

Proteins for the future

Differences in milk and plant protein

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Why?

Recently, the demand for plant-based milk alternatives have increased, mainly due to more focus on sustainability, lactose intolerance and diet selection.

The most popular plant drinks are based on almond, rice, oat and soy.

- But how should we choose the sources of protein in the future? And what should we base the discussions on?

Climate impact

A comparison of milk and plant-based beverages shows that the CO₂ emission per liter beverage is significantly lower for plant-based beverages⁴. However, **the CO₂ emission per amount of protein is significantly lower for milk** compared to plant-based beverages.

Further, plant drinks are often more processed products, based on different ingredients, imported to Denmark and heat treated. - Is this leading to a higher energy requirement?

Essential amino acids

Plant originating proteins are low in essential amino acids. Methionine and cysteine are limiting in almond, pea and soy, whereas lysine is limiting in rice and soy, meaning that even mixing different plant drinks will often not solve this deficiency completely.

Most plant drinks simply contain less protein compared to milk. Thus, if we look at price per amount of protein, milk is cheaper than plant drinks. A quality which deserves to be more widely recognized.

Table showing nutritional content, DIAAS values, environmental influence and prices of bovine milk and plant-based milk alternatives

	Energy (kcal/100g) ¹	Fat (g/100g) ¹	Protein (g/100g) ¹	Carbohydrates (g/100g) ¹	Calcium (mg/100g) ¹	DIAAS ²	CO ₂ emission (kg/L) ^{3,4}	CO ₂ emission (kg/kg protein)	Water consumption (L/L drink) ³	Price in Denmark (kr/L) ¹	Protein price (kr/kg)
Whole milk	64	3.5	3.4	4.8	120	1.18	1.2	35.6	1000	11	324
Skimmed milk	34	0.1	3.4	4.8	124	1.18	1.2	35.6	1000	9	265
Soy	35	2.1	3.7	0.1	10	0.90	0.35	9.5	300	20	541
Almond	50	2.7	1.1	4.9	9	-	0.28	25.5	4000	26	2364
Oat	47	1.3	0.3	8.1	7	0.54	0.21	70.0	-	20	6667
Rice	54	1.1	0.1	11	2	0.59	0.55	550.0	-	20	20000

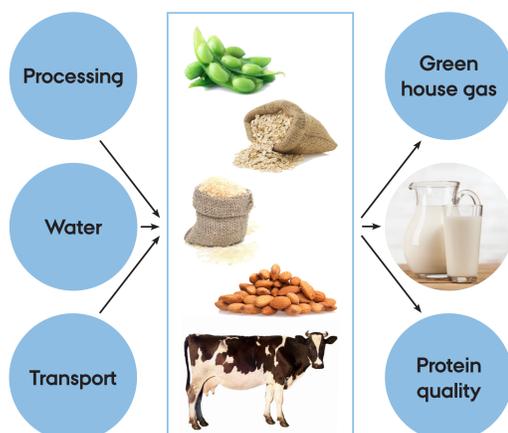


Figure 1. Illustration of some of the parameters influencing raw materials of milk and plant-based beverages, which in the end affects final product, climate impact and protein quality.

Protein quality

The Food and Agriculture Organisation (FAO) has introduced a score, which gives an estimate on protein digestibility and amount of essential amino acids, called Digestible indispensable amino acid score (DIAAS). In a comparison of dairy protein and selected plant protein sources, **only the dairy proteins had a DIAAS ratio above 1.00**, which is the criteria for an excellent protein source. Further, the higher degree of processing of most of the plant drinks may lead to more modifications of the proteins and potentially changes in protein quality.

Reference

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