Plant-Based Proteins

Market Analysis & IP Landscaping of Meat, Dairy and Egg Alternatives

PRESCOUTER 2022

In this Intelligence Brief, we explore the current directions and emerging innovations of plant-based proteins including meat, dairy, and egg by analyzing the drivers, challenges, markets, and recent innovation in terms of IP protection activity, particularly in areas of texturizing ingredients and methods.

The plant-based food industry is growing, with new and emerging technologies that make plant-based proteins indistinguishable from animal-based proteins.

The plant-based protein market has seen remarkable growth in the last decade compared to conventional meat products. Consumers are gaining interest in plant-based foods for a number of reasons, including perceived health benefits, taste preferences, sustainability, and animal welfare concerns. The emergence of COVID-19 has further accelerated this trend as people become more conscious of their health and well-being. Plant-based food providers are offering a range of products in categories such as plant-based egg, meat, and dairy to satisfy consumers' desires.

Besides making plant-based proteins look and taste like conventional animal-based proteins, these foods need to also have textures similar to those proteins for consumer acceptance. Achieving animal protein texture with plant-based ingredients is a challenge for food developers because plant tissues are rigid and unbending, whereas muscle tissues are elastic and flexible. Therefore, veggie burgers often feel crumbly and mushy compared to meat, which provides chewiness. Some plant-based food companies such as Beyond Meat and Impossible Foods have made profound advancements in the field with their technologies. To achieve the appearance and taste of meat products, Impossible Foods uses genetically engineered yeast to produce soy leghemoglobin, which gives the meaty flavor and "bleed" appearance of real meat. Beyond meat, on the other hand, uses beet juice in its products to mimic the bleeding of real meat.

Contents

Plant-Based Protein Market

As the demand for plant-based foods increases, the global plant-based protein market is expected to grow at a CAGR of 7.2% from 2020 to 2026 and reach US$15.6 billion by the end of 2026.

Global value of the plant-based protein market from 2020 to 2026. **Source:** Markets and Markets

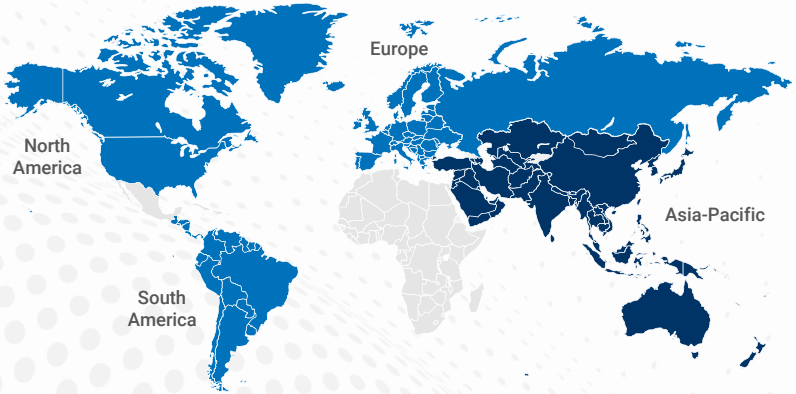


Figure 1. Plant-based protein market size (CAGR%), 2020 - 2026.
Source: Markets and Markets

A global increase in the trend of veganism and involvement of manufacturers is propelling the plant-based protein market to grow.

Expansion and new product launches would create profitable opportunities for market players in the next five years.

The Asia Pacific market is projected to be the fastest growing market from 2020 - 2026 with a CAGR of 8.7%. Japan is projected to have the highest CAGR of 9.6% of all regions during this forecast period. The growth is attributed to the increase in consumer interest and investments by manufacturers.

Source: marketsandmarkets.com

Meat alternatives dominate the global plant-based protein market and are projected to reach US$3.79 billion by 2026.

Meat alternatives are identified as ecological choices in terms of resource input and consumption. Plant-based meat is currently available in forms like patties, sausages, and ground. The combination of different plant-based sources enables manufacturers to innovate and develop new product types.

Convenience food products include ready meals, ready-to-drink (RTD) beverages, and processed meat products. Vegan-ready meals have gained popularity with urban consumers due to their price and widespread availability.

Dairy alternatives have shown considerable growth in the plant-based protein market. One driver is the increased instances of lactose intolerance in consumers. Dairy alternatives come in different forms including milk, yogurt, cheese, and creamers. Some of the most common sources are soy, wheat, pea, almond, and hemp. Newer sources include oat and flax.

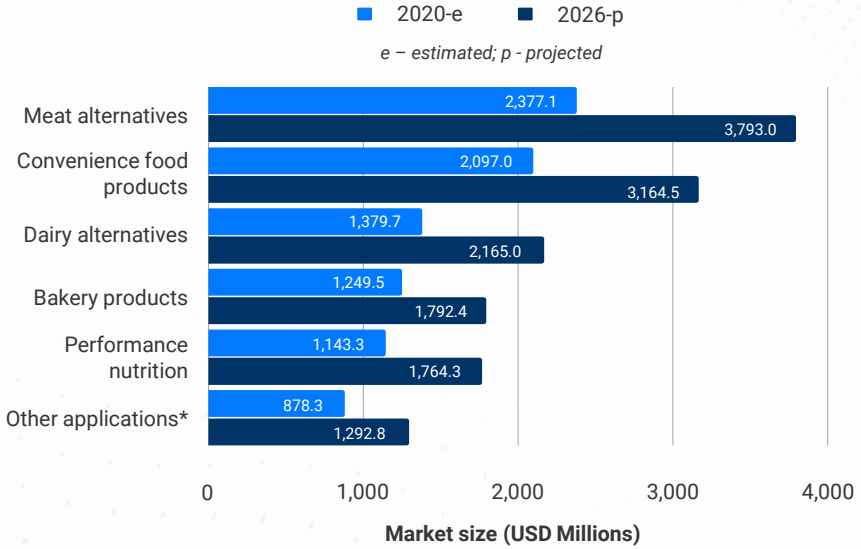
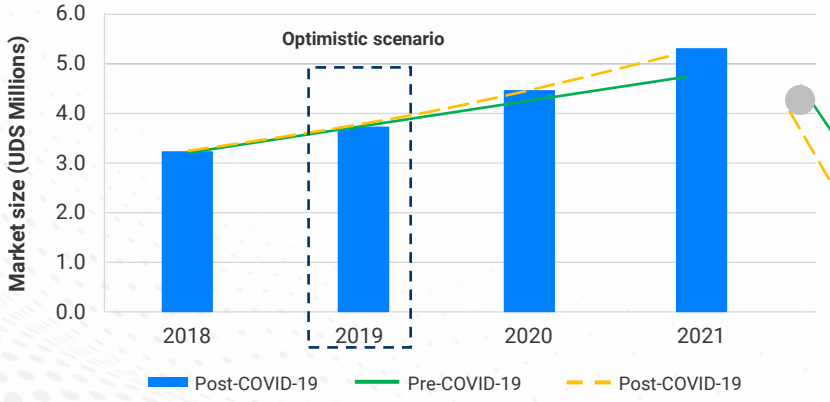


Figure 2. Plant-based protein market by food application type. Others applications include confectioneries, beverages, baby food products, dairy & dairy products, and pet food products. **Source:** Markets and Markets

COVID-19 increased the CAGR of the global plant-based meat market from 14.1% to 17.4% (2018 - 2021).



Note: Optimistic scenario is considered to compare the pre- and post-COVID-19 effects.

Figure 3. The impact of COVID-19 on the plant-based meat market.
Source: Markets and Markets

The demand for plant-based meat surged due to increase in global concerns of animal-based diets, health awareness and consumers shifting preferences.

One of the major restraining factors of the plant-based meat market is price. Plant-based meat is more expensive than regular meat. The prices in this market were expected to increase as COVID-19 has led to trade barriers, disrupted raw material supply, and inefficient distribution channels.

Pre-COVID-19 **CAGR (2018-2021): 14.1%**

Post-COVID-19 **CAGR (2018-2021): 17.4%**

In the United States, plant-based milk is the most developed category and had the greatest dollar sales out of all plant-based categories in 2021. Plant-based egg is the least developed but the fastest growing category.

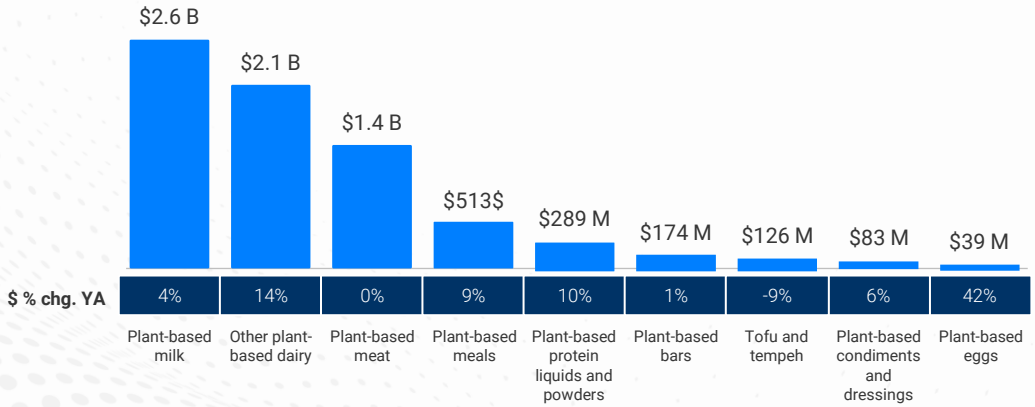


Figure 4. US plant-based food dollar sales and dollar sales growth, by category, 2021.
Source: Good Food Institute

Almost all the plant-based categories grew in 2021 except for tofu and tempeh.

Plant-based milk led the plant-based categories with $2.6 billion in sales and is expected to have continued growth.

Plant-based meat sales remained steady in 2021 at $1.4 billion. Sales had grown 74% since 2018.

Plant-based egg is the least developed category with $39 million in sales, but it had the greatest growth at 42% within one year. It grew exponentially since 2018 with more than 1000% growth.

US sales growth of most plant-based proteins outperformed their respective animal-based proteins. Plant-based egg sales growth was the most rapid while animal-based egg sales declined.

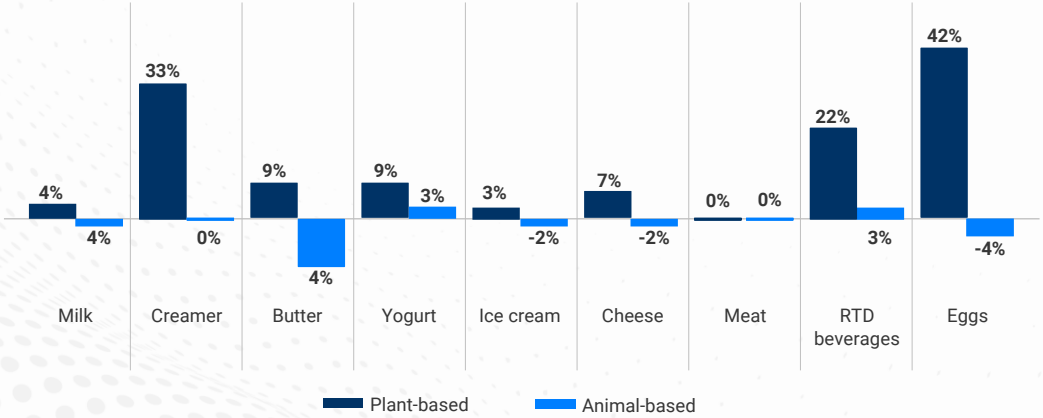


Figure 5. Comparison of US plant-based vs. animal-based categories in dollar growth from 2020-2021.
Source: Good Food Institute

Dollar sales growth of most plant-based categories outpaced the respective animal-based categories except for plant-based meat, which sales did not grow or decline, same as the animal-based meat sales.

Plant-based milk sales increased by 4% while animal-based milk decreased by 2%.

The plant-based categories are expected to grow and earn greater shares of their respective category as more innovative products appeal to consumers.

$5 billion invested in alt proteins in 2021

Global alternative protein companies secured $5 billion in disclosed investments in 2021, which is 60% more than the $3.1 billion raised in 2020 and five times as much as the $1 billion raised in 2019.

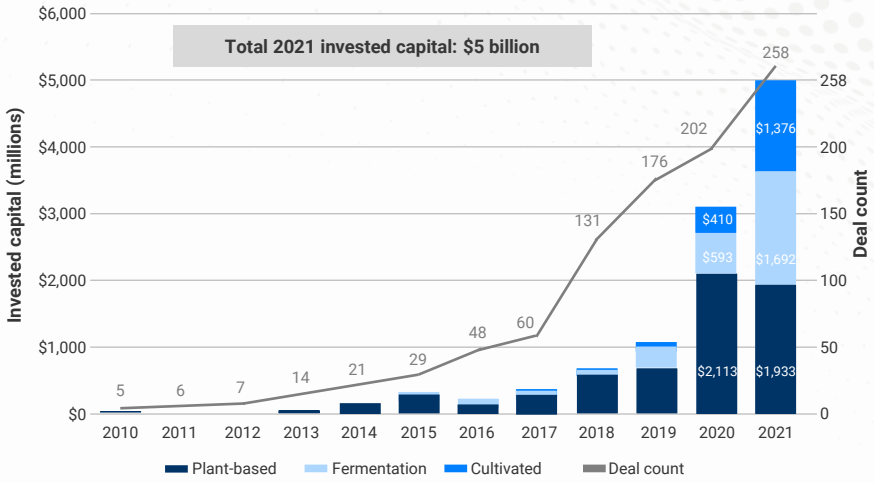
Cultivated meat companies secured $1.4 billion in investments in 2021, which is said to be the most capital raised in any single year in the industry's history and more than three times the $400 million raised in 2020. In 2021, the industry's investor base grew 43% from the prior year, bringing the total number of unique investors to 434.

Plant-based meat, seafood, egg, and dairy companies secured $1.9 billion in investments in 2021, which is on par with the $2.1 billion raised in 2020 and almost three times the $693 million raised in 2019. In 2021, the industry's investor base grew 40% from the prior year, bringing the total number of unique investors to 1,093.

Record $5 billion invested in alt proteins in 2021, surging 60 percent since 2020, GFI.
Source: Good Food Institute

Good Food Institute

Annual alternative protein invested capital and deal count



Annual alternative protein investment summary, 2010-2021

Category	Invested capital			1-year growth (2020-2021)	Largest rounds (2021)
	2021	2020	All-time (2010-2021)		
Total alternative protein	$5.0 B	$3.1 B	$11.1 B	+60%	$500 million Impossible Foods
Plant-based	$1.9 B	$2.1 B	$6.3 B	-	$500 million Impossible Foods
Fermentation	$1.7 B	$600 M	$2.8 B	3x	$350 million Nature's Fynd & Perfect Day
Cultivated	$1.4 B	$400 M	$1.9 B	3x	$347 million Future Meat Technology

56% of U.S. consumers were interested in vegetables as plant-based protein sources, followed by grains, nuts and seeds in 2021.

