

# Nutritional Comparison of Plant-Based Dairy Alternatives vs. Cow's Milk

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## Abstract

*The increasing popularity of plant-based dairy alternatives has sparked a closer look at how they compare to traditional cow's milk, especially in terms of nutrition and health. Cow's milk is usually regarded as a good source of high-quality protein, calcium, vitamins B12 and D, and other critical elements. Its complete protein and easily absorbed calcium make it particularly important for bone health. However, more people are turning to plant-based options like almond, soy, and oat milk due to concerns about lactose intolerance, vegan diets, and environmental impact. This article explores the nutritional makeup of popular plant-based milks, focusing on their protein, fat, carbohydrate, vitamin, and mineral content. Soy milk is the most like cow's milk in terms of protein, while almond and oat milk are lower in protein but offer other benefits, like healthy fats and fiber. Plant-based milk replacements are typically fortified with vitamins and minerals, such as calcium, vitamin D, and B12, to mimic the nutritious content of cow's milk. However, differences in how our bodies absorb these nutrients and the presence of additives in plant-based milk should be considered. The article discusses the health impacts of both cow's milk and plant-based alternatives, including their effects on digestion, allergies, bone strength, and heart health. While plant-based milk is a good choice for those with dietary restrictions, it is important to choose carefully to ensure proper nutrition. In the end, this comparison highlights the pros and cons of both cow's milk and plant-based options, showing that the best choice depends on individual health needs and preferences.*

**Keywords:** Plant-based, almond milk, soy milk, oat milk, protein

## INTRODUCTION

Plant-based dairy substitutes have grown in popularity in recent years as people look for alternatives to traditional cow's milk. Many consumers are switching to plant-based milk for various reasons, including lactose intolerance, which makes it difficult for some people to digest cow's milk, and the rise of veganism, which avoids animal products altogether. Environmental concerns also play a role, as some believe that plant-based milks have a lower impact on the planet compared to dairy farming. Given these growing trends, it's important to understand how the nutritional content of these alternatives stack up against cow's milk. This comparison allows consumers to make informed judgments about which option best meets their dietary needs and health goals [1–3].

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Received Date: October 26, 2024  
Accepted Date: October 28, 2024  
Published Date: November 07, 2024

**Citation:** Nupur Raj. Nutritional Comparison of Plant-Based Dairy Alternatives vs. Cow's Milk. *Research & Reviews: Journal of Dairy Science & Technology*. 2024; 13(3): 7–11p.

## NUTRITIONAL COMPONENTS TO COMPARE

When comparing plant-based milk to cow's milk, it is important to look at several key nutritional components. First, macronutrients like protein, fat, carbohydrates, and calories play a major role in determining nutritional value. Cow's milk is known for its high-quality protein, while plant-based options like almond and oat milk generally contain less protein, with soy milk being the closest match. Micronutrients, such as vitamins

(B12, D, and A) and minerals (calcium, potassium, and magnesium), are also crucial for health. Cow's milk naturally contains many of these nutrients, whereas plant-based milk often needs to be fortified to provide similar benefits. Another key factor is bioavailability, which refers to how well the body can absorb and use nutrients from various sources [4]. Cow's milk has naturally high bioavailability, especially for calcium, while fortified plant-based milks may not always be absorbed as effectively. Lastly, many plant-based milks include additives and fortifications to enhance their nutritional profiles. Common additives include calcium and vitamin D, which help make plant-based milk nutritionally comparable to cow's milk, but the presence of other additives like thickeners and sweeteners should be considered when evaluating overall health benefits. Cow's milk is well-known for its impressive nutritional profile, particularly in terms of macronutrients. It is a superb source of high-quality protein, known as "complete" because it contains all the important amino acids our bodies require for growth and repair. In terms of fat, cow's milk naturally contains saturated fat, though low-fat and skim versions are available for those looking to reduce their fat intake. The natural carbohydrate in cow's milk is lactose, which provides energy but can be problematic for those with lactose intolerance [5]. Cow's milk contains essential micronutrients in addition to its macronutrient content. It is naturally abundant in calcium, which is essential for strong bones and teeth. It also contains phosphorus and potassium, both of which support various bodily functions, and vitamin B12, which is important for nerve function and the production of red blood cells. Cow's milk is often fortified with vitamin D to enhance calcium absorption, making it an even more powerful source of bone-strengthening nutrients.

Because of its nutrient density, cow's milk provides several health benefits. It plays a key role in supporting bone health, particularly for children, teens, and older adults, due to its calcium and vitamin D content. Milk's protein content promotes muscle growth and recuperation, making it a popular choice among athletes and anyone looking to maintain muscular mass. In general, cow's milk is a healthy food that contributes to a well-balanced diet by delivering a variety of nutrients that promote overall health and wellness.

