

Unlocking the Next Generation of Dairy & Alternatives

Clean-Label Processing with Enzymes

Breaking Boundaries: Dairy and Plant Based Synergies

Food Focus Thailand 20226

At Novotel Future Park Rangsit

September 10th , 2026

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Regional Manager of Application Development

Amano Enzyme Asia Pacific Co., Ltd.



Amano Enzyme

Amano Enzyme, as a global company, has been researching natural's enzymes with pioneering spirit to develop and manufacture microbial enzymes since 1948

The Three Synergies - Make a better world with Japanese biotechnology

Food × Medical application



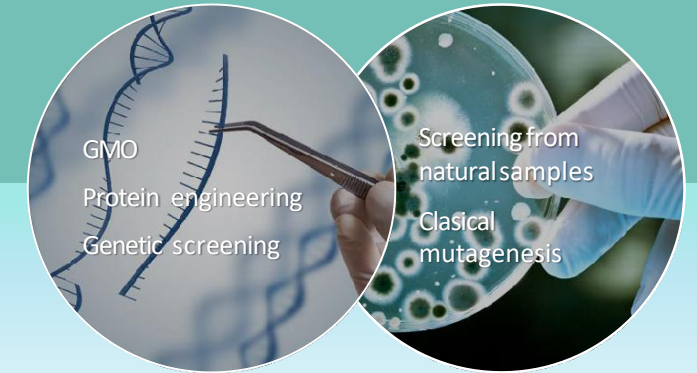
Leveraging our expertise in medical and food areas to develop innovative applications with consistent and high quality

Koji × Liquid fermentation



Enabling the production of a wide range of unique products with koji and liquid fermentation and production technology

Modern × Classical biotechnology



Differentiating and creating a unique value proposition with modern and classical biotechnology

ENZYMES WITH UNLIMITED POSSIBILITIES

We only identified 0.01% of all microorganisms

0.01%

Global architecture, local application

Whether engineering high-yield meat stocks, enhancing umami and kokumi profile with debittering or producing bioactive compounds, Amano Enzyme delivers dedicated technical support and reliable supply chain across North America, Europe and Asia



Quality Assurance

Delivery consistence with high quality that compliance worldwide

**Manufacturing the products
with consistent and high quality**

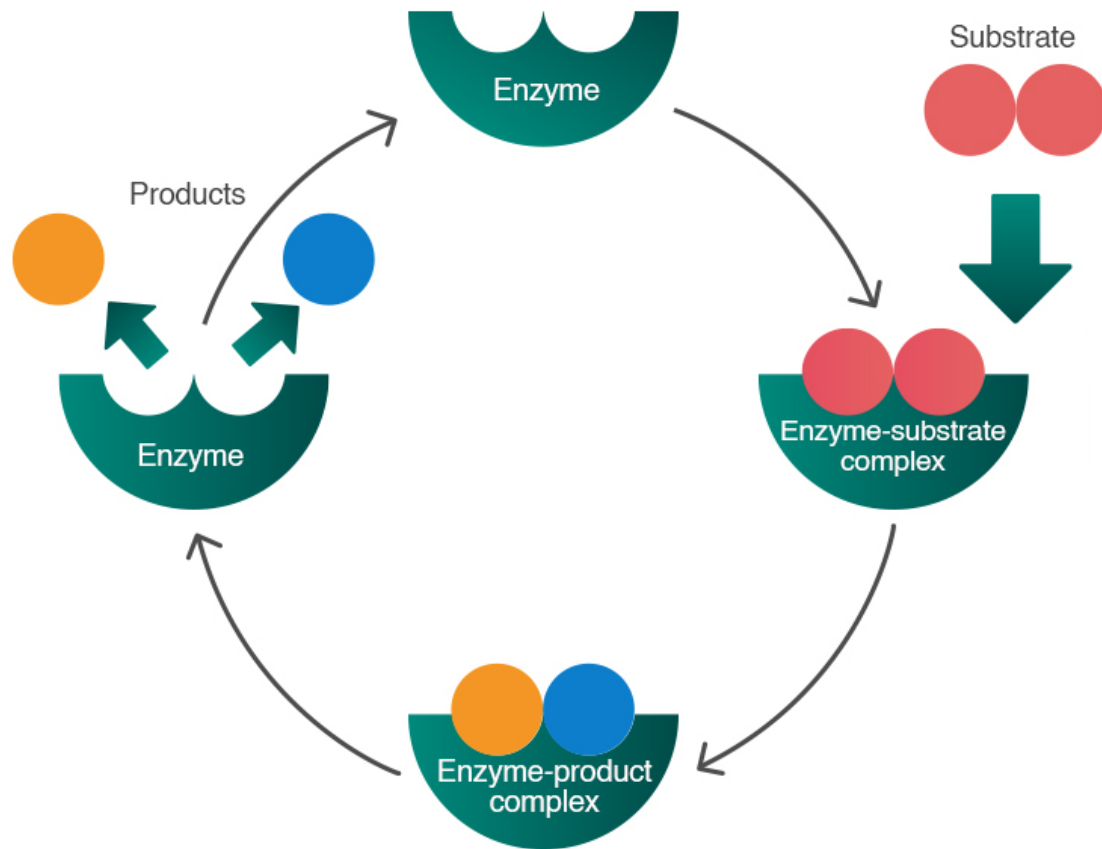
- GMP for API
- FSSC22000
- ISO13485
- ISO14001
- Regional regulatory requirements



Meet various food product requirements



What are Enzymes?



Natural

They are natural and are found everywhere. They manage every biochemical reaction in human body



Protein

They are made up of small amino acids strung together in a linear polymer

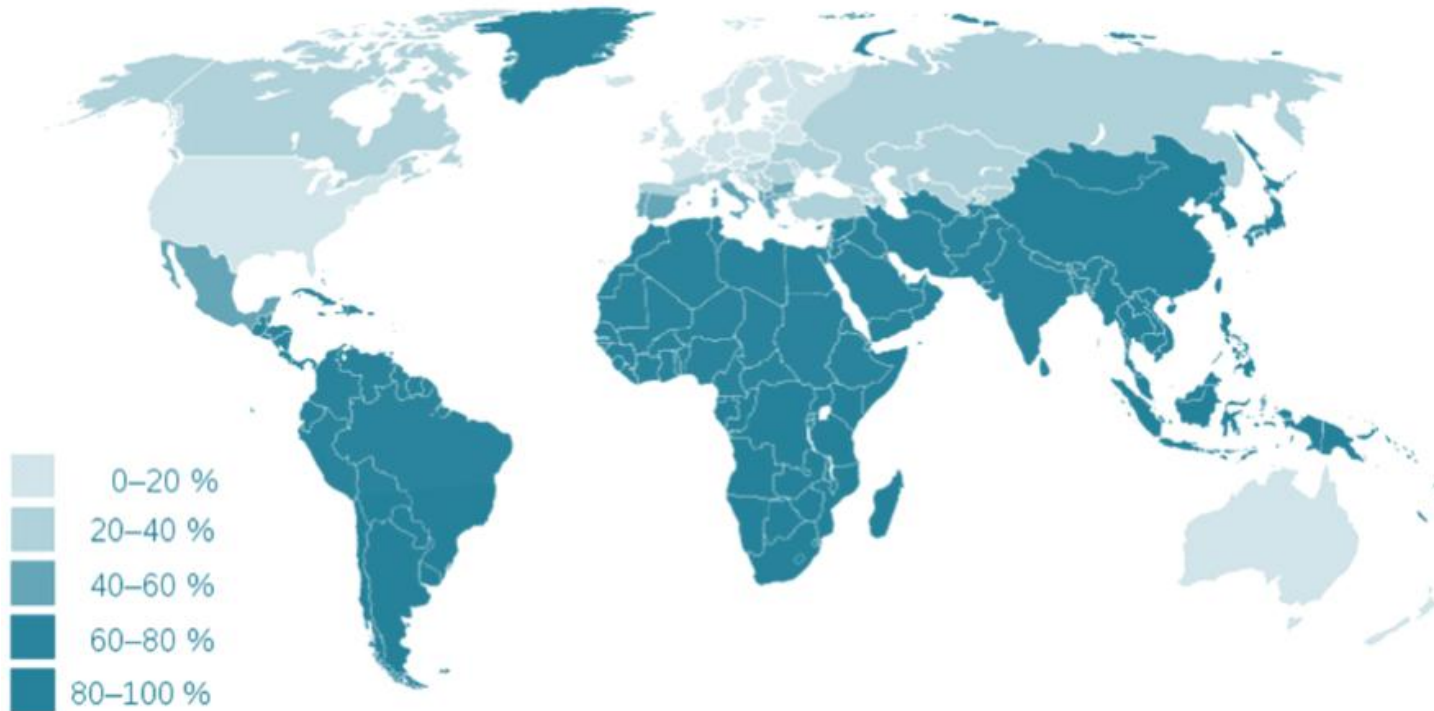


Catalysts

They are natural biological catalysts, improve the rate of chemical reaction

Enzyme have a function during processing, but not in the final product, and have often been removed during process, so they do not have to be included on the label.

Three Compounding drivers are accelerating the global shift away from traditional dairy



Biological Realities

Lactose intolerance affects an estimated 33% of the global population, alongside cow's milk protein allergy driving infant diet shifts



Environmental & Ethical

Mainstreaming vegan and flexitarian diets aim to drastically reduce carbon, land, and water footprints.



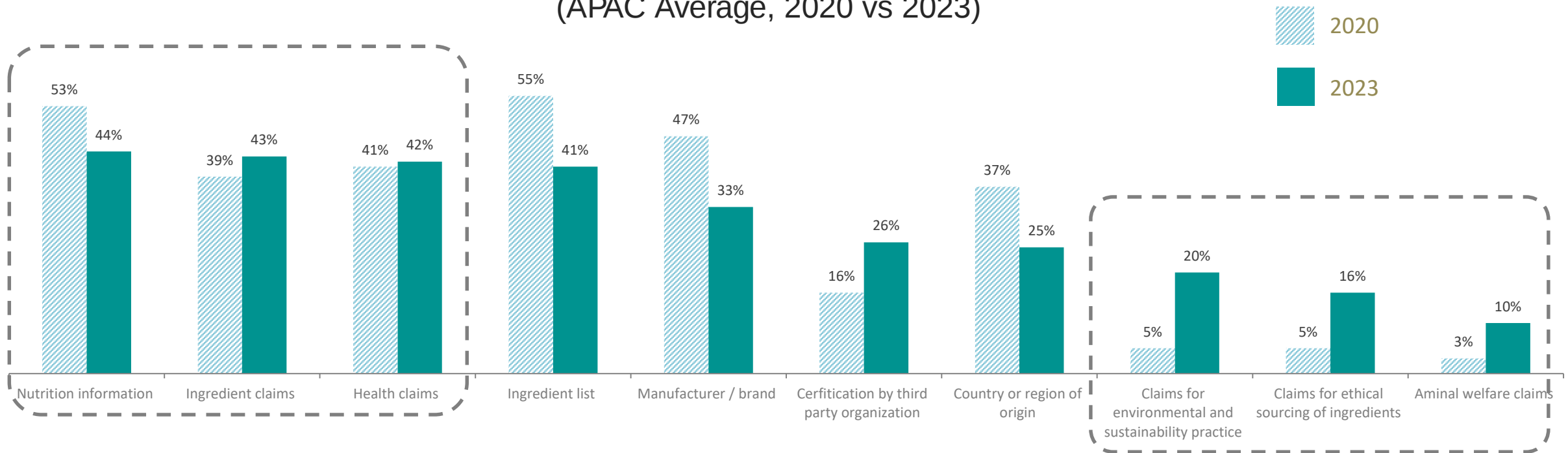
Health Perceptions

Rising consumer desire to avoid saturated fats, exogenous hormones, and antibiotic residues associated with conventional dairy cattle.