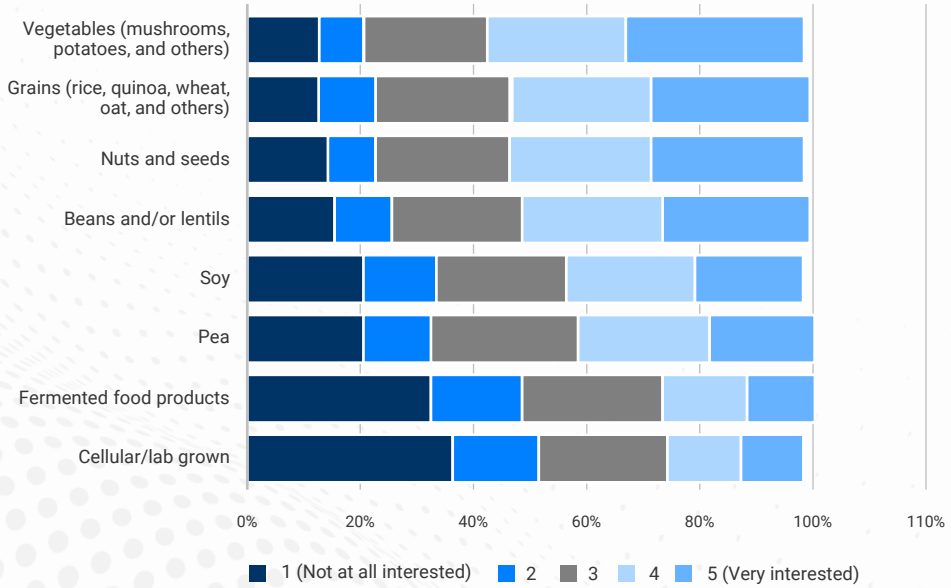
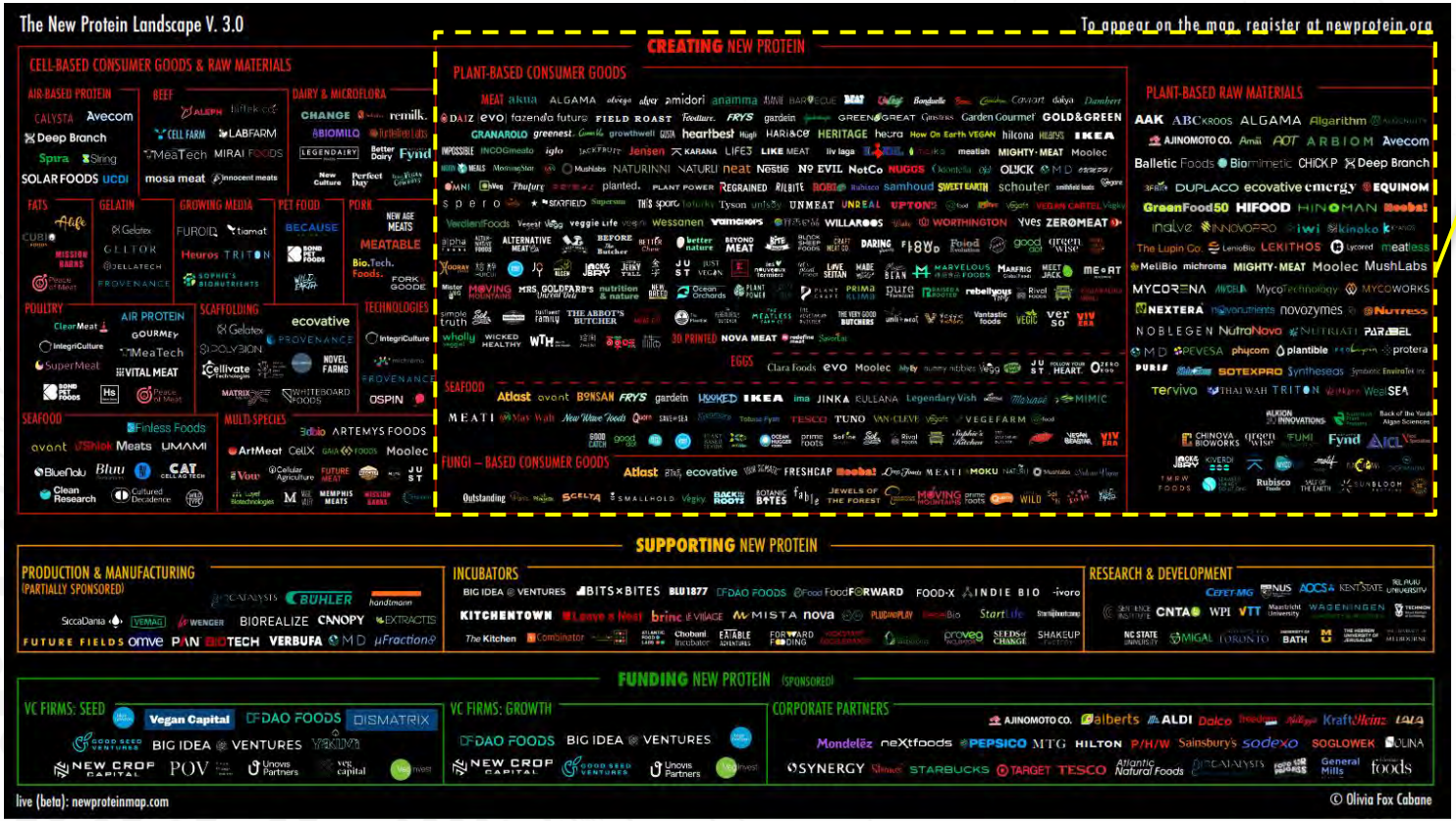


Figure 6. Consumer interest in plant-based meat and other alternative protein sources in the US in 2021.
Source: Statista

According to a survey conducted in 2021, consumers were mostly interested in vegetables such as mushrooms and potatoes as plant-based protein sources, followed by grains, nuts and seeds.

Consumers had the least interest in cellular/lab grown protein sources. A literature review reveals that food neophobia and concerns with health and safety are the top reasons consumers are hesitant to accept the new technology. Other factors including price and taste are also important in consumer acceptance or rejection.

The New Protein Landscape

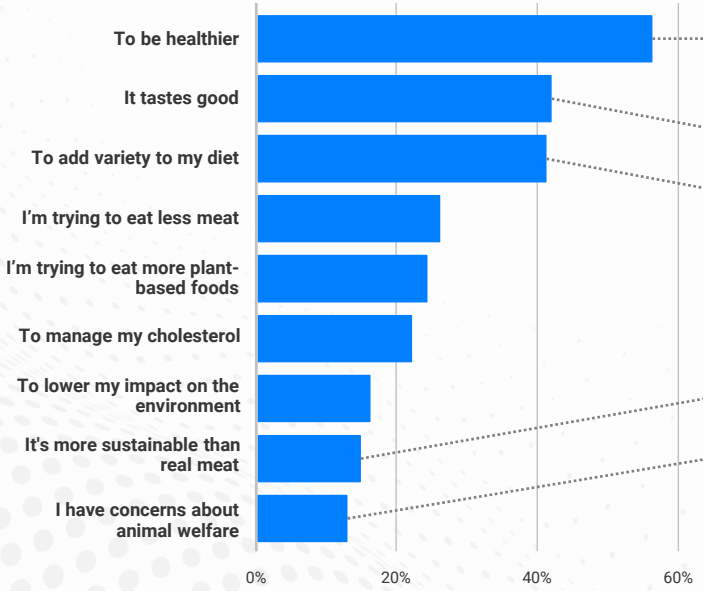


Plant-based consumer goods & plant-based raw materials

Figure 7. Organizations in the new protein space.
Source: newprotein.org

Drivers for Plant-Based Proteins

Perceived health benefits and taste preferences are the top reasons consumers purchase plant-based foods and beverages.



57% of American consumers were actively purchasing plant-based proteins due to their perceived health benefits.

42% of consumers indicated that plant-based protein products taste good.

41% would likely keep buying them because they add variety to their diets.

Only **17%** of consumers selected "lower my impact on the environment" as a reason for consuming plant-based proteins. Likewise animal welfare was ranked as the lowest of concerns.

Figure 8. Drivers that motivate consumers for eating plant-based proteins, March 2020 Lightspeed/Mintel. The study was conducted over 2000 US households. Interestingly different studies carried from 2019-2021 tend to echo one another in terms of findings. Source: greenqueen

Plant-based food and beverages are poised for growth, driven heavily by health and taste considerations, followed by sustainability and animal welfare concerns expressed by consumers.

Before the COVID-19 pandemic, academic and market studies identified three major drivers leading consumers to seek out new sources of proteins other than those provided by animal agriculture: health, environmental degradation, and animal welfare.

The most frequently identified driver is the expectation that **plant-based proteins are healthier**. In 2020, Midan found that 49% of respondents (out of 750 people) indicated that their consumption of plant-based proteins has to do more with health than with any other reason. These findings are consistent among traditional meat consumers, flexitarians, vegetarians and vegans.

According to the International Food Information Council (IFIC), a 2021 survey found that 64% of Americans choose foods & beverages made with clean ingredients. Similarly, 80% of Europeans will acquire a clean-label product that clearly states the ingredient list. Compared to animal-based products, **consumers perceived plant-based proteins as clean products**. Having clean label ingredients in these products may further drive consumer's purchase intent.

A second "foundational" influent driver is related to **taste preferences**. In the UK, 8 out of 10 consumers are looking for better-tasting plant-based proteins, which calls for a need to **prioritize** the eating experience for consumers in terms of **taste**, **quality**, and **variety**.

In 2021, the IFIC reported that 67% of Americans consumed plant-based proteins, and 22% consumed them on daily basis. Although it has been over two years since the beginning of the pandemic, consumer's consciousness of their health and their buying choices are drivers that are enduring and are still good news for the plant-based protein sector.

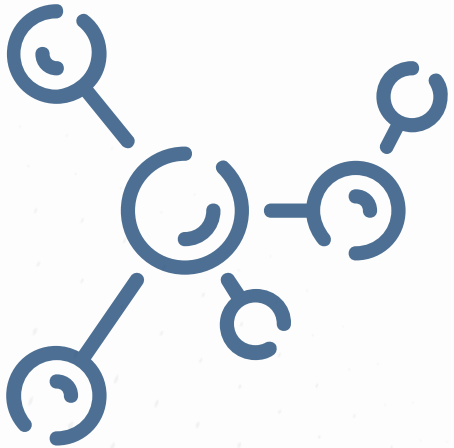
Challenges of Plant-Based Proteins

Novel plant-based products are often lower in daily nutritional intake compared to traditional plant-based products.

All diets based on “traditional” plant-based proteins met daily nutritional requirements (e.g., calcium, potassium, magnesium, phosphorus, zinc, iron and Vitamin B12), and are low in saturated fat, sodium and sugar. However, novel plant-based proteins are below daily intake requirements and have a higher content of saturated fat, sodium and sugar.

Animal-based proteins contain 9 essential amino acids required as daily intakes. Plant-based foods (e.g., fruits, vegetables, nuts, seeds and grains) lack one or more of these amino acids; therefore they need to be consumed in combination. Most of the arguments that plant-based meat manufacturers make is that their products are comparable in quality to animal protein. However, most comparisons are focused only on protein content.

Moreover, plant-based meat alternatives lack important amino acids and derivatives important for brain and muscular function (e.g., creatine, taurine and anserine) while metabolites (polyphenols and antioxidants) are found exclusively in plant-based meats.



Novel plant-based products are often lower in daily nutritional intake compared to traditional plant-based products.

Across demographics, **health and high-quality proteins** are major declared reasons for consumers to look for plant-based protein products, while for some, it represents a viable alternative to decrease their intake of animal-based protein products.

	Calories (kcal)	Carbs (g)	Protein (g)	Total Fat (g)	Sat Fat (g)	Chol (mg)	Na (mg)	Sugar (g)	Fibre (g)	B12 (µg)	Ca (µg)	K (µg)	Mg (mg)	P (mg)	Zn (mg)	Fe (mg)
Reference	2482.1	290.4	104.5	101.9	27.4	383.4	4663.5	130.9	19.5	5.7	1143.0	3122.8	324.5	1589.1	15.1	16.0
Flex-Trad	2478.0	304.0	103.1	96.9	20.1	309.3	3882.3	116.0	23.1	3.5	1685.1	3424.8	400.7	1946.4	11.8	15.1
Flex-New	2434.8	276.6	99.4	106.1	50.4	325.2	6514.0	132.2	21.7	2.3	992.7	2169.8	269.4	1586.3	9.6	20.4
Veg-Trad	2486.1	304.0	100.9	100.3	20.7	235.2	3497.8	115.8	26.1	3.8	1913.4	3808.3	435.5	2091.2	13.4	16.8
Veg-New	2516.7	296.8	107.8	105.8	40.5	23.4	8053.0	131.8	22.1	1.2	853.9	2291.5	256.9	1545.6	8.6	19.3
Vegan-Trad	2514.1	303.9	99.3	107.0	20.7	0	3621.8	136.9	40.7	2.3	552.8	3666.3	799.7	2068.6	13.6	22.2
Vegan-New	2471.2	290.7	104.4	105.4	41.3	0	8166.4	133.4	17.6	1.2	429.6	1987.9	272.1	1308.5	7.0	20.4
Dairy Guidelines	2200-2400	130	56	20-35% (49-93g)	<27	-	2300	<60	31	2.4	1000	3400	400	700	11	8

Table 1. Nutritional compositions of a reference omnivore diet to traditional and newer versions of flexitarian diets with reduced meat intake, vegetarian diet with no meat, and vegan diet without meat, dairy or eggs. **Source:** MDPI

Plant-based meat alternatives may not yet be nutritionally healthier than real meat.

The plant-based alternative is a product fortified with iron from soy leghemoglobin, vitamin C, thiamin, riboflavin, niacin, vitamin B6, vitamin B12, and zinc. The micronutrients within grass-fed beef are part of the natural food matrix.

New technologies, such as fermentation can help boost the nutritional profile of plant-based products, making them healthier than animal-based products.

Ground Beef

Nutrition Facts	
Serving size	**(113g)**
Amount Per Serving	
Calories	**220**
	% Daily Value*
Total Fat 14g	**18%**
Saturated Fat 5g	**25%**
Trans Fat 0g	
Cholesterol 60mg	**20%**
Sodium 70mg	**3%**
Total Carbohydrate 0g	**0%**
Dietary Fiber 0g	**0%**
Total Sugars 0g	
Includes 0g Added Sugars	**0%**
Protein 23g	**46%**
Vitamin D 0.1mcg	0%
Calcium 12mg	0%
Iron 2mg	10%
Potassium 289mg	6%
Thiamin 0.05mg	4%
Riboflavin 0.2mg	15%
Niacin 4.8mg	30%
Vitamin B6 0.4mg	25%
Folate 6mcg	2%
Vitamin B12 2mcg	80%
Phosphorus 175mg	15%
Zinc 4.6mg	40%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Plant Alternative

Nutrition Facts	
Serving size	**(113g)**
Amount Per Serving	
Calories	**250**
	% Daily Value*
Total Fat 14g	**18%**
Saturated Fat 8g	**40%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 370mg	**16%**
Total Carbohydrate 9g	**3%**
Dietary Fiber 3g	**11%**
Total Sugars 0g	
Includes 0g Added Sugars	**0%**
Protein 19g	**38%**
Vitamin D 0mcg	0%
Calcium 180mg	15%
Iron 4.2mg	25%
Potassium 610mg	15%
Thiamin 28.2mg	2350%
Riboflavin 0.4mg	30%
Niacin 4.8mg	30%
Vitamin B6 0.4mg	25%
Folate 115mcg	30%
Vitamin B12 3mcg	120%
Phosphorus 180mg	15%
Zinc 5.5mg	50%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Figure 9. A nutritional comparison of a plant-based meat alternative with grass-fed ground beef. Source: Nature

Fermentation can address the problems of color, taste, and texture, and boost the nutritional profile of plant-based protein products.