### **NUTRITIONAL PROFILES OF POPULAR PLANT-BASED MILKS**

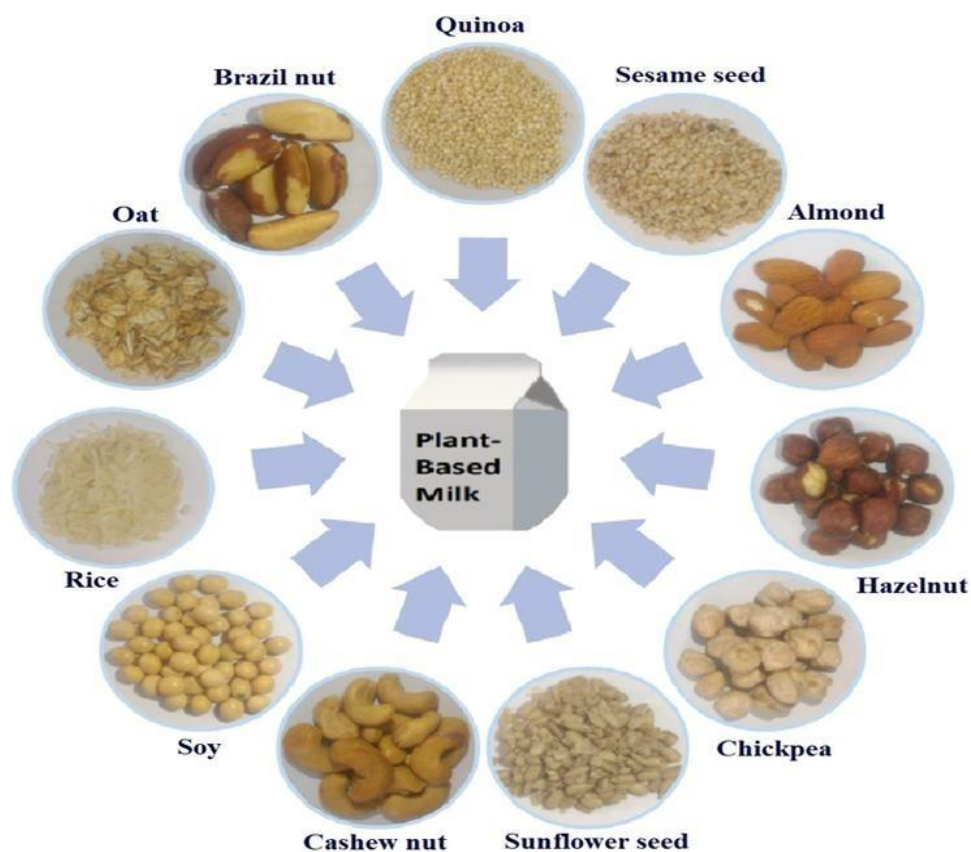
Plant-based milks have distinct nutritional profiles, responding to a variety of dietary needs (Figure 1).

1. Almond milk is a popular option due to its low calorie, protein, and carbohydrate content. As a result, it may be less satiating or nutrient-dense than other options. Nonetheless, almond milk is sometimes supplemented with calcium and vitamin D to make it more like cow's milk, and it is naturally abundant in vitamin E, an antioxidant; nonetheless, it lacks many other essential minerals.
2. Soy milk is renowned for having the closest protein content to cow's milk of any plant-based milk. It is usually supplemented with calcium, vitamin B12, and vitamin D to provide the same benefits as cow's milk. Soy milk also contains isoflavones, which are substances that may have additional health benefits, such as improving heart health and balancing hormones. Soy milk is an excellent substitute for dairy protein due to its greater protein content.
3. Oat milk is another popular option, especially for people who want a creamier texture. It has more carbohydrates than other plant-based milks, and it also provides fiber, particularly beta-glucan, which is known to support heart health by helping lower cholesterol. Oat milk, like other plant-based alternatives, is often fortified with calcium, vitamin D, and B vitamins to boost its nutritional value.
4. Other alternatives like coconut, rice, and pea milk vary in nutrient content. Coconut milk, for example, is high in fat but low in protein, while rice milk is very low in protein but often fortified to add extra nutrients [6–8].

### **COMPARISON OF KEY NUTRIENTS**

When comparing cow's milk to plant-based alternatives, there are several key nutrients to consider. Protein is a major factor. Cow's milk and soy milk are both complete proteins, meaning they include

all the essential amino acids that our bodies require. On the other hand, almond and oat milk are much lower in protein and do not offer the full range of essential amino acids, so they may not be as beneficial for muscle building or repair. Fat content also differs. Cow's milk contains saturated fat, which is why some people choose lower-fat or skim versions. In contrast, most plant-based milks are lower in fat or contain healthier unsaturated fats, which can be better for heart health. When it comes to calcium, cow's milk naturally provides a high amount, which is important for bone health. Most plant-based milks are fortified to match these levels, but the body may not absorb the calcium from plant-based sources as easily as it does from cow's milk. Vitamins like B12 and D are also important. Cow's milk naturally contains vitamin B12, while plant-based milks often must be fortified with it, especially for people on vegan diets. Both cow's milk and plant-based milk is usually fortified with vitamin D, since it's naturally low in both. Carbohydrates are another point of difference. Lactose occurs naturally in cow's milk, although plant-based alternatives, such as oat, almond, and soy milk may contain added sugars or natural carbs. To prevent excessive sugar, check the labels and choose unsweetened plant-based milks (Table 1) [9].