Health and wellness are top-of-mind for APAC consumers and shape their purchase decisions

Question: When selecting which packaged food and beverages to buy, aside from price, please rank the following in importance from 1 to 10, where 1 is most important and 10 is least important

% Ranked Top 3
(APAC Average, 2020 vs 2023)



Ref.: ATLAS, Ingredion Proprietary Consumer Research 2023

Digestive health concerns impact dairy perception and consumption in APAC

People with lactose intolerance are discouraged from consuming dairy despite the health benefits, bringing brands to reassure consumers on digestibility in lactose-free dairy

IN CHINA

53%

of Chinese consumers say that **lactose in milk could trigger allergy symptoms** including bloating and diarrhea

IN THAILAND

34%

of Thai consumers agree that **dairy milk upsets their stomach**

IN INDIA

34%

of Indian consumers say that **health concerns (eg bloating, diarrhea) made them limit/reduce the amount of cow's milk** they consume

Base: China: 2,971 internet users aged 20-49 who have drunk milk and flavoured milk in the last three months; Thailand: 1,500 internet users aged 18+; India: 3,000 Internet users aged 18+

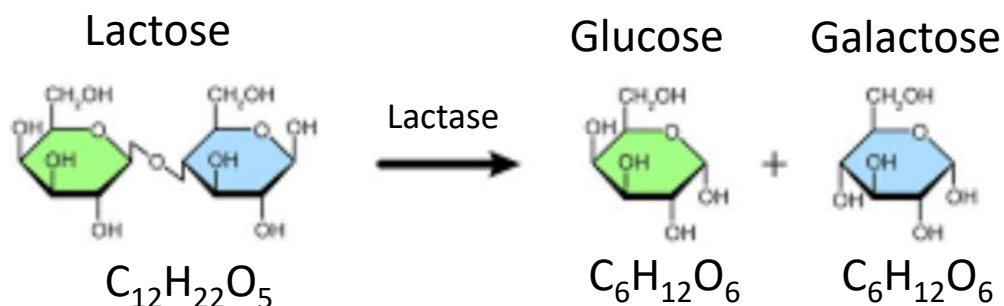
Source: KuRunData/Mintel; Dynata/Mintel; Ipsos Observer/Mintel

In APAC, lactose-free dairy product launches are on the rise



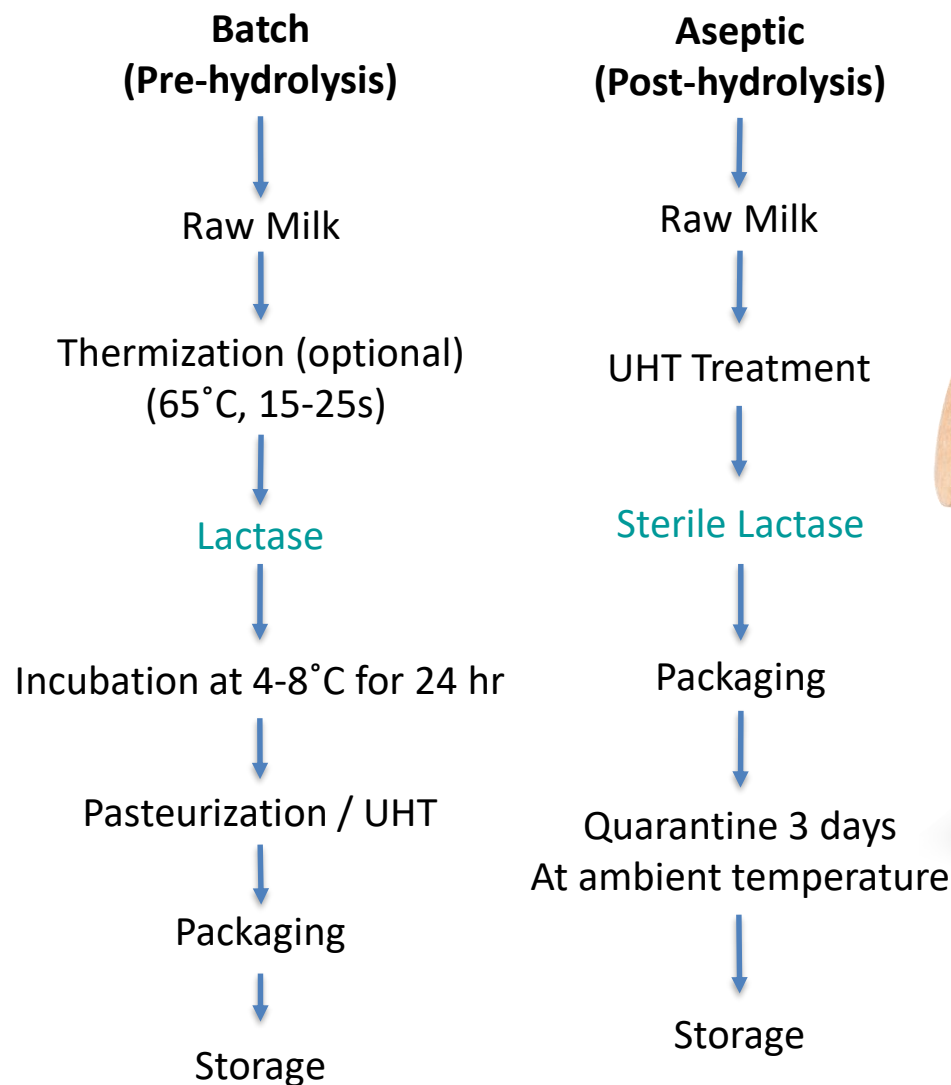
Source: [Mintel GNPD](#)

Production of Lactose-Free Dairy Products – Hydrolysis



SansLacto 2.0 :

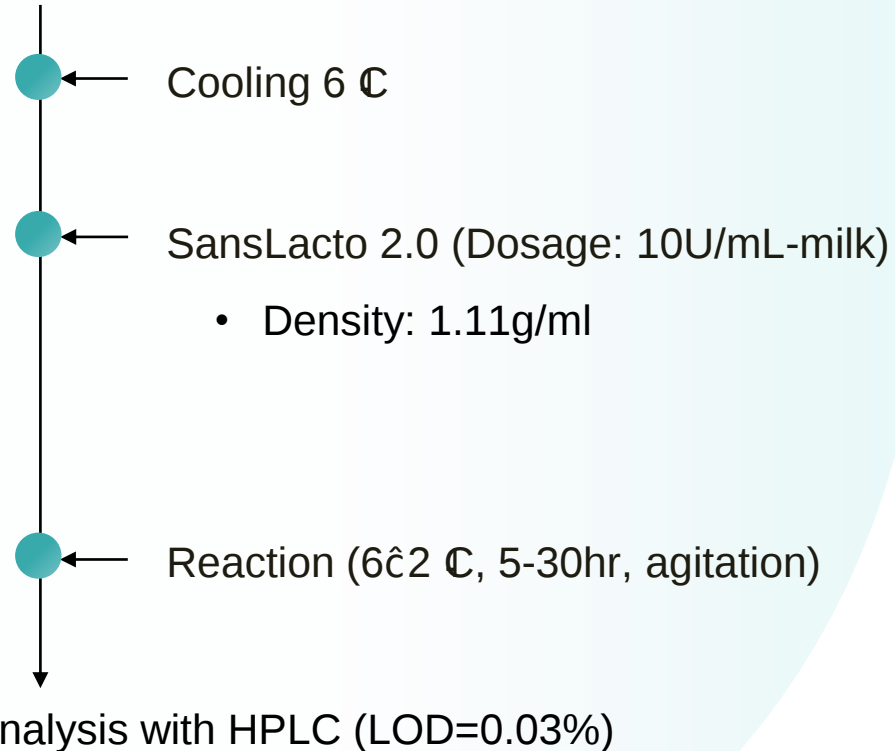
- Comprehensive non-GMO solution
- Beta-galactosidase
- Hydrolyzes lactose to D-galactose and D-glucose in neutral pH
- Manufactured process using a selected strain of yeasts
- FDA approved
- Non-GMO



Faster and more efficient non-GM lactase

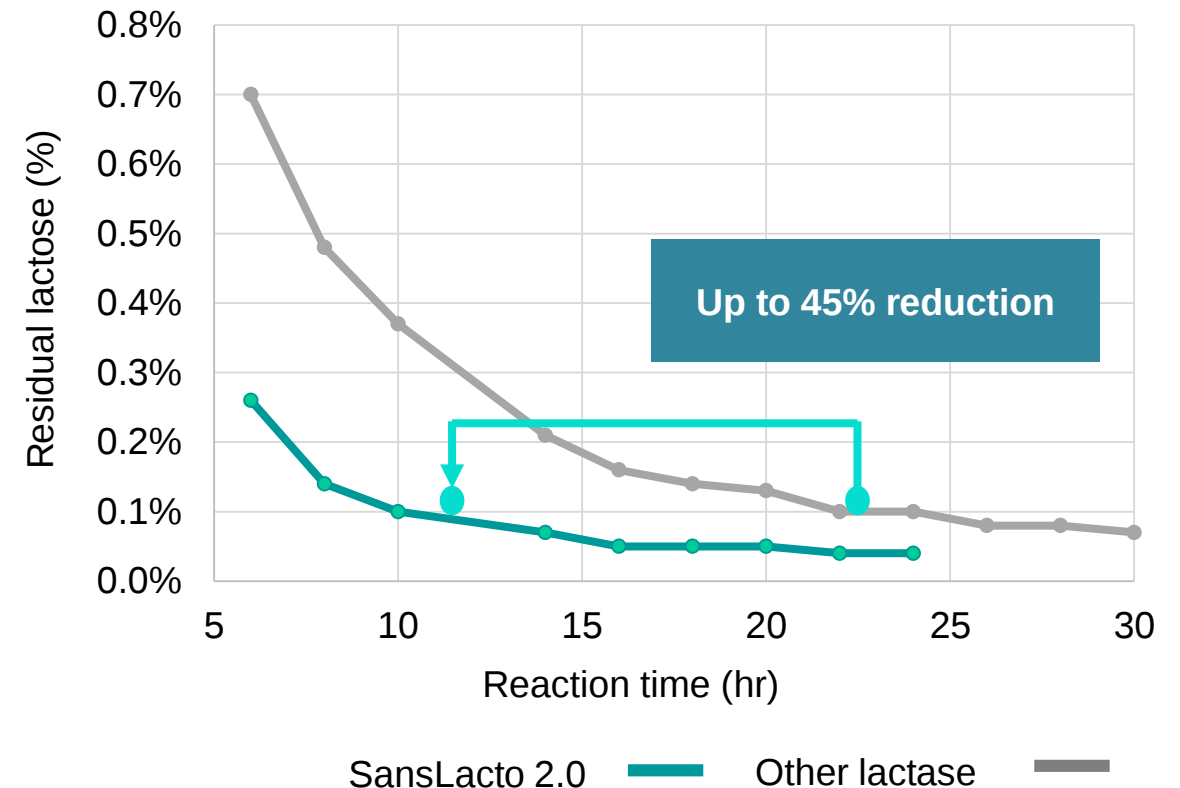
Protocol

Cow's milk ¹⁾ (Lactose: 4.77g/100mL)



1) Cow's milk= UHT treated cow's milk

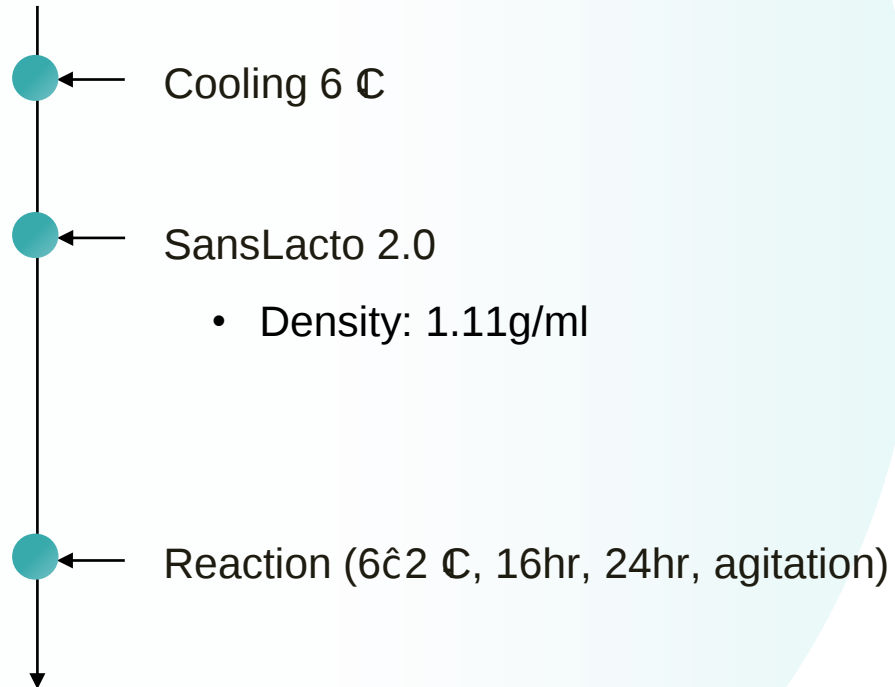
Reduced the reaction time by up to 45%



Increasing dosage to meet stricter target of residual lactose <0.01%

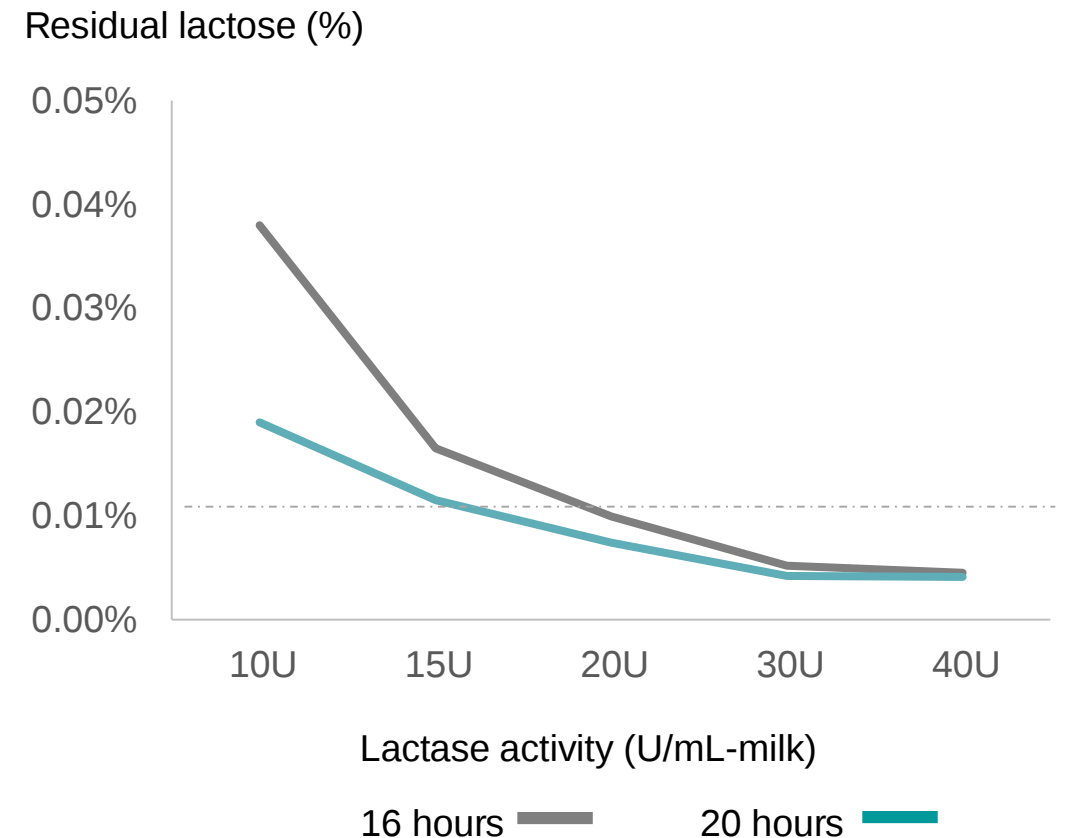
Protocol

Cow's milk ¹⁾ (Lactose: 4.77g/100mL)



