possible usage in an energy bar for athletes.

2. Muskmelon seeds

Muskmelon or Cantaloupe (*Cucumis melo* L.) belongs to the Cucurbitaceae family that is native to India and Africa. It is a scabrous annual climber or creeping herb with coarse, pointed stems, simple soft hairy orbicular-reniform leaves, and tendrils that can be cultivated over trellises. It is a popular horticulture crop that is grown because of its nutritional value and appealing scent (Thakur *et al.*, 2019; Aluko *et al.*, 2021).

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2.1 Health benefits

Muskmelon seeds aid in the treatment of dysuria and irritating discharges, hematoma, endotoxemia, congestive heart failure, and also promote wound healing, inflammation reduction, blood cholesterol reduction, as well as keeping renal function (Vishwakarma *et al.*, 2017; Amin *et al.*, 2018). Muskmelon seeds have analgesic, gastroprotective, diuretic, hepatoprotective, anthelmintic, anti-inflammatory, anti-hyperglycemic, anti-hypothyroidism, anti-diabetic, anti-carcinogenic, anti-angiogenic, anti-adipogenic, anti-dyslipidemic, anti-Alzheimer, anti-bacterial, anti-microbial, anti-oxidant and anti-ulcer activity (Asif *et al.*, 2014; Khalid *et al.*, 2021).

2.2 Nutritional profile

The seeds of muskmelon have high nutritional value due to their protein, carbohydrates, fiber, vitamins, minerals, carotenoids, and glyceride oil (30-50%); and have been said to have therapeutic benefits, and various useful bioactive components like naringenin-7-O-glycoside, luteolin-7-O glycoside, 4-hydroxybenzoic acid, amentoflavone, vanillic acid, and gallic acid. Seeds also contain both polyunsaturated and monosaturated fats (Petkova and Antova, 2015; Qian *et al.*, 2019). The composition of muskmelon seeds and their profile of fatty acids indicates the high content of linoleic acid (omega-6) and omega-3 fatty acids. They also contain high levels of important amino acids including methionine, isoleucine, tyrosine, valine, and phenylalanine (Maran and Priya, 2014; da Cunha *et al.*, 2020).

3. Pumpkin seeds

Pumpkin (*Cucurbita* L.) is a member of the Cucurbitaceae family. Pumpkin is a perennial plant with a 12-meter-long climber stem and verdant produce. It is a leafy green vegetable that comes in a variety of shapes, sizes, weights, and colors (Chahal *et al.*, 2021). The seeds of pumpkin can be ovate-elliptic, abundant, with a yellowish-white surface, and can be soft and delicious (Ahmad and Khan, 2019).

3.1 Health benefits

Pumpkin seeds include fiber that can help with constipation, satiety, decreased blood glucose, and intestinal transit time (Nyam *et al.*, 2013). Pumpkin seeds are renowned for their relaxation of the sphincter and bladder, reducing the risk of cardiovascular, hypotriglyceridemic, hepatoprotective, anxiety, reproductive health, biliary vesicle, protecting bones, anti-cancerous, anti-hypertensive, anti-diabetic, anti-hypercholesterolemia, anti-tumor, anti-fungal, anti-

bacterial, anti-inflammatory, anti-oxidant, anti-rheumatic, anti-ulcerative, anti-depressant, anti-microbial, anti-mutagenic, anthelmintic and immunomodulatory properties (Amin and Thakur, 2013; Kaur *et al.*, 2020; Chahal *et al.*, 2021).

3.2 Nutritional profile

Pumpkin seeds are useful in a variety of ways and contain a lot of protein, carbohydrates, fat, fiber, minerals, and vitamins, they are deemed essential for human well-being (Koklu *et al.*, 2021). Seeds also include all nine essential amino acids, along with their high lipid content (40-50%), which includes essential fatty acids that are from the omega-3 and omega-6 families, and they have crucial roles in a variety of metabolic processes. In addition, seeds contain significant amounts of bioactive components like trigonelline, nicotinic acid, carotenoids, and D-chiro-inositol (Seymen *et al.*, 2016; Chatain *et al.*, 2017; Lestari and Meiyanto, 2018; George *et al.*, 2020). Vitamin E is also present in pumpkin seeds and it contains four tocotrienols and tocopherol (α , β , γ , and δ) isomers (Dotto and Chacha, 2020).