Fermentation technologies can contribute to:

Color, taste and texture

- Provide the needed **globular proteins** that can help plant-based proteins to mimic animal proteins. Globular proteins supply the texture and mouthfeel in meat, for instance.
- Impossible Burger obtains soy leghaemoglobin (globular protein) through fermentation process. The protein gives the red color and meaty flavor to Impossible Burger's signature products.
- Address off-flavors and aromas through unique additives.
- MycoTechnology uses fermentation to improve taste and texture, decrease aroma, and increase solubility.

Nutrition enhancement

- Boost the nutritional profile of plant-based products with fewer additives (i.e. replacing current fats used), and therefore offering high-quality plant products and providing consumers with more variable food and drink options.

The strategies and information provided in this report are an example of the insights clients rely on PreScouter for.

PreScouter is helping companies implement more sustainable practices throughout the entire product lifecycle, while ensuring the safety of products for consumer health, through the services listed on the right.

PreScouter's Proven Track Record

500+
Clients Worldwide

5000+
Challenges Conquered

150K+
Hours of Research

"Working with PreScouter is like having a secret information drawer. When you need perspective and insight you can open the drawer and, presto, you have what you need."

Rowena Pullan, Strategic Innovation Leader, VP Wellness R&D at Pfizer

PreScouter's research consultancy has helped drive strategic planning and specific solution development decisions for some of the most sustainable and prominent companies in the world, for years.

1. Identifying novel biobased and/or natural sources with similar or better efficacy compared to currently sourced ingredients.
2. Assessing actionable technologies that enable consumers to tailor the use of active ingredients to their specific needs.
3. Reviewing and ranking competitor activity to determine areas of opportunity and differentiation.

IP Landscape

Executive Summary

The IP analysis in this Intelligence Brief focuses on identifying innovations in the form of patents in the plant-based protein (meat/dairy/egg) space that are related to texturizing ingredients or methods, and clean labeling. The IP analysis indicates that there is a great amount of patenting activity in the plant-based meat space, followed by plant-based dairy and egg.

Plant-based Meat

- Top countries of origin:
  1) China
  2) United States
- **Top assignees:** Northeast Agricultural University and Sichuan Meishan Qingxin Lotus Agricultural Co., Ltd.
- **Patents of interest:** Plant-based meat with mycelium-producing fungus, efficient soybean processing system, plant-based meat crosslinking agent, fat-free vegetarian meat protein

Plant-based Egg

- Top countries of origin:
  1) United States
  2) India, Germany, Australia
- **Top assignees:** Just Inc, Earth Island, and Zero Egg Ltd.
- **Patents of interest:** Egg replacement containing euglena-derived components, plant-based egg alternative with pea protein isolate and rice protein ingredient, microalgae-based egg substitute

Plant-based Proteins

Plant-based Dairy

- Top countries of origin:
  1) China
  2) United States
- **Top assignees:** Société des Produits Nestlé and Fuji Oil Co., Ltd.
- **Patents of interest:** Plant cell culture with transgenic casein proteins, plant-based milk fermentation product, plant-based butter-like composition, centrifugal beverage maker for plant-based milk

IP Landscape

In this IP landscape, we explore the IP space of plant-based proteins by visualizing the data for each protein type (meat/dairy/egg), followed by highlighting select patents of interest:

- Technology landscape
- Cell diagram
- Top CPC subgroup (Cooperative Patent Classification)
- Simple legal status
- Top countries of origin
- Top assignees
- Patents of interest summary
- Patent highlights

Simple Legal Status Definitions

Below are the Simple Legal Status definitions used on the platform:

Simple Legal Status	Explanation
Inactive	Patent is inactive for various reasons.
Active	Patent is currently active.
Pending	The application is published or under examination prior to the patent being issued or the application is abandoned.
PCT Designated Stage expired	PCT stands for Patent Cooperation Treaty, which allows applicants to seek patent protection internationally. PCT Designated Stage expired indicates that the deadline for entering the national phase of the designated countries has been exceeded.
PCT Designated Stage	Within the deadline for entering the national phase.
Undetermined	The legal status of the patent has yet to be confirmed.

Legal Status Definitions

Legal status	Explanation
Published	An application was published. It is not a granted patent and it does not necessarily mean that the application will result in a patent.
Examining	A patent application has entered the search and examination phases.
Granted	An application becomes a granted patent/patent in force.
Double	Abandonment of patent right or utility model to avoid double patenting.
Withdrawn	An application open to public inspection was withdrawn at the request of the applicant.
Rejected	An application is rejected by the examiner.
Revoked	Whole invalidation of a patent. A member of the public can question the validity of the patent on various grounds.
Expired	Patent term expired.
Non-payment	Non-payment of annual maintenance fees resulting in the invalidation of the patent.
Restoration	Where a time limit prescribed in the Patent Law is not observed by the patentee because of force majeure, resulting in loss of their rights, they may within a specified time limit, request the Patent Office to restore their rights.

Legal Status Definitions

Legal status	Explanation
Ceased	A patent has run its full term or ceased due to some reasons.
P-Revoked	Part of claims are declared invalid through invalidation procedure.
Abandoned	Patent right is abandoned.
PCT publication	A PCT application has been published. Has not yet entered the national phase with the individual patent offices.
PCT-NP (In time limit)	Patent application has entered national phase procedures with the individual patent offices and is within the designated time period.
PCT-NP (Past time limit)	Patent application has entered national phase procedures with the individual patent offices and has exceeded the designated time period.
Non-Entry PCT-NP	Has not entered national phase in any country and has exceeded the designated time period.

Plant-Based Meat Alternatives

Key Findings | Meat Alternatives

The IP analysis of plant-based meat indicates that there is a great amount of patenting activity in this space. The 3-year technology landscape reveals a trend in the use of ingredients such as **soybean protein**, **peanut protein**, **wheat protein powder**, **seaweed dietary fiber**, and **konjac gum**. Most patents found under this search query have keywords "**preparation method**" and "**vegetarian meat**." Most patents found in this space are classified in the CPC subgroup "A23V2002/00 Food compositions, function of food ingredients or processes for food or foodstuffs." In terms of simple legal status, the majority of patents (59%) are in the pending stage whereas 24% are active. China is the top country of origin, taking up 77% of the patents, followed by the United States at 6.4%. The top assignees are Northeast Agricultural University and Sichuan Meishan Qingxin Lotus Agricultural Co., Ltd.

Eight patents were selected by PreScouter's research team as interesting innovations that use different types of texturizing ingredients or methods to produce clean label plant-based meat products. Within these patents, protein sources include pea protein, quinoa, soybean, peanut, pea and corn. Ingredients like konjac root, fenugreek, pea starch, potato starch, fermented gluten, gluten flour, transglutaminase, methylcellulose and starch are used to provide the textural characteristics of the product.

Four patents were highlighted with first claim and abstract information. These inventions relate to:

1) a plant-based meat analogue involving mycelium-producing fungus
2) an efficient vegetarian meat production and processing system for cutting and stirring soybean tissue protein
3) a plant-based meat cross-linking agent and preparation methods of the agent and the plant-based meat product
4) a fat-free vegetarian meat protein and its preparation method.

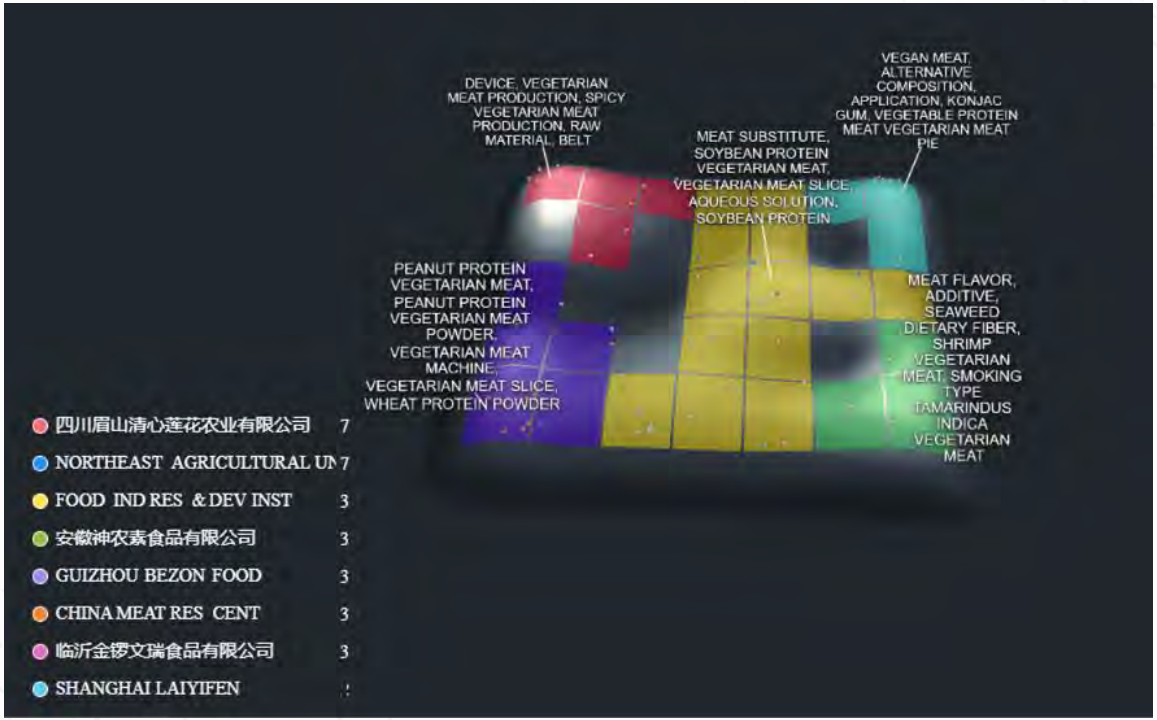
Search Query

((("plant-based meat" OR "plant based meat" OR "vegan meat" OR "vegetarian meat" OR (("meat analogue" OR "faux meat" OR "mock meat" OR "fake meat" OR "imitation meat") AND "plant protein") AND ("texturizer" OR "texturizing" OR "texture") AND ("clean label" OR "clean labeling")) OR TACD_ALL:("plant-based meat" OR "plant based meat" OR "vegan meat" OR "vegetarian meat" OR (("meat analogue" OR "faux meat" OR "mock meat" OR "fake meat" OR "imitation meat") AND "plant protein") AND ("texturizer" OR "texturizing" OR "texture") AND ("clean label" OR "clean labeling"))) AND TTL_ALL:("plant-based meat" OR "plant based meat" OR "vegan meat" OR "vegetarian meat" OR (("meat analogue" OR "faux meat" OR "mock meat" OR "fake meat" OR "imitation meat") AND "plant protein")) NOT TTL_ALL:("color" OR "colour" OR "browning" OR "cellular agriculture" OR "packing" OR "packaging" OR "box" OR "bag" OR "sauce" OR "flavor") NOT ABST_ALL:("cellular agriculture") AND APD:[20190420 TO *]

This search query targeted IP applied in the last 3 years in relation to plant-based meat. This generated **94 simple patent families and 107 single applications in total**.

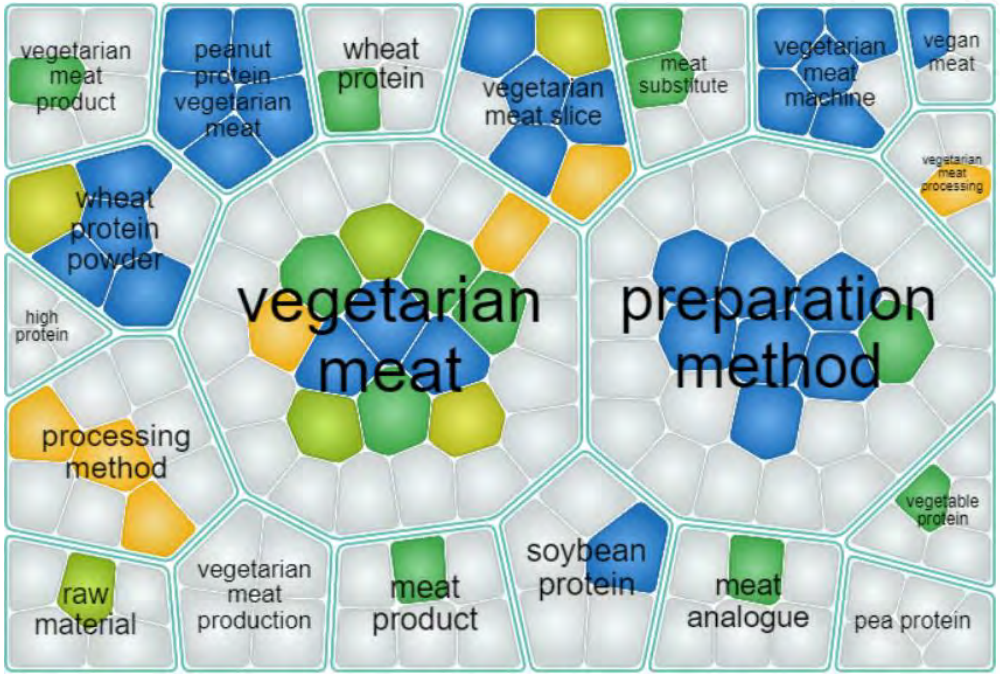
Technology Landscape

The Technology Landscape visualizes the layout of the technology space, with peaks representing more concentrated areas of patenting activity and troughs representing areas of little or no activity - these suggest areas of potential opportunity and exploration. The 3-years landscape reveals a trend in the use of ingredients like soybean protein, peanut protein, wheat protein powder, seaweed dietary fiber, and konjac gum.



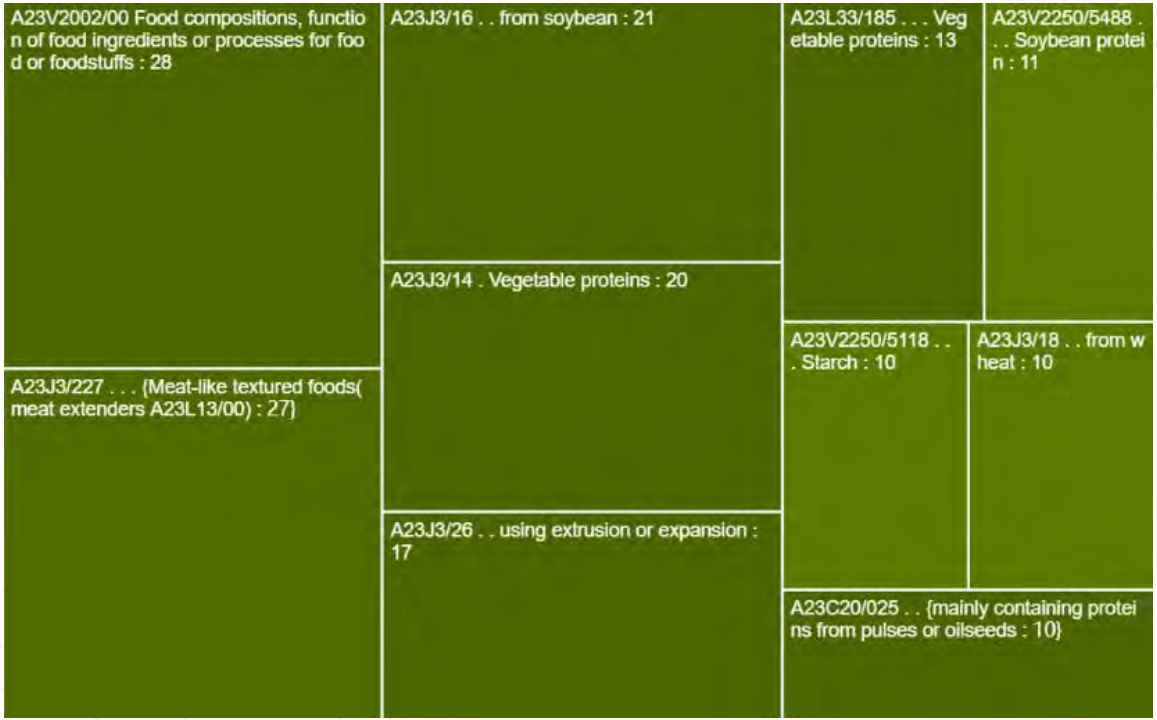
Cell Diagram

The cell diagram shows the keywords and phrases of the records owned by the top current assignees in the technology field. This is helpful for providing a deeper understanding of the concepts within the defined technology and the assignees that are working on those concepts. It helps differentiate the technological focus of each of the top current assignees. The relative coverage is represented by the number of cells under each assignees, with each cell representing the same number of patents.



