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Review on development and fortification of iron rich seeds flours-based muffins

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Abstract

This paper explores the incorporation of pumpkin seeds and garden cress seeds into muffins to create a fortified and nutritious baked good. Pumpkin seeds are rich in protein, healthy fats, Fiber, and minerals like magnesium, zinc, and iron. Garden cress seeds are packed with iron, calcium, and vitamins C and A. By adding these seeds to muffins, not only do we enhance the texture and flavour, but we also significantly boost their nutritional value. This review discusses the health benefits of these seeds, the impact of fortification on the muffins' nutritional profile, and the potential for these fortified muffins to contribute to a balanced diet.

Keywords: Fortified muffins, pumpkin seeds, garden cress seeds, nutrient-rich, health benefits

Introduction

Muffins are a beloved baked treat, known for their soft, spongy texture and delightful flavors, making them a popular choice for breakfast or a quick snack. While traditionally made from refined of minerals such as calcium, iron, and phosphorus, as well as Fiber and vitamins. Incorporating these flours not only increases the nutritional content of muffins but wheat flour, which provides carbohydrates, protein, and fat, there is a growing trend towards enhancing the nutritional value of muffins. This trend caters to health-conscious consumers seeking high-quality, low-calorie products with reduced fat and sugar content.

To enhance the nutritional value of muffins, one strategy is to use alternative flours that are rich in essential nutrients. For example, malted finger millet flour is a nutrient-dense option, containing high levels also adds unique Flavors and textures.

This review explores the nutritional benefits of incorporating ingredients like pumpkin seeds and garden cress seeds into muffins. Pumpkin seeds are rich in oil, minerals, while garden cress seeds are particularly high in iron. By including these ingredients in muffins, their nutritional value can be enhanced, appealing to health-conscious consumers. Additionally, understanding how these ingredients affect the quality and nutritional content of muffins can provide valuable insights for creating healthier and more nutritious baked goods.

It is a nutritious and economical product belonging to the Cucurbitaceae family. The species *Cucurbita pepo* L., *Cucurbita maxima* Duchesne, and *Cucurbita moschata* Duchesne are harvested worldwide for their economical and environmentally friendly properties (Caili F, 2006) [6].

Pumpkin Seed

Pumpkin a member of the Cucurbitaceae family, is cultivated worldwide as a vegetable, alongside cucumbers and squash. It has a long history of traditional medicinal use in many countries. Pumpkin seeds are highly nutritious, containing iron, protein, and other essential nutrients. They are often consumed as a snack in various regions. Pumpkin seed oil is used in cooking and in products like chocolates and cereal bars. Research indicates that pumpkin seeds can improve iron status, particularly in women. They have a high oil content of around 41.59%, protein content of 25.4%, and total ash content of 2.49%, along with beneficial compounds like phenolic compounds, sterols, waxes, and tocopherols. The popularity of pumpkin seeds and their oil is on the rise globally, with countries such as Australia, Serbia, Hungary, and Slovenia being major producers. (Ardabili 2011) [3].

Garden cress seed

Despite its nutritional and functional profile, garden cress remains one of the world's most underutilized crops.

Therefore, this review aims to provide a comprehensive summary of the phytochemical profile and biological activity of garden cress seeds. It seeks to highlight the chemical and nutritional composition of *Lepidium sativum*, focusing on its bioactive profile, health claims, therapeutic benefits, and industrial applications. Anti-nutritional's are compounds found in plant products that reduce the availability and utilization of nutrients and food intake.

Review of literature

Anuradha Dutta *et al.* (2018) ^[1] conducted a study on the quality evaluation of differently processed wheat flours. Wheat, being cultivated on more land area than any other commercial food crop, has a global trade volume greater than all other crops combined. It is the primary source of vegetable protein in human diets worldwide, containing a higher protein content than other major cereals. Various processing techniques are employed to produce different types of wheat flour, such as resultant flour, chakki flour, and maida (Refined flour), each with distinct physicochemical, nutritional, and sensory characteristics.

HN Ramya and S Anitha (2020) ^[7] conducted a study on the development of muffins using a combination of wheat flour and coconut flour, with honey as a sweetener. Coconut flour, known for its unique taste, aroma, and rich nutrient profile including vitamins, minerals, and dietary fiber, offers potential applications in baking and human nutrition. The research aimed to assess the impact of honey and varying levels of coconut flour on muffin properties. Four types of muffins were prepared: T₁ (0% coconut flour), T₂ (5% coconut flour), T₃ (15% coconut flour), and T₄ (25% coconut flour). T₄ muffins were found to be the most acceptable based on their physicochemical properties, scoring highest in color, texture, and overall acceptability. The results indicated that incorporating 25% coconut flour into the batter improved both the sensory and physicochemical characteristics of the muffins, consequently enhancing their nutritional value.

