

Rediscover Dairy

September 2022

In this newsletter, the **RediscoverDAIRY** team of Milk SA focuses on plant-based beverages.

Find out more about the Consumer Education Project (CEP) of Milk SA at www.rediscoverdairy.co.za and follow them on their **RediscoverDAIRY Facebook** and **Instagram** pages.



Plant-based beverages, presented as alternatives to milk: What you need to know

Reference article on the Rediscoverdairy website: **Dairy as part of a plant-based diet**

Plant-based products are increasingly promoted as alternatives to milk, yoghurt and cheese. Here is what you need to know about how they compare nutritionally

A Terms

1. What is a plant-based diet?

A plant-based diet refers to dietary patterns with a greater emphasis on foods derived from plants, such as fruits and vegetables, whole grains, pulses, nuts, seeds and oils.

Such diets do not exclude animal foods completely, but include proportionally more plant-based foods.

2. What are plant-based milk alternatives?

Plant-based milk alternatives are water-based beverages made from extracts of legumes, cereals, nuts or seeds and with several additives added. They are often fortified to mimic the nutritional profile of milk.

These products are also referred to in this document as plant-based beverages or plant-based alternatives.

3. What is milk?

Milk is a liquid food produced by the mammary glands of mammals. It is a single-ingredient product, meaning no added ingredients, and contains many important nutrients in their natural and most bioavailable form.

4. What is the milk matrix?

The milk matrix refers to the specific structure of milk and the unique combination of nutrients and bioactive factors, and their interaction, to produce the overall effect on health.

5. What is a whole food?

Whole foods are foods that are not processed or only minimally processed. These foods are therefore close to their natural state, such as fresh vegetables and fruit, whole grains, nuts, pulses and milk.

B Key Points

- o Milk and dairy are **nutrient dense** and provide **high-quality protein** and a variety of **important micronutrients** in a form that is **easily absorbed**.
- o Plant-based beverages are often fortified to mimic the nutritional profile of cow's milk and contain additives such as stabilisers, emulsifiers, flavourings, sweeteners and salt. Compared with cow's milk, most of these milk alternatives lack nutritional balance.
- o Cow's milk has a **higher protein content** than plant-based alternatives.
- o Milk contains **lactose**, which is a naturally occurring sugar. In contrast, plant-based alternatives often contain added sugar or sweeteners to enhance their taste.
- o A strong body of scientific **evidence supports the health benefits** of milk and other dairy products. Limited evidence is available on the health benefits of plant-based beverages and the bioavailability of their nutrients in the body.
- o Replacing milk with plant-based beverages can lead to nutritional deficiencies, which could negatively affect growth and development in children and adolescents as plant-based products are naturally low in protein, vitamin B12 and calcium.
- o Plant-based milk alternatives are formulated products that are produced using many food technology interventions, making them highly processed foods.
- o When expressed per kilogram of product, plant-based milk alternatives may seem to have a more favourable environmental impact. However, milk performs better when the impact is expressed according to **nutritional value**.

© A deeper look at the consumer landscape in South Africa and what drives consumer choices

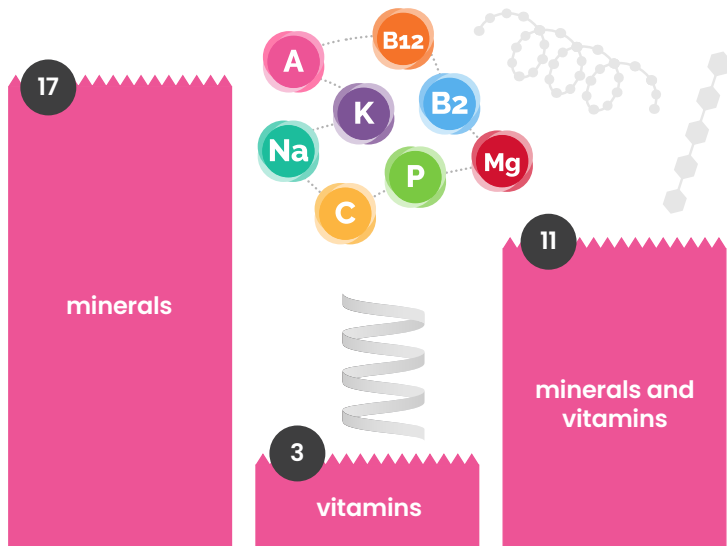
1. A word on plant-based dairy alternatives in South Africa

The demand for plant-based milk alternatives has increased over the past few years owing to a rise in **vegan, vegetarian and flexitarian diets** and a rising awareness regarding dairy allergy, lactose intolerance, consumer movement towards animal-friendly options, and emphasis on healthy eating and plant-based diet regimes.

