

Canary seed: a novel cereal from the Canadian Prairies

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Origin and development

Canary seed (*Phalaris canariensis* L.) is a cereal crop that belongs to the Poaceae family, which also includes common cereals like wheat, rye, barley and oats. Originally, the canary grass plant (Figure 1) was native to the Mediterranean region, but now it is grown commercially in several parts of the world, including Canada.

Traditionally, canary seeds were used exclusively as birdseed due to the presence of hair-like silica fibres, called trichomes, attached to the hulls (Figure 2A). These early 'hairy' varieties of canary seeds were not suitable for human consumption because the small hairs contaminated the hulled whole kernels (groats) during dehulling and were deemed hazardous and potentially carcinogenic to human health. The hairs also caused irritation to combine operators and grain handlers.

In the late 1990's, Dr. Pierre Hucl, a canary seed breeder from the University of Saskatchewan's Crop Development Center (CDC), developed a hairless canary seed (cv. CDC Maria, variety registered in Canada in 1997) in which the trichomes were completely absent from the hull and glumes (Figure 2B). The new 'hairless', or glabrous, species was not only easier to handle, but could also be safely consumed and utilized by the food industry as a cereal grain.

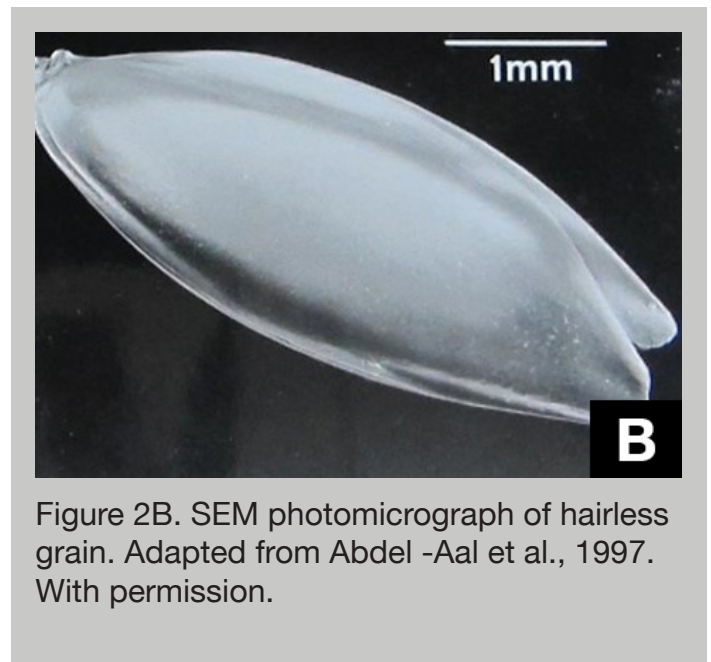
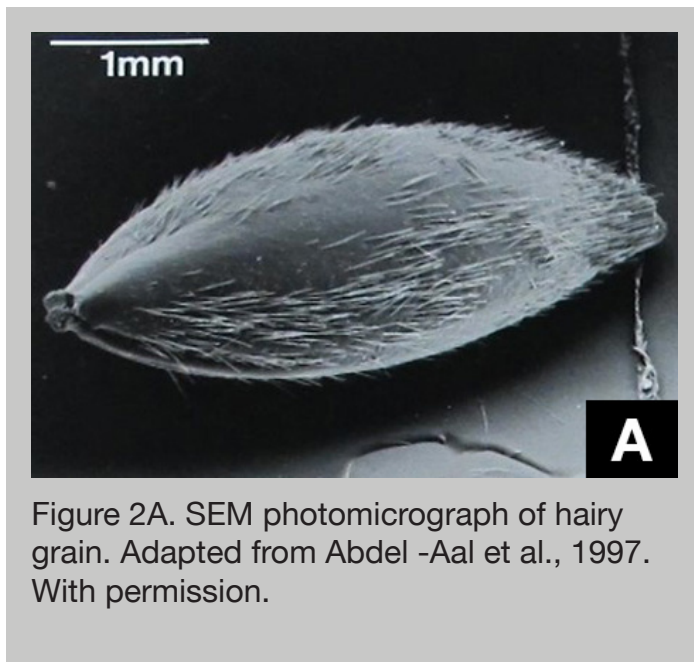
In 2015, Health Canada and the Food and Drug Administration (FDA) gave GRAS (Generally Regarded as Safe) status to glabrous canary seeds and approved them as a novel food product.



Figure 1. Canary seed plant. Photo courtesy of Gloria Gingera, Crop Development Centre, University of Saskatchewan.

