

TECH-KNOWLEDGE

The Official PMG Engineering Newsletter

FOOD & BEVERAGE
INDUSTRY

ENGINEERING
& DESIGN

SCIENCE &
TECHNOLOGY

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RICE BRAN OIL PROCESSING



Introduction

Rice bran is by-product obtained during rice milling operation. This is golden reddish cuticle obtained after removal of the husk and during polishing of the rice. Rice bran is a mixture of substances, including protein, fat, ash, and crude fiber. In many cases, bran contains tiny fractions of rice hull, which increases the ash content of bran.

Rice bran is obtained from paddy rice in a multistage process, after harvest. The grains are submitted to the milling process, where, first, the kernel is separated from the hull (dehulling). The burnishing step is carried out to remove the brownish layer of the kernel, producing germ and bran. It is used for treating diabetes, high blood pressure, high cholesterol, alcoholism, obesity, and AIDS; for preventing stomach and colon cancer; for preventing heart and bloodvessel (cardiovascular) disease; for strengthening the immune system; for increasing energy and improving athletic performance; for improving liver function; and as an antioxidant.

Rice Bran Oil Processing

1.Solvent Extraction Method –

RBO produced from solvent (normally hexane) extraction is preferred as a cooking oil, after further refinement, while the oil produced by cold pressed extraction is considered to be a superior functional oil as a dietary supplement and medicinal purposes. After solvent extraction, further refining of the rice bran oil involves degumming, neutralization, bleaching, dewaxing, and deodorizing to produce quality cooking oil, resulting in large amount of waste products left from the processes.

Degumming involves the removal of phospholipids and lipoproteins through hydration by water with citric or phosphoric acid. Free fatty acids (FFAs) are removed by caustic soda (NaOH) in the neutralization process. Rice acid oil (RAO) is the major waste product from these two steps. Then, the bleaching step is applied to remove the pigments (including chlorophylls and carotenoids) of the RBO by adsorption on activated carbon or bleaching earth. A dewaxing and winterization steps follow by maintaining the oil at a low and very low temperature respectively to cause the solidified waxes and other high melting point substances as well as high melting point wax are separated as waste products.

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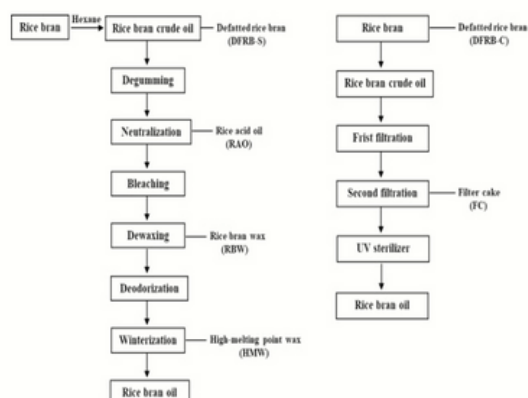
2.Cold Pressed Extraction Process -

The cold pressed RBO is produced by compressing the rice bran through a mechanical screw press under mild heating ($<50^{\circ}\text{C}$), and the resulting oil is then filtered through filter paper, to produce the refined functional oil. Defatted rice bran and filter cake are the main by-products from this process.

During both processes, a considerable amount of by-product is produced, some of which contains more or less quantities of potential ingredients for functional food, nutraceuticals and pharmaceutical manufacture. These ingredients include mainly of γ -oryzanol, tocotrienol, tocopherol, phytosterol, lecithin, carotenoids and long-chain alcohols. Rice bran wax (RBW) is also a rich source of aliphatic primary alcohols known as policosanols and many studies have shown that rice policosanols moderately decrease plasma cholesterol levels in hypercholesterolemic patients, reduce platelet aggregation.

Conclusion

RBO is known for its high nutritional value due to the high concentrations of health beneficial bioactive compounds naturally present in the oil. Hot extraction process gets more oil yield and pure edible oil than the cold processing. It is gaining huge popularity in recent days due to its umpteen health benefits including improved heart health, regulates blood glucose and blood pressure, and prevents cancers, enhanced immunity, and skin health. Furthermore, it renders powerful antioxidant, anti-inflammatory and anti-cancer effects, so reap the wellness incentives by adding this nourishing oil in your regular cooking.



