ETH zürich

D-Hest - Department of Health Sciences and Technology

# Enzyme technology in tailoring the "meat-mimicking" properties of **potato protein**

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## Enzymatic modification

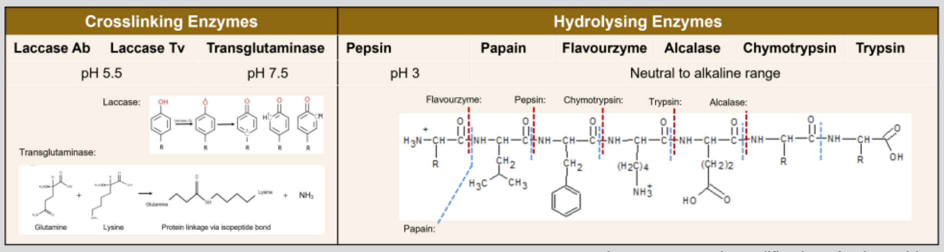


Figure1: enzymatic modification of polypeptides.

Enzyme Technologies applied on potato protein:

- Pepsin, alcalase & chymotrypsin successfully hydrolyze potato protein, improving its emulsifying properties, foamability, and oxidative stability of plant-based meat alternatives (1)(2).
- Crosslinking is an important mechanism in terms of food structure engineering (3).

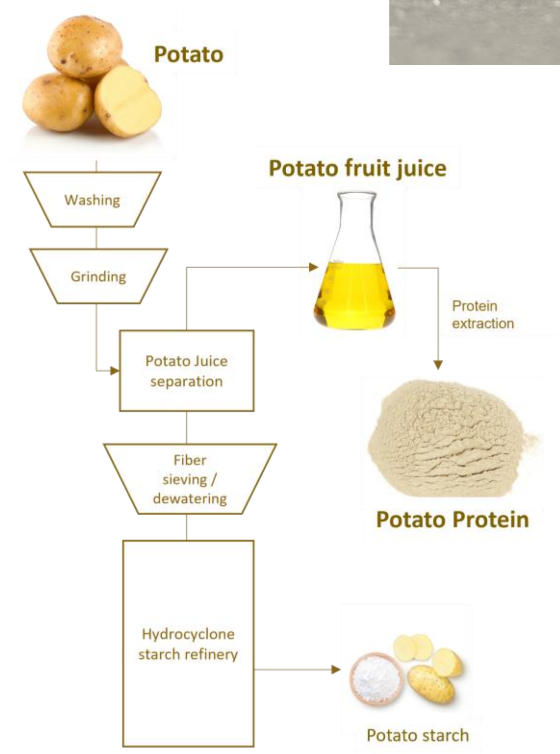


Figure 2: Potato protein extraction from sidestream in potato starch industry

### MOTIVATION

- Use side stream
- Improve gelling properties
- Application for meat analogue
- Superior amino acid profile of potato protein

## Meat analogue formulation

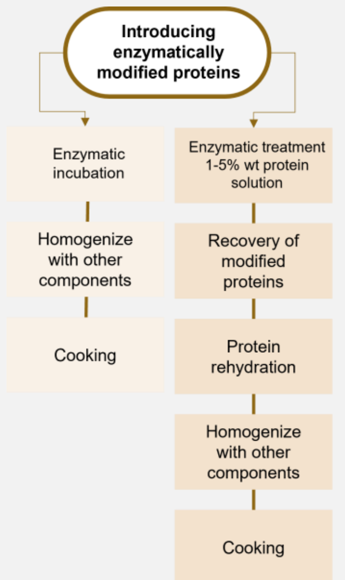


Figure 3: Preparation of meat analogue prototypes using enzyme modification.

Protein Gelation

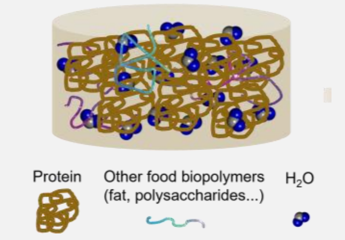


Figure 4: network formation in protein gelation.

- Transformation: solution → solid-like network
- Induced by heat, pH or ionic strength
- Protein-water & protein-protein interaction
- Unfolding of protein → increased hydrophobic interactions

## Texturing by transglutaminase

Transglutaminase treated potato protein prototypes showed similar texture attributes as chicken and commercial meat analogue (CMA).
The use of modified potato protein treated by transglutaminase in meat analogues could improve texture attributes such as hardness, cohesiveness and chewiness in meat analogues.

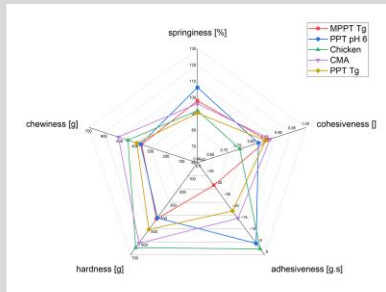


Figure 6: Texture profile of potato protein treated by transglutaminase.

## Microstructure of prototypes

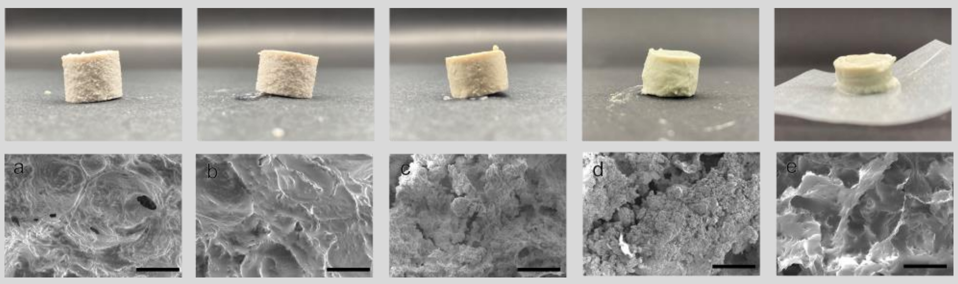


Figure 5: Structure and microstructure of modified potato protein in meat analogue prototypes.

Solanic® PPT prototype displayed a rippled and slightly porous surface (a), while the transglutaminase treated prototype showed a smoother surface indicating a more continuous network with more interaction (b). Isolated potato protein by ammonium sulfate precipitation may have reduced crosslinking and hydrolysis capability due to agglomeration (c). Modification by pepsin (e) showed a layered microstructure with less hydrophobic interaction compared to the aggregated control at pH 3 (d), resulting in a moist and less dense gel.

## Conclusion and outlook

- Developing new formulations for plant-based meat analogues promotes sustainability in the world food system by reducing meat consumption.
- The use of enzyme technology could enable the establishment of potato protein with a superior amino acid profile in meat alternative formulations.
- A stronger network is achieved through crosslinking by transglutaminase and laccase.
- Pepsin, alcalase, and chymotrypsin show potential for improving solubility and emulsification properties in meat analogues.

### References:

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