Analysis by Campden BRI (LOD=0.001%.)²⁾

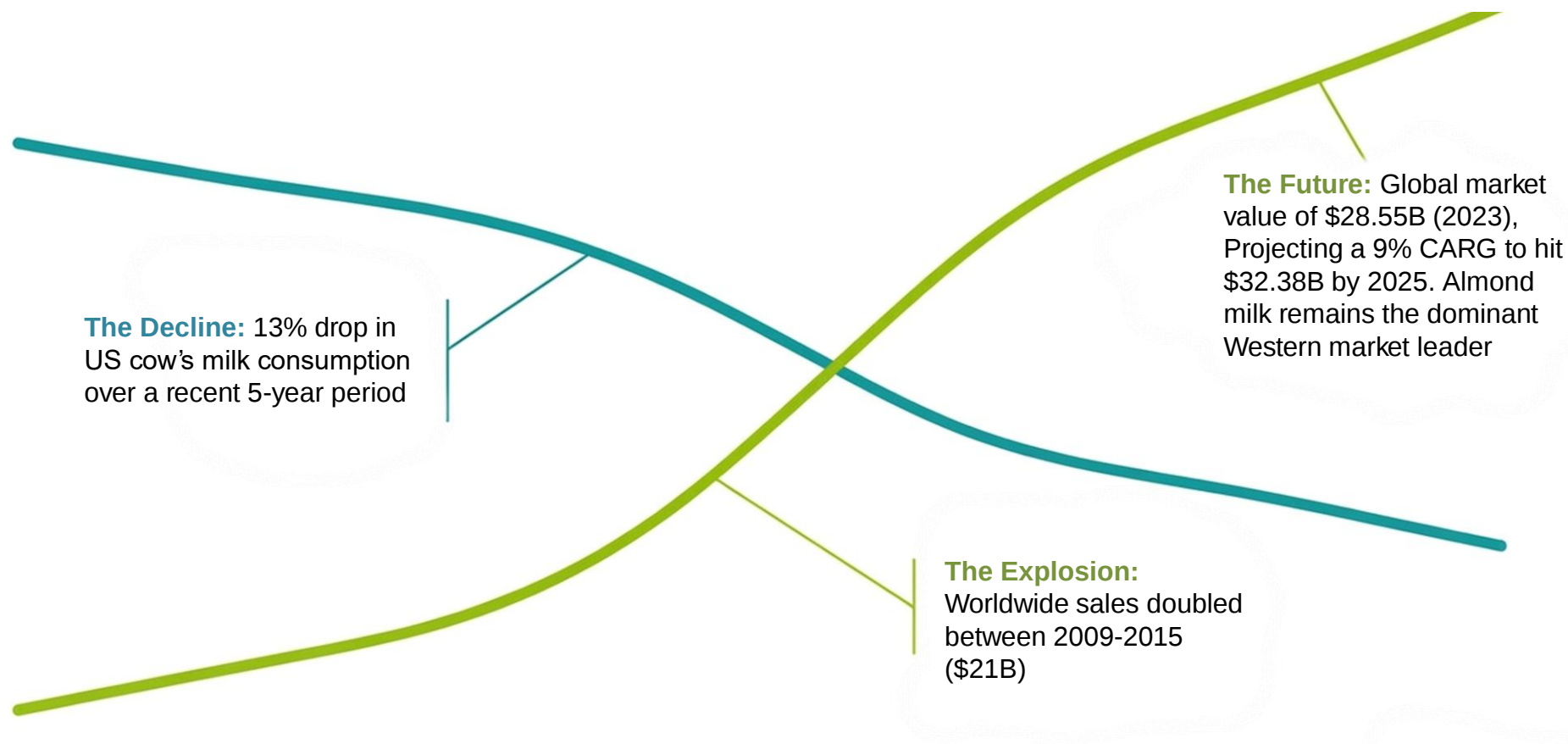
20U-30 U/mL-milk of SansLacto
is recommended



1) Cow's milk= UHT treated cow's milk 2) Report No. 142789, 144137-144151



Plant-base alternatives have transitioned from niche allergy substitutes to mainstream dietary staples



Ref: Plant-Based Milk Market Insights 2025-2035, 2023
Dairy Alternatives Market Size, Share, Growth Report, 2032, 2024

Once a movement, then a lifestyle, by now it might just be the new mainstream

ALMOND 137 ALMO ALNATURA aMYLK DANONE DREAM DRÿK Eco mil Elmhuist FOMILK Goodmylk HIPPIE MYLK Innocent KOITA KOKO MALK Mandor mylk MYLKMAN MILK 2.0 NATURLI' NILK nümoos OraS PLENISH Rita THE BRIDGE uproot Vitasoy alpro Becel Borden's MILK CALIFIA FARMS Ceresilly CORONA EARTH'S OWN ENGINE GOOD MYLK CO. GO NUTS MYLK GRANAROLO Sola BIO jojonavi K Lila MORISON NEW FARM vidua BRUK CANTINA ORIGIN ALMOND Pacific RUDE HEALTH Sola BIO SO So Nice Silk three trees Treehouse TRADER JOE'S WHOLE FOODS																					
ALGAE algenuity TRITON ALGAMA Odontella		AMARANTH HEARTBEAT vita TRADER JOE'S Eco mil		BANANA Banana Wave Take Two		BARLEY Sola BIO THE BRIDGE Take Two		BRAZIL NUT THE BRIDGE DRÿK mōlk THE BRIDGE		BUCKWHEAT OraS BIOMILQ TurtleTree Labs		CELL-BASED OraS Eco mil LA-MANDORLE		CHESTNUT OraS		CASHEW THE BRIDGE Vitasoy alpro CASTANHA CALIFIA EARTH'S OWN GO NUTS MYLK vita modest MYLK MORISON Nut Meg BRUK PLANT LIFE RUDE HEALTH SO Treehouse TRADER JOE'S WHOLE FOODS					
CHICKPEA YoFit Elmhuist INNOVOPRO ZEMPLANT		COCONUT DANONE FOMILK KOKO LALA MYLKMAN NATURLI' NILK PLENISH OraS Rita Silk uproot THE BRIDGE Vitasoy alpro CALIFIA FARMS GRANAROLO jojonavi Sola BIO KIRKLAND modest MYLK O Pacific Provamel RUDE HEALTH SO three trees TRADER JOE'S WHOLE FOODS										FLAX flaxUSA GöBeyond koko hill PLANT LIFE HAMITON		HAZELNUT Elmhuist FOMILK Innocent GRANAROLO Mandor BRUK OraS PLENISH alpro Ceresilly K Lila Pacific RUDE HEALTH		HEMP DREAM DRÿK Eco mil Elmhuist mōlk tempt GOOD HEMP Pacific		LOTUS FLOWER jojonavi			
MICROFLORA remilk. CHANGE LEGENDARY New Culture		MACADAMIA milkadamia Treehouse MYLKMAN MILKLAB TRADER JOE'S		MILLET Sola BIO lima TRADER JOE'S		OAT avocadomilk BetoOats Chobani coop DANONE DREAM DRÿK Eco mil Elmhuist freedom GO GREEN Goodmylk GRANAROLO Hood Innocent ICA JUUSTOPORTTI KOITA MYLKMAN mylk mōlk NATURLI' NILK Oats'up PLANT PLENISH Suzie's TÖATS THE BRIDGE uproot Vitasoy Vösa YOSOY AUSTRALIA'S OWN Becel Borden's MILK CALIFIA FARMS Ceresilly G Sola BIO K KARLINS MINOR FIGURES modest MYLK O ne moloko OAT LY OAT SEAR Provamel RUDE HEALTH Silk THRIVE Treehouse EARTH'S OWN															
PEA DRÿK Eco mil mōlk ripple Silk Sproud vly HEARTBEAT OraS uproot		PEANUT Elmhuist OraS Rita RUDE HEALTH uproot ZEMPLANT		PECAN MALK Treehouse nümoos		PISTACHIO 137 MYLKMAN OraS nümoos STEUBEN Ceresilly jojonavi Mandor three trees		PUMPKIN SEED Patch Organic		QUINOA DRÿK Eco mil mōlk QUINY Suzie's THE BRIDGE YOSOY Sola BIO Pacific Silk TRADER JOE'S											
SESAME Vitasoy Rita three trees HOPE LILA Eco mil		SOY alpro DANONE DREAM EDEN FOODS FOMILK HOMESoy KOITA natura NATURLI' nümoos Plant Rita VITAMILK THE BRIDGE Vitasoy Vsoy WESTY YOSOY Borden's MILK GRANAROLO Sola BIO								SPELT Ceresilly Poggio del Farro THE BRIDGE ORGANIC GEMINI PLANT LIFE lima		SUNFLOWER HOPE sesame sunbloom ALECINI BRACIA		SORGHUM Sola BIO		TIGERNUT RUDE HEALTH the TIGER NUT company Eco mil		WALNUT OraS Elmhuist 137 MARIANI		WATER LENTILS LENTIN	

Which of these product claims would influence your decision when choosing a plant-based milk beverage?

	Regional	SG	TH	MY	ID	VN	PH
Environmentally friendly packaging (eg. 100% recyclable or compostable)	24%	23%	29%	29%	20%	32%	40%
Locally owned/ manufactured	20%	16%	21%	23%	22%	30%	29%
Manufactured in a country that I have a positive impression of	13%	21%	12%	21%	7%	18%	18%
Minimal preservatives/ additives	25%	47%	25%	32%	21%	24%	33%
Low/No sugar	41%	65%	55%	59%	39%	40%	51%
High in protein	40%	51%	64%	53%	54%	30%	42%
Halal-certified	17%	5%	12%	38%	58%	16%	14%
Organic	35%	32%	53%	43%	34%	33%	58%
Low carbon footprint from farm to shelf	12%	15%	11%	14%	8%	20%	16%
Ethically sourced ingredients	21%	22%	19%	24%	36%	28%	20%
Non-GMO (genetically modified) ingredients	21%	32%	28%	24%	19%	26%	24%
None of the above	5%	8%	6%	4%	3%	12%	3%



Based on Milieu Insight survey with N=1,000 respondents each from Singapore, Vietnam, Thailand, Indonesia, Malaysia and Philippines, conducted in Jan 2023.

Ref.: <https://www.mili.eu/sg/insights/is-plant-based-milk-making-a-splash-in-southeast-asia-market-research>

Dairy alternative

Key DRIVERS of consuming dairy alternatives

49% It is HEALTHY

39% It is TASTY

25% It is CONVENIENT

Key CHALLENGES of consuming dairy alternatives

Taste and Texture

Price

Protein content

Low / no / reduced sugar

Low fat

Long list of ingredients

Natural ingredients

Ref. : Innova Meat, Dairy & Alternative Protein Survey 2022, Innova Category Survey 2023

Deconstructing the Botanical Source Matrix

Scientific Definition:

Colloidal suspension or emulsions consisting of dissolved and disintegrated plant material engineered to mimic dairy

Legumes



Soy
Peanut
Chickpea
Lupin

Nuts



Almond
Coconut
Cashew
Hazelnut

Cereals



Oat
Rice
Spelt
Corn

Seeds



Hemp
Sesame
Sunflower
Flax

Pseudocereals



Quinoa
Amaranth
Teff

Transforming plant matter into stable colloidal suspensions requires intensive bio-mechanical engineering

Plant to Carton



Pre-treatment

Soaking, blanching and dehulling to mitigate off-flavors and soften tissues



Extraction

Wet-milling and grinding to form a coarse plant slurry



Enzymatic treatment

For improving texture and physical properties of the beverage



Formulation

Adding other food ingredients such as vitamin, sweeteners, acid regulators, stabilizer and etc.



