

DuyGrain®

Upcycled Barley Protein

Cost-efficient proteins & fibres

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Benefits across food segments

Increased nutrition



- ✓ High in protein
- ✓ High in fibre
- ✓ Low in carbohydrates
- ✓ Optimal amino acid profile

Lowering scope 3 emissions*



- ✓ Low CO2 emissions
- ✓ Low land-use
- ✓ Low water use
- ✓ Screening LCA-available

Functional properties



- ✓ Great water & oil holding capacity
- ✓ Complementary flavour profiles
- ✓ Natural colourant for meat or bread
- ✓ Improves Nutri-Scores

Cost-efficient



- ✓ Replace expensive ingredients
- ✓ Extend shelf-life freshness
- ✓ Increase dough weight & output
- ✓ Enhance seed attachment

*Based on indicative result from screening LCA showing DuyGrain® can have a lower footprint than conventional ingredients it may replace. Actual impact depends on product formulation, substitution rates, and supply-chain conditions.

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DuyGrain®

Upcycled Barley Protein

Duynie's Upcycled Barley Protein called DuyGrain® is an innovative plant-based protein made from brewers' spent grain. Due to high amounts of proteins & fibres along with healthy unsaturated fats the ingredient is highly nutritious. With a wide variety of applications with functional benefits and being sustainably sourced it's the ultimate future protein, available today.



Benefits of DuyGrain®

- ✓ **Replace:** beef, pork, cocoa, flour, malt, soy & pea protein
- ✓ High proteins & fibres help with **claims & Nutri-Scores**
- ✓ Functional properties make DuyGrain® **cost-efficient**
- ✓ Upcycled plant-based origin may **lower scope 3 emissions***
- ✓ **Large scale** year-round availability & consistent quality

Applications

- Bread & dough products
- Pastries, pies & tortillas
- Cereals, crackers & nutri-bars
- Burgers, sausages & minced
- Meat alternatives
- Pasta, soups & sauces



The protein transition

Current challenges

Protein intake remains a top trend in food since consumers associate protein with overall health and wellbeing¹. At the same time, they increasingly question where that protein comes from. Especially younger generations see plant-based proteins as more natural than animal proteins². This creates clear tension. Demand for protein is rising, but conventional protein supply chains are under strain.

Animal-derived proteins face pressure from emissions targets, land use constraints and volatility in feed and energy prices³. Plant-based proteins, while widely available, bring their own challenges around cost, sensory performance and functional stability⁴. As a result, food manufacturers are navigating a narrow path between nutrition, performance, sustainability and margin protection.

Industry data from Innova shows that European consumers increasingly accept alternative protein sources, but only when taste, texture and price remain familiar⁵. Sustainability alone is rarely enough to drive purchases alone. Protein solutions must perform technically and economically. At the same time, regulations and retailers are accelerating change. Scope 3 emissions reporting, waste reduction targets and clean-label expectations are reshaping ingredient strategies across food categories⁶. This marks a shift from protein quantity to protein quality in context. Not just what protein delivers nutritionally, but what it enables across the value chain.

What the market needs

The protein transition is often seen as a move from animal to plant. In practice, it is broader and more pragmatic. It is about using existing resources more efficiently, reducing dependency on volatile raw materials, and creating protein solutions that fit the needs of a growing global population⁷.

30% of global consumers are willing to pay more for healthy food.

78% of food business think climate action is very important.

Source: Euromonitor: Rethinking food ingredients⁹
December 2024

The EU Smart Protein project goal highlights this. It validated resource-efficient, cost-effective and healthy plant proteins by future-proofing protein supply chains, with positive impacts on the bio-economy, environment, biodiversity, human nutrition, food and nutrition security and consumer acceptance⁸. One of the validated solutions was upcycling plant-based proteins. Though often seen as niche concept, it has now proven to be a realistic large-scale solution. The next challenge is to translate this into simplicity for manufacturers: providing protein solutions that reduce complexity, perform consistently across applications, support nutrition and functionality, and are available at industrial scale without relying on new agricultural inputs.



