

THE BARLEY PROTEIN BREWING STORY

By Henk Hoogenkamp

The evolving plant protein and fiber trend present challenges and opportunities for the processed meat industry. Even though health and wellness in processed meat products are not really seen as trending, consumers do pay attention and desire traditional flavor and texture, as well as keeping a clean & natural label.

Currently, the most dominant plant protein ingredients are soy, wheat, and pea. Multiple new plant protein ingredients have been introduced over the last 10 years. While some have intrinsic flaws, others are a great welcome to the toolbox of food formulators. Barley protein is now gaining traction and is creating trade awareness. Consuming foods that are better for health and ecologically sustainable for the planet is often linked with alternative protein sources such as the emerging barley protein ingredients. These “grain solutions” are shifting away from the traditional and often unsustainable animal-based protein and even the heavy-loaded soy sausages.

Barley grains have a long history of inherent goodness which now have evolved in a series of functional and nutritious plant-based ingredients. Especially barley protein is emerging as a challenger for the soy and pea domination.

“Barley flour” is a meaningful option for the world-famous British breakfast sausages. It’s

“all-plant” equivalents are in need for a protein and fiber-rich bulking ingredient that maintains succulence and texture.

Barley protein delivers a serious punch as a complete protein product, containing all the highly nutritive amino acids needed, as well as showing great application performance and organoleptic properties. The sustainability premise of barley is simple: the



grain doesn’t need much to grow and is hailed as a sustainable crop compared to the deforestation-driven soybean cultivation in the Amazon region.

Barley Protein Applications Overview

- British breakfast sausage
- Burgers & Meatballs
- Hybrid formulated meat and savoury snacks
- Extruded protein granules & crumbs

Native barley protein provides emulsifying and interfacial film-forming properties reducing the tension between water and oil droplets. The high fat encapsulation efficiency of barley protein is stable at various cooking or retorting temperatures, while it reduces oxidative degradation which may increase the shelf life of both shelfstable and frozen meat products.

These dry-fragmented non-starch barley ingredients have double-boosting performance providing essential proteins combined with the gastrointestinal the benefits of water insoluble dietary fiber for prebiotic health.

The Road to Success

The road to introduce a new plant protein ingredient is quite long. From early introduction to first order can take a minimum of 12 months, although a 2-to-3-year evaluation, testing and validation wait is more realistic. The most likely way forward is to offer food companies alternative protein solutions that clearly give application performance and cost benefits.

Although new introductions of plant protein ingredients take time before the protein is used in formulated foods and beverages, plant nutrition has a great tailwind that helps the speed of market introduction. Now that plant nutrition is trending, it can be expected that the go-to-market time for both native and soluble barley protein will be on a much shorter trajectory. Of course, the

introduction of a new plant protein ingredient still requires flawless marketing strategies in all areas of execution: application, health capabilities, as well as pro-active and solution-driven, product availability through distribution channels and competitive value propositions.

Plentiful Global Resources

EverGrain is on a mission to redirect barley spent grain nutrition into valuable protein ingredients. The company has a broad barley-based ingredient portfolio and is gaining recognition by using science-enabled solutions for tasty, healthy and sustainable food applications.

A rough estimate of the global availability of barley-spent grain is 9 million metric tons. This enormous quantity translates to a potential of about 3.4 million metric tons of functional barley protein. Through its association with AB InBev, EverGrain can access every year some 1.4 million metric tons of spent barley via the beer brewing process. This makes brewers spent barley an ideal upcycle grain showing a high bioavailable nutritional profile. The very first barley protein isolate facility is now on stream in St. Louis MO while the Belgium factory is not far behind.

The four pillars on which plant protein ingredients build are great taste/flavor, function, nutrition, and cost. Exploring innovation-driven research to improve taste, texture and color is therefore a main part of the transformation

needed to feed a growing global population sustainably.

Going forward, it is anticipated that protein ingredient certifications will become a main qualifier for formulated foods, including displaying packaging label claims. The same is true for signaling protein ingredients with important parameters such as carbon footprint,

water & land use, and avoidance of deforestation. Both upcycled nutrition and performance, as well as ecological sustainability will move forward in tandem to meet the increasing global demand for plant protein ingredients.