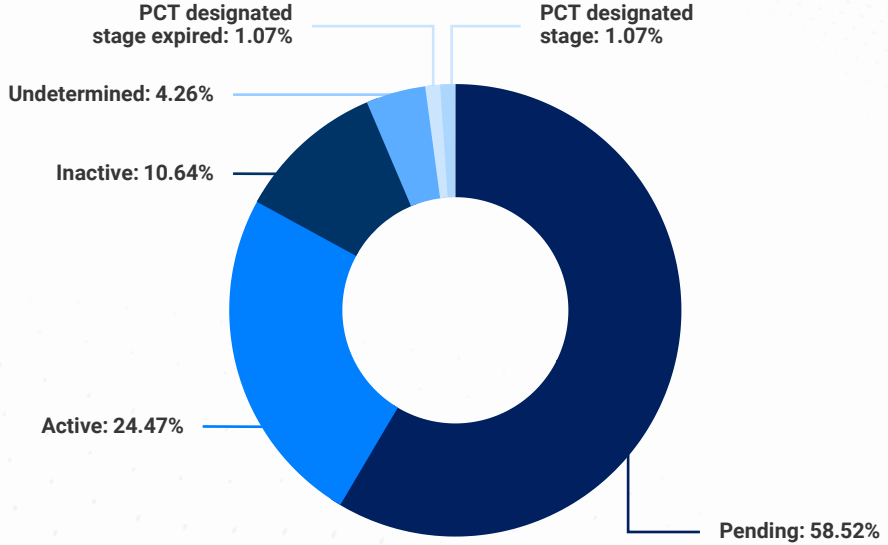
Top CPC subgroup

CPC stands for Cooperative Patent Classification and is used in 39 countries to classify the contents of patent uniformly. The top CPC subgroup visualises the major technology areas to understand alternative applications of the technology and find potential opportunities for licensing and white space. The size of the box corresponds to the number of patents that classification is attributed to. The number at the end reveals the number of patent families from the search query. A look at the main classes show that most patents within this field are under **A23V2002/00 Food compositions, function of food ingredients or processes for food or foodstuffs**.



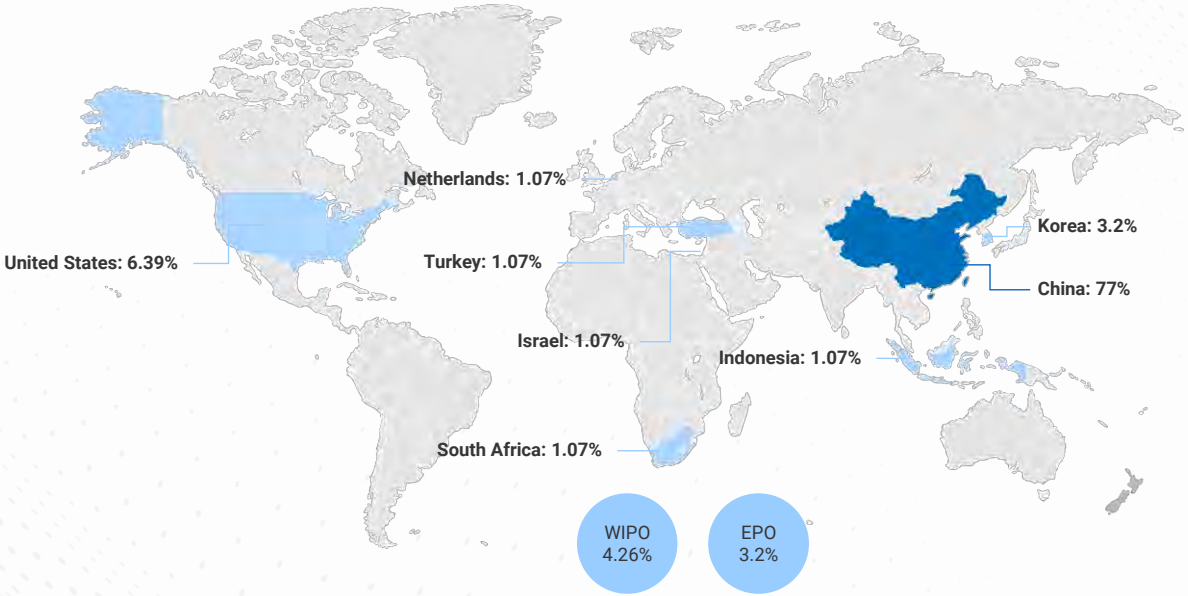
Simple Legal Status

Simple legal status breakdown of the technology field. This tells the proportion of patents in the technology space that are in effect, or no longer active. PreScouter did not filter inactive, expired, and withdrawn patents from the search as they are the reference source for prior arts. These charts show the percentage breakdown of the legal status and patent type in the technology field. 59% of the patents in this space are pending with another 24% active.



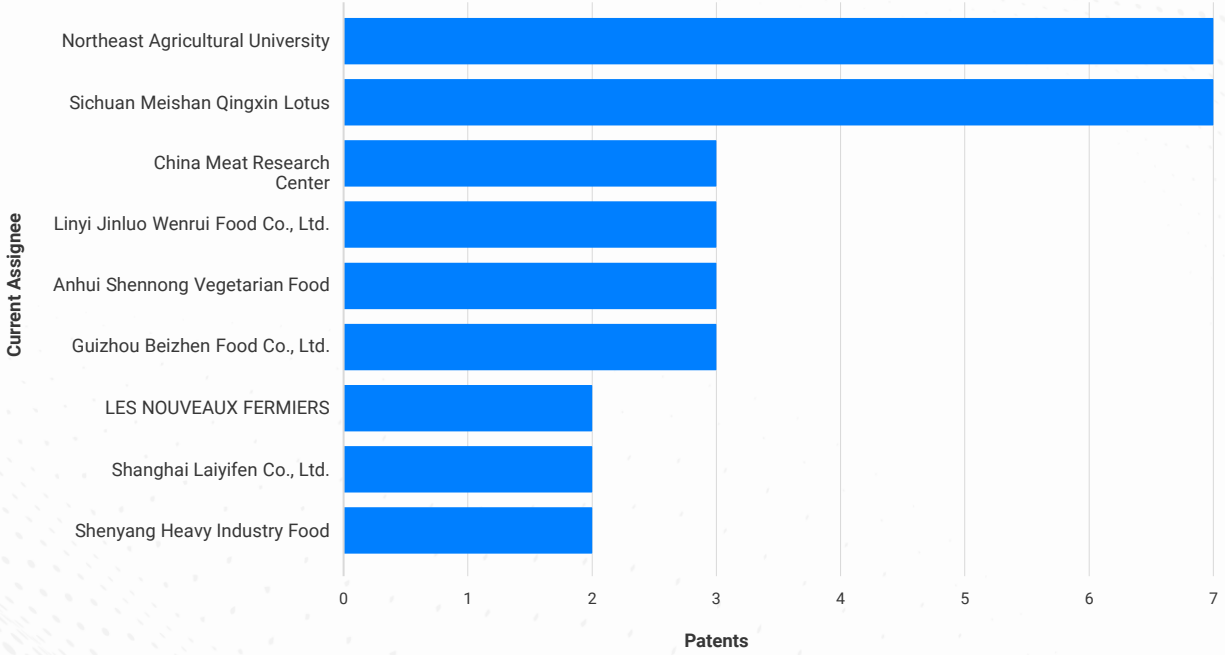
Top Countries of Origin

This map shows the patent application trend in different jurisdictions for the technology in the last 3 years. This gives an indication of the targeted geographic markets the technology is most prominent and commercialized in.



Top Assignees

The top companies with the most patents applied in the last 3 years in the plant-based meat technology field. 9 out of the top 10 assignees are Chinese companies.



Patents of Interest

The following patents were objectively highlighted by PreScouter's research team as technologies that are interesting and applicable to the plant-based meat field.

Innovation Type	Protein Source	Texturizing Ingredients	Plant-based Meat Type	Cuts	Publication Number	Title	Current Assignee	Application Date	Publication Date	Legal Status & Events
Texturizing ingredient	Pea Protein	Konjac root (Amorphophallus rivieri). The binding agent is fenugreek, in combination with pea starch or potato starch	All meat type	Chunks, strips, crumbs, sticks, fillets, etc	US20200054052A1	Vegan meat replacement food product	SOPHIE'S KITCHEN, INC.	2019-10-14	2020-02-20	Examining
Fermentation	quinoa and soybean grits	Fermented gluten	Beef	Burger, patties, sausage	WO2022079452A1	Plant-based meat analogue food	Better Nature LTD	2021-10-18	2022-04-21	-
Texturizing Ingredient	Soybean	Gluten flour	Not specified	Not specified	CN110169460A	Processing method of instant high-protein low-fat protein plant vegetarian meat without using grease	Jiangxi Baiyue Food Co.Ltd (江西省百约食品有限责任公司)	2019-06-25	2019-08-27	Examining
Texturizing methods	Soybean tissue	Not specified	Not specified	Not specified	CN110024867A	System and method for producing and processing vegetarian meat	Changsha University of Science and Technology (长沙理工大学)	2019-04-22	2019-07-19	Examining
Texturizing ingredient	Soybean protein	Transglutaminase	Not specified	Not specified	CN111616258A	Plant-based meat cross-linking agent, plant-based meat and preparation methods of plant-based meat cross-linking agent and plant-based meat	Xi'an Yuansen Biotechnology Co., Ltd. (西安源森生物科技有限公司)	2020-06-19	2020-09-04	Examining
Texturizing Ingredient	Quinoa Protein	Starch	All meat type	filaments, strips, chunks	CN110292138A	Quinoa protein vegetarian meat and preparation method thereof	Gansu Research Institute of Light Industry Co., Ltd (甘肃省轻工研究院有限责任公司)	2019-07-30	2019-10-01	Examining
Texturizing methods	Not specified	Not specified	Not specified	Not specified	CN113575628A	Feeding device for vegetarian meat production	Linyi Jinluo Wenrui Food Co., Ltd. (临沂金锣文瑞食品有限公司)	2020-06-19	2020-09-04	Examining
Texturizing ingredient	Protein powders from soybean, peanut, pea, and corn	Methylcellulose, starch	Not specified	Not specified	CN113826755A	Fat-free vegetarian meat protein and preparation method thereof	Jiashan Suiyuan Food Co., Ltd. (嘉善随缘食品有限公司)	2021-09-24	2021-12-24	Examining

Key Patent on Fermentation

Key patents were selected from the list of highly interesting patents.

WO2022079452A1 - Plant-based meat analogue food
Assignee: Better Nature LTD
Priority Date: 16 Oct 2020
Status: -

First claim:

A method of making a plant-based meat analogue food, comprising the steps of:

(a) boiling particulate vegetable material having an average diameter of about 0.5mm to about 4mm;

(b) drying the boiled particulate vegetable material;

(c) shaping the dried product of step (b) and inoculating the shaped product with at least one mycelium-producing fungus; or inoculating the product of step (b) with at least one mycelium-producing fungus and shaping the inoculated product;

(d) incubating the shaped product of step (c) at around 25°C to around 40°C for at least 12 hours; and

(e) cooking the incubated product to make the plant-based meat analogue food.

Key Patent on Fermentation - Cont’d

Abstract:

The present invention relates to plant-based foods having favourable organoleptic properties, typically meat-like properties, and a method and kit of making a plant-based meat analogue food. In one particular aspect, the invention provides a method of making a plant-based meat analogue food, comprising the steps of: (a) boiling particulate vegetable material having an average diameter of about 0.5mm to about 4mm; (b) drying the boiled particulate vegetable material; (c) shaping the dried product of step (b) and inoculating the shaped product with at least one mycelium-producing fungus, or inoculating the product of step (b) with at least one mycelium-producing fungus and shaping the inoculated product; (d) incubating the shaped product of step (c) at around 25˚C to around 40˚C for at least 12 hours; and (e) cooking the incubated product to make the plant-based meat analogue food.

Key Patent on Texturizing Method

CN110024867A - System and method for producing and processing vegetarian meat

Assignee: Changsha University of Science and Technology (长沙理工大学)
Priority Date: 22 Apr 2019
Status: Examining

First claim:

A method for producing vegetarian meat, characterized in that, it includes the following steps:

Step 1. Raw material preparation: soak the soybean textured protein in water until the protein tissue softens, and then dehydrate the soybean textured protein after soaking;

Step 2, soybean tissue protein processing: add the dehydrated soybean tissue protein in step 1 into the processing barrel (3); then the fast motor (10) drives the cutting knife (12) to rotate rapidly, and at the same time the cutting knife (12) is in the first position. Driven by an oil cylinder (6), it extends into the processing barrel (3), and driven by the first oil cylinder (6), the cutting knife (12) reciprocates up and down in the processing barrel (3) to cut soybean tissue protein; When the cutting knife (12) extends into the processing barrel, the cover plate (11) closes the upper end of the processing barrel (3) under the action of gravity;

Step 3, stirring: after the soybean tissue protein cutting in step 2 is completed, after the fast motor (10) is turned off, the first oil cylinder (6) drives the cutting knife (12) to move out of the processing barrel (3), and then the support plate (2) Rotate so that the processing barrel (3) is located directly below the stirring shaft (14); after adding ingredients into the processing barrel (3), the geared motor (15) motor drives the stirring shaft (14) to rotate, while the second oil cylinder (7) drives The stirring shaft (14) extends into the processing barrel (3) to fully mix the soybean tissue protein and the ingredients;

Step 4, molding: take out the soybean tissue protein fully stirred in step 3 from the processing barrel (3), and then extrude it through a molding machine;

Step 5. Packaging: Pack the vegetarian meat extruded in Step 4 and put it into storage.