CGC's position on canary seed

Canary seed is not currently included among the 20 grains officially regulated by the *Canada Grain Act* (CGA). The Canary Seed Development Commission of Saskatchewan made a formal request to the Minister of Agriculture and Agri-Food Canada and to the CGC to designate canary seed as an official grain under the CGA. The CGC developed [a regulatory proposal](#) that would make canary seed an official grain subject to all provisions of the CGA and the *Canada Grain Regulations* effective August 1, 2021. With this change, the Canadian Grain Commission would be responsible for the determination of the grade and dockage analysis of canary seed and producers would be protected under the Canadian Grain Commission's Safeguards for Grain Farmers Program.



Production and other metrics

- The average production of canary seeds in Canada over the last six years was 149,600 tonnes and the average seeded area was 273,050 acres (Figure 3).
- Saskatchewan accounts for over 95% of Canadian acreage and production and is the world's leading producer and exporter of canary seeds.
- Canada accounts for 65% of global production and about 80% of total export of canary seeds (Figure 4). The top export locations include Mexico, Belgium, Brazil, Spain, the United States and Colombia.
- Yields of canary seeds range from 897 to 1569 kg/ha (800-1400 lb/acre).



Figure 3. Acreage and production of canary seeds in Canada in the last five years. Source: Statistics Canada (year of reference)

- At \$0.25 average price per pound, the crop brings ~\$81.6 million annually to Canadian producers.
- The common 'hairy' varieties grown in Canada are Keet, Cantate and Elias.
- The 'hairless', glabrous varieties include CDC Maria, CDC Togo, CDC Bastia, CDC Calvi, CDC Cibo and the recently registered CDC Lumio (2019). Several varieties are available from CANTERRA SEEDS.
- Glabrous canary seeds can have a brown or yellow coat (Figure 5).

