



Clean Labelling

Natural Emulsifiers

Q4 | 2019

INDUSTRY PULSE



FOOD & NUTRITION
INDUSTRY INSIDER

FutureBridge

QUARTERLY ANALYSIS

Oct 2019 - Dec 2019

Product launches

Product categories mainly encompass yogurt, snacks, and baby foods

Patent

Players are patenting their innovative technologies for purification and processing to get a competitive edge

Research

Research activities to find a stable plant-based alternative is increasing

FutureBridge Insights:

- **Natural emulsifiers** have emerged as high ingredients that are being utilized in **variety of food products like dairy, beverage, and bakery**
- **Established players** like **BASF** and **ADM** are patenting novel ingredients and technologies that enables them to get a competitive edge in the market
- Research activities is increasing wherein universities like **Hubei University of Technology** and **Tarim University** are finding novel plant-based alternatives
- The **market for natural emulsifiers is increasing** as there is high demand for healthy clean label alternatives

Things to look out for:

- **Launch** of plant-based emulsifiers that use **fruits & vegetables** and to provide **health benefits** and deal with **challenges like cost**
- Use of **new purification and extraction technologies** for effective usage of natural emulsifiers
- Players tapping in to new **geographies** to target a wider audience and to **promote their flagship products**

Key players :



Note: Only top companies of this quarter are considered and all the logos, patents and research are hyperlinked to respective sources



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- Emulsifiers are added to **increase product stability** and **attain improved shelf-life of the product**. They should have **hydrophilic** and **lipophilic affinity** to keep the emulsion intact.
- Food emulsifiers have a variety of **functions including stabilization, reduction of surface tension** and to **modify the crystallization of fat**.
- Natural emulsifiers can be utilized in a variety of products like **beverage, dairy, spreads, and infant formulas**.

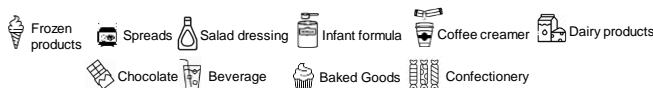
Natural emulsifiers are being opted by industry players to create a more complete clean label product

Natural emulsifiers: Introduction

- Emulsions usually consist of either oil **droplets suspended in an aqueous phase** or **water droplets in oil** and the function of emulsifiers is to **keep the emulsions intact**.
- Emulsifiers are **amphiphilic** molecules, which are used to form and stabilize emulsions.
- They are found in broad range of foods and they affect **many food qualities such as appearance, texture, reducing fat content, and shelf life**.
- Natural Emulsifiers include: **biosurfactants, phospholipids, biopolymers, and colloidal particles**.

Type	Benefits	Applications
Lecithin (Phospholipids)	<ul style="list-style-type: none"> • Rheology modification • Dough conditioner/ strengthener • Increased shelf life 	
Whey Protein (milk proteins)	<ul style="list-style-type: none"> • Emulsion stabilization • Increased shelf life • Enhanced flavor or texture 	
Casein (milk proteins)	<ul style="list-style-type: none"> • Emulsion stabilization • Thickening/ texturizing 	
Gum Arabic (glycoproteins)	<ul style="list-style-type: none"> • Emulsion stabilization • Thickening/ texturizing 	

(Categories: Chocolate & confectionery, Beverages & mixes, Dairy Products, Baked goods, Ingredients, Sauces & spreads)



Source: [Research Paper](#)

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- Health aspects like **maintaining bowel movement, lower cholesterol** etc. are **promoting factors** for natural emulsifiers.
- **Clean label demand** is **propelling force** for increased usage of natural alternative.
- **Taste and versatility** act as major disadvantages. There is a need for emulsifiers that **do not need to be used in combinations** and **can provide complete functionality**.