There is no doubt that plant protein-formulated foods and beverages are getting more essential for

the health of both humans and planet Earth. Besides soy and pea protein, the most interesting emerging plant proteins are mung bean, fava, chickpea, oat, barley, canola and sunflower. Plant proteins need to not only fulfill important parameters such as yield per hectare, land availability for cultivation, water requirements, and fertilizers, but also take the protein properties and their sidestreams into consideration.

Upcycling Performance

Barley is a pragmatic choice to convert spent grain into an emerging source of new plant protein solutions for use in a wide range of formulated food products. Seen from this perspective, barley is a welcome source to help alleviate possible future supply-chain protein shortages for a world that is in urgent need to transition into more sustainable food choices.

The residual side-stream protein still has unique features as these components can be naturally captured and modified for upstream protein and fiber solutions for many foods and plant meat applications.

The future posterchild of plant-based products is the ongoing transition of barely grain and spent barley grain into a premium organoleptic and nutritional ingredient.

Barley, and especially barley-spent grain, is emerging as a formidable alternative to the current selections of plant protein sources of soy and pea. Beer-brewing companies around the world have vast amounts of barley-spent grain available that otherwise will be sold as a source of high-protein feedstock.

In recent years, barley spent grain has undergone a “trash-to-treasure” transformation and proprietary technology refinements now allow valuable macro- and micro components to be captured for use in a wealth of food products, including beverages and plant meat foods.

that involve temperature, pH, alkaline, acids, as well as enzymes to modify protein performance.

Physical separation is a time-tested process with dry/air fragmentation and follows steps such as de-husking, sieving, heat stabilizing, and final grinding. Physical plant



Protein Recovery Methods

Both physical and chemical methods can be used to obtain the separation of the various compounds that are embedded in the plant substrate. Chemical processing entails the use of a sequence of treatments

treatment systems are usually most cost efficient. Because of the high demand for “green & clean” food labels, air fragmentation has become a popular choice to maintain the all-natural characteristics of the individual plant protein or plant fiber ingredient.

The arrival of barley protein ingredients at the world scene can be seen as a functional plant protein alternative across the entire value chain that will ultimately provide consumers with a great-tasting, nutritional and environmentally sustainable product. As protein know-how moves ahead, it is expected that emerging technologies like gene editing and artificial intelligence (AI) will speed up performance improvements such as water binding, fat binding, and color, flavor and taste sensations.

More than Just Protein

One of the main problems for companies that promote plant protein ingredients is to find commercially viable options to successfully sell the remaining carbohydrates and fiber. The valorization of these components often makes or breaks the successful business case for the protein component. The latter is the main reason why soy is leading because its high oil content as well as the lecithin are in great demand globally.

Fine Tuning by Design

The use of enzymes -such as protease, amylase and bromelain- is also termed hydrolyzation which is the process of cutting or splitting the protein chain into predetermined chain lengths. As a rule of thumb, the higher the enzyme dosage and the longer the incubation or holding time at preset temperatures, the higher the protein or separated amino acids content. Yet, a possible negative side effect of longer incubation is that amino acids and peptides are formed with a bitter note. Seemingly small processing changes

can have significant influence in the protein performance such as being easy dispersible, gelling- and emulsification properties.

Many plant protein ingredients have undesirable flavors, like earthy or beany notes. Barley-spent grain has a light sweet taste that needs little masking to deliver authentic flavor in formulated food. The patented processing and technology deliver a premium quality barley protein ingredient that is both nut and lactose free.