Increased competition is expected as more companies will expand their portfolios, although local production remains low and thus this beverage category relies on imports.

The lactose-free milk offerings have grown in popularity and have become more available across South Africa.

Research by the Consumer Education Project of Milk SA showed that the most popular types of plant-based milk alternatives consumed in South Africa are **almond, soy and oat** milk. Most of the participants that consumed plant-based milks did so only occasionally and were also consumers of cow's milk.



2. Plant-based beverages in the retail market: Read the label

The nutritional composition of plant-based dairy alternatives is not consistent (see Table 1). Some are sweetened while others are not. Furthermore, fewer than half (n = 31) of the products sampled were fortified, of which:

- o 17 brands were fortified with minerals only (mostly calcium)
- o 3 brands were fortified with vitamins only
- o 11 brands were fortified with both minerals and vitamins

At the moment there is no regulation stipulating the nutritional requirements for plant-based beverages and as a result, within a specific category, the number of ingredients and micronutrients added may vary. However, all categories of plant-based beverages contain stabilisers.



Table 1: Comparison of nutritional content of plant-based milk alternatives and cow's milk (per 100 g of product).

	Nutrient	Full-cream Milk	Fat-free Milk	Soy Milk		Oat Milk		Almond Milk	
				Sweetened (n = 11)	Unsweetened (n = 5)	Sweetened (n = 4)	Unsweetened (n = 2)	Sweetened (n = 4)	Unsweetened (n = 7)
Macronutrients	Energy (kJ)	293.0	146.0	115.0–302.0 102.0–266.0		180.0–331.0 154.0		102.0–155.0 69.0–151.0	
	Fat (g)	3.4	0.2	0.8–3.5 1.7–2.6		0.9–3.4 1.5		1.1–2.5 1.1–2.8	
	Total carbohydrates (g)	4.6	4.8	2.0–12.0 0.1–7.0		6.4–8.0 5.0		2.8–5 1–2	
	Added sugar (g)	0	0	1.0–10.0 0.3–1		2.6–6.4 0.9		1.7–5.4 0.2–0.3	
	Protein (g)	3.3	3.3	1.7–3.8 2.2–3.7		0.9–1.5 0.8		0.5–0.8 0.2–2.82	
Micronutrients	Calcium (mg)	120.0	123.0	0.1–120.0 19.4–132.0		0.0–120.0 106.1		0.0–140.0 0.0–142.0	
	Sodium (mg)	48.3	52	12.0–105.0 11.0–72.0		32.0–41.0 53.0		41.0–60.0 0.1–60.0	
	Magnesium (mg)	11.7	11.0	0.0 0.0		0.0 0.0		0.0 0.0	
	Phosphorus (mg)	90.3	101	0.0–48.3 0.0		0.0–80.0 0.0		0.0 0.0	
	Potassium (mg)	157	166	0.0–199.0 0.0		0.0–114.0 0.0		0.0 0.0	
	Vitamin A (µg)	43.4	2	0.0–80.0 0.0		0.0 0.0		0.0–55.0 0.0–120.0	
	Vitamin B2 (mg)	0.2	0.14	0.2 0.2		0.0 0.0		0.0–0.2 0.0–0.2	
	Vitamin B12 (µg)	0.4	0.38	0.4–0.5 0.4		0.0 0.0		0.0–0.4 0.0–0.4	

Source: Milk SA report on plant-based milk alternatives in the South African retail market. (2020)

3. Consumers choose plant-based milk alternatives in the belief that they are healthier: Setting the record straight

A strong body of scientific evidence supports the **health benefits of milk and other dairy products**, whereas limited evidence is available on the health benefits of plant-based beverages and the bioavailability of their nutrients in the body. Owing to the difference in nutritional composition, replacing milk with plant-based beverages can lead to nutritional deficiencies, which could negatively affect growth and development in children and adolescents.



a Plant-based beverages are not nutritionally equivalent to milk

Consumer research suggests that people perceive plant-based beverages to be healthier than milk and that they offer a solution to lactose intolerance or milk allergies.