Clean label demand is one of the major driving factors for natural emulsifier market

Natural emulsifiers: Advantages and Disadvantages



Provide health benefits

Plant-based or natural emulsifiers can provide benefits as they contain fibre, can maintain bowel health, and lower cholesterol levels



Can provide multiple utilities

Works as dough conditioner, improves texture, improve fat dispersion, provide stability, and can inhibit crystallization



Provides a clean label

Natural alternatives provide a clean label and promote transparency and hence are being opted by entities



Not as effective and versatile as synthetic counterparts

Need to be used together with other ingredients in order to emulsify effectively



Taste and stability

Emulsifiers should have a neutral taste and should not provide a specific odor to the product. In addition to this there should be stability even at extreme environmental conditions



Costly

In comparison to synthetic emulsifiers the natural emulsifiers are more costly

Source: [Research Paper](#)

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- Established players like **General Mills** and **Kraft Heinz** are launching multiple products that utilize natural emulsifiers like **soy lecithin** and **whey protein**.
- There is high usage of natural emulsifiers in **dairy products** like **yogurts, creams, and cheese** as these products **require stable emulsions**.
- Lecithin and starch based emulsifiers are **conventional** and **traditional options** and there is still a need for **innovative plant-based ingredients that provide stability**.

In Q4 2019, soy lecithin was one of the most utilized natural emulsifier in snacks, bakery, and dairy products



Natural emulsifiers: Ingredients Q4 2019

Ingredient	Company (end-product users)	Product category	Product
Soy Lecithin	General Mills (USA) 	Snack/Cereal/Energy Bars	 Almond Granola Bars
Sun Flower Lecithin	Kodiak Cakes (USA) 	Baking Ingredients & Mixes	 Protein-Packed Chocolate Chip Muffin Mix
Whey Protein	Kraft Heinz (USA) 	Fresh Cheese & Cream Cheese	 Pumpkin Spice Cream Cheese Spread
Casein Protein	Kellogg's (USA) 	Meat Substitutes	 Garden Veggie Burgers
Starch	Ultima Foods (Canada) 	Spoonable Yogurt	 Fig Honey on the Bottom Yogurt
Egg Protein	Moranca Food (China)	Sweet Biscuits/Cookies	 Chocolate Flavored Cookies with Soft Filling

Source: Mintel



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- Emulsifiers with **high viscosity like potato fiber and bamboo flour** are ideal for bakery products like **bread, cakes, snacks, and frozen products**.
- Emulsifiers like **chickpea flour that have low viscosity** are ideal for **dairy products like yogurts and beverages**.
- After studying the characteristics it can be concluded that **mustard flour and chickpea flour** are the **most stable**, hence **can be exploited commercially**.

Could plant-based ingredients provide alternatives to synthetic emulsifiers?

Natural emulsifiers: Review on plant-based emulsifiers

Ingredient	Oil Droplet Size (µm)	Fresh Emulsion Consistency	Phase Separation			Emulsion after 7 days
			Sedimentation	Creaming	Syneresis	
Chickpea flour	2	Low viscosity, easy pourable	After 7 days	No	No	No
Bamboo fiber	4	Very high viscosity, paste like consistency, non pourable	No	No	After 24 hours	Yes
Potato fiber	8	Very high viscosity, grainy texture, non pourable	No	No	No	No
Peanut flour	15	Viscous liquid, easy pourable	No	No	After 14 days	No
Mustard flour	11	Very high viscosity, paste like consistency, non-pourable	No	No	After 7 days	Yes

*Other relevant plant-based emulsifiers include: cocoa powder, cocoa fibre, pea fibre, and rice flour

- Aspects like **sedimentation, creaming and syneresis** (release of moisture) were considered to test the characters of various plant-based ingredients. Various **factors like temperature, pH** etc. can also **affect the stability** of an emulsion.
- The consistency of emulsion was also noted in different ingredient and it was found that **mustard, bamboo and potato had high viscosity, which promotes high stability**.
- According to the review only **bamboo fiber and mustard flour remained an emulsion after 7 days** and hence can be utilized as **plant-based emulsifiers in variety of products**.

