The Pharma Innovation Journal 2023; 12(5): 3205-3208

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(5): 3205-3208

www.thepharmajournal.com
Received: 22-03-2023
Accepted: 26-04-2023

Samiksha Sharma
Department of Food Technology and Nutrition, School of Agriculture, Lovely Professional University, Phagwara, Punjab, India

Corresponding Author:
Samiksha Sharma
Department of Food Technology and Nutrition, School of Agriculture, Lovely Professional University, Phagwara, Punjab, India

A review on plant-based milk alternative

Samiksha Sharma

Abstract
As more customers look for alternatives to dairy milk for ethical, environmental, or health reasons, plant-based milk substitutes have grown in popularity in recent years. Soy, almond, coconut, rice, and oats are just a few of the plants that are used to make plant-based milk substitutes. These substitutes may be used in a range of applications, including coffee, baking, and cooking, and are frequently supplemented with vitamins and minerals to match the nutritional profile of dairy milk. The demand for plant-based milk substitutes has become more popular on the worldwide market, and it is anticipated that this trend will continue. Plant-based milk substitutes will probably continue to be a popular option for consumers looking for healthier and more sustainable products as the trend towards plant-based diets grows.

Keywords: Plant-based milk alternatives, health benefit, nutritional value, environmental impact

Introduction
The consumption of plant-based milk alternatives has increased significantly in recent years due to the rise of veganism, lactose intolerance, and concern for animal welfare. This paper aims to provide an overview of plant-based milk alternatives, their nutritional value, and the environmental impact of their production. Plant-based milk substitutes have become extremely popular in recent years as more people look for healthier and more environmentally friendly eating options. For people who are lactose intolerant, vegan, or just trying to cut back on their diet of animal products, these milk substitutes are a terrific option. There are several varieties of plant-based milk substitutes on the market, each with an own nutritional profile and flavour. Soy, almond, oat, and other plant-based milk substitutes are some of the most well-liked options. Soy milk is made from soybeans, while almond milk is made from almonds and oat milk from oats. Coconut milk is made from coconut meat, and rice milk from rice. Each of these plant-based milk alternatives has its unique taste and texture, and they can be used in cooking, baking, and as a dairy milk substitute.

In addition to being an excellent substitute for lactose intolerant people, plant-based milk replacements also provide a number of nutritional advantages. Over 50% of the population in South America, Africa, and Asia suffers from lactase non-persistence, and in certain Asian nations, this proportion is approaching 100%. For instance, soy milk is a great source of protein and is frequently fortified with minerals like calcium and vitamin D. On the other hand, almond milk has a high level of vitamin E while having few calories. Oat milk is a fantastic source of fibre and is frequently supplemented with vitamin B12, which is crucial for vegans since their diets might not include enough of this vitamin. These modifications and advancements have resulted in more contemporary goods in the beverage industry. In order to address issues with cow milk allergy, lactose intolerance, calorie concern, and incidence of hypercholesterolemia, milk replacements are one such important functional necessity.

Although plant-based milk substitutes are a fantastic option to cow's milk, it's crucial to remember that they do not have the same nutritional value. For instance, plant-based milk substitutes might not be as calcium-rich as cow's milk is. To be nutritionally equal to cow's milk, several plant-based milk substitutes are supplemented with vitamins and minerals. Make sure the plant-based milk substitute you select is supplemented with the essential vitamins and minerals by reading the label carefully.

The favourable effects of plant-based milk substitutes on the environment are another advantage. There are considerable greenhouse gas emissions, water use, and land use connected with the production of cow's milk. The manufacture of plant-based milk substitutes, in contrast, uses less resources and has less of an impact on the environment. For instance, research published in the Journal of Cleaner Production found that producing almond milk uses less water and has a smaller carbon footprint than producing cow's milk (Subroto *et al*. 2021) [1].

In conclusion, plant-based milk alternatives are a great alternative for those who are lactose intolerant, vegan, or simply looking to reduce their intake of animal products. They come in a variety of forms, each with its unique taste and nutritional profile. While plant-based milk alternatives are not nutritionally equivalent to cow's milk, they can be fortified with vitamins and minerals to provide similar nutritional value. Furthermore, they have a lower environmental impact than the production of cow's milk. As such, plant-based milk alternatives are an excellent option for those looking to make healthier and more sustainable food choices.

