Bridge2Food Europe 2026

Clean labels solutions for plant-based foods

11th June | Panagiotis (Panos) Voudouris, Bei Tian, Nam-Phuong Humblet-Hua, Laurice Pouvreau

Clean label

- Demand for plant-based foods: Driven by health and sustainability
- Success depends on: Texture, taste, and nutrition
- Key limitation: Plant proteins have lower functionality than animal proteins
- Current solution: Additives (e.g., starches, hydrocolloids) to improve texture
- Challenge: Long ingredient lists → perceived as non–“clean label” / ultra-processed

Clean label concept: Simple, familiar, natural ingredients

Clean Label Solutions

Clean Label Solutions

Our partners

Clean Label Solutions

Our partners

WAGENINGEN UNIVERSITY & RESEARCH

WU

Protein stable dispersions & true gels

(Physical Chemistry and Soft Matter & Food Physics)

Protein-Protein interactions

(Physical Chemistry and Soft Matter & Food Physics)

Protein – Matrix interactions

(Food Process Engineering)

WR

Application solutions (Wageningen Food & Biobased Research)

Clean label – Application formats




Different format – Different challenge

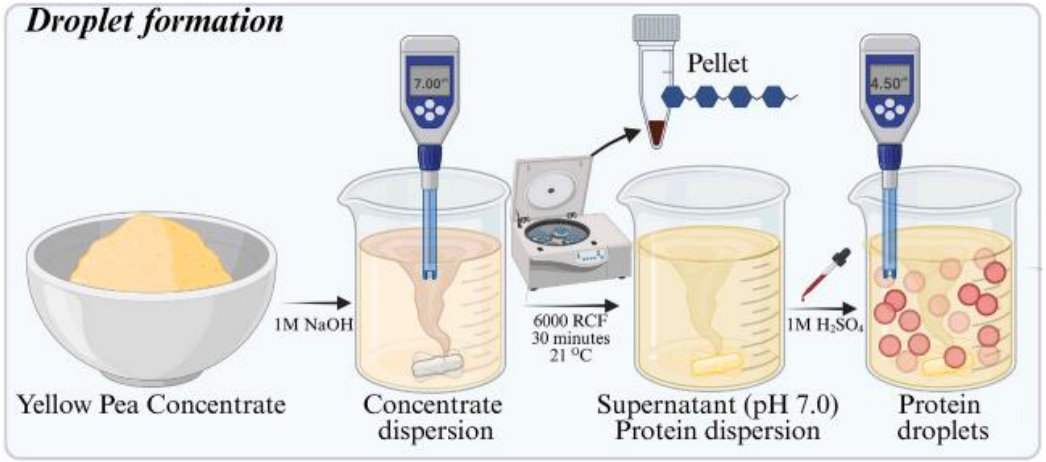
Aim generate technologies/strategies to:

- Burger: Replace methylcellulose (MC) with clean labelled ingredients
- Cheese: Self-supporting plant protein emulsion gels without the addition of hydrocolloids and/or modified starch
- Yogurt: No hydrocolloids and/or modified starch in formulation
- Beverage: Stable solution preventing sedimentation without using hydrocolloids

Understanding key characteristics of commercial plant-proteins

Protein stable dispersions

Concentrates: Native fraction



N. Doshi, J. Purrini, L. Pouvreau, E. van der Linden, P. Venema, R. de Vries, Protein-dense droplets to powders: creating low-viscosity colloidal plant protein ingredients, Journal of Food Engineering, 406, 2026. (10.1016/j.jfoodeng.2025.112796)

Understanding key characteristics of commercial plant-proteins

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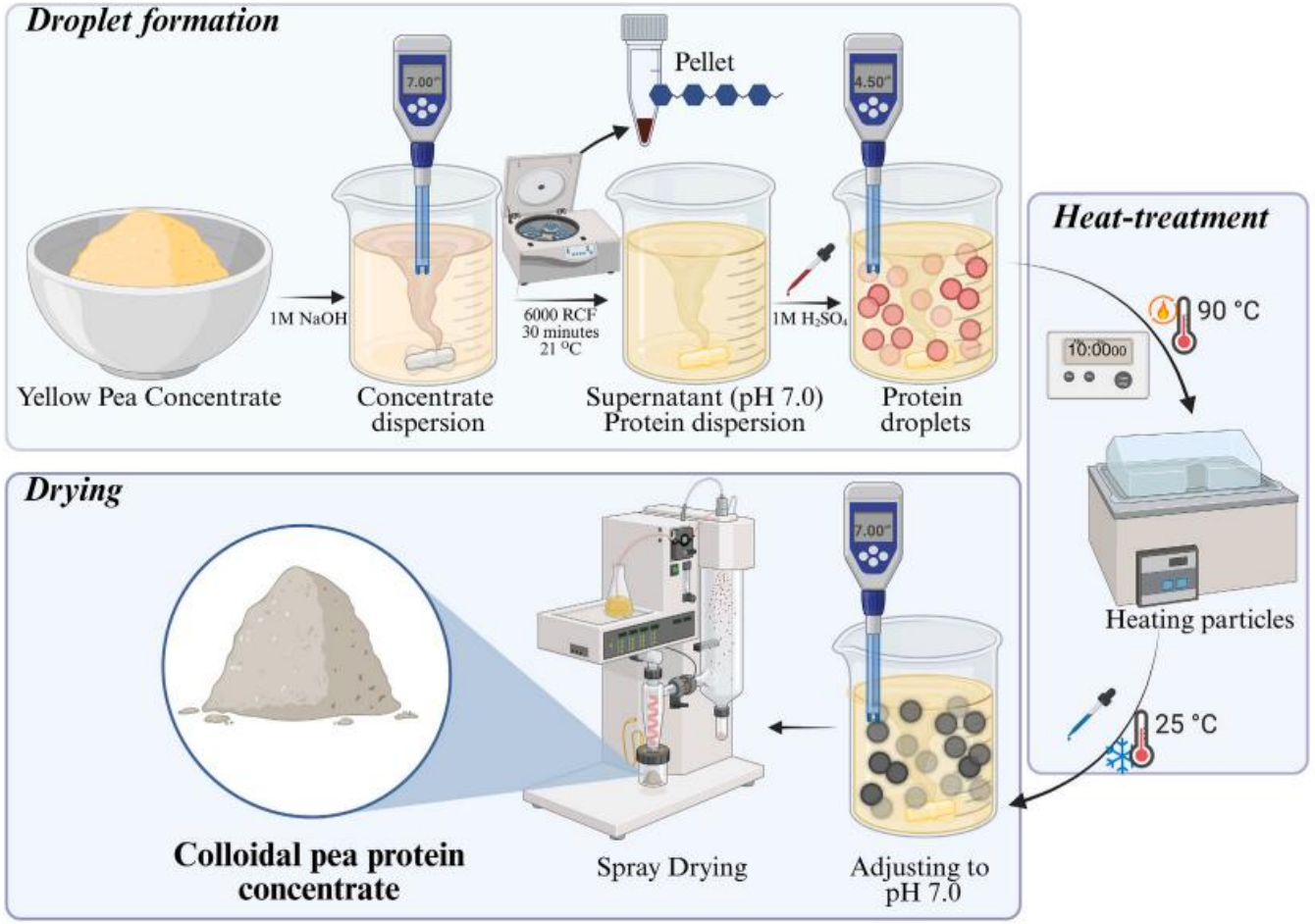