However, although plant-based milk alternatives look like milk or are labelled 'milk', these plant-based beverages differ from cow's milk with regard to nutritional composition, as shown in Table 1.

Plant-based beverages generally:

- o are **low in protein** (except for some beverages derived from soya and peas, and some oat milks)
- o have a **lower protein quality** than milk (except for soya-derived beverages, which have a similar protein quality to milk, especially if made from crops that are **genetically modified** for increased protein content and an improved amino acid profile)
- o contain **added sugar** (whereas plain cow's milk contains no added sugar)
- o contain **additives** (e.g. emulsifiers, stabilisers, etc.), and
- o do not naturally contain the vitamins or minerals found in milk, and therefore are often **fortified** to imitate the nutritional composition of milk.



b Cow's milk is higher in energy than plant-based milk alternatives

The energy content of plant-based alternatives varies, depending on the addition of ingredients such as sugar and oil. Full-cream milk generally has a higher fat content than plant-based alternatives although coconut versions have the highest fat content among plant-based alternatives.

c Milk contains high-quality protein

Milk is **naturally rich in 'complete' protein** (which provides all essential amino acids), whereas plant-based milk alternatives contain mostly 'incomplete' protein (which does not provide all essential amino acids). Owing to the proportional contribution of essential amino acids, the protein in cow's milk has a higher bioavailability than that of plant-based milk alternatives. For example, the nutritive value of soy protein is limited owing to its lower content of methionine and cysteine.

Therefore, when plant-based protein is used, more total protein must be consumed for the body to get enough of the amino acids it needs.

d Calcium in milk is easily absorbed by the body

The most noticeable difference between the mineral content of cow's milk and that of plant-based beverages is that calcium is not naturally found in these milk alternatives. Manufacturers have to fortify plant-based beverages with calcium to provide comparable amounts to that found naturally in cow's or goat milk. The most common forms used for fortification are **calcium carbonate** and **calcium triphosphates**.

However, the bioavailability of fortified calcium does not compare well with that of calcium occurring naturally in foods, possibly owing to the presence of **isoflavones** and **phytates**, which generally **decrease calcium absorption**. This means that the amount of calcium indicated on the label does not necessarily translate to equivalent nutritional value, as it is not only the amount of calcium present in foods but also the bioavailability (amount that can be absorbed by the digestive system) that determine how much is available to the body.

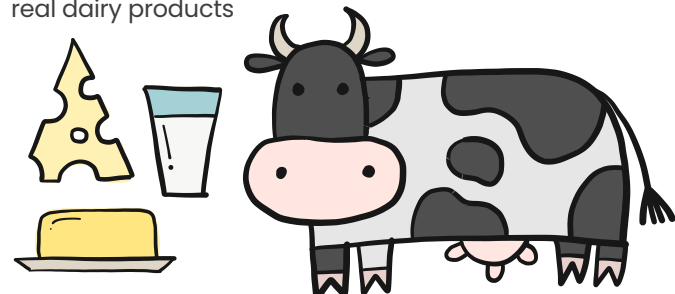
Dairy foods are excellent sources of calcium and the presence of **lactose** and **casein phosphopeptides** also promote calcium absorption.

e Plant-based beverages are highly processed, contrary to health authorities' recommendations for consuming less processed foods

Milk is a whole food and a **natural product**, which requires minimal processing. It can be consumed directly after milking but is typically heat treated to improve hygiene and shelf life. In South Africa, **no additives** are added to fresh, pasteurised milk.