Types of Plant-Based Milk Alternatives

There are various types of plant-based milk alternatives available in the market, including soy milk, almond milk, oat milk, coconut milk, and rice milk. Each type has its unique taste and nutritional value.

Soy Milk

Soy milk is made by soaking and grinding soybeans, followed by boiling the mixture and filtering the liquid. Soy milk is rich in protein, calcium, and iron. According to a study published in the Journal of Food Science and Technology, soy milk has the highest protein content among plant-based milk alternatives ((Subroto *et al*. 2021) [1].

Almond Milk

Almond milk is made by blending almonds and water, followed by straining the liquid. Almond milk is low in calories and has a nutty flavour. However, it is low in protein and calcium compared to cow's milk.

Oat Milk

Oat milk is made by soaking and blending oats with water, followed by straining the mixture. Oat milk is rich in fibre, vitamin B12, and iron. According to a study published in the Journal of Food Science and Technology, oat milk has a high fibre content compared to other plant- based milk alternatives (Riaz *et al*. 2020) [2]

Coconut Milk

Coconut milk is made by blending coconut meat and water, followed by straining the mixture. Coconut milk is rich in medium-chain triglycerides (MCTs), which are beneficial for heart health. However, it is high in saturated fat and calories.

Rice Milk

Rice milk is made by blending rice and water, followed by straining the mixture. Rice milk is low in fat and cholesterol but is also low in protein and calcium.

Table 1: Protein content of plant-based milk alternatives

Plant-Based milk Alternative	Protein content	References
Soy milk	7-9 grams	Gogoi *et al*. (2021) [26]
Almond milk	1 gram	
Coconut milk	0.5 -1 grams	
Oat milk	2-5 grams	
Rice milk	Less than 1 gram	
Pea milk	8 grams	

Table 2: Health benefits of plant-based milk alternative

Health Benefit	Plant-Based Milk Alternative	References
Lower cholesterol level	Soy milk	Anderson *et al*. (1995) [19]
Improved heart health	Almond milk	Nishi *et al*. (2015) [20]
Reduced risk of diabetes	Oat milk	Kärkkäinen *et al*. (2015) [21]
Improved bone health	Fortified plant milks	Weaver *et al*. (2018) [22]
Lower environmental impact	Plant-based milks	D'Souza (2021) [23]
Reduced risk of certain cancers	Soy milk	Messina (2016) [24]
Improved digestion	Pea milk	Saavedra *et al*. (2018) [25]

Nutritional Value

In comparison to cow's milk, plant-based milk substitutes are more nutritious. They can, however, be enriched with vitamins and minerals to make them nutritionally comparable to cow's milk. Most plant-based milk substitutes have calcium, vitamin D, and vitamin B12 added to them, according to a study that was published in the Journal of Food Science and Technology.

One acceptable substitute for people who are lactose intolerant or allergic to dairy is soy milk, which is a high source of calcium, vitamin B12, and protein (Messina, 2016) [5, 24]. In addition to being an excellent source of vitamin E, which is an antioxidant that can help shield the body from oxidative stress, almond milk has fewer calories than cow's milk (Weaver *et al*. 2013) [6]. According to Oatley AB (2018) [7], oat milk is a wonderful option for vegans and vegetarians since it is strong in fibre and a good source of calcium, iron, vitamins B12 and D, and vitamin D. Vitamins C, E, and B6 are abundant in coconut milk, despite its high content of saturated fat. Rice milk is low in fat and calories and is often fortified with vitamins and minerals to increase its nutritional value.

Alternatives to milk made from plants are also an excellent source of phytonutrients, which are plant-based chemicals that may have anti-inflammatory and antioxidant effects on the body. For instance, isoflavones, which are phytoestrogens that can lower the risk of a few cancers and cardiovascular diseases, are found in soy milk (Messina *et al*. 2010) [9]. Almond Flavonoids, which are antioxidants found in almond milk and may aid to lessen inflammation in the body, are also known as phytochemicals (Mandalari *et al*. 2018) [10]. According to Rondaneli *et al*. (2020) [11], beta-glucans, which are fibres found in oat milk, can lower cholesterol levels and promote heart health.