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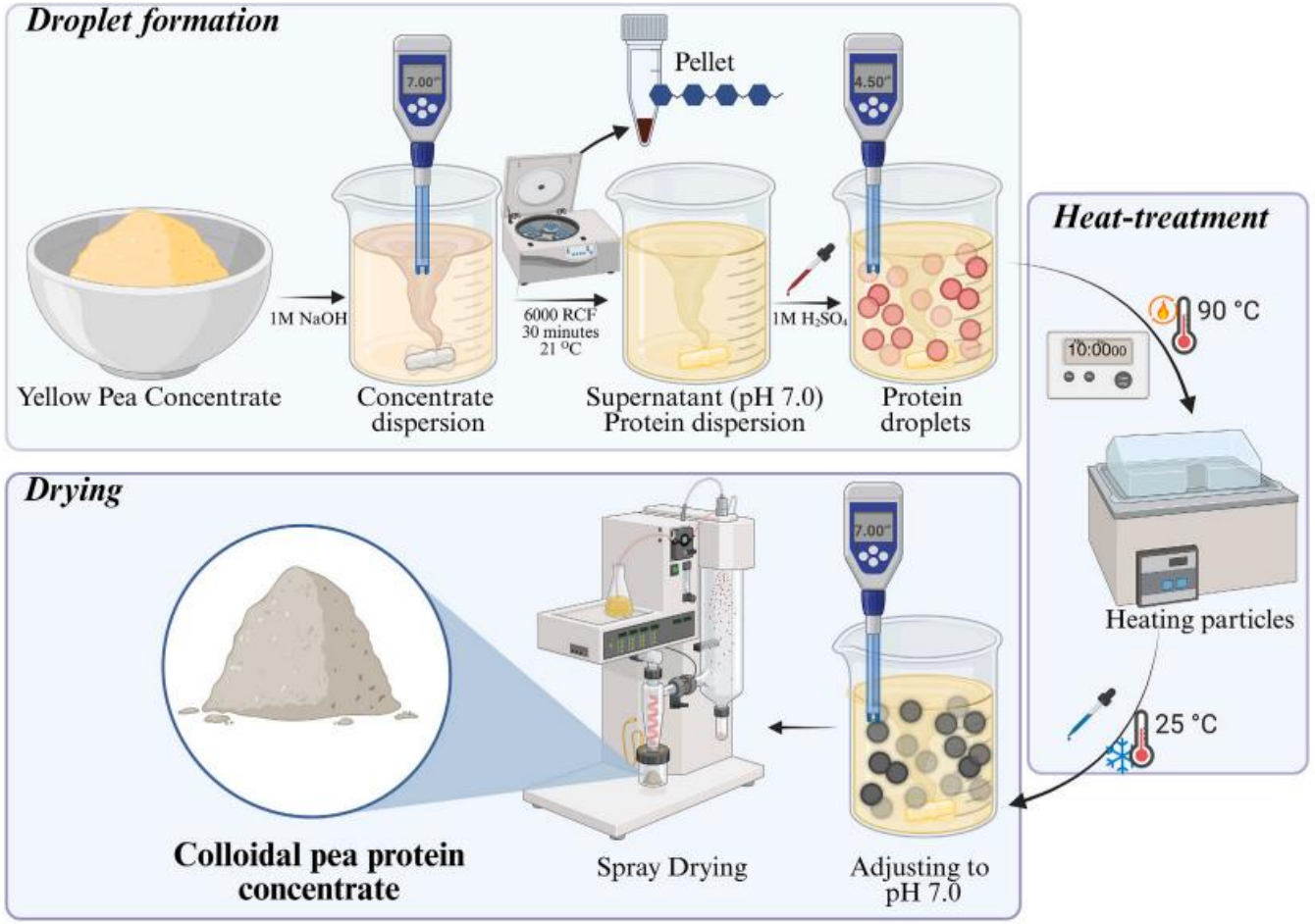
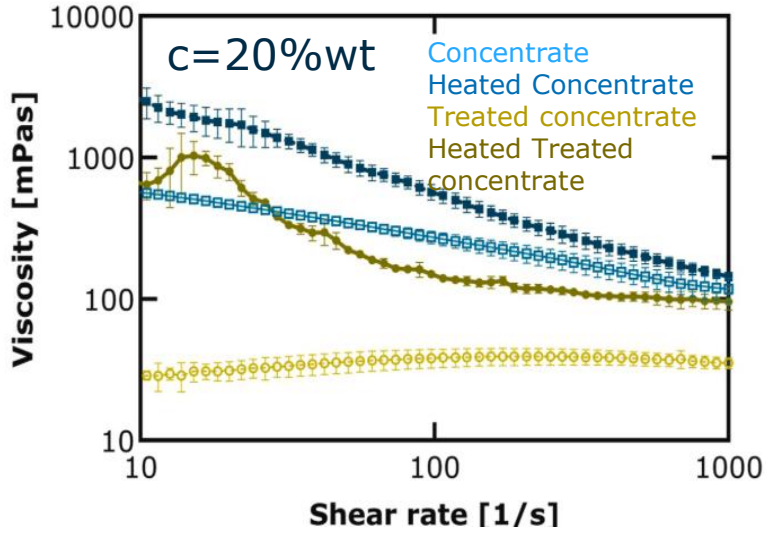