Homogenization & Thermal

UHT or High pressure homogenization to ensure microbial safety and stabilize the lipid water suspension

Role of Enzyme in Dairy Alternative

More than a processing aid to reduce viscosity and facilitate process

TASTE

Enzymatic hydrolysis of starch into simple sugars, like maltose and glucose, is a key process for targeting desired sweetness profile

FUNCTIONALITY

Enzymatic modification of proteins plays a significant role in improving solubility, emulsification and foaming

NUTRITION

Along with increasing the protein content and non-digestible polysaccharides, the enzyme reduces the content of naturally occurring anti-nutritional factors (e.g. phytates)

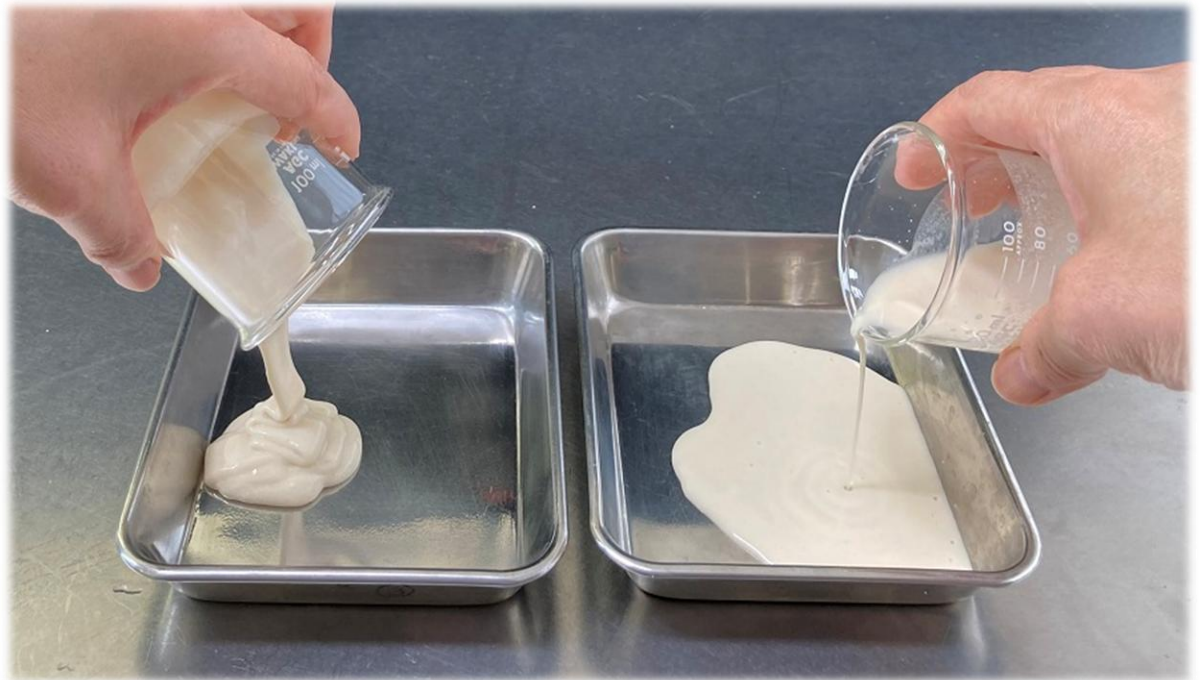
SUSTAINABILITY

Enzymatic hydrolysis of cell-wall polysaccharide aid to make a better utilization of the raw material, reducing waste and improving the overall sustainability of the process



Enzymes are needed to help process cereal grains

- Due to their starch structures, cereals and grains often become thick and viscous when mixed with water.
- Enzymes help break down the starch into sugars for easier processing. However, this can result in higher sugar content on the product label.
- Our specialty enzymes can help break down starch for ease of processing without taking them all the way to sugars.

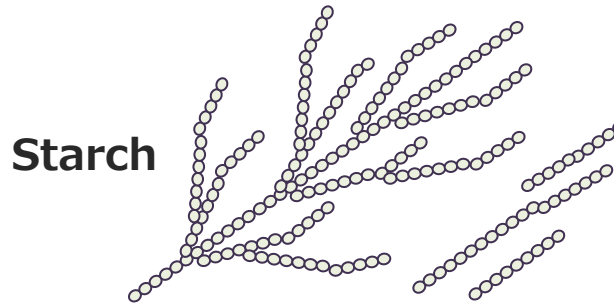


Control

KLEISTASE SD80NA

Viscosity reduction with alpha amylase on 20% oat flour suspension (w/w water)

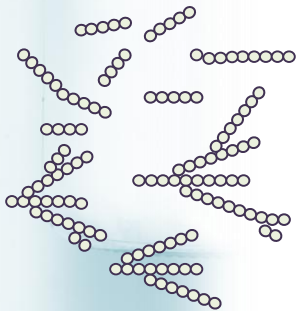
Various enzymes can be used to break down starch



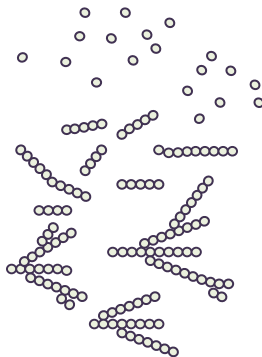
Viscosity Reduction

Sweetness Improvement

α -Amylase

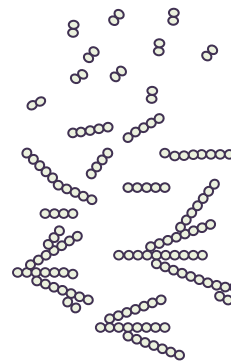


Glucoamylase



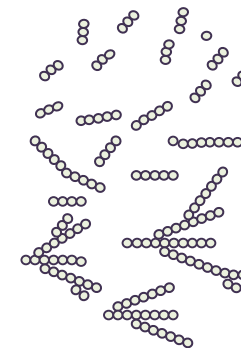
Glucose
(G1)

β -Amylase



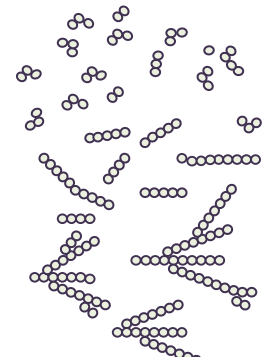
Maltose
(G2)

Maltotriohydrolase



Maltotriose
(G3)

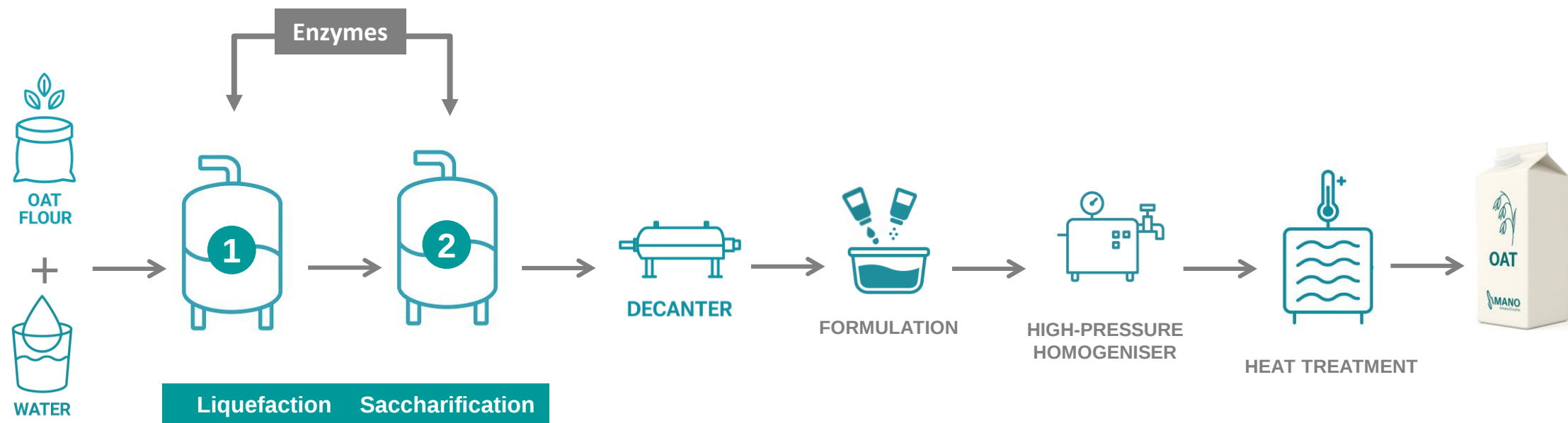
Transglucosidase



Isomaltooligosaccharide
(IMO)



Amylase in Oat Drink Production



	Liquefaction	Saccharification
Purpose	Breaking starch into shorter chains	Converting starch into simple sugars
Enzyme	Kleistase E5NA	Beta-amylase F Veramax™ G3 Gluczyme NL4.2
Why	to reduce viscosity	to control sweetness and sugar profile in the final product

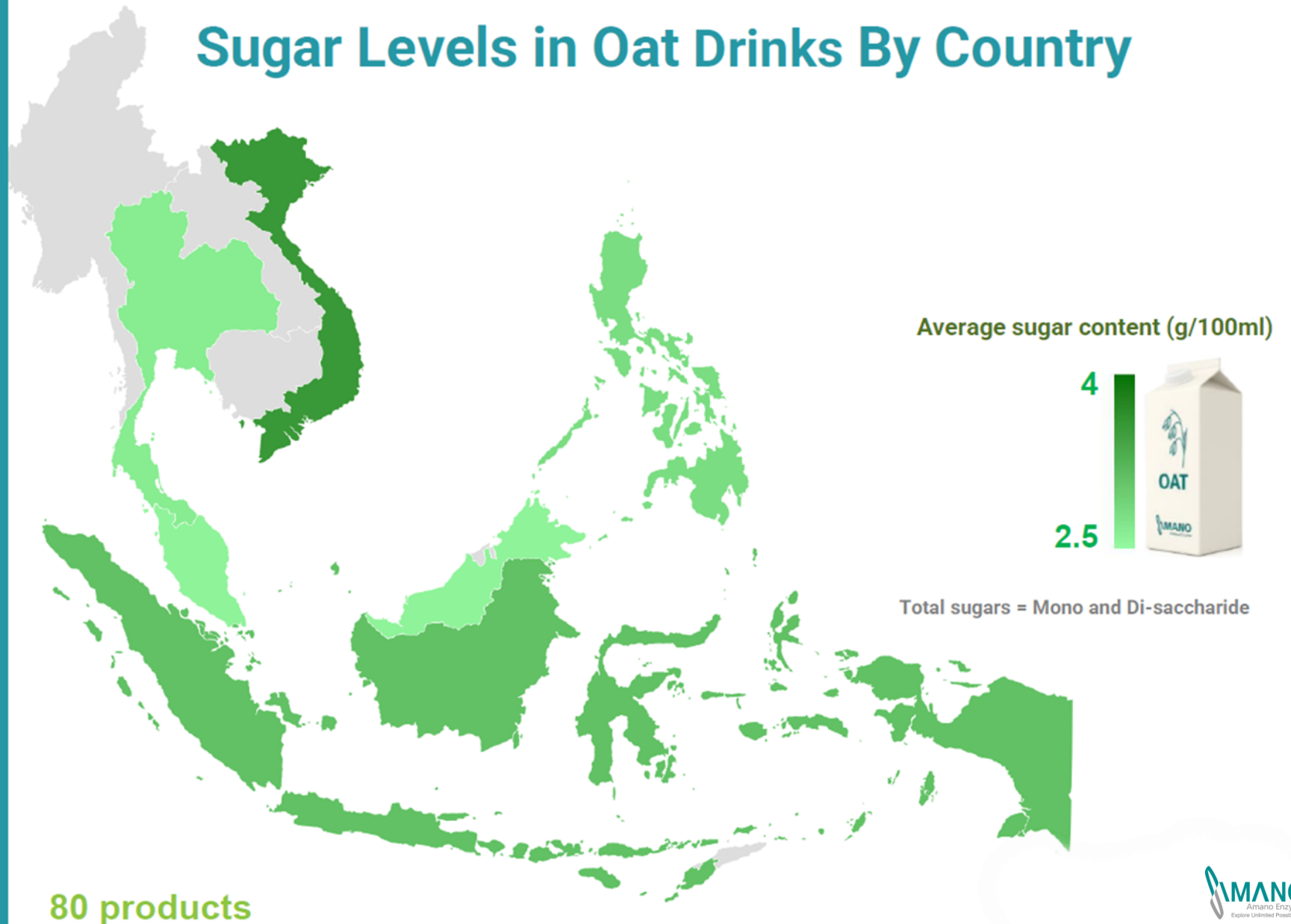


Master the Art of Sweetness

How Sweet Are Products in Southeast Asian Markets?