Key Patent on Texturizing Method - Cont’d

Abstract:

The invention discloses a vegetarian meat production and processing system, which comprises a base, a rotatable support plate is arranged on the upper end of the base, and a processing barrel with an open upper end is arranged on the support plate; The upper end of the column is provided with a top plate, the lower end of the top plate is provided with a first oil cylinder and a second oil cylinder at intervals, the piston rod of the first oil cylinder is connected with the first mounting seat, and the first mounting seat is provided with a drive for cutting A fast motor for shaft rotation; the piston rod of the second oil cylinder is connected to a second mounting seat, the second mounting seat is provided with a deceleration motor for driving the rotation of the stirring shaft, and the stirring shaft is provided with a stirring rod. The present invention also provides a method for producing vegetarian meat, which comprises the steps of raw material preparation, soybean tissue protein processing, stirring, molding, packaging and the like. The purpose of the present invention is to quickly complete the cutting and stirring of soybean tissue protein and improve production efficiency.

Key Patent on Texturizing Ingredient

CN111616258A - Plant-based meat cross-linking agent, plant-based meat and preparation methods of plant-based meat cross-linking agent and plant-based meat
Assignee: Xi'an Yuansen Biotechnology Co., Ltd. (**西安源森生物科技有限公司**)
Priority Date: 19 Jun 2020
Status: Examining

First claim:

A plant meat cross-linking agent, is characterized in that, Including the following raw materials: purified water, vegetable protein powder, konjac flour, transglutaminase.

Abstract:

The invention discloses a plant meat cross-linking agent, which comprises purified water, plant protein powder, konjac flour and glutamine transaminase. The preparation method is as follows: firstly, the vegetable protein powder and the konjac flour are mixed and processed, and then pure water is added for homogenization treatment to obtain a feed liquid; finally, the feed liquid and the transglutaminase are stored separately and mixed when they are used. Also disclosed is a method for preparing vegetable meat by using the above-mentioned vegetable meat cross-linking agent: first soaking the dried vegetable tissue protein in water to soften it, then removing the silk and mixing it evenly to obtain the raw material of silk protein; mixing the vegetable meat cross-linking agent with The spice is added to the raw material of the shredded silk protein, and the mixture is uniformly mixed to obtain a mixed material; then the mixed material is added into a mold, flattened, sealed and pressed; finally, the mold is demolded, packaged, and sterilized. The plant meat cross-linking agent is used in the preparation process of the plant meat, and can improve the degree of cross-linking between the tissue proteins of the plant meat, improve the texture of the plant meat, and make the appearance and taste of the plant meat closer to real meat.

Key Patent on Texturizing Ingredient

CN113826755A - Fat-free vegetarian meat protein and preparation method thereof
Assignee: Jiashan Suiyuan Food Co., Ltd. (嘉善随缘食品有限公司)
Priority Date: 24 Sep 2021
Status: granted

First claim:

A zero-fat meat protein, characterized in that:

The formula of the product does not contain oil; the product is prepared from the following raw materials by weight: 14000-14800 parts of ice water, 140-170 parts of brewed soy sauce, 560-680 parts of food-grade thickener, 560-680 parts of vegetable protein isolate, 370-400 parts of edible salt, 140-170 parts of mushroom seasoning powder, 160-200 parts of yeast extract, 16800-17400 parts of vegetable protein slurry, 180-200 parts spices, 1000-1350 servings of food additives.

Abstract:

The present application relates to the technical field of vegetarian meat processing, in particular to a process and formula that uses no added oil, zero-fat vegetarian meat protein and a preparation method thereof. A zero-fat meat protein, the formula of the product does not contain oil, and the processing temperature of the product is 0-8°C; the product is prepared from the following raw materials by weight: ice water, brewed soy sauce, food-grade thickener, vegetable protein isolate, edible salt, mushroom seasoning powder, yeast extract, vegetable protein slurry, spices, food additives. This application has the advantages of zero fat, high protein, and low calorie, and is an optional ingredient for increasing hypertension, hyperlipidemia, and diabetes.

Plant-Based Dairy Alternatives

Key Findings | Dairy Alternatives

The IP analysis of plant-based dairy indicates that there is a lesser amount of patenting activity in this space compared to plant-based meat. The 3-year technology landscape reveals a trend in **new taste experience**, **bean protein**, and **milk tea beverage**, etc. Most patents found under this search query have keywords "**plant milk**" and "**preparation method**." Most patents found in this space are classified in the CPC subgroup "A23C11/103 containing only proteins from pulses, oilseeds or nuts, e.g. nut milk." In terms of simple legal status, the majority of patents (42%) are in pending stage whereas 15% are active. 42% of the patents were international patents that were submitted to WIPO, followed by 24% filed in China and 18% in the United States. The top assignees are Société des Produits Nestlé and Fuji Oil Co., Ltd.

Seven patents were selected by PreScouter's research team as interesting innovations that use different types of texturizing ingredients or methods to produce clean label plant-based dairy products. Within these patents, protein sources include casein proteins expressed in plant cell cultures, soymilk, almond milk, oats milk, macadamia nut milk, coconut or almond milk, balck sesame puree, bean protein, quinoa rice, oat rice, millet, rye rice, corn germ and broken gem. Other ingredients include a-carotene, b-carotene and lycopene from carrots cells, bacterial lactic acid (fermentation), a Protease enzyme, plant-derived oils and fat, gellan gum, carrageenan and microcrystalline cellulose, and maltodextrin.

From the list of interesting patents, four patents were particularly highlighted with first claim and abstract information. These inventions relate to:

1) plant-based dairy substitutes and the preparation method by using a plant cell culture, preferably carrot cells which expresses transgenic casein proteins
2) a method for producing plant-based milk fermentation product
3) a plant-based butter-like composition
4) a centrifugal beverage maker for producing juice or plant-based milk

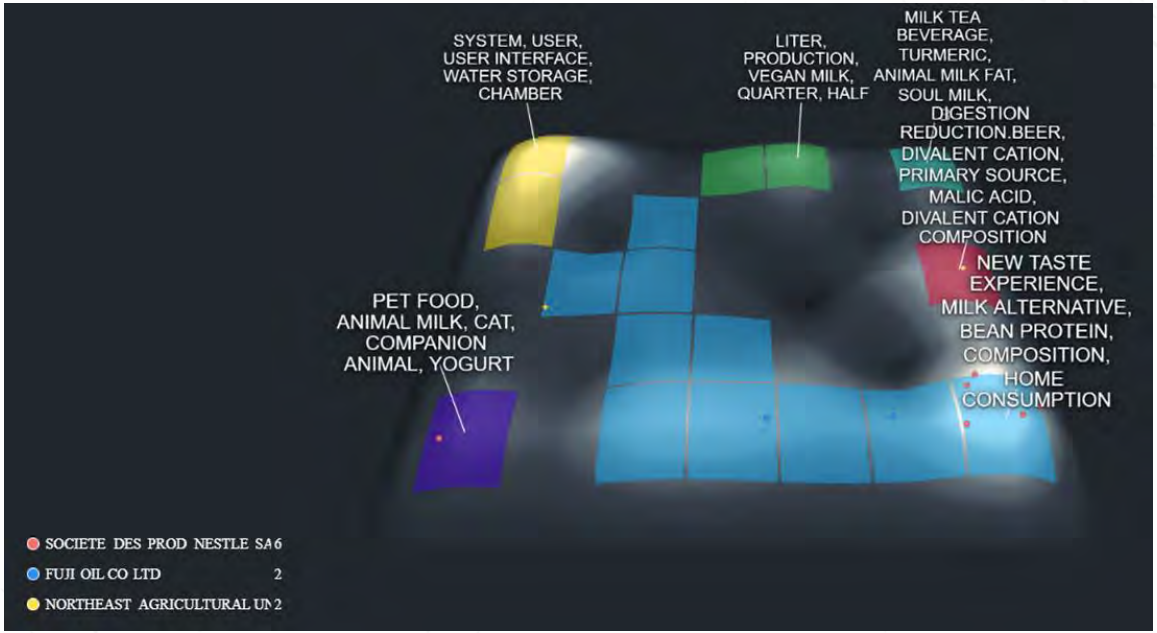
Search Query

((("plant-based dairy" OR "plant based dairy" OR "vegan dairy" OR "plant-based milk" OR "plant based milk" OR "vegan milk" OR "plant milk" AND ("texturizing" OR "texturizer" OR "texture") AND ("clean label" OR "clean labeling")) OR TACD_ALL:("plant-based dairy" OR "plant based dairy" OR "vegan dairy" OR "plant-based milk" OR "plant based milk" OR "vegan milk" OR "plant milk" AND ("texturizing" OR "texturizer" OR "texture") AND ("clean label" OR "clean labeling"))) AND TA_ALL:("plant-based dairy" OR "plant based dairy" OR "vegan dairy" OR "plant-based milk" OR "plant based milk" OR "vegan milk" OR "plant milk") AND APD:[20190420 TO *]

This search query targeted IPs applied in the last 3 years in relation to plant-based dairy. This generated **33 simple patent families and 52 single applications in total**.

Technology Landscape

The Technology Landscape visualises the layout of the technology space, with peaks representing more concentrated area of patenting activity and troughs representing areas of little or no activity - these suggest areas of potential opportunity and exploration. The 3-years landscape reveals a trend in new taste experience, bean protein, milk tea beverage, etc.



Cell Diagram

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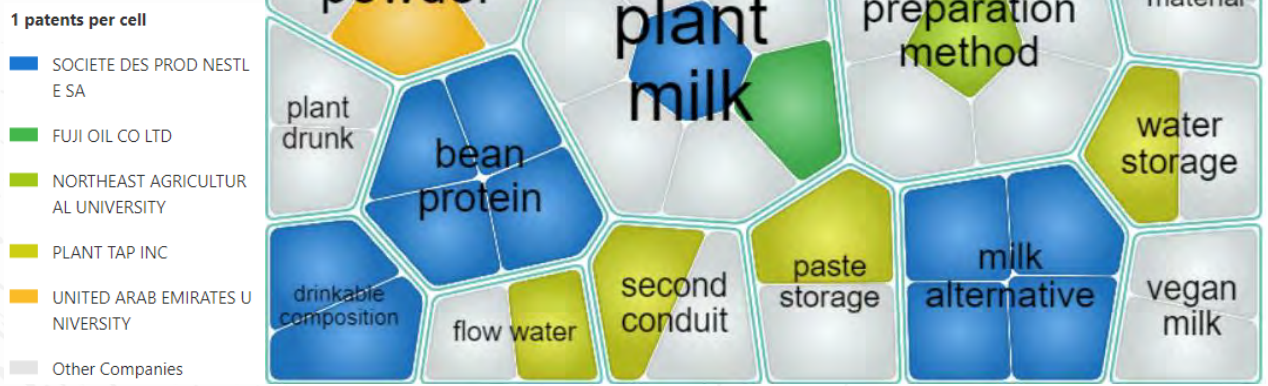
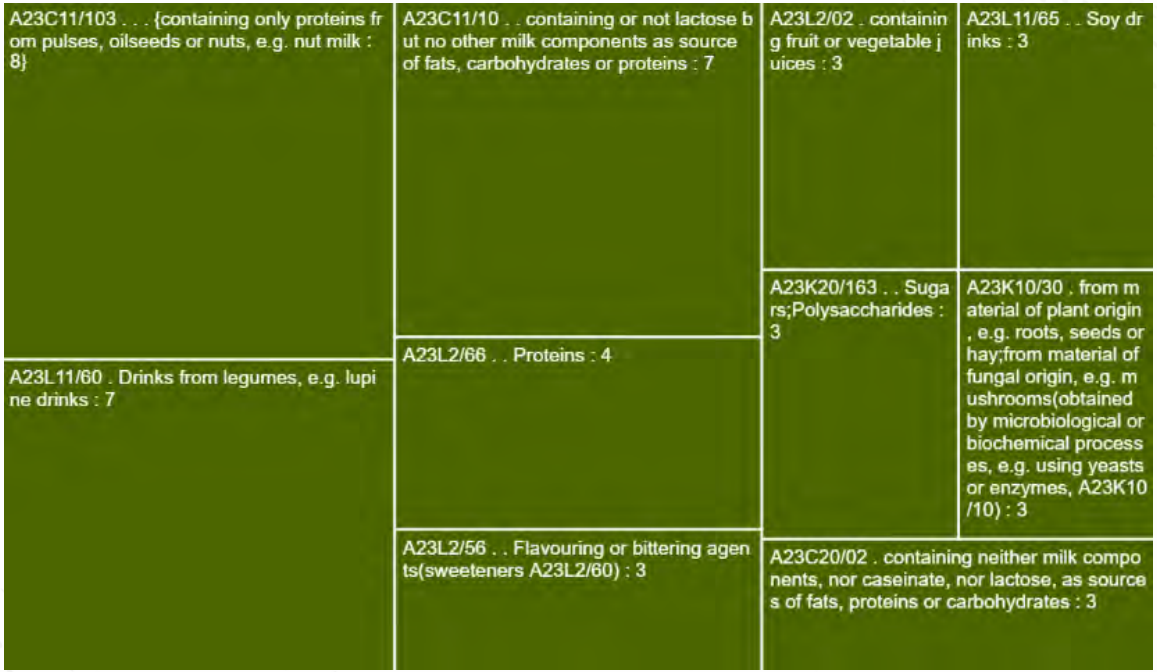


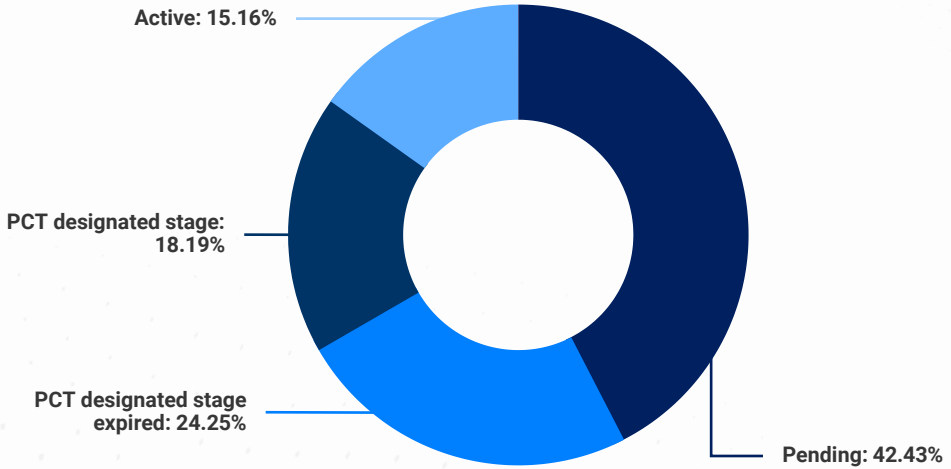
Top CPC subgroup

The top CPC subgroup visualizes the major technology areas to understand alternative applications of the technology and find potential opportunities for licensing and white space. The size of the box corresponds to the number of patents that classification is attributed to. The number at the end reveals the number of patent families from the search query. A look at the main classes show that most patents within this field are under **A23C11/103 containing only proteins from pulses, oilseeds or nuts, e.g. nut milk**.



