

WUR MINIScreen platform

Fast-track development of plant-based products



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Optimise your plant-based products by application of fermentation technology with WUR's innovative MINIScreen platform. This high-throughput platform finds tailor-made fermentation solutions for optimal flavour, texture, and shelf-life. It enables you to bring more diverse and better plant-based products to the market.

Fast-track development of plant-based products

The market for plant-based proteins as healthy, sustainable nitrogen sources in the human diet has expanded rapidly. For future success, a number of challenges related to plant-based proteins must be solved. The current products on the market are unable to convince most consumers to switch towards plant-based foods given the presence of off-flavors, long ingredient list and low nutritional value of these products. Combining the reduction of off-flavors with reducing the ingredient list and increasing nutritional value is challenging and clear-cut solutions are not available.

This triggered the food industry to take a fresh look at age-old fermentation processes, which were among the first food processing methods, for plant-based opportunities. The development of advanced fermentation strategies offer food developers opportunities for overcoming the current challenges. For instance, food fermentation or fermentation-derived ingredients can enhance the

flavour, mitigate off-notes and affect the nutritional composition by either enrichment or removal of compounds of plant-based products. Furthermore, enzymes produced via fermentation can improve the protein functionality or even restructure them.

What is MINIScreen?

WUR's MINIScreen (Matrix InteractIon Screening) platform is a fast screening platform enabling the development of plant-based products by using a miniaturized version of the product. This platform assists the food industry by carrying out dedicated contract research projects to screen for improvements by fermentation performed in the miniaturized version of the relevant product matrix of interest. With the MINIScreen platform, new innovative products can be developed in a relatively short timespan, with reduced risks and optimal use of resources. The platform can be used for multiple purposes that results in the improvement of the performance and overall quality of plant-based products:

- 1 Screening for fermenting cultures that produce desirable components or improve functionality (for example flavour compounds, dietary fibre, vitamins, colour, bio-thickeners);
- 2 Screening for cultures that remove undesirable aspects, for example mitigation of off-flavours or anti-nutritional factors, allergens;
- 3 Screening of clean label preservation solutions by fermentation for shelf-life extension and safety assessment.

MINIScreen for maximal impact

The MINIScreen platform allows high-throughput screening of plant-based proteins for desired functionalities coupled to chemical, microbiological or physical analysis. Within MINIScreen, hundreds to thousands of conditions may be screened on a weekly basis.

A pipetting robot for automated liquid handling is used to automatically determine viable cell concentrations of beneficial organisms (fermentation) or unfavourable organisms (spoilage or pathogenic microorganisms) ensuring reproducibility of the fermented product whilst at the same time ensuring safety and shelf-life are within the required parameters. Furthermore, viscosity can be determined and may serve as an indicator for potential texture properties. Finally, samples for protein functionality and flavour analysis may be taken in time and analysed by a range of advanced high-throughput methods including PTR-HRMS and receptor based approaches. For example, flavour-active volatiles formed are grouped into functional aroma groups to efficiently assess which ferments should be selected for further development. These collaborations build on WFBR's leading expertise on strains, cultures, grow conditions, food microbiology, and flavour.

Delivering the right flavour and structure

The use of plant-based proteins often results in undesirable flavour off-notes like 'beany', 'green' and 'earthy' notes. In combination with the flavour knowledge and capabilities within WUR, the

MINIScreen platform can be used to screen for natural masking compounds/strategies, which may be utilised in the product formulation.

Fermented foods are generally recognised and appreciated for their flavour: a combination of the original components present in the foodstuff and the unique components produced by microbial conversion. It is possible to screen for



Our tailor-made offer

Wageningen experts start the project by discussing the final product requirements with respect to flavour, nutritional value and shelf-life. We then leverage the innovative MINIScreen (Matrix INteractIon Screening) platform for fast screening of miniaturized plant-based foods. You receive a comprehensive, tailor-made approach to help you develop fermentation solutions attuned to your needs. This all-inclusive approach includes:

- 1 Definition of the research strategy for development of your plant-based alternative and validation of the MiniScreen setup for your specific product and Key Performance Indicators
- 2 Screening for the right Key Performance Indicators with respect to flavour aspects, nutritional value, texture and shelf-life
- 3 Validate hits from the screening phase in real applications on lab-scale
- 4 Scaling-up the most promising concepts for testing at the client facilities

fermentation solutions that produce, for example, a more savoury/meaty aroma or enhance/mask typical flavour notes.

The improvement of the textural properties of plant-based food can be assisted by fermentation by improving cross-linking properties of proteins resulting from proteolytic activity or by production of polysaccharides. Solid-state fermentation and fermentation of liquids can enhance structure and mouth feel in plant-based products without the addition of classic texturizing ingredients such as gelling agents and thickeners.

Safe and nutritional foods

Meat and dairy alternatives tend to have lower nutritional values than traditional meat and dairy products, surveys show consumers are taking note. Researchers from Wageningen Food & Biobased Research have studied vitamin-producing food grade bacteria and have

developed fermentation processes leading to vitamin-fortified (plant-based) products. A specific example of such a fortification is the co-fermentation of the *Rhizopus* sp mould and *Propionibacterium freudenreichii* subsp. *freudenreichii* bacterium using (combinations of) lupin, chickpeas, barley, fava beans or green peas, to create tempeh-like meat alternative with vitamin B12 levels up to 3.0 µg/100 g.

One nutritional concern for meat alternatives is the high levels of sodium used to preserve the food and improve the taste and shelf life. Wageningen experts mitigate this challenge by selecting fermentations that are rich in umami compounds. For this, a specifically developed cell-based assay is used. Furthermore, the MINIScreen approach allows selection from a large range of formulations and/or ferments that show improved shelf-life characteristics. Combining these technologies allows you to identify the product which will provide you with the best flavor/texture profile whilst at the same timing ensuring safety and shelf life are optimal.

The benefits of MINIScreen

- Tailor-made fermentation solutions that aim to screen the product or ingredient matrix for specific functionality requirements of your plant-based products?
- High-throughput screening means a fast-track comprehensive approach to product development
- Miniaturized size means cost-effective methodology for maximal de-risking of your R&D project

Contact

Are you interested to find out how this MINIScreen platform could fast track your plant-based products? Please contact Joost Blankestijn to make an appointment to discuss this in detail.

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