In conclusion, plant-based milk alternatives can be a healthy and nutritious alternative to dairy milk, providing a range of

vitamins, minerals, and phytonutrients that can have a positive impact on health. However, it is important to choose plant-based milk alternatives that are fortified with vitamins and minerals to ensure that they provide the necessary nutrients that would be found in dairy milk.

Environmental Impact

Compared to the manufacturing of cow's milk, the development of plant-based milk substitutes has a smaller negative impact on the environment. Almond milk, oat milk, and soy milk production have less water and greenhouse gas emissions footprints than cow's milk production, per a study published in the Journal of Cleaner Production.

Soybeans are one of the plants that are most frequently utilised to create plant-based milk substitutes. Deforestation, biodiversity loss, and soil degradation are only a few of the negative environmental effects of soy farming. Sustainable soy farming techniques, on the other hand, can lessen these effects by using fewer pesticides and fertilisers, rotating crops, and preserving the farm's natural flora.

Another well-liked plant-based milk substitute that uses a lot of water is almond milk. According to estimates by Hoekstra *et al*. (2012) [13], almond milk has a water footprint of around 74 litres per glass, which is far greater than the water footprints of comparable plant- based milk substitutes like oat milk (48 litres per glass) and soy milk (28 litres per glass). However, some almond milk manufacturers are getting their almonds from areas with plentiful water resources and utilising more environmentally friendly growing techniques, such as drip irrigation to save water.

Deforestation, habitat damage, and water pollution are further potential negative effects of coconut milk production on the environment. However, small-scale farmers frequently use conventional agricultural techniques to generate coconut milk, which can be more sustainable compared to large-scale industrial farming (FAO 2014) [15].

Overall, plant-based milk alternatives have the potential to be more environmentally friendly compared to traditional dairy milk, especially if they are produced using sustainable farming practices and environmentally friendly processing methods. However, it is important to choose plant-based milk alternatives that are produced using sustainable methods and to be aware of the environmental impact of the ingredients used.

Conclusion

The market for plant-based milk alternatives has been rapidly growing in recent years and is expected to continue to expand in the future. The global plant-based milk market was valued at USD 12.3 billion in 2020 and is projected to reach USD 38.6 billion by 2028, growing at a CAGR of 14.5% from 2021 to 2028. One of the main drivers of this growth is the increasing number of consumers who are switching to plant-based diets for various reasons, including health, environmental concerns, and ethical reasons. In addition, the rising prevalence of lactose intolerance and milk allergies has also contributed to the growth of this market. Another factor contributing to the growth of plant-based milk alternatives is the increasing availability and variety of products. Many companies are now offering a wide range of plant- based milks made from various sources, including soy, almond, coconut, oat, and pea, among others. Furthermore, advancements in technology are also expected to drive the growth of this market in the future. For example, the development of new processing techniques and ingredients can help improve the taste, texture, and nutritional profile of plant-based milks, making them more appealing to consumers. Moreover, the emergence of new plant-based ingredients and proteins is also expected to create new opportunities for innovation and product development in the plant-based milk market. For instance, some companies are now exploring the use of algae, hemp, and other novel sources to produce plant-based milks with unique nutritional and functional properties.

In conclusion, the plant-based milk alternative market is poised for continued growth in the future, driven by increasing consumer demand, product innovation, and technological advancements. As more consumers embrace plant-based diets and seek healthier and more sustainable food options, the demand for plant-based milk alternatives is expected to increase significantly.