In contrast, plant-based beverages are mostly water-based suspensions, with added vitamins and minerals (when fortified) and ingredients such as stabilisers, starches, thickeners and emulsifiers. They often contain small quantities of the original ingredient and therefore do not provide a whole-food effect. For example, to produce oat beverages, on average, takes 14 production steps, 15 steps for almond beverages and 13 steps for soy beverages.

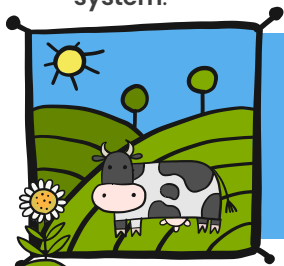
The production of plant-based milk alternatives can present new challenges, as they need to be analysed for residues and contaminants as well as allergens (such as soya, nuts and gluten), especially when vegan alternatives are produced on the same line as real dairy products



4. Consumers choose plant-based milk alternatives based on the misperception that they are healthier for the environment

The environmental impact of cow's milk compared with that of plant-based beverages is a big debate.

All food production – whether of plant-based or animal-based foods – has an impact on the environment. Reducing the environmental impacts of the food system is more complex than considering only whether the food is derived from plant or animal sources. Understanding the food system needs a **multidimensional approach**, as plants and animals work best as an **integrated system**.



Greenhouse gas emissions from dairy production cannot be compared with those for producing plant-based milk alternatives, without considering the nutritional contribution of both.
(Smedman et al, 2010)

The nutritional profiles of dairy- and plant-based beverages are fundamentally different, which complicates the direct comparison of the relative contribution of their production to greenhouse gas (GHG) emissions. Extensive research has been conducted regarding both the contribution of dairy to human health and its impact on **environmental sustainability**, compared with fairly little research around the production, consumption and integrated health effects of plant-based beverages used as milk alternatives. In addition, it is not yet clear how GHG emissions associated with the production of plant-based beverages compare with those of dairy production when figures are adjusted for nutritional and economic factors.

As most plant foods have a lower carbon footprint than most animal foods, there is a common perception that plant-based beverages are a more environmentally responsible option than milk. This idea is often used in the marketing of plant-based beverages. Although GHG emissions from milk would appear to be higher than those from plant-based beverages when expressed per kilogram, this is not true, as one would have to drink a larger amount of a plant-based beverage for the equivalent nutritional value offered by cow's milk.

The production and processing steps needed to deliver these higher volumes of plant-based beverages have a direct impact on various environmental factors,

decreasing the environmental sustainability of plant-based beverages.

Producing plant-based beverages also involves intensive heat and mechanical processes, as well as several additives (e.g. stabilisers, emulsifiers and fortified supplements) having to be added to the raw material to produce a fluid alternative to milk; the same extent of processing is not required in the production of dairy milk. In fact, **milk is wholly edible**, whereas a large portion of the plant materials used in producing a plant-based milk alternative is not and contributes significantly to the waste stream (flow of specific waste, from its source through to recovery, recycling or disposal).

Emerging research will shed more light on the **whole-view environmental impact** of consuming plant-based dairy alternatives.

REFERENCES

Main source:

Dairy as part of a plant-based diet:

www.rediscoverdairy.co.za/health-forum-ask-the-experts/plant-based-journal

Additional sources consulted:

EDA Factsheet, November 2021

eda.euromilk.org/fileadmin/user_upload/Public_Documents/EDA_Position_papers_-_Fact_Sheets/Fact_sheets/EDA_QA_Milk_vs_plant_based_beverages.pdf

National Dairy Council, Ireland. Dairy Nutrition Forum. Volume 9: Issue 2. Dairy alternatives – how do they compare?

www.ndc.ie/health

How milk compares to plant-based beverages:

www.dairy.com.au/sustainability/healthy-sustainable-diets

Euromonitor International, October 2021

British Nutrition Foundation:

www.nutrition.org.uk/putting-it-into-practice/plant-based-diets/plant-based-diets

What are the biggest food safety risks for plant-based food in 2022. Merieaux Nutrisciences.

www.merieuxnutrisciences.com/asia/food-safety-risks-plant-based-foods

Smedman A, et al. Food and Nutrition research, 54, 2010



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