Independent Projects in Food Science, 30 hp (A1E or A2E – Magister or Master)

NB! A1E can be written in Swedish or English, A2E must be written in English.

If you are interested in any of the suggested projects or just want more information please contact the supervisor. For some projects see more details below.

Impact factors controlling the desired raw milk quality, mainly for the production of cheese and milk powder
Contact: Maria.A.Karlsson@lrf.se Tel. 010-1844418

Nutritional density in relation to environmental impact - how do we best evaluate food from a health and environmental perspective?
Contact: Ann-Kristin.Sundin@lrf.se Tel. 010-1844185

Dairy matrix - milk and dairy products beyond saturated fatty acids
Contact: Ann-Kristin.Sundin@lrf.se Tel. 010-1844185

Lactose in cheese – are levels of concern?
Contact: Maria.Karlsson@lrf.se; Ase.Lundh@slu.se

Algae as a feed ingredient to reduce methane emission from dairy cows; effect on protein and fat profiles in milk
Contact: Monika.Johansson@slu.se; sabine.sampels@slu.se; Ase.Lundh@slu.se

Development of microbiota in artisan cheeses during maturation
Contact: Monika.Johansson@slu.se; Ase.Lundh@slu.se

Characterization of the microbial composition of dairy farmhouse starter cultures by culturing methods and MaldiTOF
Contact: Monika.Johansson@slu.se; Ase.Lundh@slu.se

How is FFA levels in milk affected by lactation number of the cow?
Contact: Monika.Johansson@slu.se; Ase.Lundh@slu.se

alfa-s_1 casein mutation in goat; effect on cheese yield
Contact: Monika.Johansson@slu.se; Ase.Lundh@slu.se

Association between cheese yield and low expression of alpha S1 casein in milk from Swedish goats.

Project in collaboration between Swedish farmhouse dairy producers (Sveriges gårdsmejerister) and SLU. The project can be constructed both as an individual investigation or as a work for two Masters students.

Contact: Monika.Johansson@slu.se; Ase.Lundh@slu.se

Dietary fiber, starch and phenolic profile of Swedish pea fractionates obtained from Pea Biorefinery process
Contact: Roger.Andersson@slu.se Santanu.Basu@slu.se

Pulse milling and Sieving: Functionality of the different fractions
Contact: Santanu.Basu@slu.se Roger.Andersson@slu.se

Pea Starch Functionality
Contact: Shishanthi Jayaratna, shishanthi.jayarathna@slu.se

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Grain morphology profiling with the novel Cgrain instrument. Comparison between wheat landraces and modern cultivars at different cultivation conditions. (www.slu.se/brodprojekt)
Contact: Roger.Andersson@slu.se

Do you want to help Åland to develop a sustainable food strategy? Or do you want to be a part of Åland's artisan food craft?
Contact: Magnus Stark magnus.stark@landsbygd.ax on Ålands Rural center or monika.johansson@slu.se

Investigating exopolysaccharides (EPS) formation und composition in oleaginous read yeasts.
Contact: Volkmar Passoth Volkmar.Passoth@slu.se

Microbial lipid and carotenoid production from logging residues
Contact: Volkmar Passoth Volkmar.Passoth@slu.se

Extraction and analysis of extracellular substances in oleaginous read yeasts – identifying novel compounds for industrial applications
Contact: Volkmar Passoth Volkmar.Passoth@slu.se

Light dependency of carotenoid production in oleaginous read yeasts

Contact: Volkmar Passoth Volkmar.Passoth@slu.se

Genetic manipulation of oleaginous read yeasts using CRISPR/Cas
Contact: Volkmar Passoth Volkmar.Passoth@slu.se

Characterisation of microbial consortia during combucha-brewing
Contact: Volkmar Passoth Volkmar.Passoth@slu.se

Stability of pasteurised and non-pasteurised combucha
Contact: Volkmar Passoth Volkmar.Passoth@slu.se

For detailed information please contact: Volkmar Passoth (Volkmar.Passoth@slu.se).

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Valorisation of ice-cream waste – alternatives to animal feed?
Contact: Monika Johansson Monika.Johansson@slu.se; Lina von-Hackewitz Lina.von-Hackewitz@unilever.com

Impact of increasing ice-cream storage temperature on product quality and carbon footprint
Contact: Monika Johansson Monika.Johansson@slu.se ; Lina von-Hackewitz Lina.von-Hackewitz@unilever.com

Gluten composition in flour and dough
Contact: louise.selga@lantmannen.com , 072 237 14 97

Effect of enzymatic treatment on the gelling properties of pea protein.
Contact: jaqueline.auer@slu.se; mathias.johansson@slu.se

Effect of enzymatic treatment on the solubility and functional properties of different plant-based proteins.
Contact: jaqueline.auer@slu.se; mathias.johansson@slu.se

Making Tofu products using Swedish grain legumes
Contact: Jing.lu@slu.se; anja.herneke@slu.se

The consumer's dilemma – food safety vs food waste

Contact: Karin Söderqvist, Karin.soderqvist@slu.se (Department of Biomedical Sciences and Veterinary Public Health, SLU) and Marie Lange, marie.lange@ikv.uu.se (Department of Food Studies, Nutrition and Dietetics, Uppsala University)