4. Cucurbitaceae family plants seeds-based energy bars in sports nutrition

4.1 Energy bars potent for sports nutrition

A professional athlete is a fitter member of society who requires improved nutrition. Sports nutrition is a branch of nutrition that primarily deals with athletes' body proportions, exercise physiology, and maintaining health. It includes the practical components of nutrition information through food regimens that supply energy for regular physical exercise, improve exercise performance, and repair processes (Jabeen *et al.*, 2021; Sharma *et al.*, 2021). Energy bars, also known as Nutri bars, are nutriment and handy snacks that are popular among athletes and other physically active people. Protein in energy bars not only provides energy, but it helps to develop muscular strength and preserve tissues (Vyas and Saini, 2018; Aljaloud *et al.*, 2020).

4.2 Cucurbitaceae family plants seeds-based energy bars and their application for athletes

In response to the rising desire amongst athletes for natural, convenient, and healthy foods, efforts are being undertaken to increase the nutritional and functional value of snack foods by altering their nutritive content. The most difficult aspect of making a good energy bar is combining a variety of ingredients with precise features into a product with appearance, taste, and visual appeal in order to meet particular nutritional requirements. It is a cooked or baked food, and the batter is constantly

mixed throughout cooking and baking to keep it from falling apart (Ahmad et al., 2017; Omran, 2018).

4.2.1 Muskmelon seeds-based energy bar

Konwar et al. (2021) prepared the energy bar by incorporating different ingredients like oats, dehydrated beetroot cubes, groundnuts, dates, jaggery, white sesame seeds, pumpkin seeds, flax seeds, and muskmelon seeds. These raw ingredients are good in protein (especially branched-chain amino acids), crude fiber, vitamins, minerals, fatty acids, phytochemicals, antioxidants, and inorganic nitrite. The study found that supplementing experimental rats with various mixes of nutraceutical bars led to an increase in muscle and liver glycogen storage, which contributed to increased swimming and running duration. By boosting hemoglobin levels, muscle and liver glycogen depletion, and so raising exercise performance, a multi-blend nutraceutical bar boosts antioxidant enzymes and anti-fatigue activity because of its good nutrient profile. Therefore, with strength and endurance exercises, this energy bar performs a key function in physiological protection and performance enhancement of athletes.

4.2.2 Pumpkin seeds-based energy bar

Umme et al. (2021) prepared the energy bar by using different ingredients with amount like oats (10 g), cornflakes (10 g), chickpea (5 g), pumpkin seed flour (15 g), nuts (7 g), raisins (6 g), skim milk powder (10 g), water (6 g), sunflower oil (10 g), salt (0.2 g), lecithin (0.8), glucose syrup (10 g), and brown sugar (10 g). According to the study, an energy bar prepared with these components may easily meet the necessary daily protein consumption. The nutritional value of this energy bar in 100 g was 412.72 kcal, 73.19% carbohydrate, 9.74% protein, 9.05% fat, 3.10 mg calcium, 0.2 mg iron, 153.45 mg magnesium, 450.75 mg phosphorus, and 220.45 mg potassium.

5. Conclusion

Fruit from the Cucurbitaceae family is commonly eaten across the world, yet it includes a huge amount of seeds that are wasted. These seeds are high in nutrients, bioactive compounds, and therapeutic properties. We concluded that the incorporation of different seeds with other ingredients in energy bars has good texture, aroma, flavor, and shelf-life; therapeutic properties; as well as highly nutritional in macro and micro-nutrients, bioactive compounds, and phytochemicals that are required by the athletes. Furthermore, with endurance and strength exercises, these nutrients in the form of energy bars played a significant role in performance enhancement and physiological protection of athletes in

sports. These energy bars can be sold on the market in the form of ready-to-eat snacks or healthy nutrition bars, as well as assisting food makers and processors in rethinking nutrition components.

Conflict of interest

There are no conflicts of interest stated by the authors.

Acknowledgements

The authors have expressed gratitude to the Banasthali Vidyapith's Central Library in Rajasthan for providing internet laboratory facilities.

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