Source: [Research Paper](#)



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- Established players like **BASF** and **ADM** are filing **patents** to provide solutions for **challenges** like **cost** and **purification** processes that can **increase effectiveness**.
- Players are focused on developing **new technologies** or **processes** for **purification**, **increasing the stability** by **overcoming biological barriers** like **pH**, **acidity**, and **enzymatic activity**.
- Various protein isolates like **wheat**, **soy**, **rice**, and **potato** can be **utilized as emulsifying agents** in bakery products.


Established players are patenting technologies and ingredients to deal with challenges such as cost and effectiveness

Natural emulsifiers: Patent Analysis

Title of Study: Protein hydrolysates as emulsifier for baked goods

Data Source
Secondary
Sci. Pub.
Patent

Innovation
Ingredients
Technology



Technology Overview Application Number- WO2019081706A1
Publication Date: 02 May 2019

The patented describes the use of protein hydrolysate as a natural emulsifier for the preparation of baked goods like cakes, fat free cakes, wherein the molecular weight of the protein hydrolysate is between 600 and 2400 Da and the solubility of the protein hydrolysate is at least 85 %. The protein is selected from wheat, soy, rice, potato, pea, sunflower, rape seed, lupin and milk protein. Cake structure evaluation, solubility test, degree of conjugation, evaluation for bitterness was done and wheat protein isolate and casein were concluded to be best.

Value Addition	Product Application
<ul style="list-style-type: none"> The natural emulsifier will help in cost reduction and it allows to generate a fine foam, which can stabilize foam under stressful environments and results in a higher cake volume compared to conventional emulsifiers. 	<ul style="list-style-type: none"> Cakes Fat-free


Inventor

Thrandur Helgason, Dieter Hietsch, Peter Horlache, Jochen Kutscher, Selina Marz

Title of Study: Processes for fractionating phospholipids

Data Source
Secondary
Sci. Pub.
Patent

Innovation
Ingredients
Technology



Technology Overview Application Number- US10392410B2
Grant Date: 27 Aug 2019

The patent describes a processes of purifying or fractionating phospholipids that can be used as natural emulsifiers. The process comprises mixing a solvent with a phospholipid containing material (miscella, molasses, lecithin, and combinations of any thereof) thus producing a feed; placing the feed in contact with an adsorbent, such as polymeric resin; eluting atleast one phospholipid from the adsorbent with an elution solvent; collecting the eluted; allowing a precipitate to form in the eluted, at least one phospholipid and the elution solvent; removing the precipitate from the eluted; and concentrating at least one phospholipid in the elution solvent.

Value Addition
<ul style="list-style-type: none"> Current methods of purifying use lecithin at starting point, its drawback is that higher value phospholipid may be obtained, but value of the lecithin is lower value since it has been depleted of the high-value phospholipid. This new method provides improved method of fractionating and/or purifying phospholipids, yet keeping the value of the various products associated with the process.

Inventor

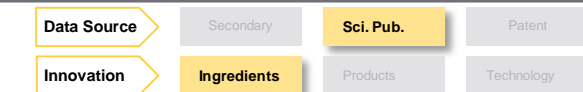
Greg Dodson, Doug GeierJohn, G. SoperKristen Eilts

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- Fruits and vegetables can be used as natural emulsifiers as they are cost-effective solutions that promote clean labelling as well as environment sustainability.
- The study revealed that pomegranate peel can be used as an emulsifier as it shows high stability at different pH and Na⁺ concentrations.
- This can be further utilized as a new ingredient at industrial scale by entities as it can enhance the emulsion properties.

Researchers are studying properties of fruits and vegetables that can be used as potential emulsifying agents

Title : [Study on the Emulsifying Properties of Pomegranate Peel Pectin from Different Cultivation Areas](#)



Pomegranate peel pectin can be used as a natural emulsifier and to test its properties samples were collected from Chinese Xinjiang, Sichuan and Yunnan provinces (YNPP), through rheometer, interfacial rheometer etc.

