

TECH-KNOWLEDGE

The Official PMG Engineering Newsletter

FOOD & BEVERAGE
INDUSTRY

ENGINEERING
& DESIGN

SCIENCE &
TECHNOLOGY

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PLANT-BASED MILK



Introduction

Plant-based milk, line the shelves in the refrigerator section of most supermarkets these days. These are the milk alternatives that results from breakdown (size reduction) of plant material (cereals, pseudo-cereals, legumes oilseeds, nuts) extracted in water and further homogenisation of such fluids, results in particle size distribution in range of 5-20 μm which imitates cow's milk in appearance and consistency. Although, there is no stated definition and classification of these plant-based milk alternatives in literature, a general classification of the plant based/vegetable milk alternatives into five categories is attempted, which is as follows:

1. Cereal based : Oat milk, Rice milk, Corn milk, Spelt milk.
2. Legume based : Soy milk, Peanut milk, Lupin milk, Cowpea milk.
3. Nut based: Almond milk, Coconut milk, Hazelnut milk, Pistachio milk, Walnut milk.
4. Seed based: Sesame milk, Flax milk, Hemp milk, Sunflower milk.
5. Pseudo-cereal based : Quinoa milk, Teff milk, Amaranth milk.

Different types of Plant-Based Milk

1. Almond milk :

Almond tastes almost similar to regular milk but is thinner in consistency. It contains lower amounts of carbohydrates and saturated fat as compared to dairy and is also lactose-free.

2. Coconut Milk :

Coconut is a nutrient-dense product and is a good source of fiber. It is rich in vitamin and minerals such as iron, calcium, potassium, magnesium and zinc. It also contains a significant amount of vitamin C and E. The use of coconut milk is associated with health benefits such as anti-carcinogenic, anti-microbial, anti-bacterial, and anti-viral.

3. Soy Milk :

Soy milk was the first plant-based milk that provided nutrients to the population where the milk supply was inadequate or for the populations who were allergic to milk proteins and were lactose intolerant.

4. Oat Milk :

As the name suggests, it is made from oats. Extracted from whole groats or steel-cut oats, the milk is obtained by these oats being soaked in water, blended, and finally strained using a cheese cloth.

5. Quinoa Milk :

Quinoa offers more protein and fibre than most other grains, is naturally gluten-free, and contains all the essential amino acids. It is also rich in iron, magnesium, and zinc.

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Functional components of plant-based milk.

S.No.	Type of milk	Functional or bioactive compound	Health Benefit.
1.	Soy Milk	Isoflavone	Protective against cancer, cardio problems
		Phytosterols	Cholesterol-Lowering properties
2.	Peanut Milk	Phenolic compounds	Protective role against oxidative damages
3.	Sesame Milk	Lignans such as sesamin, sesamol, sesaminol	Antioxidative, antitumor, anticarcinogenic
4.	Almond Milk	Alpha-tocopherol	Protection against free radicals
5.	Coconut Milk	Lauric Acid	Promotes brain Development, Elasticity of blood vessels
		Vitamin E	Fights against ageing nourish skin

Nutritional Comparison of Different Milks

	WHOLE MILK	REDUCED FAT (2%) MILK	SOY MILK BEVERAGE *	ALMOND MILK BEVERAGE *	COCONUT MILK BEVERAGE *
NUTRIENTS IN ONE CUP OF ...					
CALORIES	146 g	122 g	110 g	60 g	70 g
FAT	8 g	5 g	4.5 g	2.5 g	4.5 g
CARBS	11 g	11 g	9 g	8 g	8 g
PROTEIN	8 g	8 g	8 g	1 g	NONE
CALCIUM	28%	28%	45%	45%	10%



Conclusion

Cow's/buffalo milk is considered a staple in many people's diets, but lactose intolerance, dietary restrictions, and ethical preferences have led people to discover the beauty in non-dairy options too. So if you are looking for a milk alternative as a source of nutrition, find one that has a similar protein and carbohydrate count to cow's milk — that's 8g and 12g respectively. Most non-dairy milk is also fortified with vitamins and minerals naturally found in animal products, making them a good source for vegans who lack these essential supplements in their daily diet.

Plant-based milk is often thinner and lighter in texture. Additives such as salt, carrageenan and vegetable gums are usually added to achieve a thicker and smoother texture while giving the milk longer shelf life. While not detrimental to your health, these thickening agents have been known to cause inflammation and gastrointestinal issues for some, which negates the benefits of adopting this dairy-free lifestyle.