Turn aggregated plant proteins into structured colloidal particles giving:

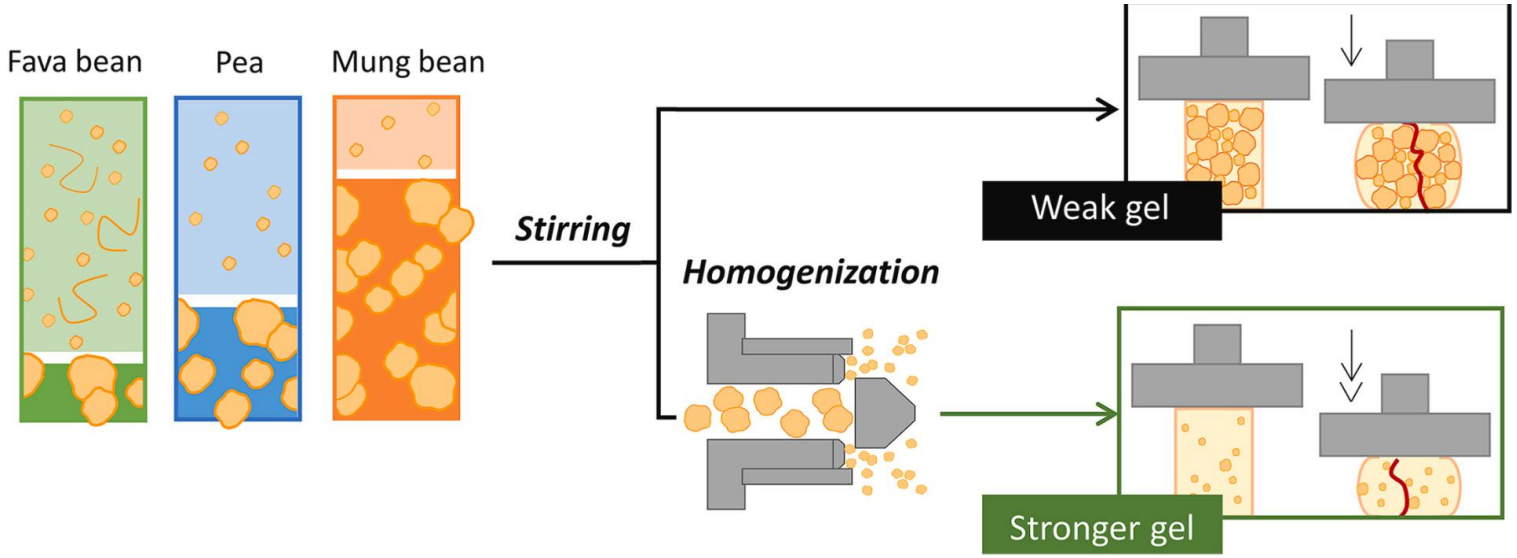
- ✓ better dispersibility
- ✓ lower viscosity at high protein content
- ✓ improved functionality

N. Doshi, J. Purrini, L. Pouvreau, E. van der Linden, P. Venema, R. de Vries, Protein-dense droplets to powders: creating low-viscosity colloidal plant protein ingredients, Journal of Food Engineering, 406, 2026. (10.1016/j.jfoodeng.2025.112796)