MYCOTOXIN IN EDIBLE NUTS, OILSEEDS, AND LEGUMES



Introduction

Food commodities like nuts, oilseeds and legumes are major dietary constituents which are widely consumed across world in form of traditional food or as a functional ingredient in processed foods. These constituents also help in combating various lifestyle associated chronic disorders as these are enriched in dietary proteins, fiber, polyunsaturated fatty acids, and phytochemicals. However, these materials, due to their physical and chemical composition, are particularly susceptible to mycotoxin contamination due to the presence of filamentous fungi/molds. Mycotoxin contaminated can occur any time during supply chain, either during vegetation in the field or during storage, as well as during the processing.

Mycotoxin based contamination appears to be one of the major causes for economic losses of food and feed stuff and generating health-related risks posing serious health threat to both humans and livestock. Mycotoxins are low molecular weight secondary metabolites that are naturally produced by certain moulds in food products under warm and humid conditions. Mycotoxins appear in the food chain as a result of mould infection of crops both before and after harvest.

Classification of Mycotoxin Flora:

Fungi contaminating nuts, oilseeds and legumes have been conventionally divided into two groups:

- 1. Field Fungi:** Field fungi are those that infect the crops throughout the vegetation phase of plants and they include plant pathogens such as *Fusarium*, *Alternaria*, and *Botrytis* species. .
- 2. Storage Fungi:** This group include *Aspergillus*, *Penicillium*, *Rhizopus* and *Mucor* genera that infect grains after harvesting i.e., during storage.

Types of Mycotoxins

1.Aflatoxins:

The aflatoxins are the major mycotoxin contaminants of peanuts, hazel nuts, pistachio nuts, almonds, brazil nuts, walnuts and therefore the most important mycotoxins entering the human food chain upon consumption.

2.Ochratoxin A (OTA)

It is produced by *P. verrucosum* and *P. nordicum* and by a few *Aspergillus* species including *A. carbonarius* and *A. niger*. The mycotoxin occurs on a wide variety of food products including coffee, grapes, beans, chickpeas, and nut seeds such as pecans and pistachios. OTA exhibits immunosuppressive, nephrotoxic, nephrocarcinogenic and teratocarcinogenic effects.

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3. Deoxynivalenol (DON)

It is one of the major trichothecene mycotoxins produced mainly by *Fusarium graminearum*, *F. culmorum* and *F. crookwellense* which mainly infects the food commodities like maize, millet, sorghum and soybeans and rice. The major acute toxic effect of DON is related to feed refusal, vomiting and severe gastrointestinal toxicity in animals. Other effects include teratogenicity, cardiotoxicity, and disruption of the immune system.

4. Zearalenone (ZEA)

It normally co-occurs with DON and exhibits its activity by binding to estrogen receptors altering the estrogen responsive elements in the nucleus. ZEA also interferes with steroid metabolism and hence could be involved in the disruption of the endocrine system and has been shown to increase liver cell and pituitary tumors in mice. ZEA, α -zearanol and the type B trichothecene, 15-acetyl DON, are consistently detected in soybean oil.

5. Fumonisin:

It is mainly produced by *Fusarium verticillioides*, *F. proliferatum* and *A. niger*. It causes a wide variety of toxic syndromes in animals, and depending on the animal species could affect the liver, kidneys, lungs and brain. They have been associated with the development of liver and esophageal cancer and neural tube defects in humans. Fumonisin has been classified as an apparent non-genotoxic carcinogen that exhibited its mode of action via the disruption of lipid biosynthesis and hence the structure and function of cellular membranes.



Conclusion

Exposure to mycotoxins needs to be kept as low as possible to protect the people. Mycotoxins not only pose a risk to both human and animal health, but also impact food security and nutrition by reducing people's access to healthy food. WHO encourages national authorities to monitor and ensure that levels of mycotoxins in foodstuff on their market are as low as possible and comply with the both national and international maximum levels, conditions and legislation.



INDUSTRY BUZZ

Changes in paradigm for guaranteeing food safety and industrial leadership.