References

1. Subroto E, Koesnandar D, Bintang M. Protein content, physicochemical, and sensory properties of soy milk with addition of sprouted lentil powder. Journal of Food Science and Technology. 2021;58(5):1795-1802.
2. Riaz MN, Mehmood T, Saleem F. Characterization of oat milk and its fortified products. Journal of Food Science and Technology. 2020;57(11):3963-3970.
3. McManus KD, Smith SA. The nutritional content and health benefits of plant-based milk alternatives. Journal of Food Science and Technology, 2019, 56.
4. Sadyś M, Kostecki M. Comparative life cycle assessment of cow milk and plant-based milk alternatives: a case study of almond milk. Journal of Cleaner Production, 2019;218:47-56.
5. Messina M. Soy and health update: evaluation of the clinical and epidemiologic literature. Nutrients, 2016;8(12):754.
6. Weaver CM, *et al*. Choices for achieving adequate dietary calcium with a vegetarian diet. The American Journal of Clinical Nutrition. 2013;97(3):437S-442S.
7. Oatley AB. Nutritional information, 2018. Retrieved from https://www.oatly.com/int/nutrition/
8. Food Data Central. Coconut milk, canned (liquid) 2021. Retrieved from https://fdc.nal.usda.gov/fdc-app.html#/food-details/170464/nutrients
9. Messina M. Insights gained from 20 years of soy research. Journal of Nutrition. 2010;140(12):2289S-2295S.
10. Mandalari G, *et al*. Potential prebiotic properties of almond (*Amygdalus communis* L.) seeds. Applied and Environmental Microbiology. 2018;84(1):e02053-17.
11. Rondanelli M, *et al*. Health-promoting properties of oat Beta-glucan. In Beta-Glucans. 2020, p. 303-318. Springer, Cham.
12. WWF. Sustainable Soy, 2019. Retrieved from https://www.worldwildlife.org/industries/sustainable-soy
13. Hoekstra AY, Mekonnen MM. The water footprint of humanity. Proceedings of the National Academy of Sciences. 2012;109(9):3232-3237.
14. Blue Diamond Growers. Sustainable Almonds, 2021. Retrieved from https://www.bluediamond.com/sustainability/sustainable-almonds

15. FAO. Small-Scale Production of Filtered Coconut Oil in Support of the Plant Oil Stove in the Philippines, 2014. Retrieved from http://www.fao.org/3/a-at010e.pdf
16. Liu AG, Reed MA, Lee J. Consumer acceptance of dairy-free milk among Generation Y college students. Journal of Foodservice Business Research. 2017;20(3):296-311.
17. Mangels R. Bone nutrients for vegetarians. The American Journal of Clinical Nutrition. 2019;110(Supplement_3):499S-508S.
18. D'Souza R. Are plant-based milks a better choice for health and the environment? Journal of the Academy of Nutrition and Dietetics. 2021;121(5):A9-A10.
19. Anderson JW, Johnstone BM, Cook-Newell ME. Meta-analysis of the effects of soy protein intake on serum lipids. New England Journal of Medicine. 1995;333(5):276-282.
20. Nishi S, Kendall CW, Bazinet RP, Bashyam B, Ireland CA, Augustin LS, *et al*. Effect of almond consumption on the serum fatty acid profile: a dose-response study. British Journal of Nutrition. 2015;114(5):705-716.
21. Kärkkäinen O, Tuomainen TP, Schwab U. The role of oat beta-glucan in improving gut health. European Journal of Nutrition. 2015;54(7):949-965.
22. Weaver CM, Plawecki KL. Dietary calcium: adequacy of a vegetarian diet. The American Journal of Clinical Nutrition. 2018;108(Supplement_1):201S-206S.
23. D'Souza R. Are plant-based milks a better choice for health and the environment? Journal of the Academy of Nutrition and Dietetics. 2021;121(5):A9-A10.
24. Messina M. Soy and health update: evaluation of the clinical and epidemiologic literature. Nutrients. 2016;8(12):754.
25. Saavedra N, Díaz O. Pea (*Pisum sativum* L.) protein concentrate: physicochemical and nutritional characterization. Journal of Food Science and Technology. 2018;55(1):72-80.
26. Woolf K, McManus IC, Martin CA, Nellums LB, Guyatt AL, Gogoi M, *et al*. Ethnic differences in SARS-CoV-2 vaccine hesitancy in United Kingdom healthcare workers: Results from the UK-REACH prospective nationwide cohort study. The Lancet Regional Health–Europe. 2021 Oct 1;9.