Understanding key characteristics of commercial plant-proteins

Protein-Protein interactions

Isolates: Soluble/Insoluble fraction - Controlling gelation behavior



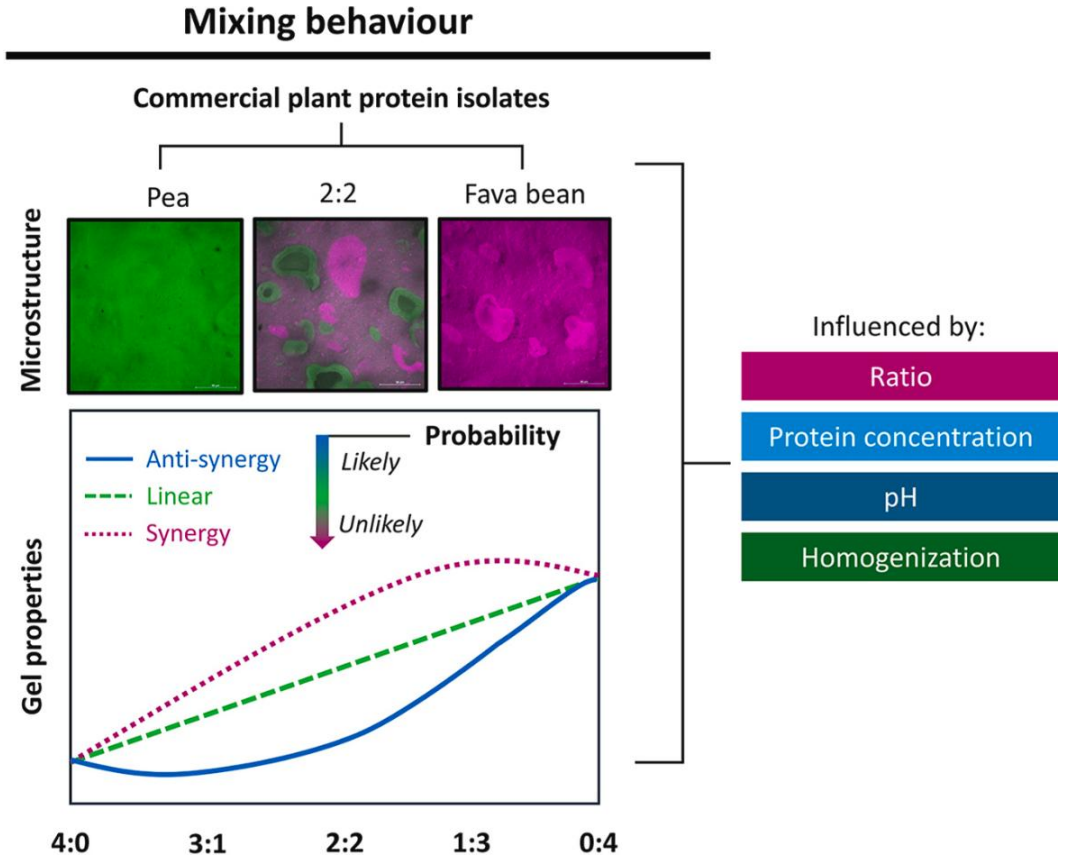
✓ Gelation is governed not only by soluble proteins, but by the balance between soluble and insoluble fractions.

S.W.P.M. Janssen, L. Pouvreau, R.J. de Vries, Commercial plant protein isolates: The effect of insoluble particles on gelation properties, *Food Hydrocolloids*, 154, 2024. (https://doi.org/10.1016/j.foodhyd.2024.110049)

Understanding mixing behavior of commercial plant proteins

Protein-Protein interactions

Isolates mixes - Strategies for controlling mechanical properties

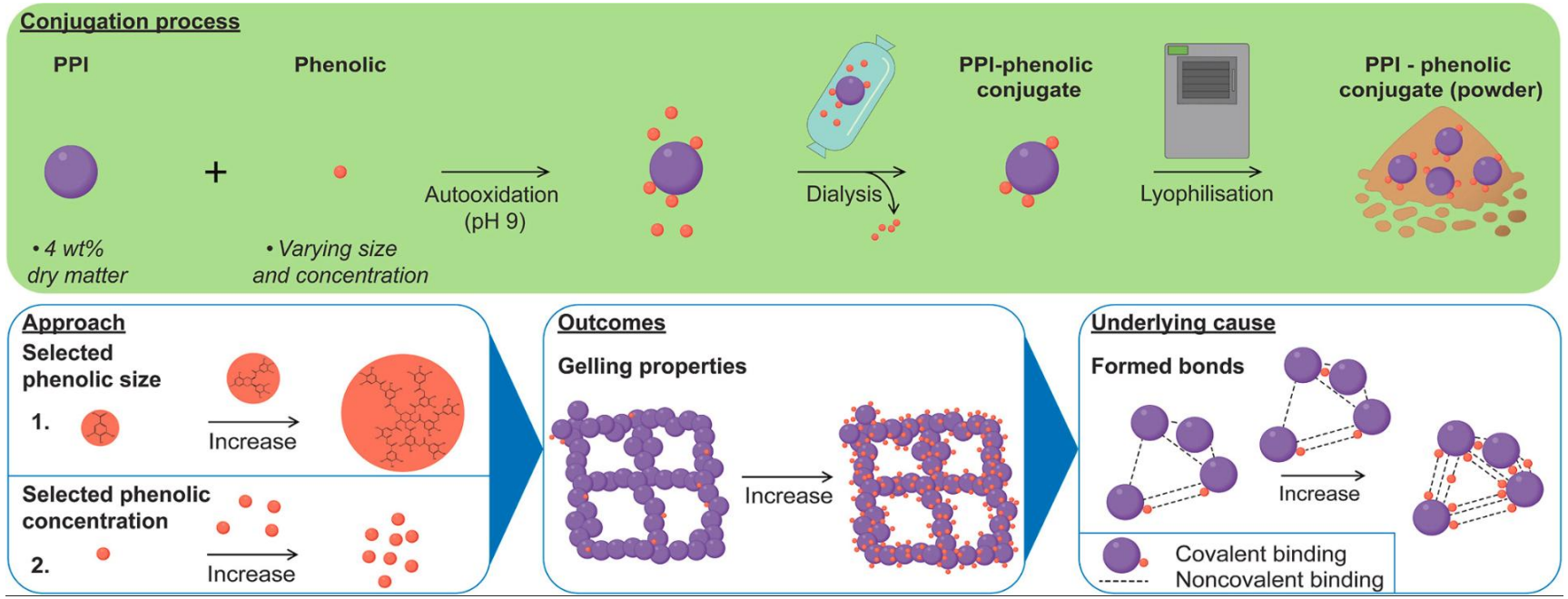


- ✓ Protein isolates are not synergistic by default—their structural incompatibilities matter
- ✓ Mixing disrupts network formation and continuity during heat gelation
- ✓ This leads to reduced gel strength and poorer mechanical properties

S.W.P.M. Janssen, M. Lokker, L. Pouvreau, R. J. de Vries, Mixing commercial plant proteins compromises the mechanical properties of heat-set gels, *Food Hydrocolloids*, 172, 2026. (https://doi.org/10.1016/j.foodhyd.2025.111993)

Understanding interactions protein - phenolic compounds

Pea isolate and various phenolic compounds – Impact on gelling behavior



- ✓ Phenolics provide a handle to tune plant protein gels—but their impact depends on how they interact with the protein network.