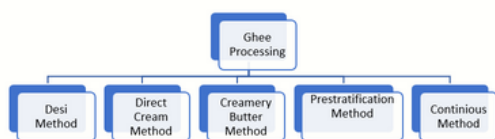
GHEE PROCESSING



Introduction

India is the world's largest producer and consumer of milk and dairy products. Ghee currently controls the second largest market share in terms of revenue in the Indian market. With the growth of the organized sector of the dairy industry and establishment of modern dairy plants, the emphasis has shifted to conducting investigations on newer and larger-scale methods of ghee manufacture which could profitably be adopted for routine ghee production by these dairies instead of the desi method used in the dairy.

There are five methods of Ghee Processing:



1. Desi method

It is an age-old process adopted mainly in rural areas/villages and at urban household levels because of simplicity in equipment and technique. This traditional method of making ghee contributes about 80% of the total ghee produced in the country. This method usually involves two routes- (1) Lactic acid fermentation of raw or heated milk is followed by the churning of curd into Makkhan (butter) . (2) Separation of malai (clotted cream) from the boiled milk and its churning into butter which is further heated to make ghee.

2. Direct Creamery method:

The direct cream method is a commercial ghee manufacturing process. Here a kettle is used to boil the milk cream. These kettles are mostly made of steel, and they come with a steam-heated jacket and fixed with an agitator, a steam regulator valve, pressure, and temperature gauging devices and a portable, hollow, stainless-steel tube with central boring for draining out the contents.

3. Creamery-Butter Method

In this method, unsalted creamery butter or white butter or cooking butter is used as a raw material for ghee making. First, the butter mass is melted at 60° C. The molten butter is pumped into the ghee boiler. The steam pressure is increased slowly to

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4. Pre-stratification Method:

Butter is produced from aged cream of 38 to 40% fat using continuous butter making machine or batch churn. Butter is then transferred to butter Melter, and melt at 80°C. This molten butter is kept undisturbed in a ghee kettle or boiler at a temperature of 80-85°C for 30 min.

5. Cream de-emulsification method:

This method of continuous ghee making is based on the principle of de-emulsification of fat in cream from oil-in-water phase to water-in-oil phase. In this process, milk is separated into the cream of 40% fat using a centrifugal cream separator a clarifactor. This cream is further concentrated in a concentrator which work under centrifugal force.

Hazards in Ghee Processing

1. Physical Hazards

- An extraneous matter like Foreign Particle, dust, dirt, glass, stone etc. due to low storage, environment.
- Very fine particles in ghee due to improper settling.

2. Chemical Hazard

- Probable Cross-contamination may occur from remaining cleaning agent. residues due to unclean pipelines.
- Polymer Migration from packaging Material.
- Cross-contamination due to residue of cleaning chemicals.



1. Biological Hazard

- Coliforms, Clostridium Botulinum, Salmonella, E.coli, Yeats & Mold / Aerobic spores due to improper cleaning.

Conclusion

Ghee is an essential part of Indian diet, religious, ceremonial function, and therapeutic purposes. Ghee is broadly prepared by two methods: traditional method and industrial method viz. creamery-butter method, direct cream method, pre-stratification method, and continuous method. On the word of market dynamics, more than 90% of the ghee is produced by traditional method by unorganized sectors in India by making makkhan and then converting it into ghee.

A close-up, shallow depth-of-field photograph of a glass cup filled with a frothy, golden-brown beverage, likely coffee or a milkshake. The background is blurred, showing hints of other cups and a warm, indoor setting.

INDUSTRY BUZZ

How Nespresso has improved its position in the Keurig-dominated U.S. market for coffee pods.

Nespresso is intensifying its rivalry for coffee pods in the U.S. market.

In the U.S., Keurig has controlled the market. At the end of the previous year, the company's U.S. coffee sales were over \$4.3 billion, and it claimed to have equipment installed in over 38 million households.

In the meantime, Nestlé's Nespresso has enjoyed more tremendous success globally, competing in the retail coffee industry, which the multinational food and beverage conglomerate estimates to be worth over \$100 billion. It is currently gaining market share in the United States.

In the U.S., Nespresso pod systems have always been relatively rare. Keurig is only noticeable in North America. As a result, the U.S. market is quite unusual, according to Matthew Barry, manager of food and beverage insights at Euromonitor International.

Although Nashville hot chicken is widely available, its hometown's culture still revolves around it.

Nearly a century ago, Nashville hot chicken started little. The specialized chicken style has now become a nationwide sensation.