Caresma Chuwa *et al.* (2022) ^[5] conducted a study on the development and nutritional evaluation of an iron-rich instant muffin mix (IRIMM) designed as a complementary food for children. The aim was to create and analyze the nutritional properties of this mix, which is a dry blend of ingredients used to make ready-to-serve muffins. The IRIMM was formulated by supplementing refined wheat flour with varying proportions of pearl millet, finger millet, and grain amaranth flour. Constant ingredients included sugar, refined oil, baking soda, baking powder, skimmed milk powder, and ripe papaya powder. Refined oil was incorporated into each recipe during muffin preparation. The muffins were then evaluated by a panel of judges. The study identified six optimal recipes, including a base recipe (control) and versions supplemented with flours from finger millet, pearl millet, and amaranth grain.

Qumar Abbas Syed *et al.* (2019) ^[9] explored the nutritional and therapeutic significance of pumpkin seeds (*Cucurbita* sp.) from the Cucurbitaceae family. Typically regarded as industrial waste and discarded, these seeds are sometimes used raw, cooked, or roasted for domestic purposes in certain areas. Rich in protein, fiber, and minerals such as iron, zinc, calcium, magnesium, copper, and sodium, as well

as polyunsaturated fatty acids (PUFA), phytosterols, and vitamins, pumpkin seeds have significant potential for use in the food industry.

NG Ivanova *et al.* (2021) ^[10] highlight that flour-based confectionery is among the most popular food items. However, due to their chemical composition and nutritional value, they are often excluded from the diets of individuals pursuing a healthy lifestyle. A current trend aims to enhance the range of flour confectionery by adding functional properties. Developing muffins with reduced sugar and fat content is particularly relevant given the global rise in nutritional diseases such as cardiovascular and oncological conditions, obesity, and anemia. Improving confectionery technology by incorporating persimmon and feijoa into processed products can scientifically address the lack of nutritionally enhanced, lower-calorie confectionery. This approach can diversify the product range and promote daily consumption. The study presents research findings on developing technology for muffins enriched with iodine and iron.

Anaaya Charaya *et al.* (2023) ^[2] found that pumpkin seeds are versatile functional foods, used both as edible seeds and oilseeds. However, their thick seed coat requires decortication, raising costs and limiting their oilseed use. Hull-less pumpkin seeds contain higher minerals (4.57 g/100 g), tocopherols (15.76 mg/100 g), and oil (36%), though hulled seeds have significantly more free amino acids and fibre. Introducing persimmon and feijoa into processed products can enhance nutritional value and reduce calories, diversifying the product range.

Kerketta Pooja *et al.* (2019) ^[8] investigated the quality characteristics and antioxidant properties of muffins enriched with multigrain flour and fruit juice or pulp. This research aimed to create nutrient-dense multigrain muffins by blending oats, ragi, bajra, and maize flour with orange and pineapple pulp or juice. The primary goal was to develop these muffins and assess their sensory, nutritional, and antioxidant properties, as well as their cost-effectiveness. A standard muffin recipe was used as a control (T₀), and five different variations (T₁, T₂, T₃, T₄, and T₅) were made by substituting refined flour with varying proportions of the multigrain flour mixture. The findings revealed that adding multigrain flour and fruit pulp or juice at different levels enhanced the muffins' sensory attributes and nutritional value while keeping the market price acceptable and reasonable.

Anuradha Dutta *et al.* (2018) ^[1] conducted a quality evaluation of variously processed wheat flours. Wheat, as a crop, covers more land area than any other commercial food crop and its global trade volume surpasses that of all other crops combined. It is a primary source of vegetable protein in human diets worldwide, offering a higher protein content than other major cereals. Wheat undergoes various processing techniques to produce different types of flour, such as resultant flour, chakki flour, and maida (refined flour), each possessing distinct physicochemical, nutritional, and sensory properties.

Tahira Mohsin Ali (2024) ^[11] describes cakes and muffins as soft wheat products made from wheat flour, sugar, fat, and eggs. Cakes and muffins come in various varieties globally, differing in flour-to-sugar ratio, presence or absence of eggs, mixing methods, colour, and fat content. The crumb of a cake is light-coloured with a fine, velvety, and tender sponge-like texture, while the crust is darker. The Flavors of

cakes primarily comes from the Maillard reaction and caramelization of sucrose, while the structure is developed through protein denaturation and starch gelatinization during baking. Muffins share similar ingredients with cakes but are smaller in size (Around 2 ounces) and are categorized as bread-like or cake-like based on their sugar and fat contents.

Conclusions

Muffins are a beloved baked treat, traditionally made from refined wheat flour, but there's a growing trend to enhance their nutritional value. This includes using alternative flours rich in essential nutrients, such as malted finger millet flour, which adds unique flavors and textures. Ingredients like pumpkin seeds and garden cress seeds also boost the nutritional profile of muffins, offering high levels of minerals and bioactive compounds. Studies have shown that incorporating these ingredients can improve the sensory and nutritional qualities of muffins, making them appealing to health-conscious consumers seeking high-quality, low-calorie options with reduced fat and sugar content.

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