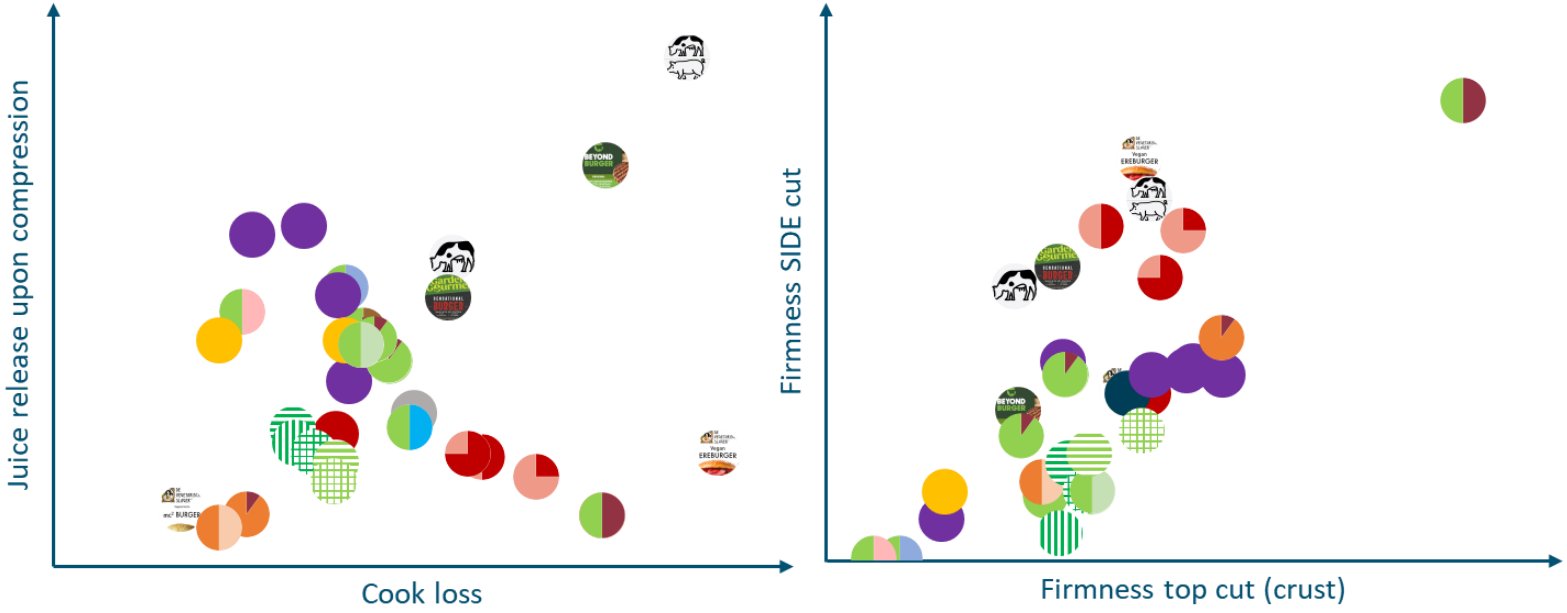
I. Faber, L. Pouvreau, A.J. van der Goot, J. Keppler,
Modulating commercial pea protein gel properties through the addition of phenolic compounds,
Food Hydrocolloids, 154, 2024 (https://doi.org/10.1016/j.foodhyd.2024.110123)

Clean label – Application formats




Plant-based burger

CLEAN LABEL
Plant-based foods



Icons – commercial products
Colored symbols – model systems prepared with different technologies

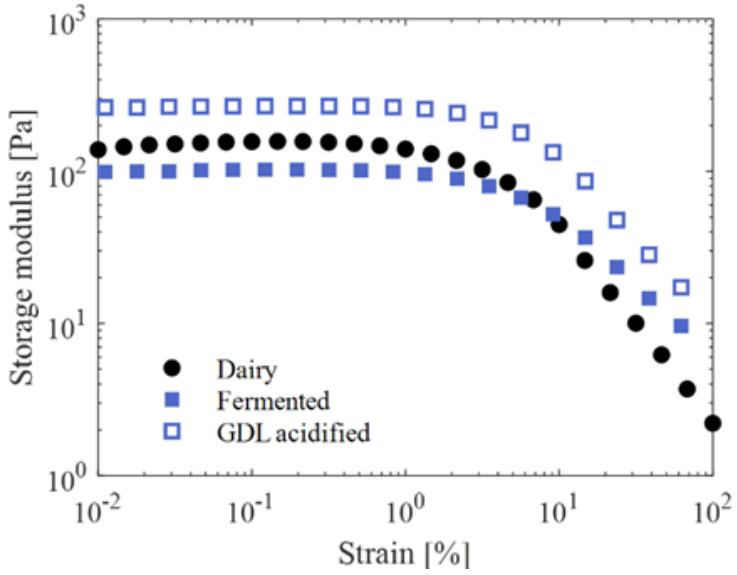
Mapping: Insights on how to tune texture and juiciness perception