Visitors and residents swarm to Tennessee to sample the delicacy, so many hot chicken eateries are vying for the top spot. Meanwhile, Nashville hot chicken is becoming increasingly popular on the menus of major fast-food chains like KFC, Baja Fresh, Dave's Hot Chicken, and others.

The trend for Nashville hot chicken experienced a surge around the start of the pandemic. It peaked by the end of 2022, according to data from Technomic, a food industry research and consulting organization.

Mentions of Nashville's hot chicken menu increased by around 25% between the first and second quarters of 2020. The rise during the previous five years is much more significant, at 65.7%.





TCL received approval from NCLT Kolkata to merge with TCPL Beverages & Foods and Tata Consumer Products.

The National Firm Law Tribunal (NCLT) in Kolkata has accepted the merger of Tata Coffee Ltd (TCL) with Tata Consumer Products and TCPL Beverages & Foods, the firm announced on Friday. Tata Coffee stated in a regulatory filing that on November 10, 2023, the NCLT, Kolkata Bench, issued a ruling approving the scheme of arrangement.

According to the filing, the corporation got a copy of the order on December 1, 2023.

Tata Coffee operates a global consumer product business, offering various food and beverage products. TCL and its affiliates primarily extract instant coffee, branded coffee, and plantation activities.



George Kovoov may be named president of PepsiCo India.

According to officials who know the situation, PepsiCo India is poised to name George Kovoov, one of its most senior executives, as president. Ahmed ElSheikh, the current president, is anticipated to move to a worldwide post in the American food and beverage business early in the upcoming year.

"There will be a leadership change, which will probably be disclosed in the upcoming months. It's only a matter of time," stated an executive who asked to remain anonymous.

Kovoov has been the general manager of beverages at PepsiCo and senior vice president since January 2022. Over the past three decades, he has worked in various top operational positions in Asia-Pacific, China, and New York for the company that produces Tropicana juices, Lays snacks, Pepsi and Mountain Dew carbonated beverages, and Doritos tortilla chips.



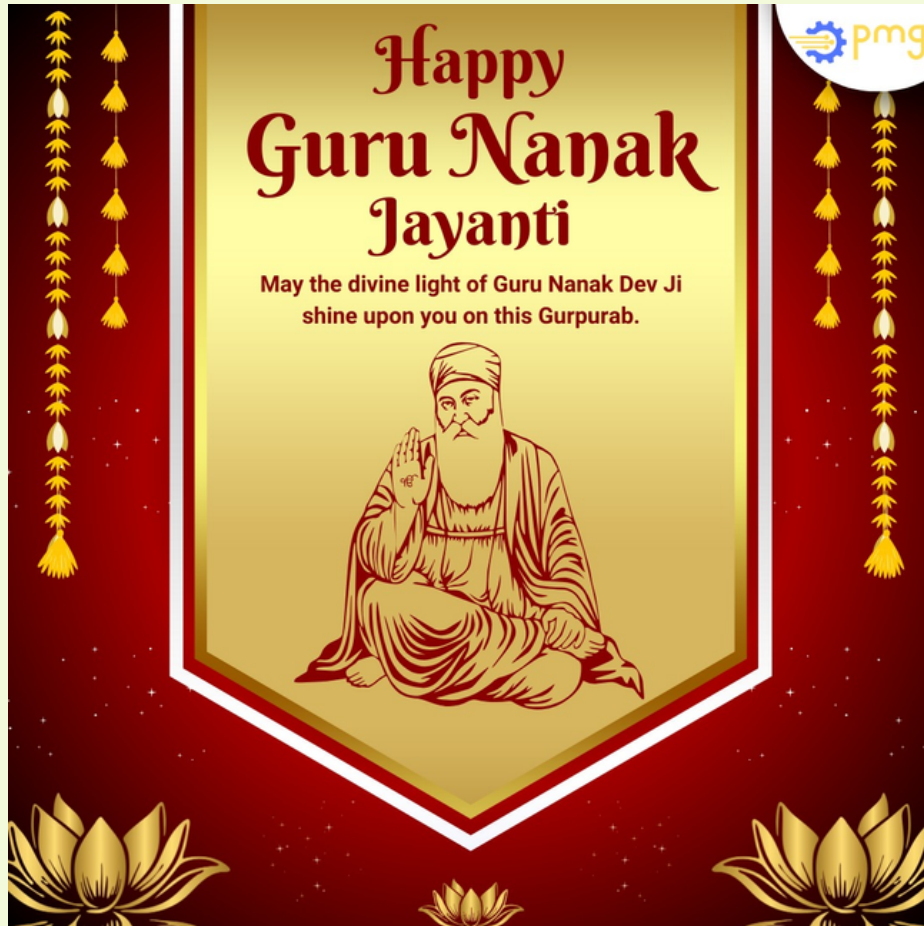
PepsiCo joins the government backed ONDC.