The properties were tested by means of Fourier transform infrared spectroscopy (FTIR), rheology and interface research technologies. The composition and structure of pectin was observed and it was concluded that pectin acetylation was highest in YNPP (58.74%)

The analysis of emulsification and storage stability of pectin was tested and all three regions showed good emulsifying properties and there was no creaming

Other analysis like rheology analysis, pH stability, influence of purification treatment, analysis of adsorption components. Emulsion droplet size were also measured

Source: [Journal of Dairy Science](#)

Conclusions: The study found that the pomegranate peel pectin emulsions in Xinjiang, Sichuan, and Yunnan have smaller particle sizes. The emulsion showed high stability under extreme environments such as pH, Na⁺ concentration, etc. but the stability was affected by freeze thaw cycle. It was concluded that emulsifying properties of pomegranate peel pectin show promising results and can be utilized for the future research as cost-effective solution.

Authors: Hu Zhuang, Shang Chu, Ping Wang et.al.

Universities associated with:

- Hubei University of Technology, China
- Tarim University, China

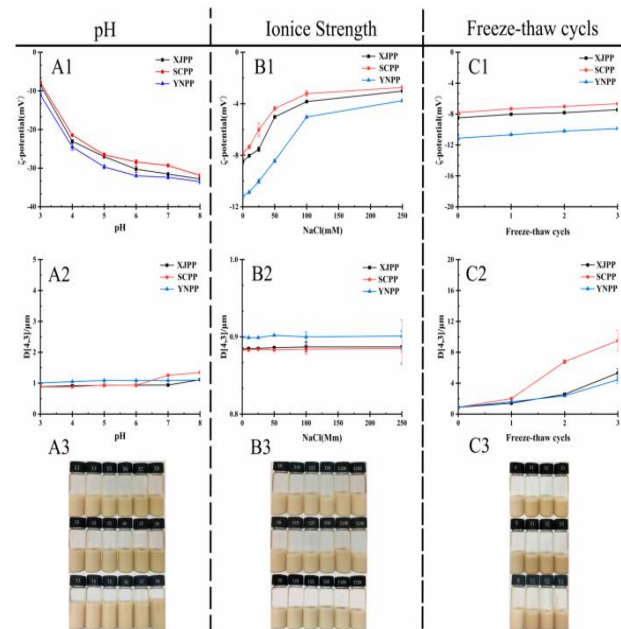


Figure 1. Influence of pH on emulsion ξ -potential (A1), average particle size (A2), emulsion stability (A3), Na⁺ on emulsion ξ -potential (B1), average particle size (B2), emulsion stability effect (B3), freeze-thaw cycles on emulsion ξ -potential (C1), average particle size (C2) and emulsion stability (C3). The emulsion was observed after seven days of storage at room temperature

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- **Phytoption** has received multiple awards for its **innovative ingredients** that can **enhance the quality of products**, and can be **utilized in food, beverage, pharmaceutical, agriculture, and cosmetics**.
- The company manufactures a product called **Floura** which is **gluten-free, non-GMO, and chemical-free** and the product has **multiple applications in dressings, desserts, and bakery**.

Phytoption is an innovative startup that has received multiple awards and recognitions



Natural Emulsifiers: Standout startup


United States
2011

PRODUCT PORTFOLIO

Floura, Phytyglycogen and SoluPhy

INVESTMENTS

Purdue University, Grants and Awards



RECENT FUNDING

Seed funding- Dec 20, 2018 (\$250,000)

PATENTS

Dendritic emulsifiers and methods for their use and preparation- [WO2011062999A2](#)



FOUNDER

Joanne Zhang (Phytoption is a spin-off company from Purdue University)

AWARDS

National Science Foundation SBIR-TECP, BioCrossroad Business Venture Competition National Science Foundation SBIR Phase I & STTR Phase II, and 2nd place in the Global Food and Health Innovation Challenge

COMPETITORS

DESCRIPTION

Floura is a natural emulsifier and stabilizer. It is non-GMO, gluten-free, chemical-free. Can be used in flavors, colors, milk shake and plant-based beverage, sauce and dressing, frozen dessert, bakery.

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