*Bakteriell kontamination av vildsvinskött från jägare och vilthanteringsanläggningar i Sverige.***Contact:** Jonas Malmsten, Institutionen för vilt, fisk och miljö E-post: jonas.malmsten@slu.se, Su-Lin Hedén, Su-lin.Leong@slu.se

Fatty acid composition in pigs from different breeds – is the Mangaliza pig a better converter to omega 3?
Contact: Sabine Sampels, Sabine.sampels@slu.se

Steam explosion pretreatment of wheat bran for arabinoxylan extraction – project in collaboration between Lantmännen and SLU

Contact: Solja Pietiäinen solja.pietiainen@lantmannen.com tel 0766970022

PROJECT DESCRIPTIONS

Impact factors controlling the desired raw milk, mainly for the production of cheese and milk powder

How is the milk raw material affected by the various factors in the value chain? Especially genetic markers for milk quality. Problematization about the total number of bacteria is also relevant.

Investigating exopolysaccharides (EPS) formation und composition in oleaginous read yeasts.

EPS are used as viscosity agents (thickeners) and emulsifiers in food industry, in medical application for coating of medical devices and for waste water treatment as they adsorb heavy metal ions and aromatic compound. In this project you are going to study the formation of EPS in different *Rhodotorula toruloides* strains and analyze their chemical nature.

Microbial lipid and carotenoid production from logging residues

Oleaginous read yeasts may accumulate lipids to levels exceeding 70 % of their cell dry weight and are strong carotenoid producers. These lipids can sustainably replace vegetable oils in food and feed. Carotenoids are used as nutritional supplements, dye in dietary supplements, pharmaceuticals and cosmetic industries. The use of logging residues from forest industry as a substrate to produce lipids and carotenoids can add an additional value to Swedish key industries and decrease the dependency for importing unsustainably produced vegetable. In this project you

are going to analyse the lipid content and carotenoid composition from different *Rhodotorula toruloides* strains growing on logging residues.

Extraction and analysis of extracellular substances in oleaginous read yeasts – identifying novel compounds for industrial applications

The composition of the extracellular substances secreted by oleaginous read yeasts has been poorly understood. Examples of known substances are various exopolysaccharides, which are used in food industry as e.g. viscosity agents (thickeners) and emulsifiers. However, there are still a lot of unknown substances secreted by red yeasts. Among these substances many may be of relevance for food industries or other industrial sectors. In this project you examine the composition of the supernatants for the presents of extracellular substances from different red yeasts.

Light dependency of carotenoid production in oleaginous read yeasts

Oleaginous read yeasts are strong lipid and carotenoid producers. The latter is used as nutritional supplements, dye in dietary supplements, pharmaceuticals and cosmetic industries. For the successful commercial production of carotenoids from red yeast, the carotenoid content should be as high as possible, and quantitatively reliable. Carotenoids are produced by cells in response to oxidative stress. In this study you will investigate the impact of light on the carotenoid content of the cells.

Genetic manipulation of oleaginous read yeasts using CRISPR/Cas

The oleaginous read yeasts *Rhodotorula toruloides* is a strong lipid and carotenoid producer and a workhorse for biotechnology applications as it can be metabolically engineered to produce compounds not naturally produced by this yeast. In order to alter yeast performance and lipids towards the production of food/supplements, animal feed and oleochemicals of industrial relevance genetic modifications are needed. One of the recent genetic techniques that is breaking new ground for metabolic manipulation is CRISPR/Cas, a genome editing technology used to edit DNA at precisely defined sites. Alternatively, we are going to develop knock-down of genes using anti-sense technology, which is easier to obtain, since it is based on a system that is naturally present in this yeast.

In this project you will further develop the application of CRISPR/Cas for the genetic manipulation of *Rhodotorula* strains. This requires a basic understanding of genetics and molecular techniques.

Characterisation of microbial consortia during combucha-brewing

This project will be done in collaboration with Källsjö Bryggeri. This company is producing high-value combucha with a character that reminds to Champaign. There is, nevertheless, some fluctuation in the quality, which is probably to a large part due to changes in the microbial consortium. This project aims to monitor the microbial population during fermentation. Methods to be used will include culturing of microbes and their identification with molecular techniques.

Stability of pasteurised and non-pasteurised combucha

This project will be done in collaboration with Källsjö Bryggeri. This company is producing high-value combucha with a character that reminds to Champaign. Currently, the company is pasteurising their product to ensure its stability until consumed. However, heat treatment affects the final taste, therefore it needs to be tested, whether one can store the product without pasteurising or with less intense pasteurisation. Different badges of combucha will be stored for varying times and at different temperatures, and the hygiene (microbial populations) will be tested. Methods to be used will include culturing of microbes and their identification with molecular techniques.

Valorisation of ice-cream waste – alternatives to animal feed?