The Food Safety and Standards Authority of India's (FSSAI) vital role is ever-changing along with the culinary scene. A new era for the food business is being ushered in by the recent revisions to the Food Safety and Standards Act of 2006 and the redesigned Food Safety and Standards Institute (FSSAI), which emphasizes the entire process from farm to table and the quality of the final product. This piece examines how these modifications have altered the industry and their revolutionary effects.

Under the watchful eye of FSSAI, the food business has experienced a dramatic change. The FSSAI's laws include various topics, including training, audits, personal hygiene, safety, cleanliness, and continuous improvement. They function as a comprehensive reference. In addition to raising the bar for food safety, these actions have given rise to an industry-wide consciousness and accountability culture.

Standards that are clear aid consumers in identifying vegan goods.

The vegan food sector is expanding at a healthy rate with the spread of the vegan lifestyle throughout India. In 2023, a national study was commissioned by Veganuary, a global movement encouraging people to try becoming vegan for a month. The survey results indicated a significant propensity of the general public towards eating a plant-based diet. An astounding 706,965 individuals took part in the Veganuary challenge worldwide.

In India, the vegan food market is expanding significantly. Over 150,000 people have tried veganism for a month in only the previous two years, and 150 Indian businesses have seized the chance to promote veganism among their employees and introduce new goods, vegan menu items, and special incentives.



for what is thought
to be best in any
point of view.
Paradigm
typical example.
accepted perspective
discipline at a given
time and place.





Coca-Cola and the International Cricket Council (ICC) have extended their eight-year collaboration.

An eight-year worldwide agreement between the International Cricket Council (ICC) and Coca-Cola has been announced. The relationship will run through the end of 2031 and include ICC World tournaments in all three formats.

Coca-Cola's dedication to sports was evident during the official signing event, which was held at the ICC Headquarters and was a significant turning point for the alliance. As one of the ICC's longest-running partnerships with a single brand, this eight-year arrangement as a Global Partner of the organization has been in place for 13 years (2019 - 2031).

Functionals: An essential part of promoting well-being wellbeing.

Over the past few years, the functional foods and beverages market has grown significantly as consumers have become more interested in items that provide improved wellbeing and nutritional benefits. Functional foods are those that, when consistently consumed as part of a balanced diet, offer additional health advantages beyond simple nourishment. Usually, these goods have bioactive ingredients that support physiological processes above and beyond mere sustenance. The functional food and beverage industry is expected to grow significantly in the upcoming years as people become more aware of the connection between nutrition and overall wellness and, as a result, a more health-conscious global population.



Lite Bite Foods

Lite Bite Foods plans to introduce ten products and expand into tier 2 cities by the end of 2023.

Lite Bite Foods announces ten new releases in India in December, capping off 2023 in style. This is a significant expansion, especially after tier 2 cities like Kochi, Mohali, and Faridabad. The company leverages these recent launches as crucial turning points in its rise to fame and becomes a dominant force in the F&B industry. By adopting a progressive mindset and remaining steadfast in its dedication to innovation, LBF has established itself as a leader in the industry.

LBF is a prominent F&B retail company in India known for its innovative and big-scale operations. It has transformed the industry since 2002 by skillfully fusing old and modern ideas. Key cities such as Delhi NCR, Chennai, Mumbai, Pune, Bengaluru, Kochi, Ahmedabad, Indore, Lucknow, Kanpur, and Mohali have witnessed its establishment, along with other international locations such as Singapore, Washington DC, Abu Dhabi, Dubai, and Bangkok. Currently, they run 27 Asia 7 locations, 32 Street Food by Punjab Grill locations, 44 Punjab Grill locations, and 17 YouMee locations.

WEEKS HIGHLIGHT

NON-TECHNICAL CONTENT



1 JANUARY

NEW YEAR

The New Year is a time that marks the beginning of a fresh calendar year. It's a moment where people often reflect on the past year, make resolutions or goals for the upcoming year, and celebrate with friends and family. It's celebrated in various ways across cultures and often involves parties, fireworks, countdowns, and other festivities.

JANUARY

DID YOU KNOW?