DuyGrain® matches that need

DuyGrain® sits precisely at this intersection. It is not a response to a trend, but a response to a structural shift in how protein is valued. Produced from brewers' spent grain (BSG), DuyGrain® is a plant-based protein ingredient derived from an existing food-grade co-product stream. That origin matters. It means no additional land use, no dependency on harvest cycles, and a stable, predictable supply. From the start, it addresses one of the biggest pain points in today's protein market: uncertainty.

Beyond its nutritional profile, DuyGrain® delivers functional value. Its natural protein and fibre composition supports water binding, texture and is applicable across multiple food applications. This functional contribution translates into cost efficiency and clean-label formulations.

Most importantly, DuyGrain® reframes protein from a single-purpose ingredient into a value creator. It allows manufacturers to improve nutritional positioning, reduce environmental footprint and optimise cost-in-use at the same time. Exactly what the market needs.

DuyGrain® in 3 concepts

Concept 1: Meatballs with 5% DuyGrain®



- ✓ 25% reduced meat content
- ✓ 18.8% lower cost-in-use
- ✓ 469% increase in fibre & stable in protein
- ✓ 21.7% fat reduction
- ✓ Add savory taste & firm texture
- ✓ May reduce scope 3 emissions*
- ✓ From Nutri-Score E to D

Ingredient	Grams	%
DuyGrain®	12.5	5.0
Minced meat	137.5	55.0
Egg	29.0	11.6
Panko	24.2	9.7
Water	30.8	12.3
Potato starch	7.5	3.0
Union	5.0	2.0
Seasoning	3.5	1.4
Total	250.0	100.0

Advice

We advice an inclusion level of 2-5% in recipe and further optimise (in add %-levels) from there. Start low and gradually increase towards desired result.

30% of UK consumers see their finances as healthy.

Just **6%** see cost-of-living crisis no longer as a problem.

Source: Mintel Market Dynamics - UK 2025: processed poultry & red meat¹⁰



Preparation method

1. Cool down the materials/environment to 4-7°C
2. Pre-mix the chilled meat for 4 minutes at low-medium speed
3. Add the egg, mix again at low speed for 1 min
4. Add the pre-mixed powders, mix again at low speed for 1 min
5. Add the water and onion, mix again at low speed for 1 min
6. Cool the mixture down to 4-7°C
7. Weigh the meatballs to create 20g per meatball (+/- 0.5g)
8. Freeze the meatballs in the shock freezer for minimum of 30 min
9. Prepare in frozen condition at 220°C hot air oven, for 11min

*Based on indicative result from screening LCA showing DuyGrain® can have a lower footprint than conventional ingredients it may replace. Actual impact depends on product formulation, substitution rates, and supply-chain conditions.

Concept 2: Whole wheat bread with 7% DuyGrain®



- ✓ Replace malt/colourant or wheat flour
- ✓ **7.9%** lower cost-in-use
- ✓ **6.1%** increase in protein & **8.2%** in fibre
- ✓ **11.7%** carb reduction
- ✓ Increase total dough weight by **8.4%**
- ✓ **47%** better seed attachment
- ✓ Increased shelf life freshness
- ✓ May reeduce scope 3 emissions*
- ✓ From source of to rich in protein claim

Ingredient	Baker's%	%
DuyGrain®	7.0	3.7
Whole weat flour	88	47.1
Bread improver	2.0	1.1
Hard bread improver	1.5	0.8
Seed mix	5.0	2.7
Instant yeast	0.6	0.3
Salt	1.5	0.8
Water	81.4	43.5
Total	187.0	100.0

Advice

We advice an inclusion level of 2-10% (on bakers' percentage) in recipe changes or replacement and further optimise (in add %-levels) from there. Start low and gradually increase towards desired result.

36% of UK consumers prioritise bread with **high fibre**.

37% are interested in bread with **high protein** content.