When producing ice cream, the ice cream company in Flen is also producing waste. Today, our ice cream waste is classified as animal feed and picked up by the local farmer to be used as pig feed. The factory in Flen would like to get away from the animal feed certificate and use the food waste as something else. The student will investigate, what kind of options there are to use the food waste for something else and will plan and execute (as far as the student comes) the change.

Impact of increasing ice-cream storage temperature on product quality and carbon footprint

At the ice-cream factory in Flen, the storage temperature is -24 degrees. To lower costs and reduce the global footprint, they would like to increase the storage temperature. In this study, the student is investigating if increasing the storage temperature at the factory in Flen will affect the properties of the ice cream products and if it is reduces the costs and global footprint.

Gluten composition in flour and dough

The baking properties of flour are mainly influenced by the composition of gluten. During kneading, complexes of gluten polymers are built up into a gluten network, which entrap air during fermentation and baking. In this project, we will study how the composition of gluten changes between flour and dough, and link it to dough behavior and baking performance. You will test dough functionality at Lantmännen Cerealia in Malmö, and perform Size Exclusion-HPLC of gluten at SLU Alnarp.

Effect of enzymatic treatment on the gelling properties of pea protein.

Protein gelation is important for a broad range of applications and gives many foods their characteristic texture. Depending on the raw material and the extraction method of the proteins, the gelling properties can differ. To improve the properties of different plant-based proteins and to overcome limitations we want to investigate the effect of enzymatic treatment on the gelling properties of pea protein. Thereby emulsion gels will be prepared under different conditions and the effect of enzymes will be investigated using a rheometer, microscopy techniques, texture analyses and other relevant methods.

Effect of enzymatic treatment on the solubility and functional properties of different plant-based proteins.

Plant-based proteins often show poor solubility and a tendency to aggregate during the extraction process. This, together with other factors limits the functional properties of the proteins to some extent. To improve the properties of the proteins and to overcome limitations we want to investigate the effect of enzymatic treatment on the solubility of different commercially available plant-based proteins. Thereby the solubility of the proteins will be measured at different pHs. Afterwards, the effect of different enzymes on solubility should be investigated. In addition, light microscopy should be used to describe the structure of the proteins.

Making Tofu products using Swedish grain legumes

Background

Local protein-rich grain legumes are an attractive option, e.g. faba beans and yellow peas have high levels of protein, starch and soluble fibre, but are under-utilised in human diets in Sweden. If texture can be improved and anti-nutrients reduced in target legume-based foods, demand for local legumes suitable for large-/small-scale cultivation in Sweden will increase.

Project goals

1. Optimize Swedish legumes (e.g. faba bean, yellow pea, lentil) for making tofu
2. Characterize texture attributes and rheological characteristics

Faba beans, yellow peas and lentils from Sweden will be used, taking organic French soybeans used in commercial tofu production by YiPin as reference. Process efficiency will be evaluated as tofu yield. Protein microstructure will be characterized by microscopy (LM, CLSM), texture (hardness, elasticity, adhesiveness) with a texture profile analyser, viscoelastic properties with a rheometer, and colour using a colorimeter CR30-16 (L*a*b system). 2. Total protein content (N x 6.25) will be determined by the Kjeldahl method and amino acid composition (AA) with an AA analyser. Fatty acid components, which affect tofu hardness and indirectly the edible and

nutritional value, will be measured by gas chromatography (GC). Relations between chemical traits and sensory quality attributes of tofu will be evaluated by cluster analysis.

The consumer's dilemma – food safety vs food waste

Background:

Reducing food waste is of great importance for a sustainable development and one target of 2030 Agenda (Nr: 12.3) is to reduce food waste by 50%. The private households are responsible for the largest part of the Swedish food waste and it has been reported that more than half of the food that has been discarded at consumption level is edible at the time of wasting. This may be a consequence of that the discussion about food safety has a much longer history than the discussion about food waste. However, some food products may actually become health hazards if consumed after its use by date, e.g. smoked salmon or ham. This mainly poses a risk for the elderly, pregnant women and the immunocompromised. But in today's discussions, the debate about reduced food waste (and also economic interests) often ends up higher on the agenda than the one about food safety. This result in a struggle between the perspectives as you do not want to throw away food and at the same time you want to eat safe food.

Project:

The purpose of the project is to study consumers knowledge, routines, and attitudes towards food handling in the private household with a focus on food safety. What conflict of interest could be found between food waste and food safety actions? Which factors could impact consumer wastage? How is the relation between food safety and the aim for less food waste discussed among food retailers? In this project, qualitative data will be combined with quantitative data as it is planned to include interviews followed by a consumer survey.

Steam explosion treatment of wheat bran for arabinoxylan extraction

This is a continuation of our project investigating different treatment methods to improve arabinoxylan extractability from wheat bran. Wheat bran is a huge milling side stream that is currently used mainly for animal feed and bioenergy production even though it is full of nutritionally interesting components like dietary fiber and bioactive compounds. In this work our aim is to extract bioactive arabinoxylan from wheat bran using steam explosion treatment. You will work with the fiber extraction process and analyze fraction composition using f.ex. high performance anion exchange chromatography. This work is done in close collaboration with Lantmännen and you will have an opportunity to present your work at the company.