PLANTS
UNLIMITED™

Sugar Levels in Oat Drinks By Country

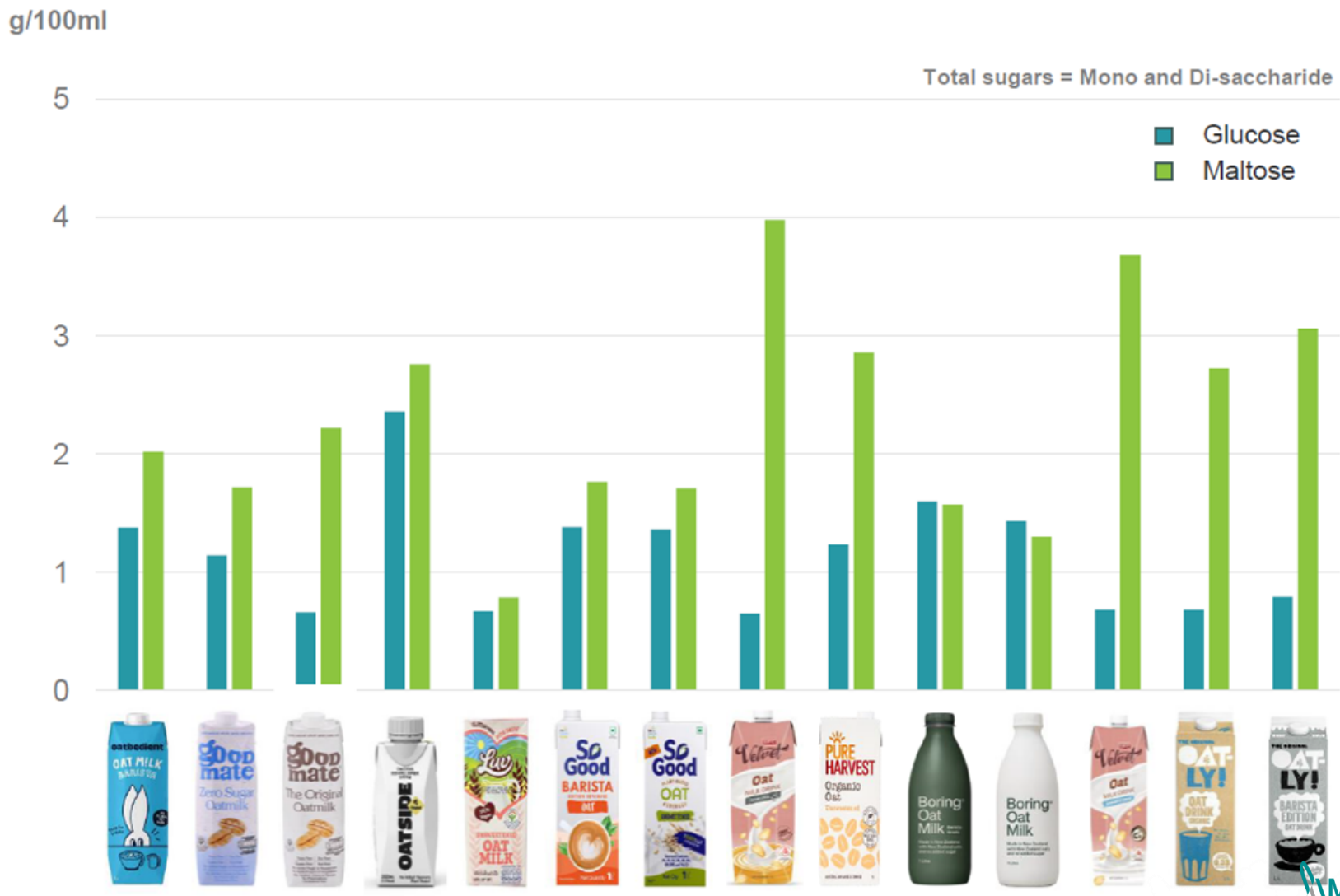


Sugar Profile

Plant-based drinks manufacturers are increasingly customising sugar profiles to enhance sweetness and flavor, aligning with consumer preferences in their target markets



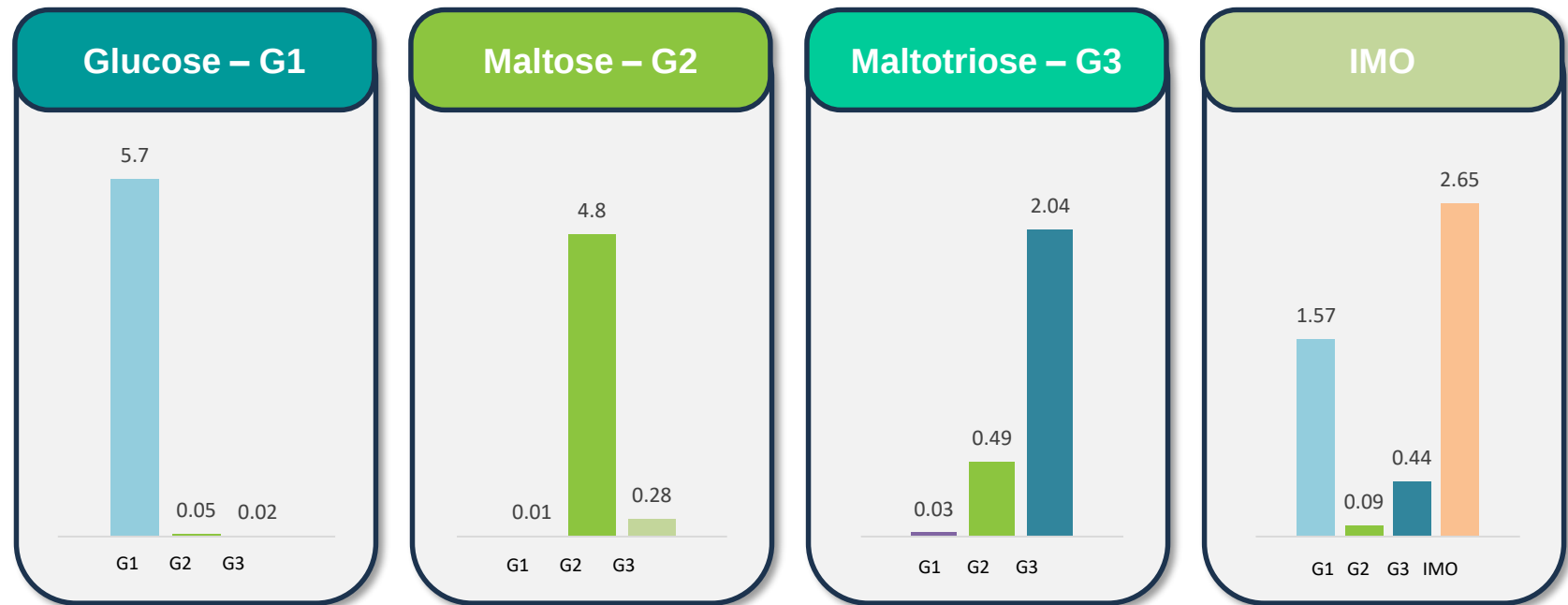
Maltose Leads Among Major Brands



Sugar profile by design

Designing Sugar Profiles with Precision

Enzymes enable the precise design of sugar composition, optimise sweetness, and unlock new flavor dimensions with sugars like maltotriose and isomaltooligosaccharides.



We can design your custom sugar profile with precision

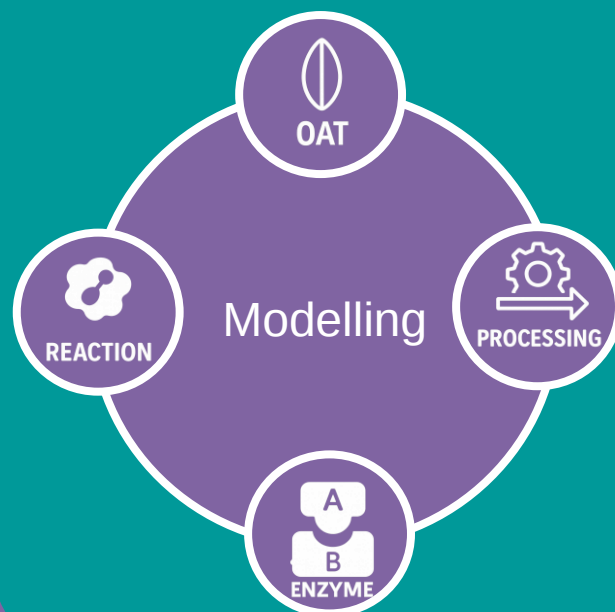
Customer needs



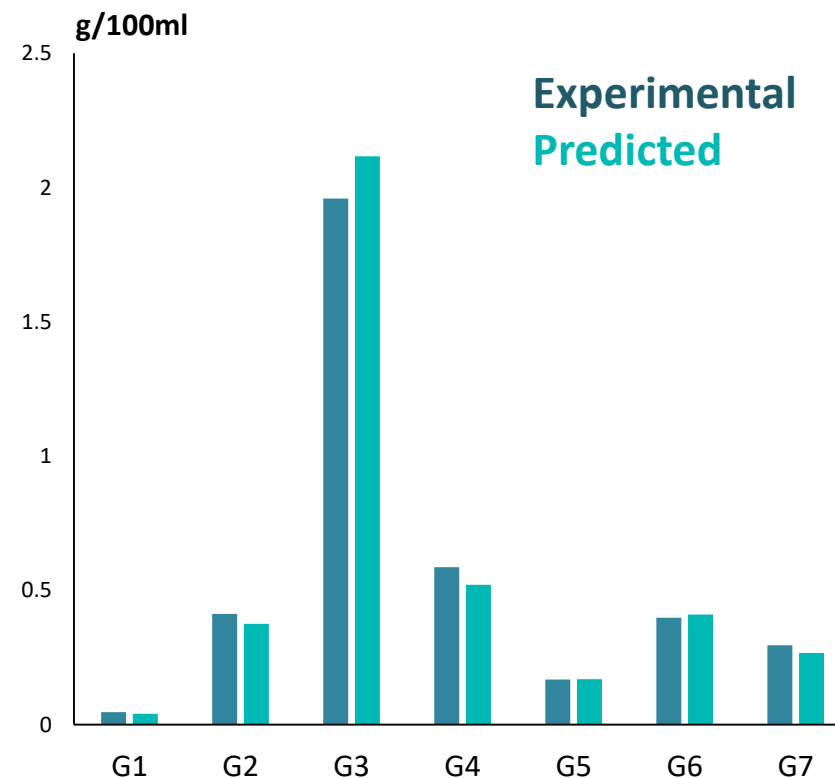
Market trend

Targeted Sugar composition

Data driven formulation



Enzyme Tool



**No Sugars
No Compromises**



CONSUMER CONCERN:

Low-Sugar and Sugar-Free Options Are Watery

Understanding the issues faced by consumers

Online consumer reviews about low-sugar and sugar-free products currently on the market.

Consumers report watery texture and lack of flavor as primary concerns.

*"Very weak - I shook the carton before opening but it was still extremely **watery** and **flavourless**."*

*"I purchased this as part of a promotion. I don't think I would buy again. **Not sweet enough** and not good in cereal or hot drinks."*

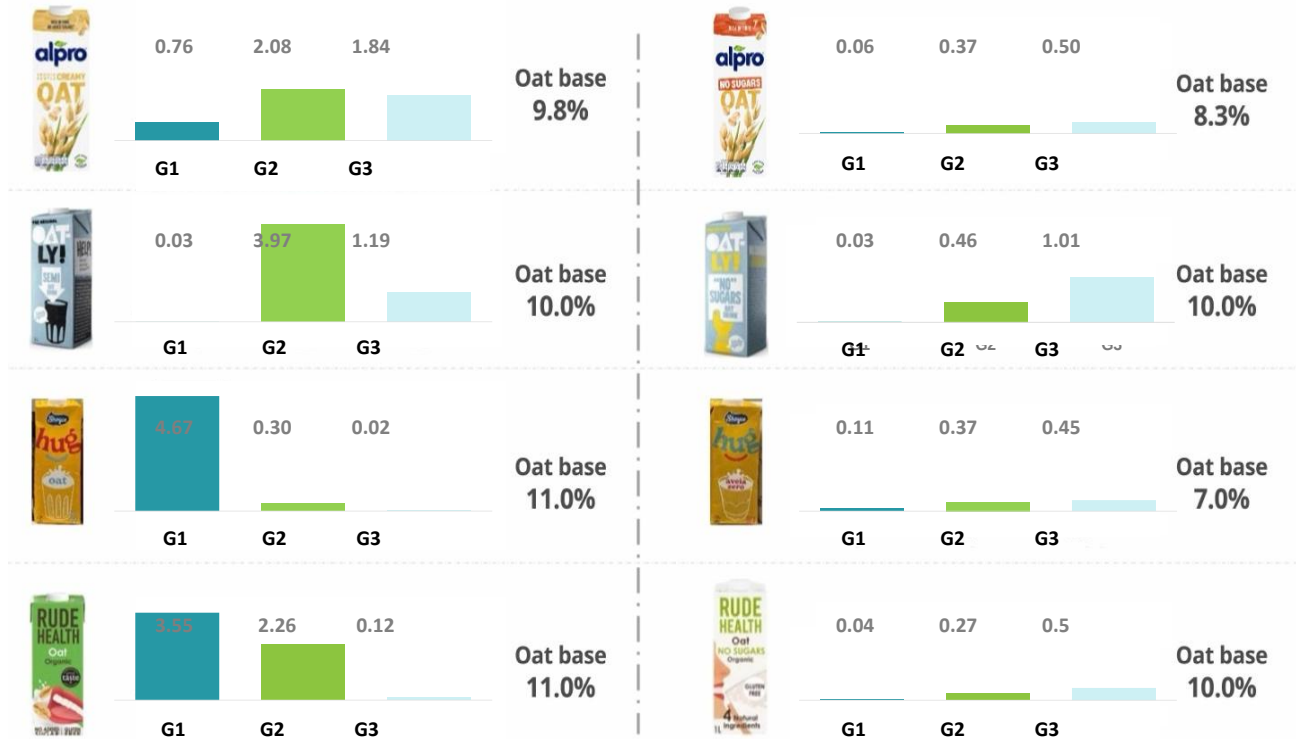
*"While this has low sugar, I do not see the need to add a lot of sunflower oil to the mix as the **taste is not pleasant** when heated or added to hot coffee. It tastes like burnt oil."*

*"Not good, **very watery and tasteless**—its not good. It's way too watery and it's flavorless."*

*"This was my first time tasting a non milk product. I tried [a No Added Sugar Oat Milk] with my regular cereal. It looked like slightly **watery milk**. There wasn't really a taste other than a slight sweetness. I prefer milk to non milk substitutes so I would not switch to Oak Milk."*

Standard vs. No Sugars: What's Really Inside?