Source:

Mintel Market Dynamics - UK: Bread 2025¹¹



Nutrition (g/100g) 0% 7% Baker's

Energy kcal	1022.2	977.4
Energy kJ	243.3	232.8
Fat	1.8	2.1
Saturated	0.4	0.4
Carbohydrates	40.7	36
Sugars	1.7	1.7
Starch	39	34.3
Fibre total	7.9	8.3
Protein	11.8	12.6

Concept 3: Meat alternative with 4.5% DuyGrain®



- ✓ 25% reduction in soy protein
- ✓ 10% lower cost-in-use
- ✓ Lower energy cost to produce TVP
- ✓ 19.3% increase in fibre
- ✓ High in fibre & protein claim
- ✓ No masking flavours needed
- ✓ Reduced typical 'plant flavour'
- ✓ Lower in kcal & sugar
- ✓ May reduce scope 3 emissions*

Ingredient	Grams	%
Soy/DuyGrain® TVP*	34.1	17.1
Water	126.3	63.2
Barley Extract	0.2	0.1
Rapeseed oil	11.1	5.5
Methyl cellulose	3.6	1.8
Potato starch	6.2	3.1
Psyllium fibre	4.0	2.0
Seasoning	14.3	7.1
Lactic acid	0.2	0.1
Total	200	100.0

*TVP made in ratio Soy:DuyGrain®; 75:25

26% of German consumers say **low price** is a top factor when buying meat substitutes.

17% mention **high fibre**.

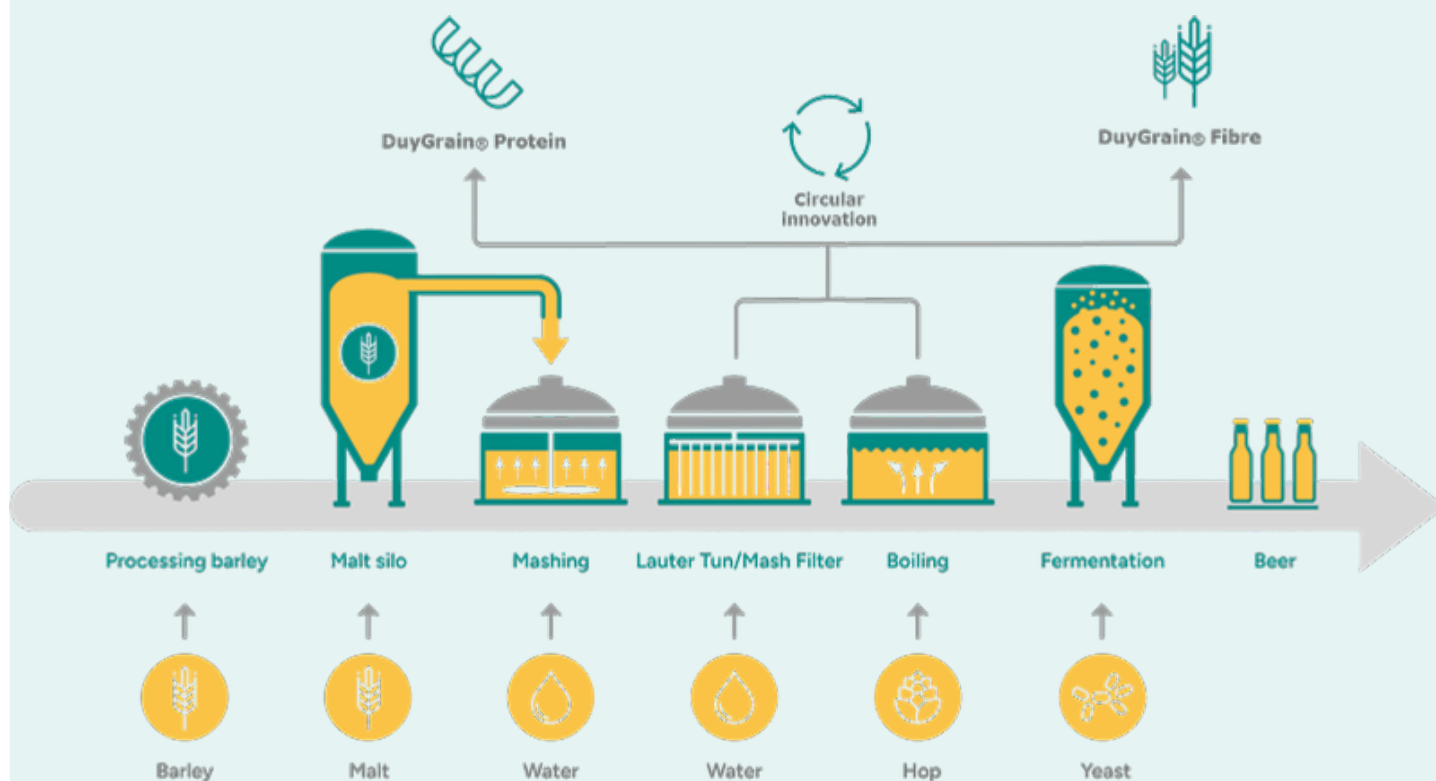
Source: Mintel Market Dynamics - Germany meat substitutes 2025¹²