MINGLING AND MIXING MACHINES



1/3

Mingling and mixing machines are industrial equipment that combines different materials or substances to achieve a homogeneous mixture. These machines are commonly used in various industries, such as food and beverage, pharmaceuticals, chemicals, and cosmetics.

- Mingling machines gently blend materials, such as powders, grains, or other dry ingredients, to create a consistent mixture.
- Can be designed for different batch sizes and mixing intensities, depending on the specific application and requirements.

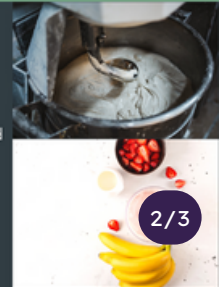
Uses

• Bakery Products

Commonly blend ingredients such as flour, sugar, eggs, and oil to make dough for bread, cakes, and pastries.

• Beverages

Used to blend ingredients for beverages such as smoothies, milkshakes, and cocktails



2/3

• Confectionery Products

Blend ingredients for candy, chocolate, and other confectionery products.

• Dairy products

Used to homogenize milk and cream to ensure a consistent texture and prevent separation.

• Sauces and dressings

Used to blend ingredients for condiments and dressings such as mayonnaise, ketchup, and salad dressings.

• Meat products

Blend ground meat with spices and other ingredients for products such as sausages and meatballs.



3/3

Fact 1

Mingling and mixing machines play a pivotal role in the food industry, seamlessly combining diverse ingredients to create uniform and high-quality products. These sophisticated machines ensure precision in blending, enhancing the overall efficiency of food production processes. From dough preparation to sauce blending, these innovative technologies guarantee consistency, reduce manual labor, and contribute to the production of delectable and standardized food items, meeting the stringent quality standards of the modern food industry.

POTATO WASHING MACHINES



Potato washing machines are specialized equipment used in the agricultural industry to wash and clean potatoes before further processing or sale. These machines are designed to remove dirt, debris, and other contaminants from the surface of the potatoes, as well as any residual pesticide or fungicide residues.



Working Principle

- 1. Loading**
Loaded into the washing machine either manually or using an automated conveyor system.
- 2. Water filling**
Treated with cleaning agents or disinfectants to help remove and kill any bacteria or other contaminants on the potatoes.
- 3. Agitation and scrubbing**
Agitated and scrubbed by rotating or vibrating drums, brushes or paddles.
- 4. Filtration**
Dirt and debris are loosened and released from the surface of the potatoes.
- 5. Drainage**
Drained from the machine, taking any dirt, debris, or contaminants with it.



6. Final rinse

Used to remove any remaining dirt or cleaning agents from the potatoes.

7. Discharge

The clean potatoes are then discharged from the washing machine either manually or using an automated conveyor system.



The key manufacturers of potato washing machines are as follows:

1. Turatti Group
2. Tong Engineering
3. Kiremko
4. Vanmark Equipment
5. Sormac
6. Allround Vegetable Processing



Fact 2

Potato washing machines streamline the food processing industry by efficiently cleaning and preparing potatoes for further production. These machines utilize advanced water jets and brushes to remove dirt and contaminants, ensuring a high level of hygiene. With adjustable settings, they accommodate various potato sizes, enhancing versatility. Potato washing machines not only save time and labor but also contribute to overall food safety and product quality in the agricultural and food processing sectors.

FAT HARDENING AND HYDROGENISING PLANTS



1/3

Fat hardening and hydrogenation plants are industrial facilities that are used to modify the chemical composition of fats and oils, primarily for use in food production. These processes involve the addition of hydrogen gas to unsaturated fatty acids, which results in the conversion of these acids into saturated fats.

- **Fat hardening plant:** Uses a process called partial hydrogenation, which involves the addition of hydrogen gas to unsaturated fats at high temperatures and pressure.
- **Hydrogenation plant:** Uses a process called full hydrogenation, which involves the complete saturation of unsaturated fatty acids with hydrogen gas.
- The raw materials for fat hardening and hydrogenation plants are typically edible oils, such as soybean oil, cottonseed oil, palm oil, or canola oil, which are sourced from agricultural producers.