- STANDARD



G1= Glucose; G2= Maltose ; G3 = Maltotriose – g/100ml

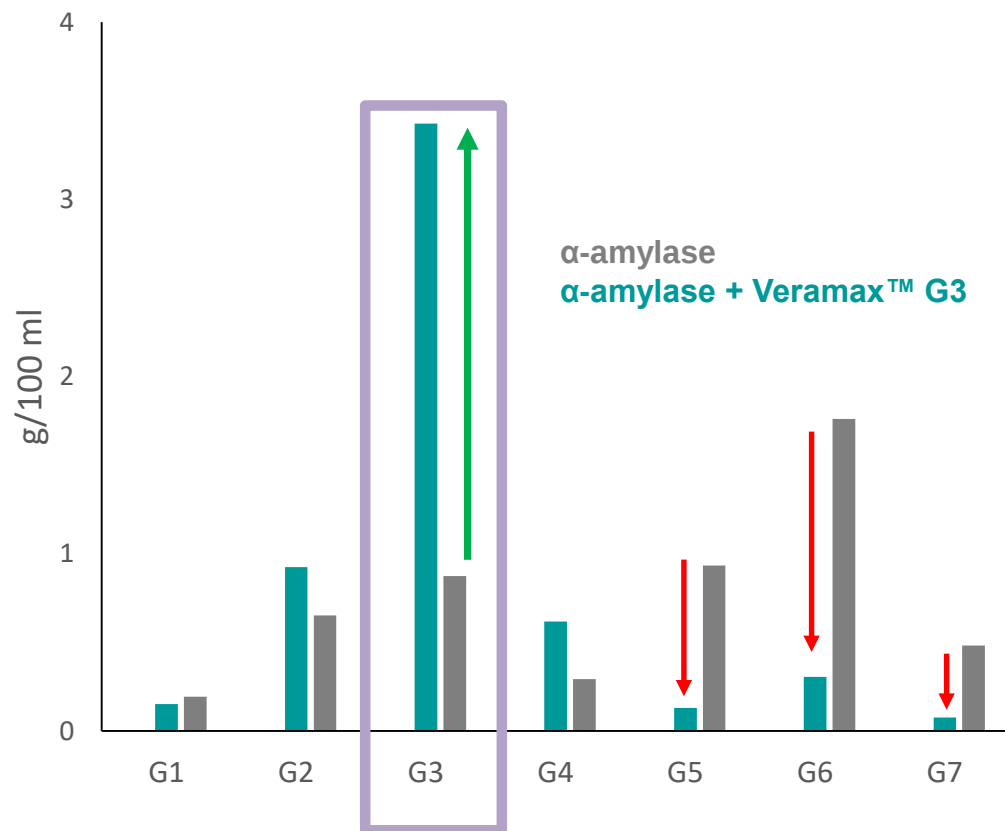
No SUGARS

Products labeled “no sugars” contain less than 0.5% sugar by weight.

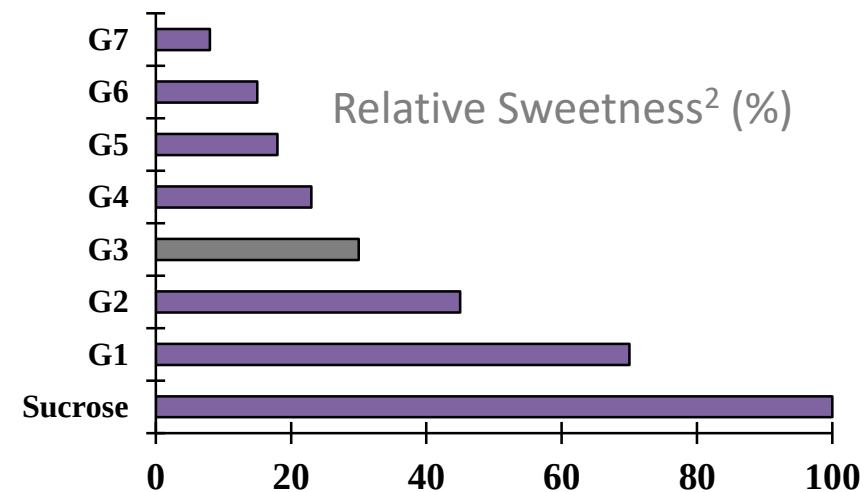
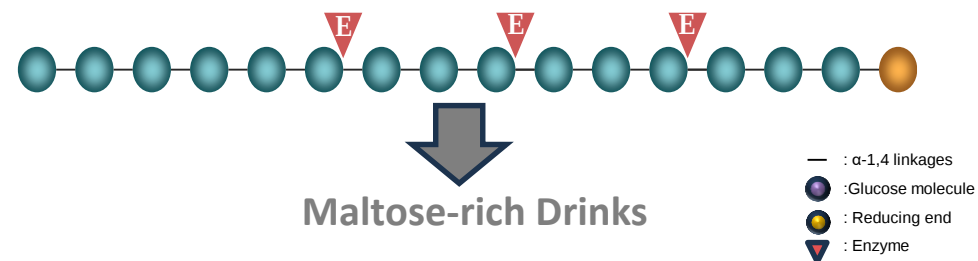
Achieving this requires careful control over the enzymatic reaction and, in some cases, may also involve reducing the oat content in the final formulation.

Veramax™ G3

- Enzyme Tool for No-Sugars Innovation
- Manufactured process using a selected strain of bacteria
- Non-GMO



It produces maltotriose by (endo-type) hydrolysis of α-1,4 starch molecules



DESIGN YOUR SUGAR COMPOSITION IN YOUR DRINK

SUGAR CONTROL SYSTEM

No compromise on <5% sugar: Sweetness profile is not the result of reducing viscosity, it is designable to make your drink.

Beyond glucose and maltose: Amano showcases maltotriose, fructose and IMO produced enzymes that provide unique sweetness.



Ask Amano for tailor-made recipe to meet your target!

**Creamy, foamy
and smooth**



CONSUMER CONCERN: Curdling in Non-Dairy Beverages

Understanding the issues faced by consumers

Views from around the web
about current non-dairy
products
on the market.

Consumers report curdling of
plant-based beverages,
especially when added to
coffee and tea.

*"From rice milk and soy milk to almond, hazelnut
and coconut milk, all of them seemed to curdle."*

*"Every time I make iced coffee with oat milk, it
curdles. What am I doing wrong?"*

*"Why does my soy milk always separate when
I add it to hot tea? It's ruining my drink."*

*"This almond milk curdled **immediately**
when I added it to my coffee. Very disappointing."*

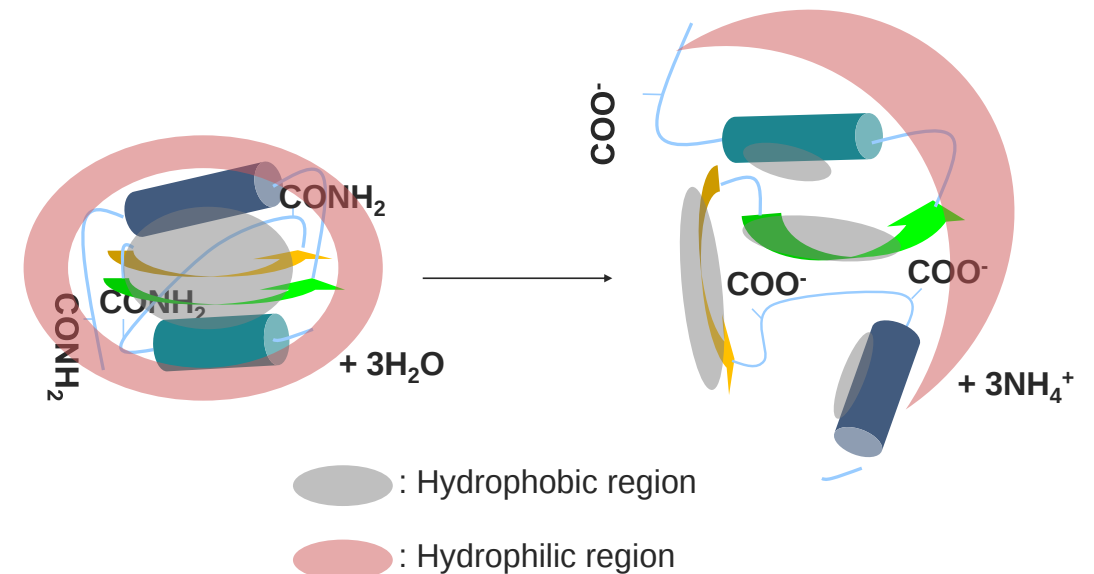
*"I've been having trouble getting a good froth with
soy milk; it often curdles when added to coffee."*

Protein-glutaminase “Amano” 1000

helps improve protein solubility and emulsification properties

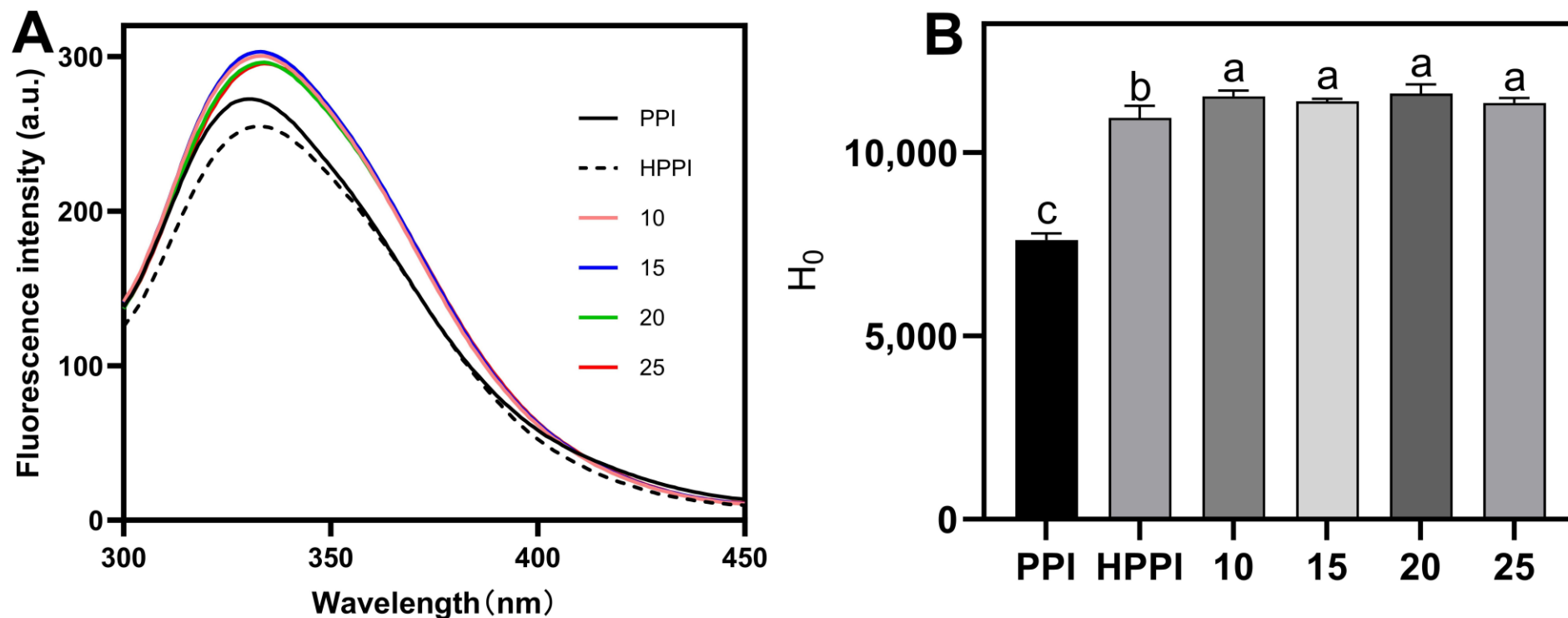
- Derived from non-GM microorganism through a unique fermentation process
- Deamidation of side-chain amide of glutamine
- Causing protein structure unfolding
- Increasing solubility of proteins
- Improve functionalities of proteins such as emulsification and foaming properties