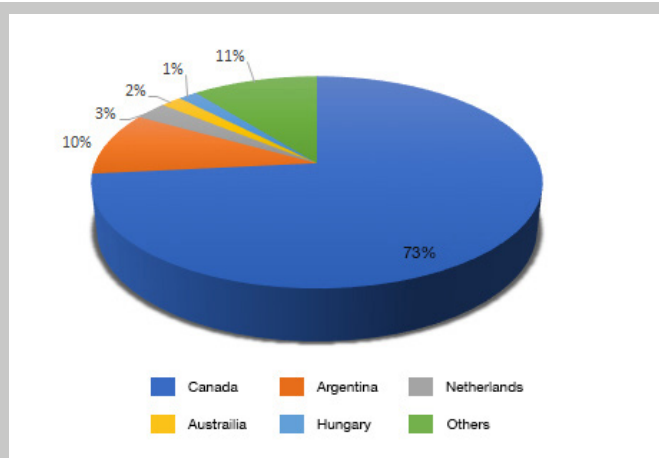


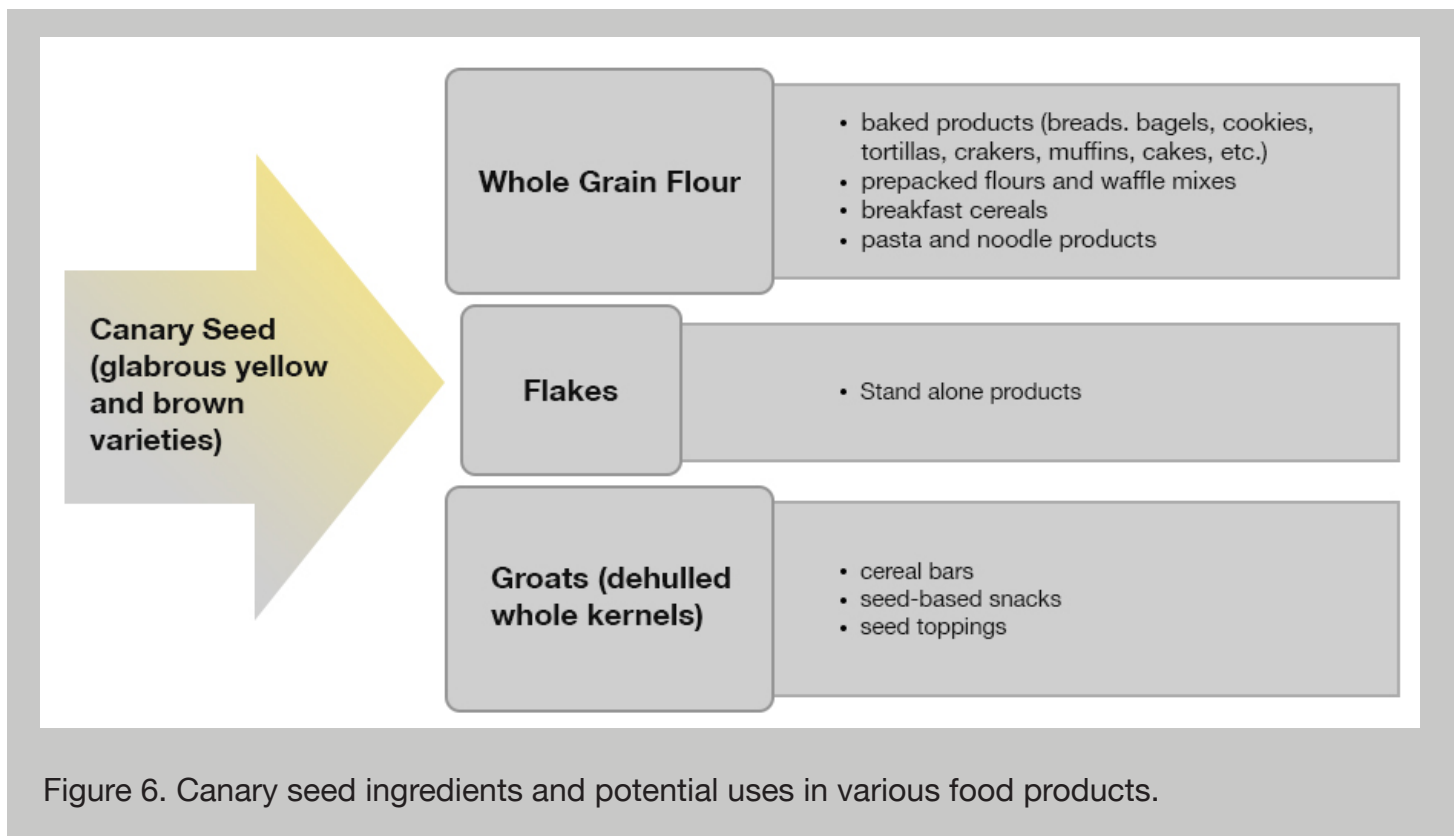
Figure 4. Shares of global export of canary seeds in 2018.



Figure 5. Yellow and brown canary seeds. Photo courtesy of Gloria Gingera.

Canary seeds as food ingredients

- Canary seeds require abrasive dehulling and aspiration to separate the seed coat from the groat to make them suitable for human consumption.
- After dehulling, the groats can be milled into flour. Roller milling, pin milling and hammer milling have all been used to make canary seed flour.
- Pin milling is the preferred method of milling canary seed due to its high oil content.
- Tempered groats have been used to make canary seed flakes.
- Dehulled groats can be used in some whole grain foods as shown in Figure 6.



What's unique about canary seeds?

Canary seeds are an excellent source of plant-based proteins as they have a higher protein content (20-22%) than other cereal grains. The major proteins in canary seed are prolamins (45.5%) followed by albumins and globulins (13.1%) (Patterson et al., 2018). Canary seed proteins have cholesterol-lowering properties that might come from their low ratio of lysine to arginine (0.2). In addition, canary seed proteins contain exceptionally high amounts of tryptophan (2.8 g/100 g protein), which make them a beneficial supplement in dairy products (Abdel-Aal et al., 2010).

Peptides obtained by digestion of canary seed proteins have the potential to lower blood pressure (Valverde et al, 2017; Mason et al., 2018). Moreover, they possess antioxidant properties and have been shown to prevent neurodegenerative and cardiovascular diseases (Chanput et al., 2009).

Canary seeds are gluten-free and can be used by consumers with celiac disease. However, canary seed contains some proteins that also occur in wheat and Health Canada (2020) requires that the statement, “may not be suitable for consumers with a wheat allergy”, is included on labels of products containing canary seeds.

Canary seeds contain about 6-9% oil with a fatty acid composition of 55% linoleic, 29% oleic, 11% palmitic, 2.5% linolenic, and 1% stearic acids (Valverde et al., 2017). Canary seed oil has a high ratio of unsaturated to saturated fats (7.5 compared with 5.0 for wheat oil) which promotes cardiovascular health, neurological function and improved immune response. With its additional antioxidant properties, canary seed oil offers a healthy alternative to other grains. (Abdel-Aal et al., 2010).

Another unique constituent of canary seed is β -carotene, which is present in larger amounts than in other cereal grains (Li & Beta, 2012). β -carotene is associated with beneficial biological functions that include boosting antioxidant activity, improving immune response, suppressing reactive oxygen species and lowering the risk of cardiovascular disease (Mason, 2018).