2/3

Uses

1. **Reactors**
Made of stainless steel and are designed to withstand high temperatures and pressure.
2. **Catalyst systems**
Used to initiate and control the hydrogenation reaction.
3. **Heat exchangers**
Used to control the temperature of the reaction mixture and to recover heat from the process streams.
4. **Distillation columns**
Used to separate the desired products from the reaction mixture.
5. **Filters**
Used to remove any solid impurities that may be present in the starting materials or reaction mixture.
6. **Storage tanks**
Used to store the finished products before they are packaged and shipped.

3/3

Fact 3

Fat hardening and hydrogenising plants transform liquid fats into solid or semi-solid forms for various applications. These facilities employ hydrogenation processes, altering the structure of unsaturated fats to increase stability and shelf life. By controlling temperature, pressure, and catalysts, these plants modify fats' consistency, enhancing their functionality in food production, confectionery, and industrial applications, meeting diverse market demands.

DISSOLVING EQUIPMENT



1/3

Dissolving equipment refers to machinery used to dissolve solid materials into liquids. It is commonly used in food processing to dissolve sugars, salt, and other ingredients into water or other liquids to make solutions or suspensions.

- Dissolving equipment can range from simple manual mixers to automated systems with precise temperature and agitation control.
- Used in a variety of applications, such as making syrups, brines, and other solutions used in the production of baked goods, confectionery, and beverages.

Uses

1. Sugar syrups for confectionery production
2. Beverage concentrates such as fruit juice concentrates
3. Sauces and gravies
4. Protein and amino acid solutions for sports drinks and nutritional supplements
5. Gelatin solutions for gummy candies and other confectionery products
6. Starch solutions for various food applications
7. Flavourings and food colourings

2/3

Market Scope

- The market for dissolving equipment is dominated by North America and Europe due to the high consumption of processed food products in these regions.
- The Asia-Pacific region is expected to witness significant growth in the coming years due to the growing food processing industry and increasing population in the region.
- The key players in the dissolving equipment market include GEA Group AG, SPX FLOW Inc., Alfa Laval AB, Tetra Pak International S.A., Bühler Group, and Krones AG.



3/3

Fact 4

"Dissolving equipment streamlines industrial processes by efficiently breaking down solids into liquids, crucial in pharmaceuticals, food production, and chemical industries. These specialized tools ensure precise dissolution, enhancing product quality and consistency while optimizing manufacturing operations for improved efficiency and output."

SALAD DRESSINGS

1/3

Salad dressings are sauces or emulsions that are typically used to enhance the flavor of salads or vegetables. They are typically made with a combination of oil, vinegar, other acidic ingredients, and herbs or spices.

Commercial Production

- 1. Ingredient preparation:** The ingredients for the salad dressing are prepared by the recipe. This may involve chopping herbs or vegetables, measuring out liquids and powders, and preparing any emulsifiers or stabilizers that may be required.
- 2. Blending:** The ingredients are blended in a mixer or blender to create a smooth and consistent texture.
- 3. Emulsification:** An emulsifier, such as mustard or egg yolk, may be added to help stabilize the mixture and prevent separation. The mixture is then emulsified to create a creamy and consistent texture.
- 4. Packaging:** The finished salad dressing is then packaged in containers, such as bottles or pouches, for distribution and sale.

2/3

Market Scope

The global salad dressing market was valued at \$3.5 billion in 2019 and is expected to reach \$4.7 billion by 2027, growing at a CAGR of 3.8% during the forecast period.

Some of the major players in the market include:

1. Kraft Heinz Company
2. Unilever
3. Nestle S.A.
4. The Clorox Company
5. Newman's Own Inc.
6. Ken's Foods, Inc.
7. Bollhouse Farms, Inc.
8. T. Marzetti Company
9. Hampton Creek, Inc.
10. Drew's LLC

3/3

Fact 5

Salad dressings add a burst of flavor and elevate the overall taste of salads, transforming a simple bowl of greens into a delightful culinary experience. From classic vinaigrettes to creamy ranch, these versatile condiments offer a spectrum of tastes, catering to diverse palates. Whether drizzled lightly for a refreshing touch or generously poured for a satisfying indulgence, salad dressings effortlessly enhance the appeal of every salad creation.



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