Deamidation at amide side-chain of glutamine



Protein-glutaminase “Amano” 1000

Modifies Protein Tertiary Structure without Inducing Peptide Bond Hydrolysis

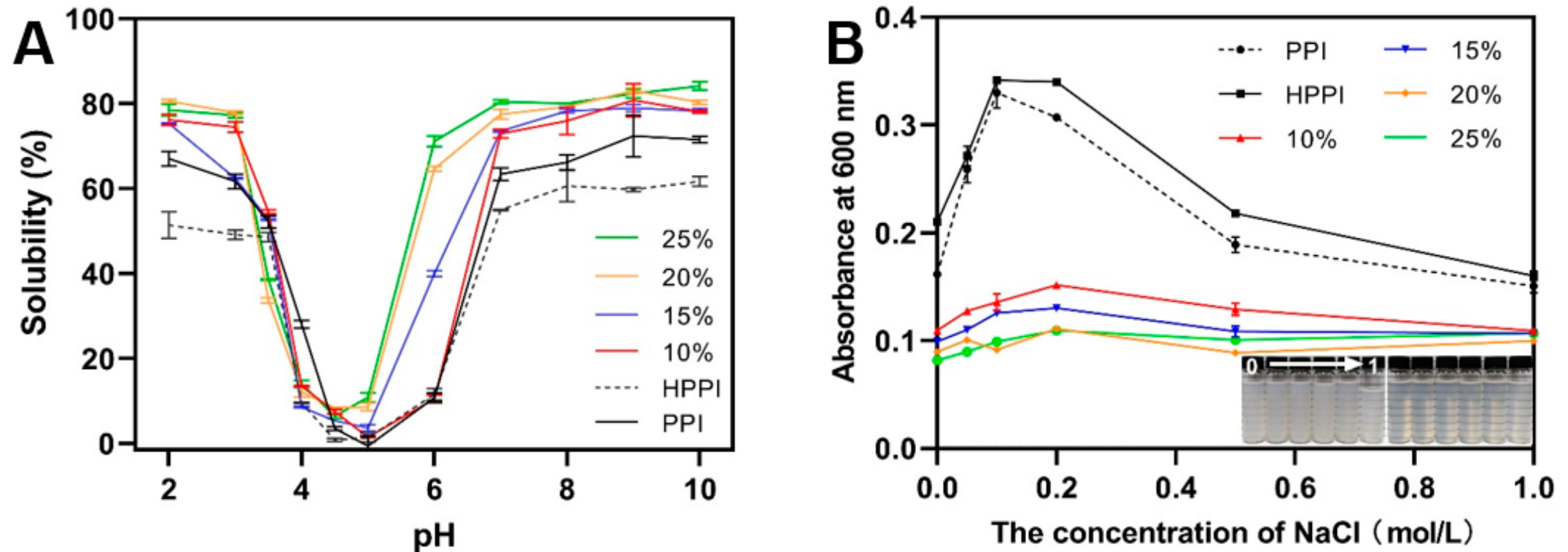


Fluorescence spectra (A) and surface hydrophobicity (B) of deamidated PPI with different DDs and control (PPI and HPPI). Different lowercase letters in (B) indicate significant differences (p < 0.05)

(Foods 2023., 12, 4130)

Protein-glutaminase “Amano” 1000

Increase Electrostatic Repulsion which Improve Protein Solubility and Inhibit Heat-Induced Protein Aggregation



(A) Solubility profile of deamidated PPI as function of pH. (B) Change in turbidity of deamidated PPI solutions after heat treatment at 80C at concentration of 0-1 mol/L

NaCl

(Foods 2023, 12, 4130)

No More Curdling of Non-Dairy Beverages in Coffee

- Ensure smoothness
- Stable drink every time

Solution: PG1000 enzyme stabilizes plant proteins, preventing separation and delivering a smooth, café-quality experience

Almond Drink



Control

PG-1000

Perfect Foam, Every Time

- High-Quality Foam in Plant-Based Drinks

PG1000 helps retain higher protein content in the final product while improving protein solubility — key factors that contribute to enhanced foam quality and stability in barista-style applications

Almond Drink

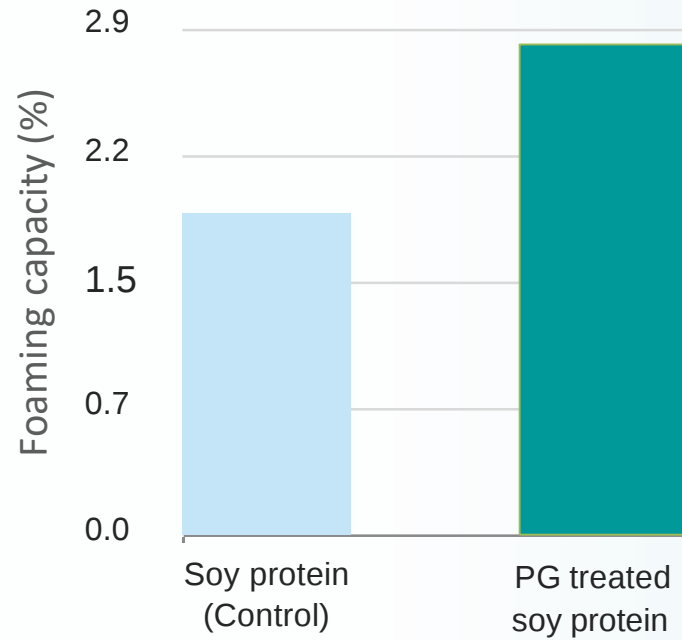


Control

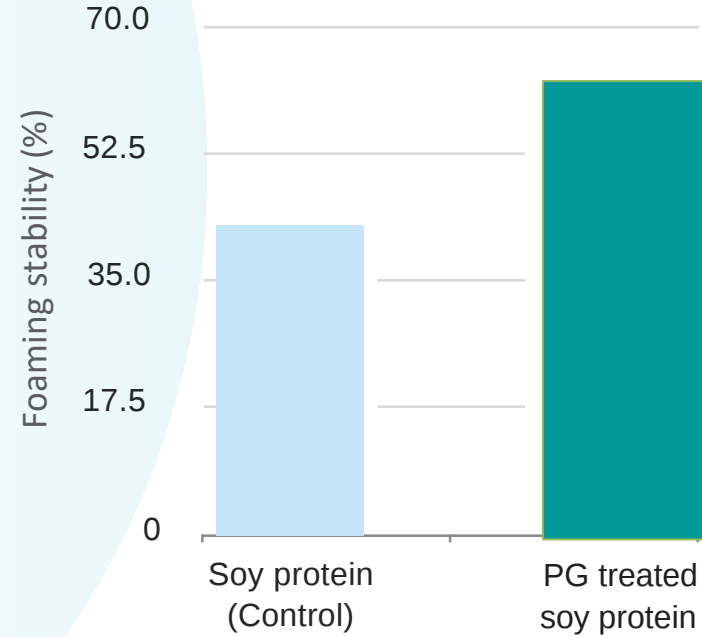
PG-1000

PG1000 advances foaming properties of plant-based drinks

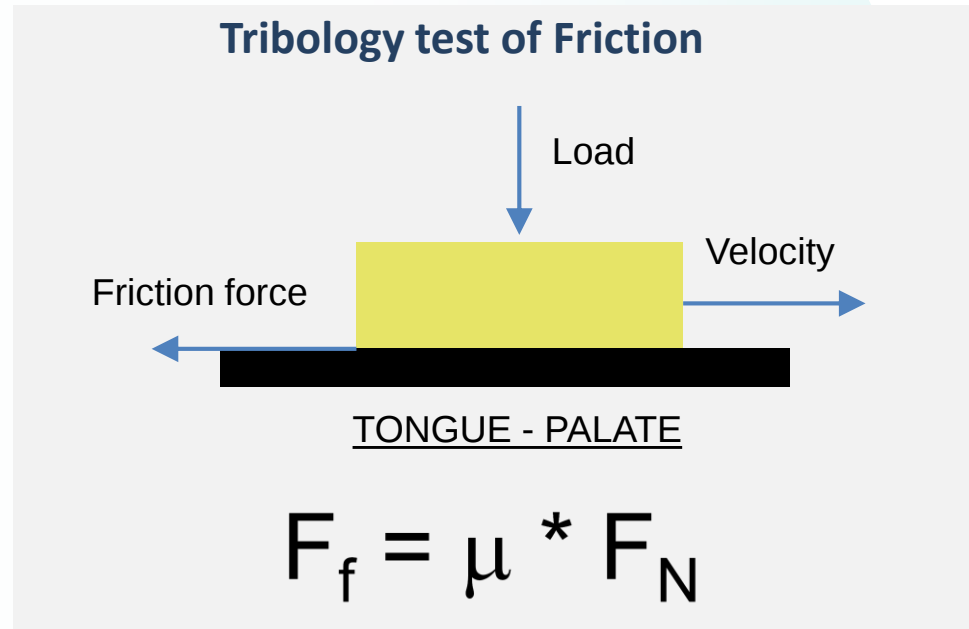
Improved Foam Formation



Improved Foam Stability

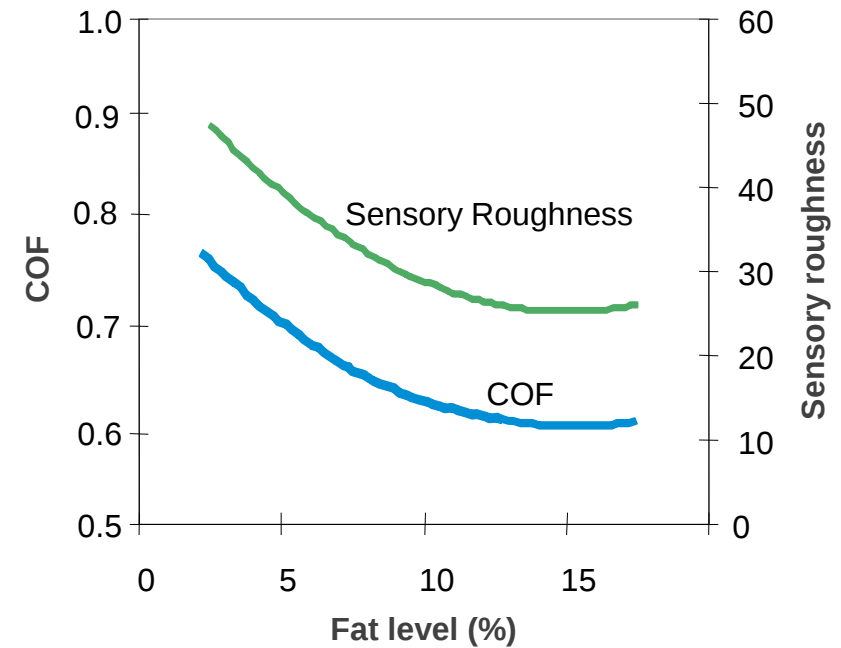


Tribology test to measure mouthfeel



F_f : Friction force
 μ : Coefficient of friction (COF)
 F_N : Normal force

Evaluation of vanilla custard

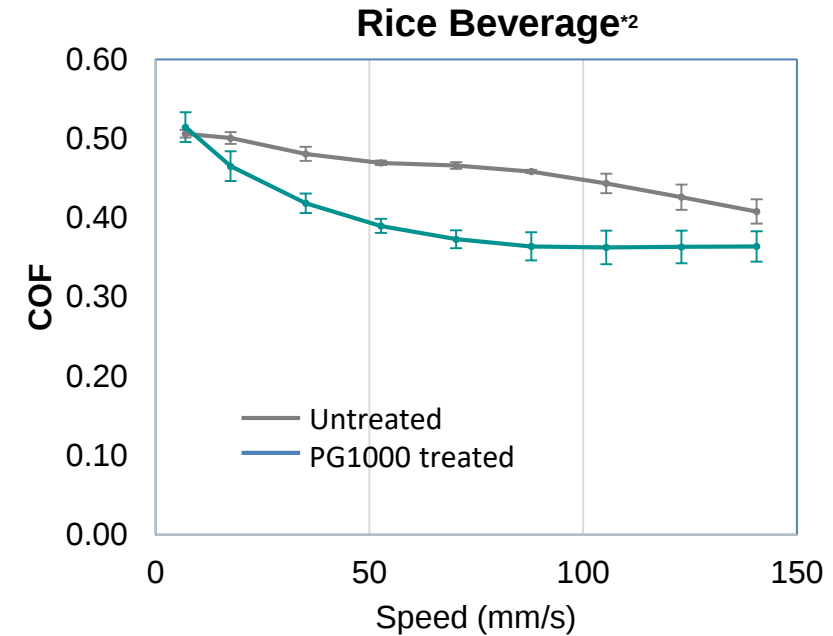
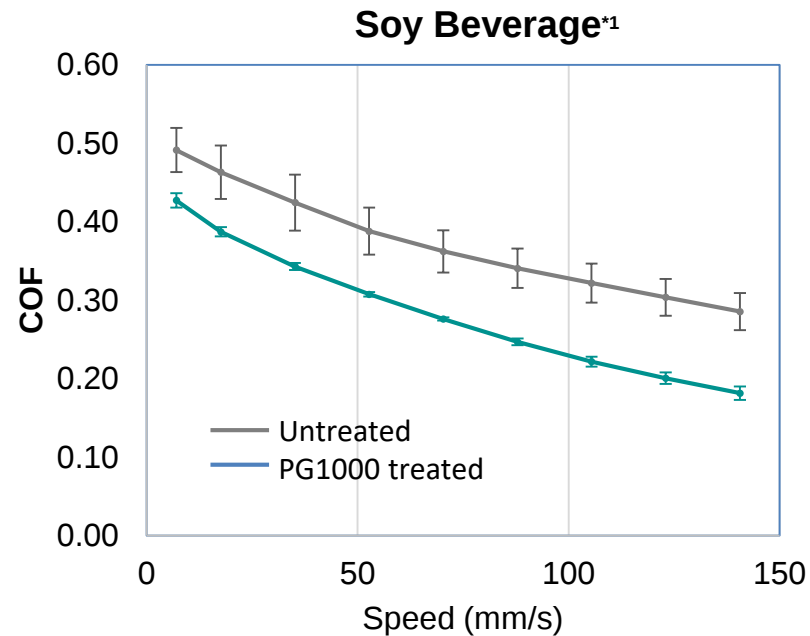