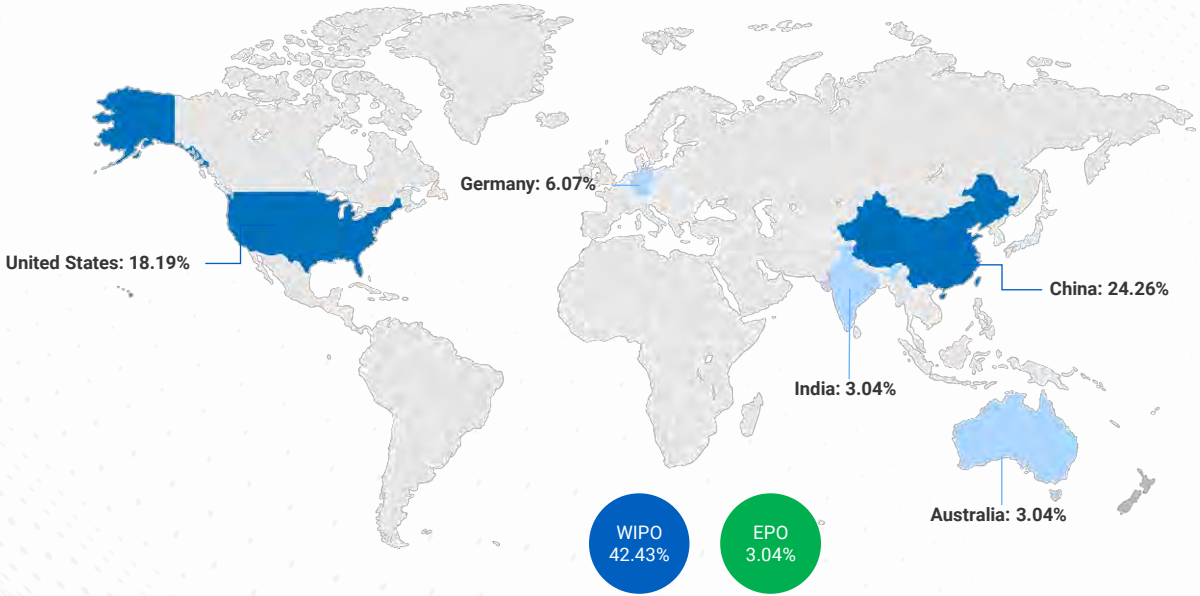
Simple Legal Status

Simple legal status breakdown of the technology field. This tells the proportion of patents in the technology space that are in effect, or no longer active. PreScouter did not filter inactive, expired, and withdrawn patents from the search as they are the reference source for prior arts. These charts show the percentage breakdown of the legal status and patent type in the technology field. 42% of the patents in this space are pending with another 15% active.



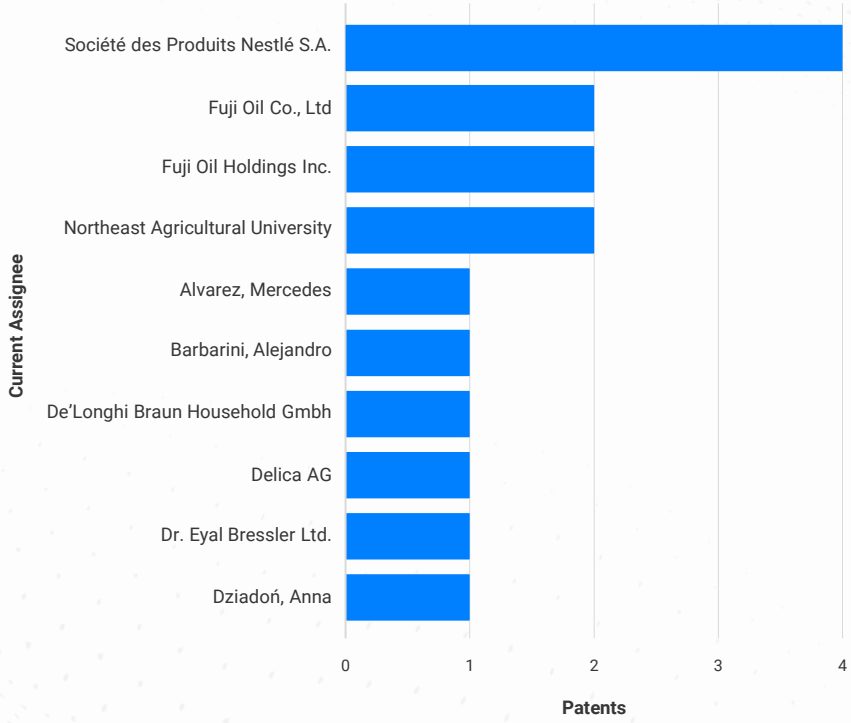
Top Countries of Origin

This map shows the patent application trend in different jurisdictions for the technology in the last 3 years. This gives an indication of the targeted geographic markets the technology is most prominent and commercialized in.



Top Assignees

The top companies with the most patent applied in the last 3 years in the plant-based dairy technology field. Nestlé and Fuji Oil lead the space in this targeted search.



Patents of Interest

The following patents were objectively highlighted by PreScouter's research team as technologies that are interesting and applicable to the plant-based dairy field.

Innovation Type	Protein Source	Texturizing Ingredients	Publication Number	Title	Current Assignee	Application Date	Publication Date	Legal Status & Events
Texturizing ingredient	Casein proteins expressed in plant cell cultures	Recombinant caseins, and a-carotene, b-carotene and lycopene from carrots cells.	WO2021191914A1	Dairy substitutes produced in plant-based systems and method thereof	BARBARINI, ALEJANDRO | DR. EYAL BRESSLER LTD.	2021-05-23	2021-09-30	PCT publication
Texturizing ingredient	Plant-based milk (soy milk, almond milk, oats milk and macadamia nut milk)	Bacterial lactic acid (fermentation) and a Protease enzyme	WO2021256507A1	Method for producing plant-based milk fermentation product	GODO SHUSEI CO., LTD.	2021-06-16	2021-12-23	PCT publication
Texturizing ingredient	Plant milk (soymilk, coconut or almond milk)	Plant-derived oils and fats	WO2020196713A1	Plant-based butter-like composition	FUJI OIL HOLDINGS INC. | FUJI OIL CO., LTD.	2020-03-26	2020-10-01	PCT-NP (Past time limit)
Texturizing method	Soy beans	None	WO2020221736A1	Centrifugal beverage maker for producing juice or plant milk	DE'LONGHI BRAUN HOUSEHOLD GMBH	2020-04-28	2020-11-05	PCT-NP (Past time limit)
Texturizing Ingredient	Black sesame puree, Bean Protein	Gellan Gum	WO2021018970A1	Plant-based milk alternative with new taste experience	SOCIÉTÉ DES PRODUITS NESTLÉ SA	2020-07-29	2021-02-04	PCT-NP (Past time limit)
Texturizing Ingredient	Quinoa rice, oat rice, millet, and rye rice	Carrageenan and microcrystalline cellulose or carrageenan and gellan gum	CN112586576A	Plant-based milk tea beverage and preparation method	HANGZHOU WAHAHA TECH (杭州娃哈哈科技有限公司)	2020-12-09	2021-04-02	Examining
Texturizing Ingredient	Soybean, corn germ and broken rice	Maltodextrin	CN111513189A	Preparation method of plant yogurt powder	NORTHEAST AGRICULTURAL UNIVERSITY (东北农业大学)	2020-05-25	2020-08-11	Published

Key Patent on Composition

WO2021191914A1 - Dairy substitutes produced in plant-based systems and method thereof
Assignee: Barbarini, Alejandro | DR. EYAL BRESSLER LTD.
Priority Date: 23 Mar 2020
Status: PCT Publication

First claim:

A plant-based dairy substitute comprising:

a. a slurry of transgenic plant cells expressing at least one form of casein;
b. water;
c. at least one chemical;
d. at least one food additive;
e. at least one vegetable oil;
f. at least one saccharide;
g. at least one vegetable protein; and
h. at least one strain of lactic bacteria; wherein said slurry is configured to be fermented by said lactic bacteria, thereby producing a plant-based dairy substitute characterized by organoleptic and physicochemical properties characteristic of dairy products of animal origin.

Key Patent on Composition - Cont'd

Abstract:

The present invention provides plant-based dairy substitutes and methods thereof. Those substitutes may be a cheese substitute, a yogurt substitute, a coffee creamer substitute and more. The present invention discloses a plant cell culture, preferably, carrot cells, which expresses transgenic casein proteins. This unique casein-expressing culture is then transformed into a slurry, which serves as the platform for the production of the plant-based dairy substitutes. Furthermore, those dairy substitutes are highly nutritious, as they contain beneficial ingredients derived from the plant cells (such as beta-carotene) in addition to high protein (casein) content. The application of carrot cell slurry containing casein proteins to those dairy substitutes provides organoleptic and physicochemical properties enhanced or similar to conventional dairy products. The carrot cells expressing casein proteins can be conserved in a powder form, as the plant cells successfully encapsulate the casein proteins, thus protecting them from physicochemical conditions, such as spray drying.

Key Patent on Composition

WO2021256507A1 - Method for producing plant-based milk fermentation product
Assignee: Godo Shusei CO., LTD.
Priority Date: 16 Jun 2020
Status: PCT publication

First claim:

The first step of mixing vegetable milk and lactic acid bacteria to obtain a mixed solution, and the second step of fermenting the mixed solution and this is a method for producing fermented vegetable milk products. Before the second step is completed, a step of adding a protease derived from the genus Penivatilus or a protease derived from the genus Trichoderma (proteo addition step) or a step of adding cellulase derived from the genus Trichoderma (a step of adding a protease) to the vegetable milk or the mixed solution (a step of adding a cellulase derived from the genus Trichoderma). A method for producing a fermented vegetable milk product, which comprises performing a cellulase addition step).

Abstract:

The purpose of the present invention is to provide a production method for producing a plant-based milk fermentation product by making a protease or a cellulase act on a plant-based milk, whereby it is possible to produce a plant-based milk fermentation product having a reduced bitter taste without the need to perform an enzyme deactivation process. The method for producing a plant-based milk fermentation product comprises carrying out a first step for mixing a plant-based milk with a lactic acid bacterium to produce a mixed solution and a second step for fermenting the mixed solution in this order, and is characterized in that a step for adding a protease originated from the genus Paenibacillus or a protease originated from the genus Trichoderma to the plant-based milk or the mixed solution (a protease addition step) or a step for adding a cellulase originated from the genus Trichoderma to the plant-based milk or the mixed solution (a cellulase addition step) is carried out prior to the completion of the second step.

Key Patent on Composition

WO2020196713A1 - Plant-based butter-like composition
Assignee: Fuji Oil Holdings Inc | Fuji Oil Co., LTD.
Priority Date: 28 Mar 2019
Status: PCT-NP (Past time limit)

First claim:

It is an emulsion containing vegetable milk and vegetable oil with a rising melting point of 20 ° C or higher, and when the protein content derived from plant milk is A% by weight and the weight ratio of fat and oil to the total amount of non-fat solids and water is B, the following conditions (a) and (b) are satisfied.

a) Ａ＝０．７～３、

b) Ｂ＝１．２～５、

Abstract:

The purpose of the present invention is to provide a plant-based butter-like composition that exhibits a good melt-in-the-mouth behavior while having a butter-like shape retention property. The plant-based butter-like composition is characterized by being an emulsion comprising a plant milk and a plant oil/fat having a rising melting point of at least 20°C and satisfying the following conditions (a) and (b): (a) A = 0.7 to 3, and (b) B = 1.2 to 5, where A wt% is the content of plant milk-derived protein and B is the weight ratio of the oil/fat fraction to the total of a nonfat solids fraction and a moisture fraction.

Key Patent on Processing Method

WO2020221736A1 - Centrifugal beverage maker for producing juice or plant milk
Assignee: De'Longhi Braun Household Gmbh
Priority Date: 29 Apr 2019
Status: PCT-NP (Past time limit)

First claim:

Soy milk maker that has a filter (10) for receiving soybean mass, a drive (50). Crushing tool (60) and a jug (20), wherein the filter (10) is arranged in the jug (20) and the comminution tool (60) can be inserted into the filter (10), wherein the drive (50) is designed to drive the crushing tool (60) to crush soybean mass in the filter (10), the filter (10) being arranged to be rotated in the jug (20) to separate the soymilk from the remaining residual material.

Abstract:

A soya-milk maker has a filter for accommodating soya beans, a drive, a comminuting tool and a jug. The filter is arranged in the jug and allows the comminuting tool to be introduced into the filter. In a first step, the drive drives the comminuting tool, wherein the soya beans are comminuted by the comminuting tool in the filter in order for soya milk and residual material to be produced from the soya beans. In a second step, the drive rotates the filter. Once the soya beans have been comminuted, the filter is rotated in order for the liquid soya milk to be separated from the remaining residual material by centrifugal force.

Plant-Based Egg Alternatives

Key Findings | Egg Alternatives

The IP analysis of plant-based egg shows that there is a small amount of patenting activity in this space. As stated earlier in this Intelligence Brief, the plant-based egg category is the least developed plant-based category, but it is the fastest growing category. Due to the small number of patents in this space, a search query with a 10-year application time range is used to provide additional analysis of the space. A technology landscape of the last 10 years reveals a trend in the use of **microalgae**, **fabaceae flour**, **wheat protein**, **soy protein**, **legume albumin**, and **starch**, to produce plant-based egg products. Most patents found under the search query have the keyword "**egg substitute**." Similarly, most patents found in this space are classified in the CPC subgroup "A23L15/35 Egg substitutes." In terms of simple legal status for patents filed in the last 10 years ago, the majority of patents (31%) are in the PCT designated stage whereas 23% are expired at the PCT designated stage. For patents filed in the last 3 years, 67% of the patents are in the PCT designated stage, whereas 17% are pending. The majority of patents are international patents submitted to WIPO (54% in the last 10 years), followed by 15% in the United States. The top assignees in the last 10 years are Just Inc, Earth Island, and Zero Egg Ltd.

Five patents were selected by PreScouter's research team as innovations applicable to plant-based egg products. Within these patents, protein sources include pea protein concentrate, euglena protein flour, pea protein isolate, rice protein ingredient, yellow pea flower (peas and fava beans), microalgae and plant protein such as soy, potato, chickpea, pea, mung bean protein, dehydrated aquafaba, chia, rice, pea broad bean, flax, lentil proteins. Texturizing ingredients include beta-glucan ready-to-gel (RTG) powder, polysaccharides such as carrageenan, methylcellulose, agar, pregelatinized starch, guar, xanthan gum, gellan gum, locust bean gum, gum arabic, tara gum, pectin, alginate, agar agar, cellulose and its derivatives.

Three patents are particularly highlighted in this report with first claim and abstract information due to their potential to be applied for clean label plant-based egg products. These inventions relate to:

1) egg replacement containing euglena-derived components
2) plant-based egg alternative with pea protein isolate and rice protein ingredient
3) microalgae-based egg substitute

Search Query

Applications in the last 3 years:

(("plant-based egg" OR "plant based egg" OR "vegan egg" OR ("egg replacement" OR "egg replacer" OR "egg substitute" AND ("plant-based" OR "plant based" OR vegan")) and ("texturizing" or "texturizer" or "texture") and ("clean label" or "clean labeling")) OR TACD_ALL:("plant-based egg" OR "plant based egg" OR "vegan egg" OR ("egg replacement" OR "egg replacer" OR "egg substitute" AND ("plant-based" OR "plant based" OR vegan")) AND ("texturizing" OR "texturizer" OR "texture") AND ("clean label" OR "clean labeling"))) AND TTL_ALL:(egg) AND APD:[20190420 TO *]

This search query targeted IPs applied in the last 3 years in relation to plant-based egg. This generated **6 simple patent families and 13 single applications in total**.