Preparation method

1. Rehydrate TVP with water and Malt extract for 30min.
2. Mix oil with Methylcellulose for 1min. on high speed (kitchen mixer)
3. Slowly add ice water within 2min. while mixing, to form the binder phase
4. Add the binder phase to hydrated TVP, mix for 2min. at low speed
5. Pre-mix the powder ingredients (starch, fibre, seasoning)
6. Add pre-mixed powders to the TVP/Binder phase, mix for 2 min. at low speed
7. Add the lactic acid gradually during the last 30s of mixing
8. Fill the mixture with sausage filler in desired thickness and weight
9. Heat in oven on perforated tray: hot air, low steam, 12 min at 95°C
10. Transfer to shock freezer for minimal 30min
11. Pack as desired (e.g. vacuumed and sealed bags)

How DuyGrain® is made



Nutritional information

	(g/100g)
Energy	1786 kj 427 kcal
Protein	50.0
Dietary fibres	26.0
Fat	17.0
Saturated	5.0
Mono unsaturated	1.9
Poly unsaturated	10.1
Trans	0.05
Cholesterol	0
Carbohydrates	8.5
Sugars	<0.5
Salt (NaCl)	<0.5
Sodium	8.0 mg

Microbial information

	Target value (cfu/g)
Total plate count	<10.000
Enterobacteriaceae	0
Escherichia coli	Negative
Yeast	<250
Moulds	<250
L. monocytogenes	Absent/25g
Salmonella spp.	Absent/25g
Bacillus Cereus	<5.000

Product information

pH	5.5-6.5
Moisture	<8%
Sensoric	Brown powder Grainy taste
Particle Size	Dv (10): 23.3 Dv (50): 60.1 Dv (90): 117.5

Due to natural variations these specs are indicative, minor variations may occur

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Duynie

Creating new value

Duynie is the European market leader in the valorisation of co-products from the food, beverage, and biofuel industries. We continuously innovate production techniques to develop circular ingredients focused on helping the food industry reducing emissions (scope 3) and move towards a more sustainable future. Our food ingredients are made from 100% co-products, meaning they are sustainable from the start and add new value to the food industry. Our constant pursuit of the highest quality, most sustainably produced co-products, combined with our industry-leading expertise and large partnerships, help us to guarantee the supply of circular ingredients to the food industry today and tomorrow. In turn, helping you to meet your sustainability and business targets. Duynie is part of agricultural cooperative Royal Cosun.

Let's innovate together

The advantages of DuyGrain® vary by application. Ranging from hybrid meat burgers to brownies, and from vegan sausages to tortillas. With our deep ingredient expertise our application specialists are ready to help you seamlessly integrate DuyGrain® into your products.

Whether your goal is to: incorporate (more) proteins and fibres, reduce scope 3 emissions, improve Nutri-Scores, lower fat content or enhance protein and fiber claims, our experts are confident and committed to finding the right solution for your challenge.

Interested in the possibilities?

Please [contact us](#) or visit [our website](#).