Related to interaction of food with oral surfaces



Correlation of COF and sensory roughness

Reduced Friction Coefficient Confirms Superior Mouthfeel of plant-based drink with PG1000 treated plant-based drinks



COF: Coefficient of Friction
Analysis: NIZO (Tribology test)

*1: Commercial soymilk (Protein: 3.3%, fat:1.9% / Ingredients: Water, Hulled Soya Beans)

*2: Commercial rice drink (Protein: 0.5%, fat:1.1% / Ingredients: water, rice, sunflower oil, seaweed lithothamnium, sea salt)

PG1000 Prevents Precipitation & Separation in Acidic Formulations

Pea protein beverage

← Add **PG1000** with protein shake ingredients

- 50-55 °C, 1-3 hr
- Add strawberry juice concentrate
- Homogenization (2,000-2,500 psi)
- Pasteurization (80 °C, 30 sec)

PG1000 treated strawberry pea protein shake*

* Protein content = 5 % (w/v) , pH ~ 4.5

Two weeks cold storage



Control

PG1000

Five months cold storage



Control

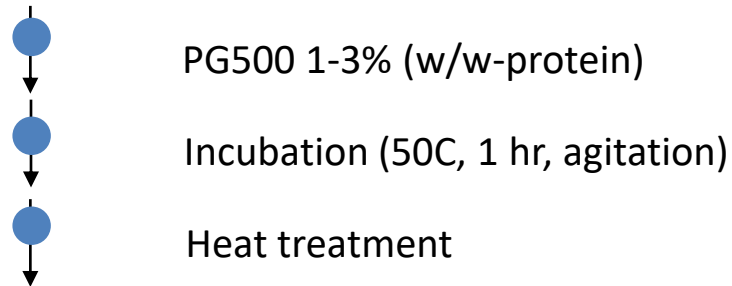
PG1000

PG500 boosts plant protein solubility, ensuring a smooth, refreshing beverage



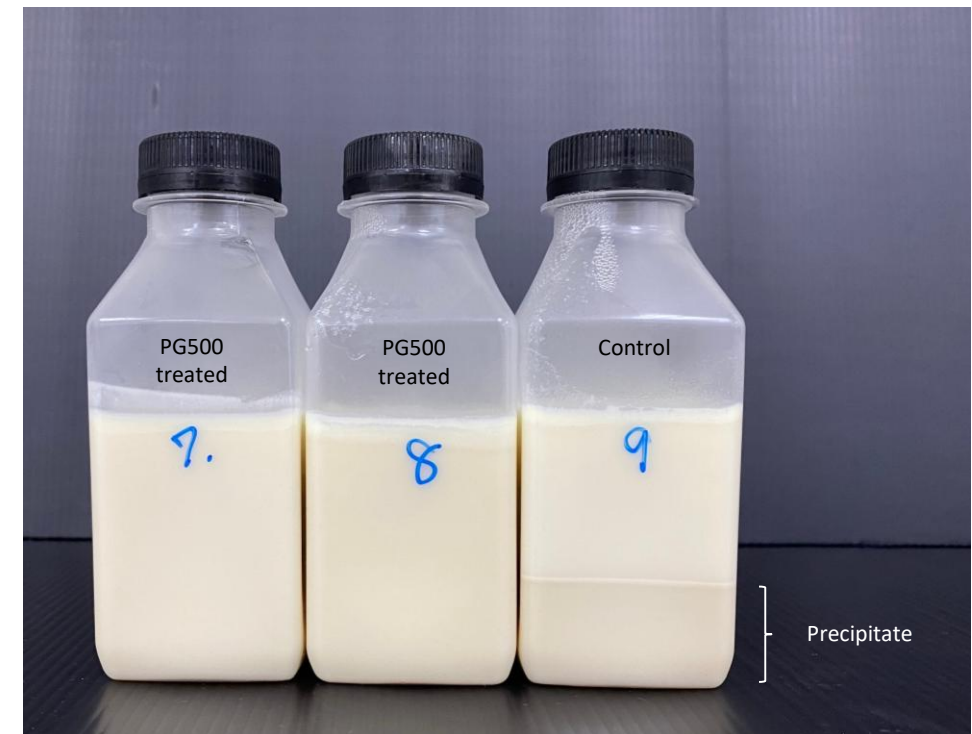
Simple process

Soy protein concentrate + soy protein isolate
(protein content 7%)



PG1000 treated high protein soy drinks

PG1000 enhances plant protein solubility, reducing drink grittiness for a smoother, more enjoyable experience

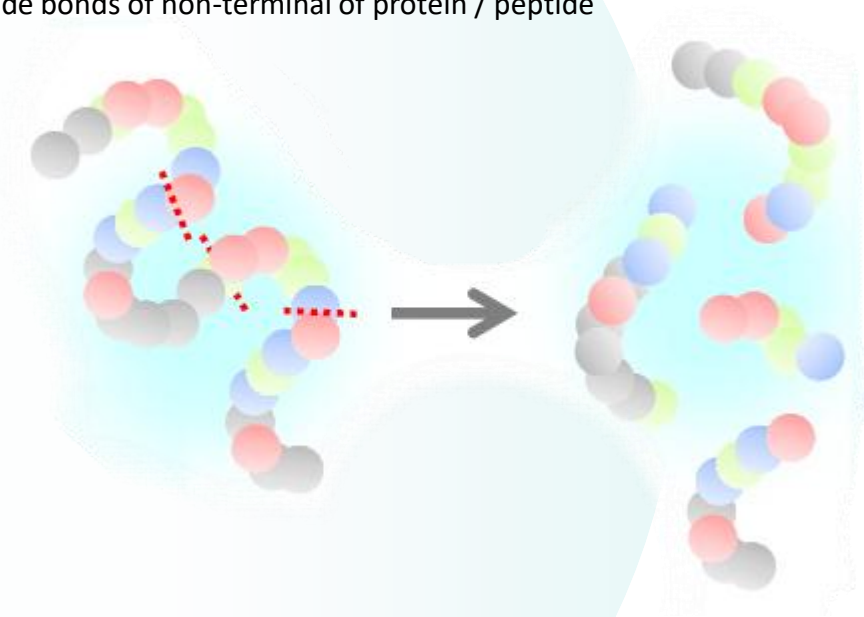


THERMOASE PC10FNA

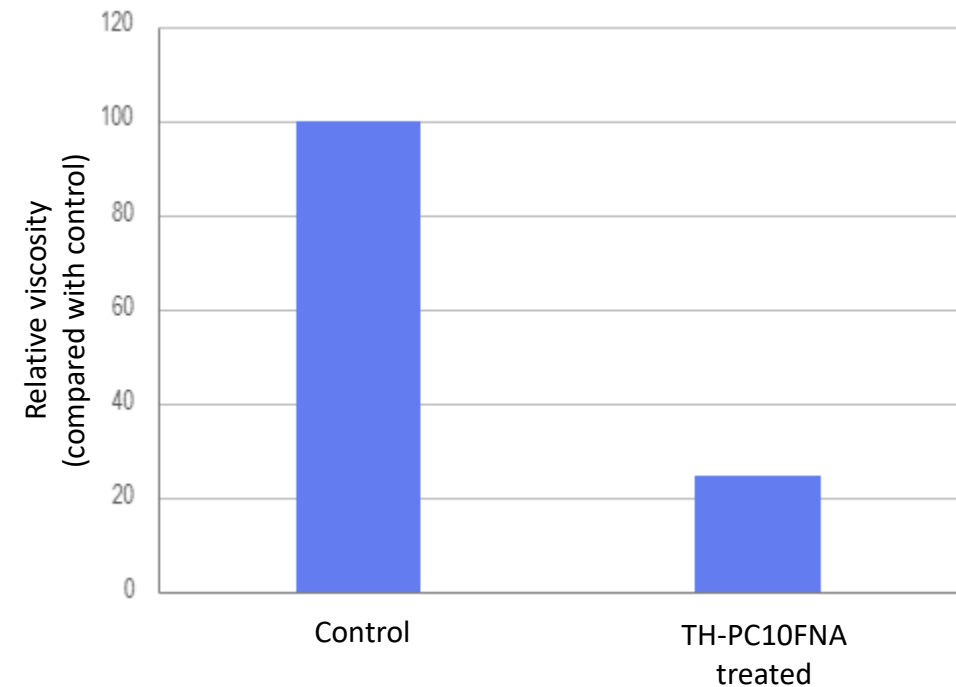
A solution for lighter, easy-to-drink high protein drink

Endo (Proteases)

cut peptide bonds of non-terminal of protein / peptide



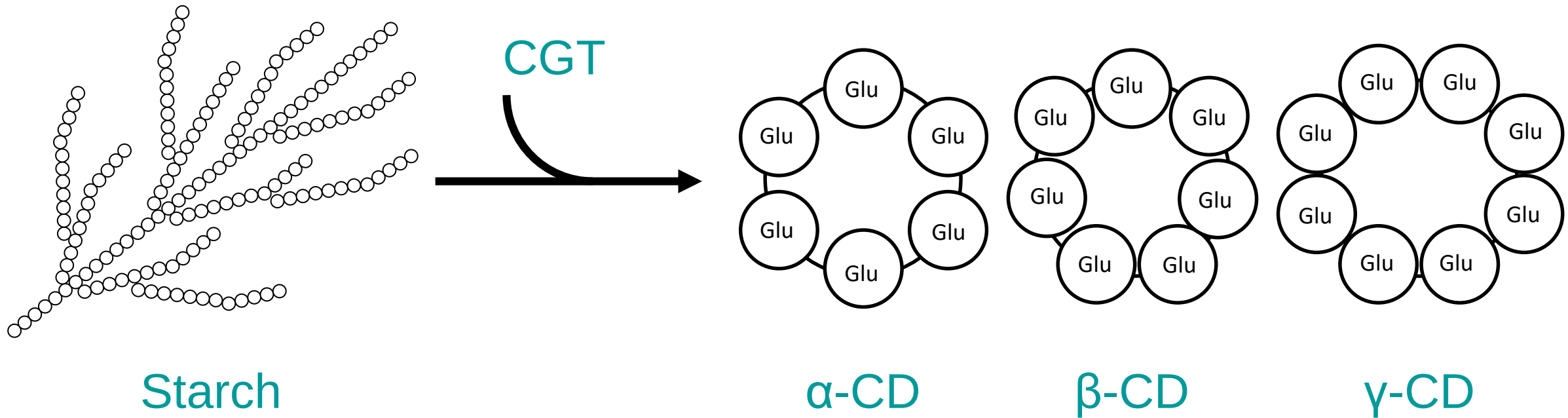
- THERMOASE PC10FNA partially hydrolyzes plant proteins
- Resulted in increase protein solubility and reduce viscosity of high protein containing products
- It generates less bitterness, compared with other proteases.



*TH-PC10FNA at dosage of 0.01% w/w of protein

** Total protein content = 8.6% w/w

Cyclodextrin glucanotransferase (CGT-SL) reduces beany note in plant-based drink



- CGT produces cyclodextrins from starch
- Resulted cyclodextrins binds with beany flavor compounds, consequently reduces their volatilization

Take Away Message

- **Enzymatic Processing** : Natural, label-friendly processing aids that overcome texture, taste, nutrition, and stability challenges in dairy and plant-based beverages.
- **Sanlacto 2.0** : Highly efficient lactase that reliably achieves target lactose reduction in dairy formulations.
- **Veramax G3** : Enables precise sweetness tuning and support “no added sugar” formulation without watery defects
- **PG1000** : Enhances protein stabilization, delivery superior creamy mouthfeel and boosts foaming stability
- **Thermoase PC10FANA & CGT-SL** : Optimize viscosity and reduce undesirable off- notes in high protein plant systems.



Contact us

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