PLANT-BASED CHEESE PRODUCTION USING OPTIMIZED FABA BEAN MILK

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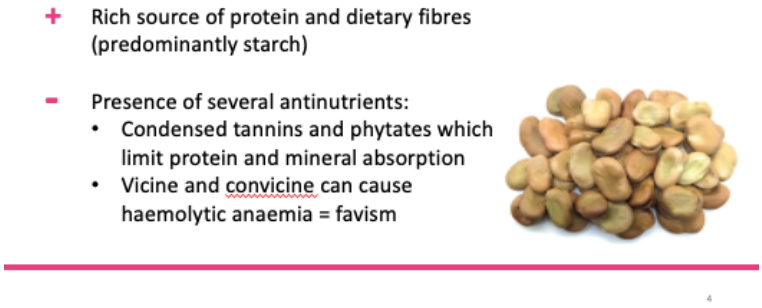
Dairy products provide a valuable source of nutrition and are included in many official nutrition guidelines, but at the same time there are numerous reasons for transitioning towards a more plant-based diet (Public Health England, 2016; Blomhoff *et al.*, 2023). Given that around a third of global greenhouse gas emissions are attributed to food production (Crippa *et al.*, 2021), it is clear that there is a desperate need to find more sustainable food solutions to feed an ever-growing population. In particular, there is a need for plant-based protein sources that provide the same high protein quality and flavour as animal-based food products.

FÆRM is a food technology start-up founded in 2020 focused on developing plant-based cheeses. Their first prototypes were produced in 2021 based on soy milk. Now, FÆRM is looking into formulating a high quality faba bean milk substitute to meet the demand for soy-free cheese production. Faba beans are a widely grown legume chosen for their nutritional value, specifically their high protein content. However thus far their use has been restrained by the presence of several antinutrients which limit their protein bioavailability.



Accordingly, this study investigated various pre-treatment and processing methods to commercial faba beans in order to encourage greater protein extraction during milk production, and thus to enhance the nutritional profile and functional properties of faba bean milk for plant-based cheese production.

Faba Bean Milk Production
After trialling various soaking treatments, faba bean milk was produced using a plant-based Milk Maker using the beans and water. Furthermore, the milk production was modified by applying a starch targeting enzyme solution, which was hypothesised to release proteins from insoluble starch and carbohydrate complexes, and thus increase the protein concentration of faba bean milk.

Protein Content
The results extended previous work on the effect of different soaking treatments by A. Dulaj and confirmed that a slightly alkaline soaking treatment appears favourable in encouraging protein extraction desirable for cheese production. Contrary to expectations, the enzyme solution failed to fulfil the potential of increasing the protein content.

Antinutrient
However, and surprisingly, the enzyme treatment significantly lowered the content of vicine and convicine, two pertinent antinutrients. These results are highly encouraging since the risk of favism makes it imperative to limit the content of vicine and convicine to ensure faba bean food products are safe and suitable for consumption. As such, the enzyme treatment is a lucrative strategy to eliminate one of the main concerns in terms of antinutrient content and to potentially reduce the unappealing discolouration of the product.

This project allowed me to use the knowledge, skills, and competences gained during my MSc. in Human Nutrition towards a practical project in a company setting. I thoroughly appreciated and enjoyed the working environment and company culture at FÆRM. I collaborated and communicated with different professionals in the company including Astrid, Head of Development at FÆRM in the context of my project design and Martina, Head of Research at FÆRM during my laboratory experiments at their lab and the Bio Innovation Institute.

Overall, I gained a much greater appreciation of all the considerations to do with product development and learnt a lot about the range of responsibilities in a start-up. I also thank Prof. Iben Lykke Petersen and Prof. Inge Tetens (University of Copenhagen) for constructive scientific discussions throughout my project.