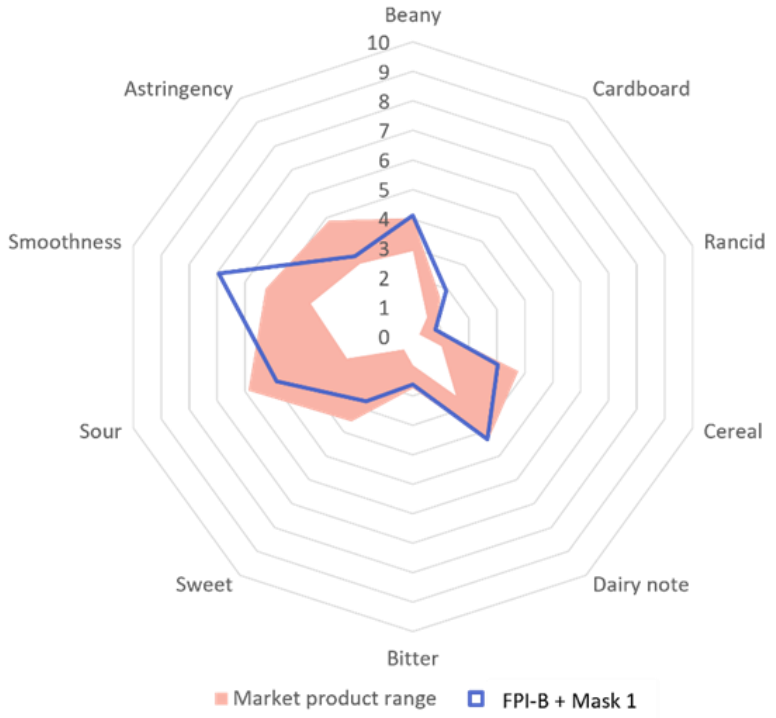
- ✓ Methylcellulose (MC) present in commercial plant-based burgers plays multiple roles in the matrix
- ✓ Multiple ingredients are needed to replace MC

Plant-based yogurt

CLEAN LABEL Plant-based foods

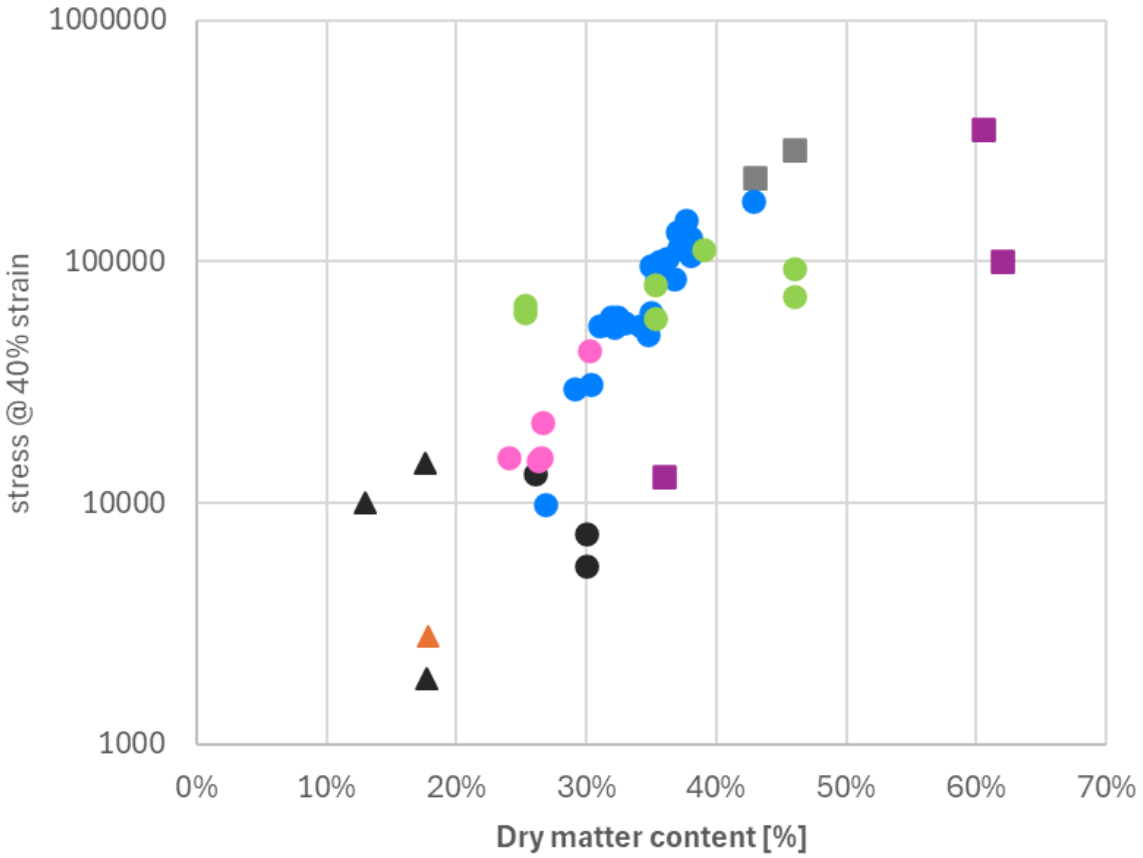
- Minimum ingredient list: plant protein, vegetable oil, water (culture)
- Comparable textural properties as dairy yoghurt
- Improved sensory attributes using maskers