The arrival of designer enzymes now allows the target and modification of the specific functionalities of plant protein ingredients. Most of these protein changes in performance and properties are:

- Reduced bitterness
- Create umami flavor
- Create bioactive peptides
- pH acidity stability
- digestibility
- dispersibility
- solubility
- reduced allergenicity
- gelation
- emulsification
- salt sensitivity
- temperature stability
- salt tolerance
- non-dusting
- non-lumping

A Welcome Biodiverse Protein

Protein is essential to proper nutrition. Barley protein is a single ingredient offering dual-function solutions for improved nutritive value and formulation challenges. Barley protein is an excellent source of essential amino acids, and especially the branched-chain amino acids (BCAAs) are considered impressive. Barley protein

therefore compares favorably to whey protein and, when blended with whey protein and/or infused with lysine or leucine, a DIAAS of 1.00 can be reached.

Beer brewing removes the soluble carbohydrates, hence most insoluble nondigestible fiber remains. These remaining fibers are closely intertwined which promotes good intestinal health with little or no bloating and other digestive problems. One of the main advantages of barley-spent grain is that most of the starch component is already removed during the beer brewing process. This will greatly improve the economics of scale. Barley-spent grain has significant cost advantages compared to soy and pea protein.

A Flashback

The introduction of a new functional or dietary plant protein ingredient can have a long timeline. Take for example, soy protein concentrate or soy protein isolate, which first became available in 1954 but only gained global success in 1990 when the price of dairy casein became prohibitive for use in processed meat products. Later examples are pea protein and potato protein. It has taken the initial pea protein companies at least 20 years to finally gain recognition and market breakthrough.

In 2010, pea protein became the darling of the consumer sympathy simply because of the negativity surrounding soy protein blamed for irresponsible growing practices such as destruction of wildlife and deforestation, not to mention the botched attempts to elevate soy proteins as a pseudo-pharmaceutical ingredient for heart health, cancer and alleviating PMS in women.

Potato protein had a very slow start and became close to folding the business. Fortunately, potato protein arrived at Impossible Foods just at the right time in their search for a gelling protein that could duplicate the properties of whey protein. The rest is history: potato protein is now in high demand and with limited global availability, this plant protein commends astronomical high pricing.

The Main Factors Driving this Ecological Protein Transition are:

- animal welfare
- wellness & lifestyle (fashion, trending, social media)
- environmental concerns, including climate change concerns

The younger generation of consumers prefer food and beverage products that are made with sustainable ingredients that they recognize and trust. The plant-based barley grain has positive name and health perceptions with all the ace-cards to become trending in a diverse range of applications such as sausages, burgers as well as the plant-based meat alternatives.

Plant Choice

When everything is said and done, for most plant protein ingredients the cornerstone of its business is still usage in processed meat products and plant meat foods. Basically, the plant protein ingredients are either used as a dry powder to build emulsion structure and/or in extruded form as an alternative for ground lean meat replacement. It is important to distinguish two entirely different market segments for these plant protein ingredients: in many countries textured plant



protein ingredients are used to aggressively reduce food costs by replacing expensive lean meat. For example, the Burger McDo is the best-selling hamburger at McDonald’s Philippines showing a plant protein inclusion level well over 50 percent. These types of products are typically described as “hybrid” i.e., a blend of lean meat and hydrated textured plant protein.

For plant meat foods the objective is not primary driven by food cost reductions, but rather answering to the sharply increasing consumer categories for vegetarian or vegan lifestyle choices, including dietary, ethical, animal welfare and sustainability concerns

Barley Texturizing Solutions

EverVita Prima is a “clean label” and non-GMO vegan barley protein offering functionality that are made through a mechanical process via upcycling what was once seen as a by-product of the beer-brewing industry. EverVita can improve viscosity and enhance moisture retention and freshness prolongation in a wide range of foods, while boosting structure and texture in plant-based meat alternatives. Both in coarsely and emulsified meat and plantmeat

products the water holding capacity of the EverVita Prima brand is 1:3.5.

The EverGrain company mission is to expand the plant ingredient portfolio with a range of high-quality barley protein products. EverVita Prima brand barley protein ingredients are “beer native” proteins that have been made using dry fragmentation showing a protein content of 38 percent. These ingredients are both available in powder, as well as in extruded form to build structure, mimicking meat texture and moisture release. Extruded products have a wide range of ingredient options, including combinations of barley protein and wheat gluten, providing lowcost options for both processed meat and “plant-meat products. ■

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