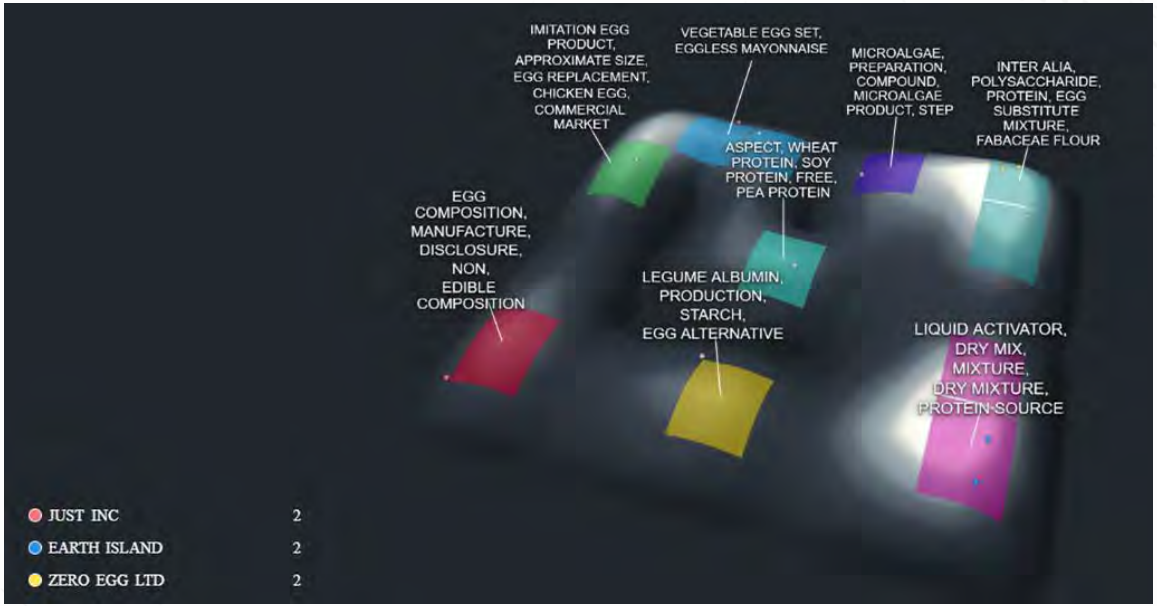
Applications in the last 10 years:

(("plant-based egg" OR "plant based egg" OR "vegan egg" OR ("egg replacement" OR "egg replacer" OR "egg substitute" AND ("plant-based" OR "plant based" OR vegan")) and ("texturizing" or "texturizer" or "texture") and ("clean label" or "clean labeling")) OR TACD_ALL:("plant-based egg" OR "plant based egg" OR "vegan egg" OR ("egg replacement" OR "egg replacer" OR "egg substitute" AND ("plant-based" OR "plant based" OR vegan")) AND ("texturizing" OR "texturizer" OR "texture") AND ("clean label" OR "clean labeling"))) AND TTL_ALL:(egg) AND APD:[20120420 TO *]

Due to the small number of patent families in this space, a search query with a 10-year application time range is used to provide additional analysis of the landscape, cell diagram, top CPC subgroups, simple legal status, top countries of origin, and top assignees. This search query targeted IPs applied in the last 10 years in relation to plant-based egg. This generated **13 simple patent families and 52 single applications in total**.

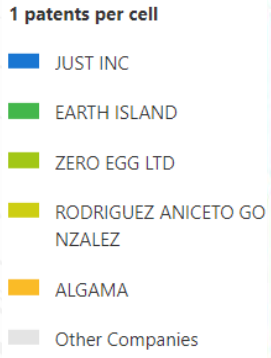
Technology Landscape

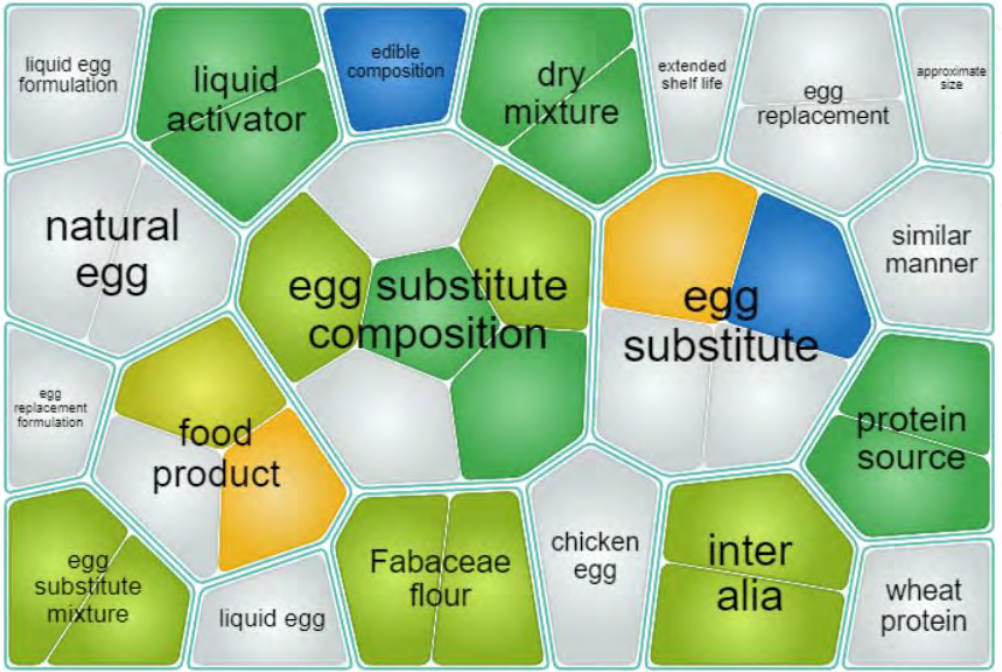
The Technology Landscape visualises the layout of the technology space, with peaks representing more concentrated areas of patenting activity and troughs representing areas of little or no activity - these suggest areas of potential opportunity and exploration. The 10-year landscape reveals a trend in the use of microalgae, fabaceae flour, wheat protein, soy protein, legume albumin, and starch, to produce plant-based egg products.



Cell Diagram

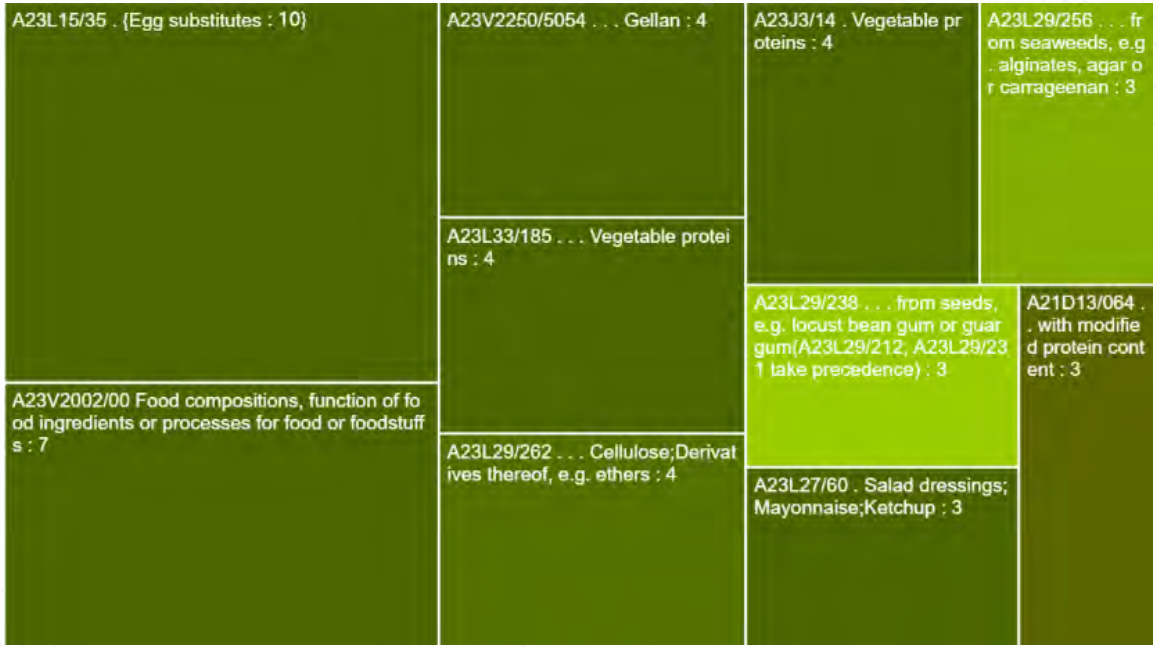
The cell diagram shows the keywords and phrases of the records owned by the top current assignees in the technology field. This is helpful for providing a deeper understanding of the concepts within the defined technology and the assignees that are working on those concepts. It helps differentiate the technological focus of each of the top current assignees. The relative coverage is represented by the number of cells under each assignees, with each cell representing the same number of patents.





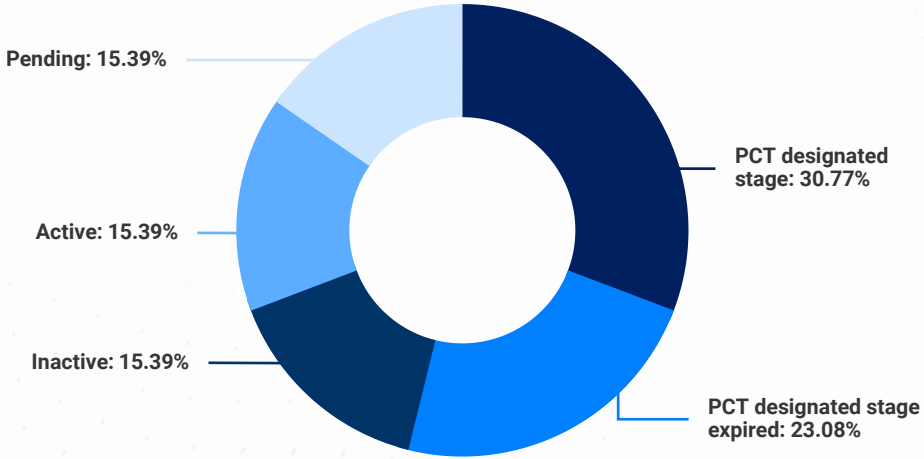
Top CPC subgroup

The top CPC subgroup visualizes the major technology areas to understand alternative applications of the technology and find potential opportunities for licensing and white space. The size of the box corresponds to the number of patents that classification is attributed to. The number at the end reveals the number of patent families from the search query. A look at the main classes in the last 10 years show that most patents within this field are under **A23L15/35 Egg substitutes**.



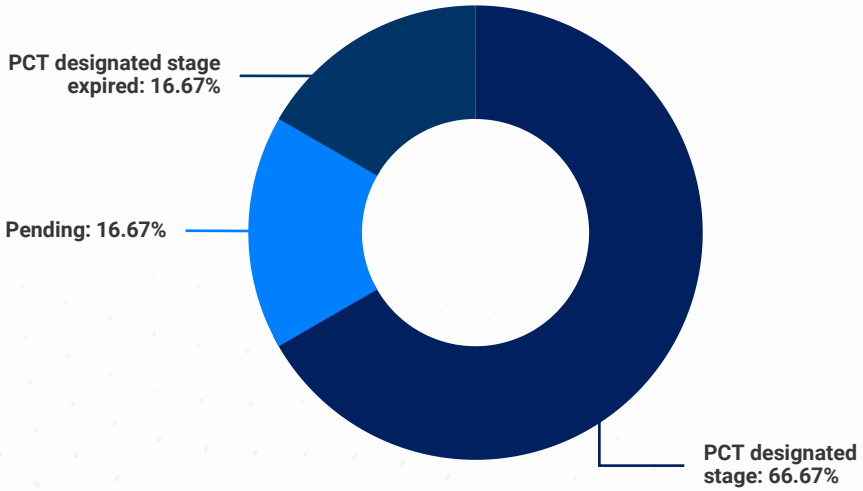
Simple Legal Status - 10 years

Simple legal status breakdown of the technology field. This tells the proportion of patents in the technology space that are in effect, or no longer active. PreScouter did not filter inactive, expired, and withdrawn patents from the search as they are the reference source for prior arts. This chart shows the percentage breakdown of the legal status and patent type in the technology field for patents applied since 10 years ago. 31% of the patents in this space are in the PCT designated stage whereas 23% are expired at the PCT designated stage.



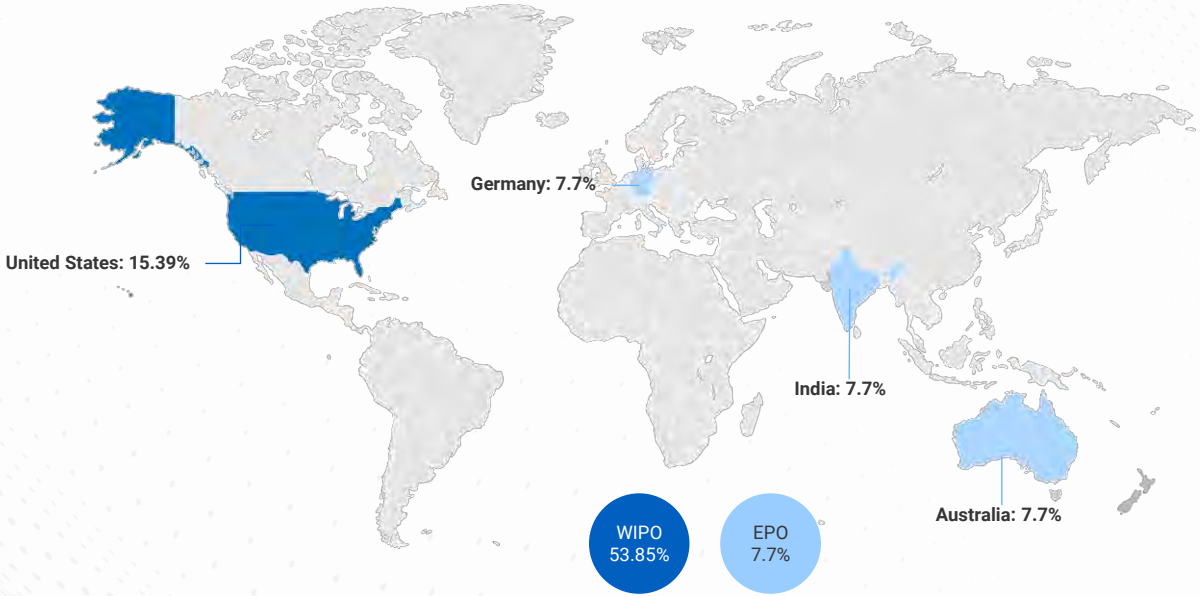
Simple Legal Status - 3 years

This chart show the percentage breakdown of the legal status and patent type in the technology field for patents applied since 3 years ago. 67% of the patents in this space are in the PCT designated stage whereas 17% are pending.



Top Countries of Origin - 10 years

This map shows the patent application trend in different jurisdictions for the technology in the last 10 years. This gives an indication of the targeted geographic markets the technology is most prominent and commercialized in.