Plant-based cheese

CLEAN LABEL
Plant-based foods



Dairy cheese

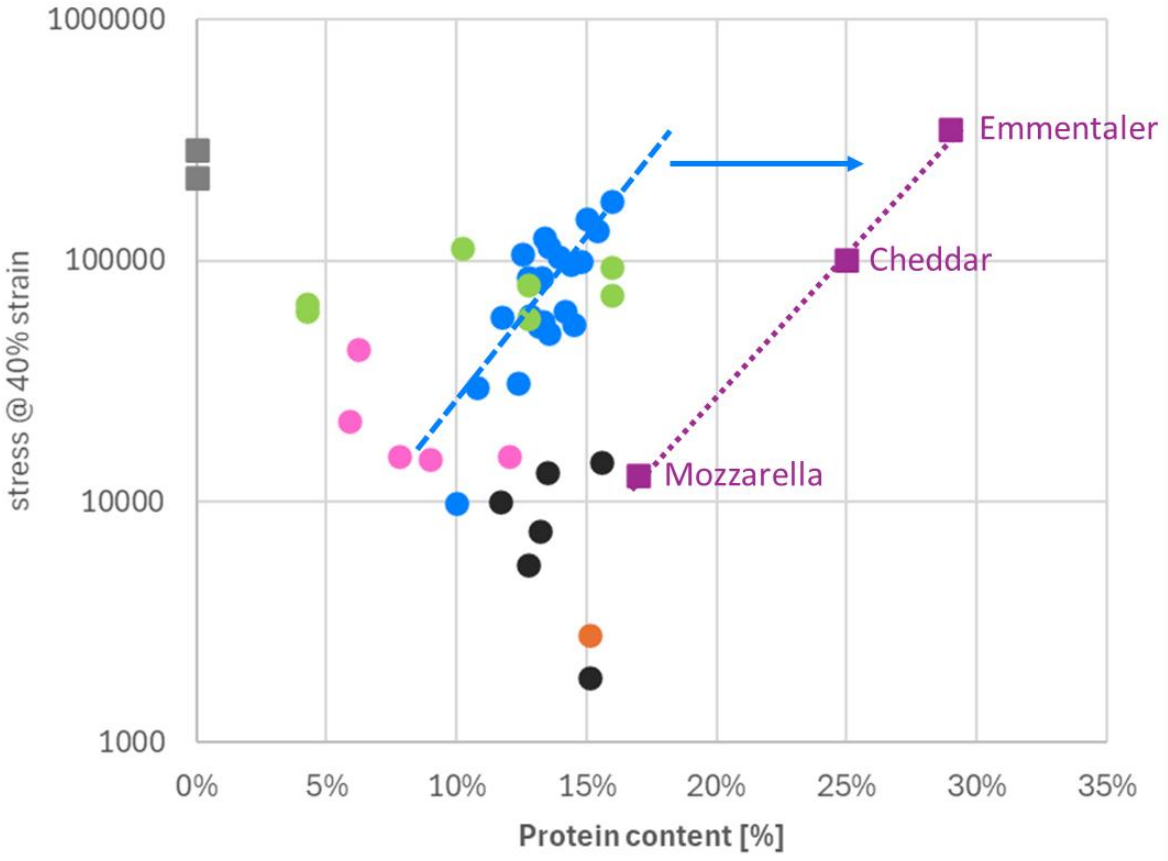
Commercial plant-based cheese

Plant-based model systems - developed through different structuring technologies

Mapping: Insights on how to tune texture

Plant-based cheese

CLEAN LABEL
Plant-based foods



Dairy cheese

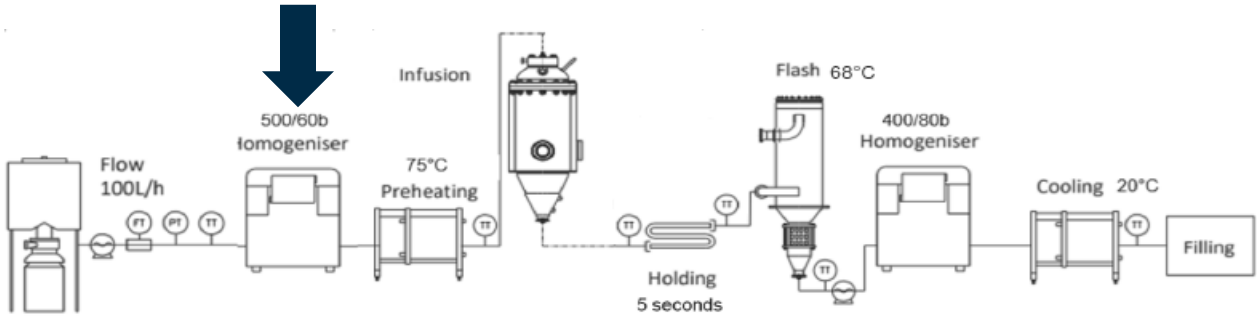
Commercial plant-based cheese

Plant-based model systems - developed through different structuring technologies

Mapping: Insights on how to tune texture

Model cheeses: High in protein (close to matching with dairy)