Through the wide range of ONDC-affiliated seller applications, this relationship is anticipated to increase consumer outreach and make the company's product line more discoverable to potential customers. Prominent snack and beverage manufacturer PepsiCo India announced its Open Network for Digital Commerce (ONDC) membership on Monday. The company also stated that this relationship would help increase consumer outreach through the wide range of ONDC-affiliated seller applications and make the product catalogue discoverable by buyers.

"The creation of ONDC as a centralized solution for diverse consumer needs is a notable step by the Indian Government to reshape the national e-commerce industry," stated Ahmed ElSheikh, President of PepsiCo India, in a statement. Maximizing consumer choice in how they choose to source our products is a top priority for PepsiCo India. We're constantly trying to develop our models for going to market.

WEEKS HIGHLIGHT

NON-TECHNICAL CONTENT



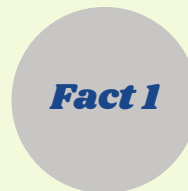
27 NOVEMBER

HAPPY GURU NANAK JAYANTI

On Guru Nanak Jayanti, we celebrate the birth of Guru Nanak Dev Ji, the founder of Sikhism. May his teachings of love, equality, and selfless service inspire us all. Wishing everyone a joyous and blessed Guru Nanak Jayanti!

DECEMBER

DID YOU KNOW?



Knife grinding machines are essential tools in the sharpening and maintenance of blades. These machines employ precision techniques to restore sharpness and ensure optimal cutting performance. Utilizing advanced technology, knife grinding machines offer efficiency and accuracy in honing various blade types. Whether in industrial settings or artisanal workshops, these machines play a crucial role in enhancing the longevity and functionality of knives, contributing to improved cutting precision and safety.

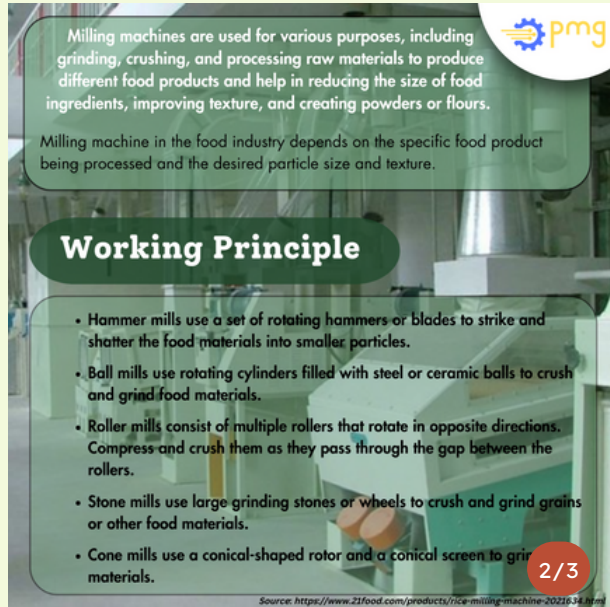




MACHINES FOR MILLING

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Source: <https://blog.fryzick.net/sop/sop-manual-for-rice-mill/>



Milling machines are used for various purposes, including grinding, crushing, and processing raw materials to produce different food products and help in reducing the size of food ingredients, improving texture, and creating powders or flours.

Milling machine in the food industry depends on the specific food product being processed and the desired particle size and texture.

Working Principle

- Hammer mills use a set of rotating hammers or blades to strike and shatter the food materials into smaller particles.
- Ball mills use rotating cylinders filled with steel or ceramic balls to crush and grind food materials.
- Roller mills consist of multiple rollers that rotate in opposite directions. Compress and crush them as they pass through the gap between the rollers.
- Stone mills use large grinding stones or wheels to crush and grind grains or other food materials.
- Cone mills use a conical-shaped rotor and a conical screen to grind materials.

2/3

Source: <https://www.21food.com/products/rice-milling-machine-2021034.html>



Market Insights

- Asia-Pacific has been a significant player in the milling machine market, with countries like China, Japan, and South Korea being major manufacturing hubs. North
- CNC (Computer Numerical Control) milling machines have gained significant market share due to their precision, versatility, and automation capabilities.
- The key players in the milling machine market include Haas Automation, Mazak Corporation, DMG MORI, Bridgeport, FANUC Corporation, Doosan Machine Tools, Okuma Corporation, Makino, HURCO, and Kent USA, among others.