**Figure 1.** Plant-based milks.

### HEALTH IMPLICATIONS

When considering the health implications of cow's milk versus plant-based alternatives, one important factor is digestive health. Many people experience lactose intolerance, which means they struggle to digest the lactose found in cow's milk. For these individuals, lactose-free alternatives are essential. On the other hand, plant-based options like oat milk are beneficial for gut health because they contain fiber, which cow's milk lacks. Fiber enhances digestive health and can help maintain a healthy gut microbiota. Allergies are another issue to consider. Cow's milk protein allergies are common, particularly in young children, while soy and nut allergies can also pose challenges. For individuals with multiple food allergies, choosing the right milk can be tricky. Alternatives like oat milk may be suitable for those allergic to both dairy and soy, providing a safe option without common allergens [10].

Bone health is another area of concern. Cow's milk is naturally rich in calcium and vitamin D, essential for strong bones. While many plant-based milks are fortified to match these nutrient levels, there is still a question about how well our bodies absorb the fortified nutrients compared to those found in cow's milk. Additionally, when it comes to heart health, the type of fat matters. Cow's milk contains saturated fats, which can impact heart health negatively, while most plant-based alternatives, like almond milk, contain healthier unsaturated fats and are cholesterol-free. This can make them a better choice for people watching their cholesterol levels. Lastly, while plant-based milk generally has a lower environmental impact in terms of water use and carbon footprint, there are sustainability concerns with certain options, such as almond milk, which requires significant water resources for production [11].

**Table 1.** Nutrients in cow's milk and some of the plant-based milks.

Milk Type	Calories Per Cup	Protein	Fat	Carbohydrates	Sugar
Cow's milk	100	8	2	12	12
Almond	35	1	3	1	0
Oat	100	3	4	14	3
Soy	100	7	4	8	1
Rice	115	1	2	22	13
Cashew	35	0	4	1	0

## FORTIFICATION AND ADDITIVES

When choosing plant-based milks, it is crucial to pay attention to fortification and additives by carefully checking labels. Many plant-based alternatives are fortified with essential elements including calcium, vitamin D, and vitamin B12 to better match the nutritional profile of cow's milk. Since these nutrients may not be naturally present in significant amounts in some plant-based milks, fortification is important for individuals relying on these alternatives to meet their nutritional needs. However, not all plant-based milks are fortified equally, so looking for those that specifically mention these nutrients can help ensure you are getting the benefits you need [12].

It is important to be aware of additives that may be included in plant-based milk. Many products contain thickeners and emulsifiers to improve texture and stability, which can sometimes affect the overall health benefits. For example, additives like carrageenan have been debated regarding their potential negative effects on gut health. Furthermore, some plant-based milks may contain added sugars to enhance flavor, which can add unnecessary calories and diminish their health. It is advisable to opt for unsweetened varieties to avoid excess sugar intake [13].

Understanding the difference between natural and fortified nutrient content is essential. Natural nutrients found in cow's milk is readily absorbed by the body, while the effectiveness of fortified nutrients in plant-based milks can vary. Some studies suggest that the bioavailability of fortified nutrients might not be as high as those found in dairy, meaning the body may not absorb them as effectively. Therefore, when choosing plant-based milk, consumers should consider both the fortification of nutrients and the presence of additives to make informed decisions about their dietary choices [14].

## CONCLUSIONS

Cow's milk and plant-based substitutes each offer distinct nutritional benefits and drawbacks. Cow's milk contains high-quality protein, calcium, and important vitamins, which promote bone health and muscle maintenance naturally. However, it contains saturated fats and lactose, which may cause problems for people who are lactose intolerant or have certain dietary requirements. On the other hand, plant-based milk like soy, almond, and oat provide more options for individuals with specific health concerns or allergies, often offering healthier fats and fiber but requiring fortification to match the nutrient levels of cow's milk. The choice between cow's milk and plant-based milk

should ultimately depend on individual dietary needs, health goals, and preferences. Those who require higher protein intake or struggle with lactose may prefer soy milk or fortified oat milk, while individuals looking for lower-calorie or vegan options might opt for almond milk. Understanding the nutritional differences and checking for proper fortifications are key in making an informed decision. Ultimately, the best approach is to maintain diversity in one's diet. Plant-based milk can offer variety and cater to specific needs, but balanced nutrition is essential. If switching to plant-based alternatives, it is important to ensure that nutrient intake remains adequate, particularly for key nutrients like calcium, protein, and vitamins. A varied diet, including both dairy and plant-based options, when possible, supports overall health and well-being.

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