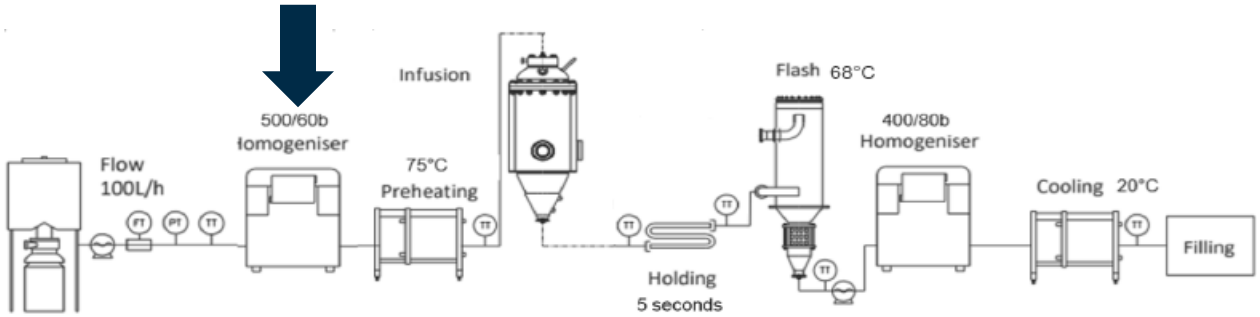
Plant-based beverage



CLEAN LABEL
Plant-based foods

An additional HPH step provides better physical stability

Plant-based beverage

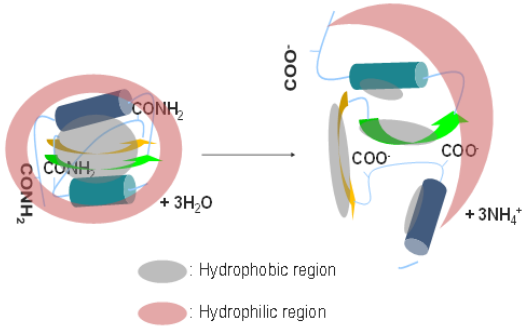


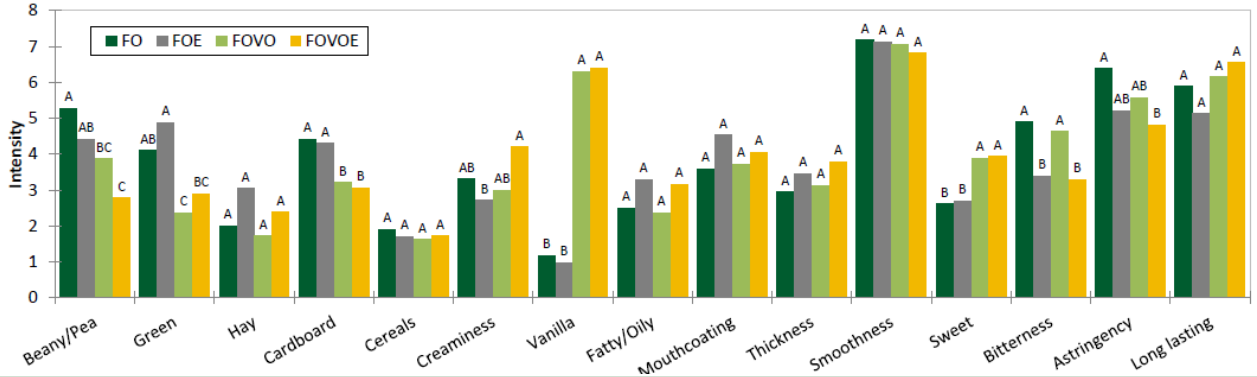
An additional HPH step provides better physical stability

Code	Description
FO	Control fava-based beverage (without enzyme & without flavour)
FOE	Enzymatic treated fava-based beverage (without flavour)
FOVO	Vanilla flavoured fava-based beverage (without enzyme)
FOVOE	Enzymatic treated & vanilla flavoured fava-based beverage

Improves performance in acidic environments

Enzymatic modification of protein





Improves flavour profile*

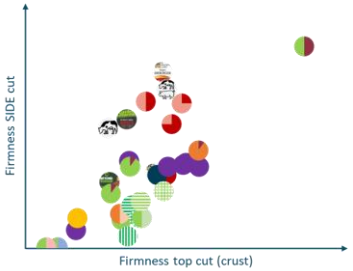
*Lopez Torres et al., BIOFLAVOUR 2025 (Poster)
Manuscript in preparation

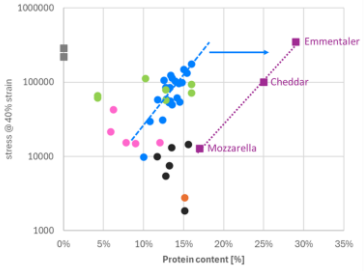
Summary

Clean label is a key requirement for plant-based product acceptance

Current formulations rely on additives → conflict with clean label perception

Solution lies in understanding and tailoring protein interactions: Protein–protein, Protein–matrix, Processing conditions





Functionality can be improved without additives by:

- Controlled structuring of proteins
- Controlled interactions (protein-protein and protein matrix)
- Process-driven design (e.g., HPH, heat, enzymatic modification)

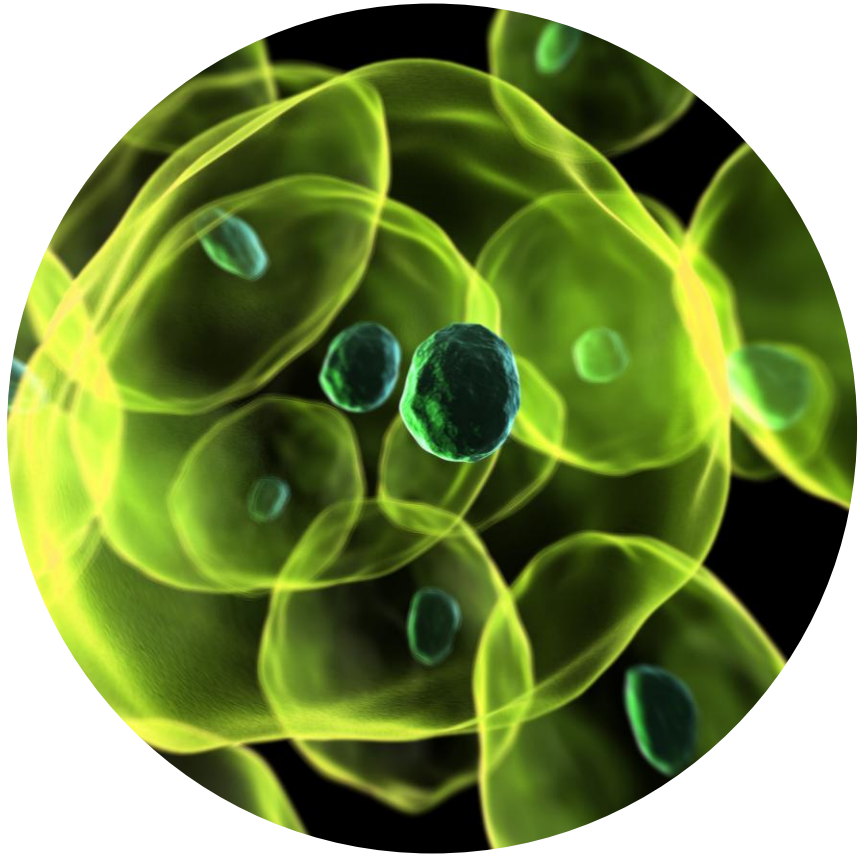
Take home message

Clean-label plant-based products are achievable through smart protein design—not by formulation complexity.

Many Thanks to all our partners for their active participation!

CLEAN LABEL
Plant-based foods

Thank you for your attention!



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https://www.wur.nl/en/research/food-and-biobased