Canary seed starch contains a slightly lower amount of amylose (22.5-23.6%) than wheat (25.6%). This amylose content causes it to form thick solutions when cooked and rigid gels upon cooling (Abdel-Aal et al., 2010). Canary seed starch has a high tendency towards retrogradation, the realignment of cooked starch as it cools, which may contribute to firmer food texture (Irani et al., 2019). The starch also tends to form resistant starch, which makes it nutritionally valuable as resistant starch lowers the glycemic index of food, promotes the growth of probiotic bacteria and improves satiety.

After dehulling, canary seeds consist of approximately 7% of dietary fiber, which is considerably lower than other cereal grains.



Mature canary seed plant. Photo courtesy of Gloria Gingera.

Trends and outlooks



Photo courtesy of Gloria Gingera, CDC, U of S

Canary seed is an excellent ingredient for balancing the nutritional value of various foods. Canary seed flour can replace wheat flour for up to 25% without negative impacts on the texture, colour and flavour of baked products (Abdel-Aal et al., 2011; Patterson et al., 2018). Canary seed ingredients have been successfully used in muffins, tortillas, pasta and noodles (Figure 7) (Patterson et al., 2018).

Possessing a natural, mild, nutty flavour, groats can be used in snaps, granola bars, bread toppings and as a safe substitute for sesame seeds, especially with the growing allergenicity of the latter (Public Health Agency of Canada, 2017).

Canary seed 'milk' is becoming a trendy beverage among consumers. It can be prepared at home by soaking canary seeds, blending with water and then straining to create a white liquid emulsion that resembles milk (see full recipe below). The health benefits of canary seed 'milk' are attributed to the release of bioactive peptides (Valverde et al., 2017). Ready-to-use canary seed milk mixes are available online and through natural food stores as dietary supplements (Figure 8).

Apart from human consumption, canary seed can be used as feed for poultry and swine (Newkirk et al., 2011; Thacker, 2003).



Figure 7. Spaghetti made with 25% yellow and brown canary seeds. Adapted from Patterson et al., 2018. Image courtesy of Canadian International Grains Institute Technical Division



Figure 8. Ready-to-use canary seed milk mix.

Trends and outlooks



Photo courtesy of Gloria Gingera, CDC, U of S

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Recipes

Canary seed brittle

Ingredients:

- 750 ml (3 cups) white sugar
- 175 ml (3/4 cup) light corn syrup
- 175 ml (3/4 cup) water
- 45 ml (3 tbsp) butter, softened
- 1 ml (1/4 tsp) salt
- 625 ml (2 1/2 cups) canary seed, roasted for 12 min. at 180 C (350 F)
- 7 ml (1 1/2 tsp) vanilla
- 3 ml (3/4 tsp) baking soda

1. In large, heavy saucepan, bring sugar, corn syrup and water to a boil over medium heat, stirring continually.

2. Brush down side of pan (without stirring) with a pastry brush dipped in cold water, until candy thermometer reaches 112 C (234 F), or soft-ball stage (when 5 ml/1 tsp hot syrup dropped into cold water forms soft, pliable ball), about 10 minutes.

3. Stir in butter and salt; cook until candy thermometer reaches 155 C (310 F), or hard-crack stage (when 5 ml/1 tsp hot syrup dropped into cold water forms hard brittle threads), about 10 minutes.

4. Remove from heat. Immediately stir in roasted canary seed, vanilla and baking soda.

5. Immediately pour onto greased baking sheet. Using a greased spatula, spread thinly over pan; let cool.

6. Cut into rectangles or break into irregular pieces about 5 cm (2 in.) in size. These can be stored in an airtight container in a cool, dark place for up to 1 week.

Source: Adapted by Carol Ann Patterson of The Pathfinders Research and Management in Saskatoon from a Canadian Living magazine recipe.

https://www.winnipegfreepress.com/arts-and-life/life/home_family/recipes-for-canary-seed-brittle-and-canary-seed-chocolate-chip-cookies-375270981.html



Photo courtesy of Debra Marshall, Crop Development Centre, University of Saskatchewan.

Canary seed milk

Ingredients:

- Water
- Cinnamon stick (optional)

Supplies:

- Blender
- Sieve

1. Soak the canary seed and one cinnamon stick (if desired) for at least 8 hrs.
2. Rinse the seeds and cinnamon stick and pour them into a blender with the desired amount of fresh water. The thicker you want the milk, the less water you should add.
3. Strain the mixture through a sieve. Discard the ground seeds. You should only consume the milky liquid.
4. Store in the fridge. It is best to consume the milk on the same day it was made.

<https://canterra.com/blog/news/how-to-make-your-own-canary-seed-milk/>



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