3/3

Source: <https://www.precision.com/target-market-for-precision-milling-machine-2021034.html>

Fact 2

Milling machines play a pivotal role in the food industry, efficiently transforming raw ingredients into diverse products. These precision machines ensure consistency and quality in food processing, meeting stringent industry standards. From grains to spices, milling machines contribute to the production of a wide range of food items, optimizing efficiency and maintaining hygienic standards to deliver safe and nutritious products to consumers worldwide.

FOOD PRODUCT STORAGE IN SILOS



1/3

A large vertical storage structure used for the bulk storage of raw materials, ingredients, or finished products. Silos are commonly used in various sectors of the food industry, including agriculture, grain handling, flour milling, feed manufacturing

Specifications

- **Construction Material:** includes steel, concrete, and sometimes high-density polyethylene (HDPE) for certain applications.
- **Capacity:** measured in terms of volume, weight, or other relevant units based on the quantity of material to be stored.
- **Discharge System:** Discharge system to ensure efficient and controlled material flow and included rotary valves, screw conveyors, gravity outlets, or pneumatic systems.
- **Sealing and Insulation:** silo is properly sealed to prevent moisture ingress, pest infestation, and contamination.
- Insulation may also be necessary to control temperature and humidity within the silo.

2/3

Types

Flat Bottom Silos

- Flat bottom and are often used for storing grains, seeds, and powdered materials.

Conical Bottom Silos

- Used for products that tend to flow less freely, such as powdered ingredients and granular materials.

Hopper Bottom Silos

- Designed for materials that need to flow easily and can be used for grains, pellets, and other granular materials.

Tower Silos

- Commonly found on farms and are used to store feed for livestock.

3/3

Ref. <https://www.sdenviro.com/hopper-bottom-silos.html>

Fact 3

Silos are crucial for storing food products, ensuring optimal conditions to preserve quality. Temperature, moisture, and hygiene control are vital for maintaining freshness. Regular inspections prevent contamination and spoilage risks. Effective aeration systems regulate air distribution within silos, preventing mold and bacterial growth. Properly managed silos guarantee prolonged shelf life, reducing waste and ensuring a steady supply of safe, high-quality food products.



Oat products are food products made from oats, a type of whole grain commonly consumed for its nutritional value. Oats are high in fiber, protein, and other important nutrients, which makes them a healthy and nutritious food choice.

Products

- Oatmeal**
Made by boiling oats in water or milk.
- Granola**
Made from rolled oats, nuts, seeds, and dried fruits.
- Oat milk**
Made from oats, which can be used as a dairy milk substitute in cooking and baking.
- Oat flour**
Made from ground oats, which can be used as a substitute for wheat flour in baking.
- Oat bars**
Made from oats, nuts, seeds, and other ingredients.



Market Scope

- The global market for oat products is expected to grow steadily in the coming years due to several factors, including increasing health awareness, changing dietary habits, and the rising demand for plant-based food products.
- Oats are popular in vegan and plant-based foods, such as oat milk, oat-based meat substitutes, and oat-based desserts.
- Some of the major players in the market include:

1. The Quaker Oats Company
2. General Mills, Inc.
3. Kellogg Company
4. Nestle S.A.
5. Post Holdings, Inc.
6. Grain Millers, Inc.
7. Nature's Path Foods, Inc.
8. Bob's Red Mill Natural Foods, Inc.



Fact 24

Oat products have gained widespread popularity for their exceptional nutritional value and versatility. From heart-healthy oatmeal to protein-packed oat bars, these products offer a rich source of fiber, vitamins, and minerals. Oats are renowned for promoting digestive health, sustaining energy levels, and supporting overall well-being. Whether enjoyed in breakfast bowls, smoothies, or snacks, oat products are a delicious and wholesome addition to a balanced diet.



1/3



2/3



3/3

Fact 5

Buckwheat products, such as flour, groats, and noodles, have gained popularity due to their exceptional nutritional profile and versatile culinary applications. Packed with essential nutrients like fiber, protein, and antioxidants, buckwheat promotes heart health, aids digestion, and supports overall well-being. As a gluten-free alternative, these products cater to diverse dietary needs, offering a wholesome and delicious option for those seeking a nutritious addition to their meals.



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for FOOD and BEVERAGE Industry with SINGLE POINT ACCOUNTABILITY

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Ownership. Reliable and Trustworthy Business.

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- ENGINEERING MUST CREATE BUSINESS VALUE
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