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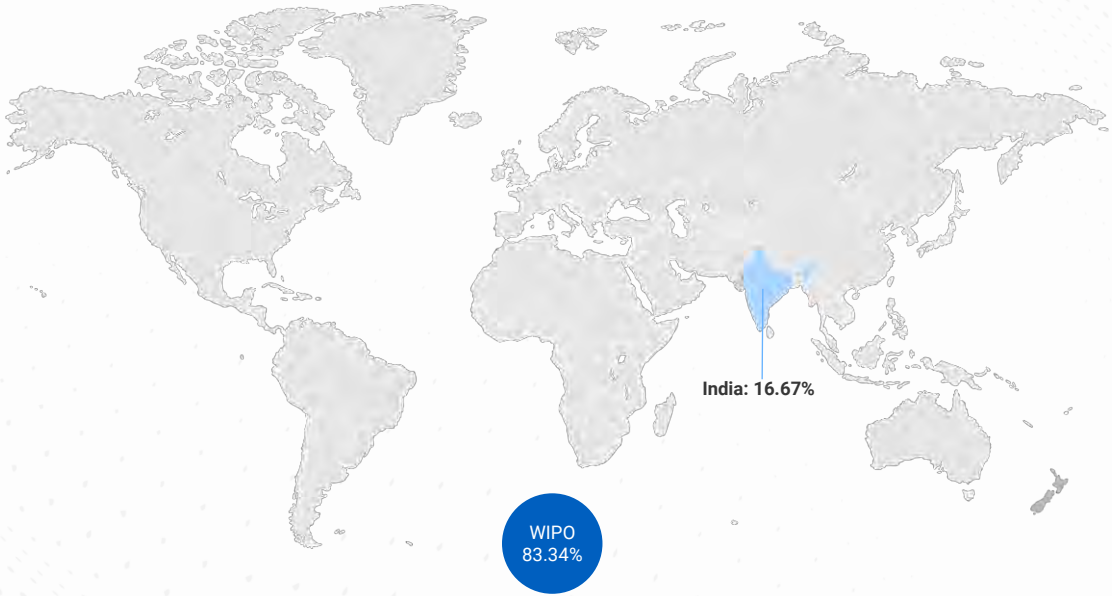
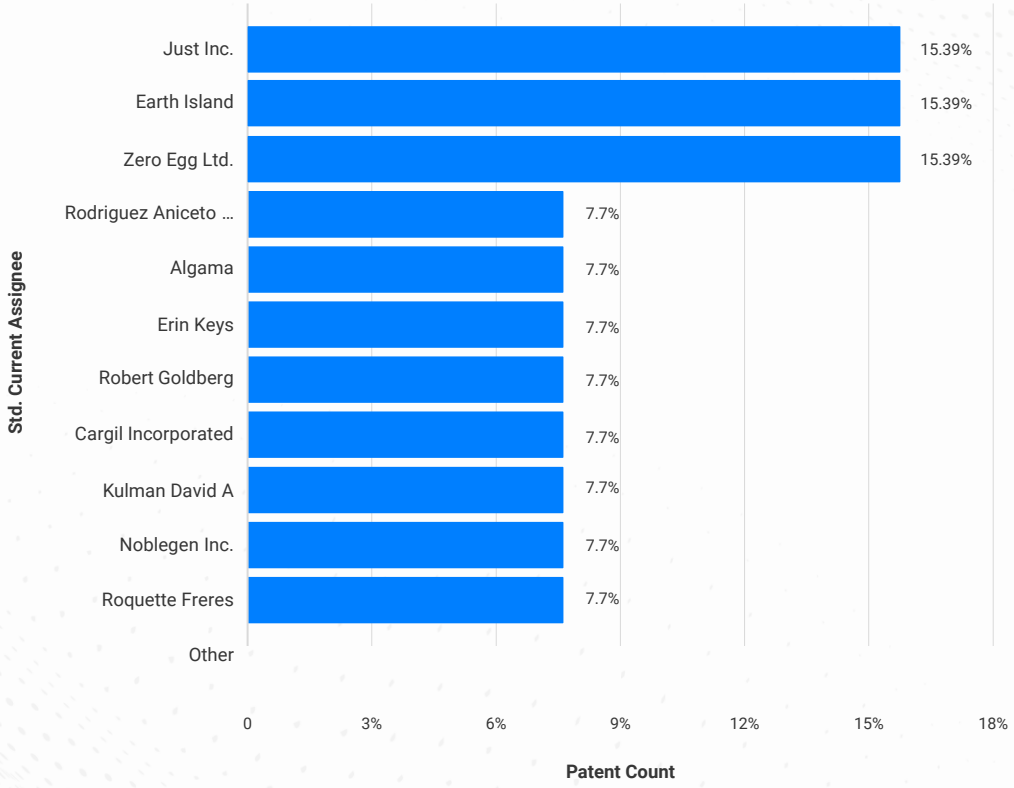


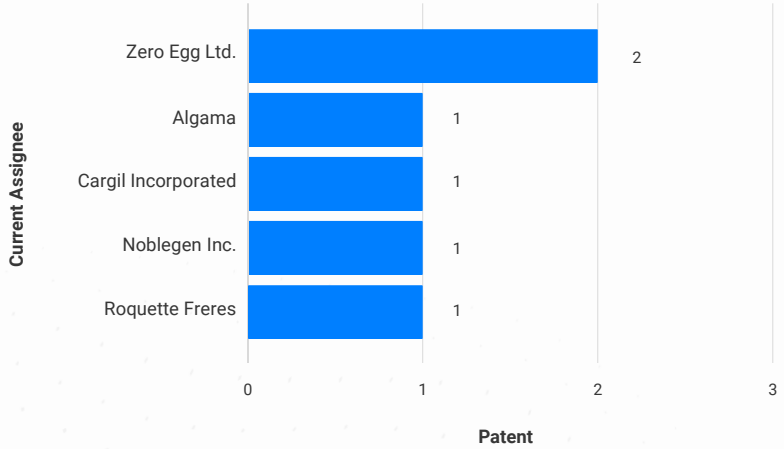
Top Assignees - 10 years

The top companies with the most patent applied in the last 10 years in the plant-based egg technology field. JUST Inc, Earth Island, and Zero Egg Ltd lead the space.



Top Assignees - 3 years

The top companies with the most patent applied in the last 3 years in the plant-based egg technology field. Zero Egg Ltd leads the space.



Patents Applied For in the Last 3 Years

The following patents were selected by PreScouter's research team as technologies that are applicable to plant-based egg.

Innovation Type	Protein Source	Texturizing Ingredients	Publication Number	Title	Current Assignee	Application Date	Publication Date	Legal Status & Events
Texturizing Ingredient	Pea protein concentrate, Euglena protein flour	Beta-glucan ready to gel (RTG) powder	WO2021116949A1	Egg replacement containing euglena-derived components	NOBLEGEN INC.	2020-12-09	2021-06-17	PCT publication
Texturizing Ingredient	Pea protein isolate and a rice protein ingredient	Methylcellulose (gellan gum, agar and carrageenan)	WO2022020149A1	Plant-based egg alternative	CARGILL, INCORPORATED	2021-07-14	2022-01-27	PCT publication
Texturizing Ingredient	Yellow pea flower (peas and fava beans)	Pregelatinized starch	WO2021219967A1	Plant-based egg alternative	ROQUETTE FRERES	2021-04-29	2021-11-04	PCT publication
Texturizing Ingredient	Plant protein (soy, potato, chickpea, pea, mung bean protein, and combination thereof)	Polysaccharide such as carrageenan, methyl cellulose, agar, or combinations	WO2019220431A1	Egg substitute mixture	ZERO EGG LTD.	2019-05-13	2019-11-21	PCT-NP (Past time limit)
Texturizing Ingredient	Microalgae (different species of Chlorophytes), and vegetable protein from sources including dehydrated aquafaba, chia, rice, pea, broad bean, flax, mung bean, chickpea, pea, potato, and lentil proteins.	Chosen from: Guar gum, xanthan gum, gellan gum, locust bean gum, gum arabic, tara gum, pectin, alginate, agar agar, carrageenan, cellulose and its derivatives.	WO2021234293A1	Microalgae-based egg substitute	ALGAMA	2021-05-19	2021-11-25	PCT publication

Key Patent on Composition

Key patents were selected from the list of applicable patents.

WO2021116949A1 - Egg replacement containing euglena-derived components
Assignee: NOBLEGEN INC.
Priority Date: 09 Dec 2019
Status: PCT publication

First claim:

A dry egg replacement composition comprising about 1% to about 100% Euglena- derived material, about 0.05% to about 70% additional protein source, and one or more additional ingredient, wherein the dry egg replacement composition comprises one or more functional property of a natural egg.

Abstract:

Embodiments herein are directed to egg replacement compositions, egg replacement emulsions, liquid eggs, liquid egg formulations, or egg replacement formulations and the use of each in a variety of food products, wherein the egg replacement compositions, egg replacement emulsions, liquid eggs, liquid egg formulations, or egg replacement formulations possess one or more functional properties similar to a natural egg.

Key Patent on Composition

WO2021219967A1 - Plant-based egg alternative
Assignee: ROQUETTE FRERES
Priority Date: 30 Apr 2020
Status: PCT publication

First claim:

Composition comprising a legume albumin and a pregelatinized starch in a respective ratio by weight of between 0.9/0.1 and 0.6/0.4, preferably between 0.8/0.2 and 0.7/0.3, even more preferably 0.75/0.25, and not comprising any non-starchy polysaccharide.

Abstract:

The present invention relates to an egg substitute and to a method for the production thereof, and to the compositions comprising said egg substitute. More specifically, the present invention relates to a composition comprising a legume albumin and a pregelatinized starch.

Key Patent on Composition

WO2021234293A1 - Microalgae-based egg substitute
Assignee: ALGAMA
Priority Date: 19 May 2020
Status: PCT publication

First claim:

Egg substitute based on microalgae, in powder form, characterized in that it comprises:

- from 40% to 90%, preferably from 40% to 80%, even more preferably from 50% to 75%, by total weight of said substitute of at least one non-microalgal vegetable flour and/or at least one non-microalgal vegetable starch, said flours and starches being chosen from: rice flour, corn flour, wheat flour, tapioca flour, lentil flour, quinoa flour, pea flour, millet flour, chickpeas, buckwheat flour, cornstarch, potato starch, rice starch, tapioca starch;
- from 8 to 30%, preferably from 10% to 30%, even more preferably from 12% to 24%, by total weight of said substitute of at least one non-microalgal vegetable protein, chosen from: dehydrated aquafaba, chia protein, rice protein, pea protein, broad bean protein, flax protein, mung bean protein, chickpea protein, pea protein, potato protein, lentil protein;
- from 1% to 15%, preferably from 3% to 15%, in an even more referred manner from 5% to 12%, by total weight of said substitute of at least one product derived from microalgae chosen from: microalgae flour, proteins from microalgae, lipids from microalgae, extracts of microalgae;
- from 0.2% to 10%, preferably from 0.2% to 5%, by total weight of said substitute of at least one non-microalgal plant fiber chosen from: oat fibers, wheat fibers, carrots, apple fibers, citrus fibers, lemon fibers, psyllium fibers;
- from 0.1% to 2% by total weight of said substitute of at least one thickening agent of plant origin chosen from: guar gum, xanthan gum, gellan gum, locust bean gum, gum arabic, tara gum, pectin, alginate, agar agar, carrageenan, cellulose and its derivatives.

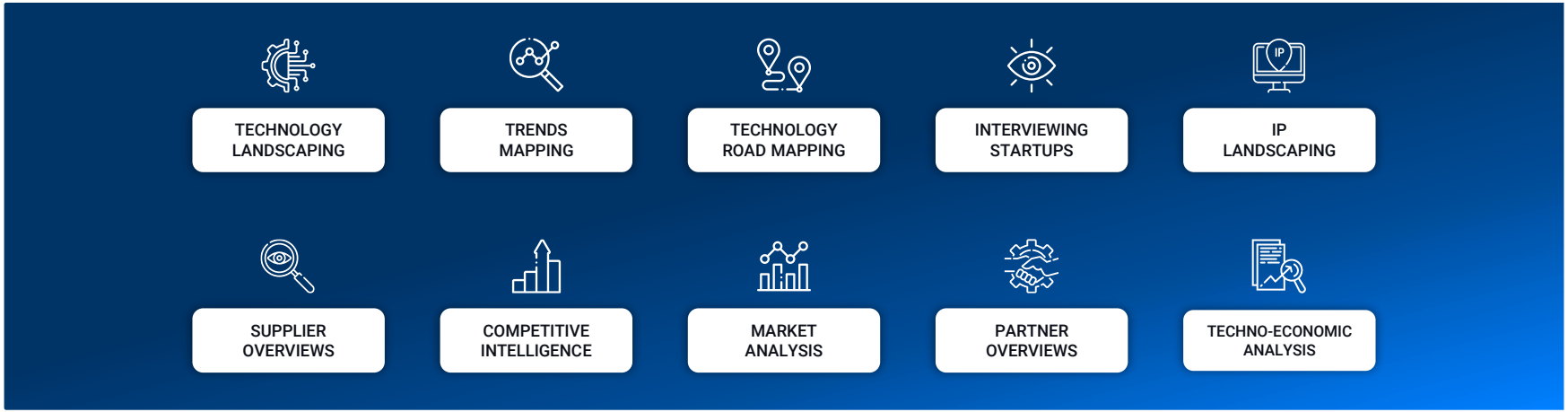
Key Patent on Composition - Cont'd

Abstract

The present invention relates to a microalgae-based egg substitute for, according to an embodiment, reducing the fat and sugar content of a food product incorporating same. The invention also relates to the method for obtaining the microalgae-based egg substitute, comprising steps of adding various compounds including a microalgae product. Finally, the invention also relates to the use of the egg substitute in a food product, a method for incorporating the egg substitute into the preparation of a food product, and the food product comprising the egg substitute.

Potential Next Steps

- ✓ PreScouter can look for more companies developing technological solutions for plant-based proteins based on your technical and business parameters
- ✓ PreScouter can conduct anonymous interviews with companies and researchers
- ✓ PreScouter can organize direct consultations between you and Subject Matter Experts (SMEs) in the space
- ✓ PreScouter can also provide an IP landscape around the topic

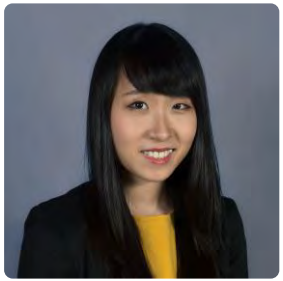


About the Authors

Gareth Armanious

PreScouter Technical Director

Gareth has been with PreScouter since 2015, and specializes in the Food & Beverage and Life Sciences industries. Since joining the PreScouter team, he has worked across multiple topics ranging from product and process improvement and development, and sustainability throughout the food and beverage industry as well as healthcare. Gareth's research background at the University of Alberta is in the biochemistry of membrane proteins in health and disease. Prior to joining the PreScouter team, he was a project coordinator for the Cancer Research Institute of Northern Alberta (CRINA).



Victoria Yeung

PreScouter Project Architect

Victoria is one of PreScouter's Project Architects specializing in the Food & Beverage industry. She holds a BS and MBS in Food Science from Rutgers University, where her research focused on identification of photosensitizers for the inactivation of foodborne pathogens. Prior to joining PreScouter, Victoria worked as a scientist at a Fortune 500 consumer packaged goods company, specializing in flavor technology and driving innovations across R&D.

Jorge Hurtado, PhD

PreScouter Researcher & Team Leader

Jorge supports PreScouter as an Advanced Degree Researcher helping provide clients with high-quality information and analysis about the latest insights into disruptive technologies, helping companies find new markets and remain competitive in their market niche. Jorge holds a MA in conservation and development, a PhD in Biology and Statistics, and a diploma in Green Economy from the University of Florida, Syracuse University, and Ryerson University; respectively.

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