SWGROW

University of the Highlands and Islands Lews Castle College

Údarás na Gaeltachta

NUI Galway

TARI FAROE SEAWEED

SLU

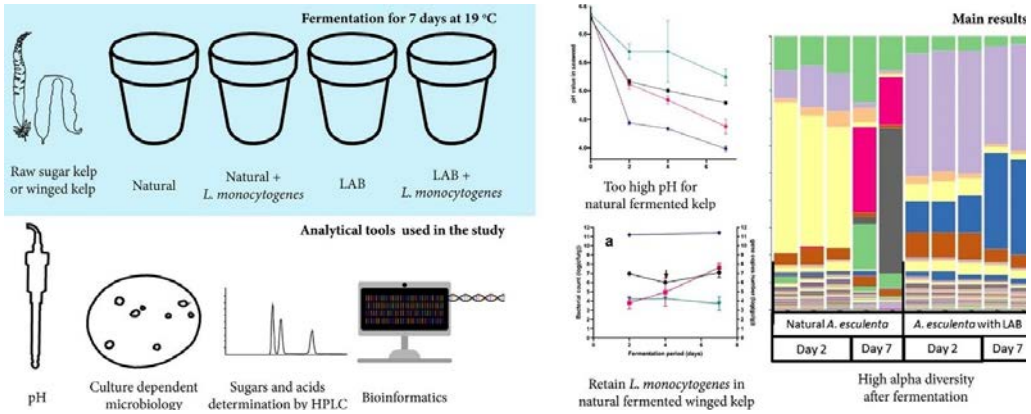
An Lanntair

NEWSLETTER FEB 2022

SEAWEED FERMENTATION

ARTEK, Sisimiut Campus (Greenland Campus), Technical University of Denmark are researching fermentation as a method to stabilize sugar and winged kelp from Maniitsoq, Greenland as part of the SW-GROW project.

Most countries with coastlines facing the North Atlantic Ocean are currently looking at establishing or increasing their production of cultivated seaweed. Given the climate, the best quality of seaweed appears to be obtained by practicing an annual harvest in the early summer months, i.e., May to June depending on the location of the cultivation site. Since the seaweed industry has the potential to be spread to many small communities and small or medium-sized enterprises (SMEs), it is relevant to investigate low cost, sustainable and resource efficient methods to stabilize the seaweed biomass after harvest, so it is not lost to spoilage.



Graphical overview of the seaweed fermentation research study

On site fermentation may be one such option that could be carried out with no input of energy.

Jonas Steenholdt Sørensen and **Lisbeth Truelstrup Hansen** had an idea to try to ferment freshly harvested farmed sugar kelp (Saccharina latissima) and winged kelp (Alaria esculenta) using the same concept as is used for sauerkraut or kimchi to see if this could work. They shredded the winged kelp and separate it into two portions, one to be fermented by the natural microflora and one to be fermented with a starter culture, in this case a Lactiplantibacillus plantarum strain. During the fermentation changes in product acidity (pH) and microbiology were monitored. They learned that fresh sugar and winged kelp cannot easily be fermented using the standard sauerkraut or kimchi method. The added starter culture grew best in winged kelp but not as well as it should to ensure a successful fermentation with a rapid drop in pH and evolution of desirable flavours. Clearly, further research and development is needed to produce fermented kelp products.

Reference.
Sørensen, JS., SK. Madsen, CH. Bang-Berthelsen, L. Truelstrup Hansen. 2021. Quality and safety aspects in fermentation of winged kelp (Alaria esculenta) and sugar kelp (Saccharina latissimi) by the natural microbiota with and without addition of a Lactiplantibacillus plantarum starter culture. Food Res. Int 352: 109265. If you want to read more about this study, then you can find the publication here: Quality and safety aspects in fermentation of winged kelp (Alaria esculenta) and sugar kelp (Saccharina latissima) by the natural microbiota with or without addition of a Lactiplantibacillus plantarum starter culture - ScienceDirect.

SEMINAR

Údarás na Gaeltachta hosted an international seminar focusing on community owned seaweed farms and energy efficiencies in the seaweed Industry. **Morven Gibson, South West Mull and Iona Development (SWMID)** spoke about their community owned seaweed farm.

Ascophylum nodosum

In July 2021 they installed the infrastructure for a 6ha seaweed farm and have just deployed 6km of seeded lines for their first crop. SWMID also owns and manages a 789 ha Tiroran Community Forest and Bendoran, a shoreside facility, that they are developing as a water sports hub and the site of shoreside processing for their recently developed community-owned seaweed farm.

Roy Bartle, Lews Castle College is a Research Associate in Engineering at Lews Castle College, part of the University of the Highlands and Islands. He has a PhD from the University of Oxford, is a Chartered Mechanical Engineer in the UK, and specialises in heat and mass transfer and renewable energy systems. Roy presented on his role in SW-GROW project which is to research efficient and sustainable seaweed drying methods and help disseminate this knowledge to SMEs in the NPA region.

Sara Norris, Sustainable Authority of Ireland (SEAI) is a Programme Executive with the Sustainable Energy Authority of Ireland's (SEAI) Business and Industry team. At SEAI Sara has worked supporting various sectors on their energy efficiency goals and spoke at the seminar about supports available. Her recent experience includes the development of the SEAI Energy Academy which offers free e-learning modules, courses, and resources on energy efficiency topics for businesses. Sara holds a MA in Human Resource Management from the National College of Ireland. A recording of the seminar is available on the SW-GROW youtube channel https://www.youtube.com/watch?v=nmIPC3irSFI

Porphyra

DNA KIT

At the **National University of Ireland, Galway (NUIG), Dr. Ronan Sulpice team** is currently focusing on the development of a DNA based kit for identification of commercial seaweeds worldwide. M orphology-based identification of seaweed species has proven difficult, and is virtually impossible in many seaweed products. While the seaweed industry is growing rapidly worldwide, it still lacks a reliable method to identify species and detect possible fraud / mislabeling. We are developing an accurate, high throughput method to identify species in commercial seaweeds using the DNA metabarcoding technique. Metabarcoding is the barcoding

coupled with Next Generation Sequencing technology, which allows for the simultaneous identification of multiple species within a sample.
Currently we are focusing on traditional barcodes used for phylogenetic studies, such as rbcL, cox1 and ITS1 regions, to design primers that could be used for the 3 groups of seaweeds, i.e., brown, red or green algae. These primers are going be tested on seaweed samples collected in Ireland and elsewhere. As a next step, we also plan to search for new barcodes by comparing genome sequences of commercial
species.

DRYING TECHNOLOGIES

Our partners **Roy Bartle** and **Alasdair Macleod from Lews Castle College, University of the Highlands and Island, Isle of Lews** have just published research on "The effect of natural convection air temperature on the drying kinetics and desorption isotherms of Alaria esculenta and Palmaria palmata." The following is the abstract:

The Northern Periphery and Arctic region face unique economic and food security challenges that may be partly answered by commercial seaweed production. Alaria esculenta and Palmaria palmata are two seaweeds commonly found in the region and suitable for cultivation and processing for food and other commercial products. The drying kinetics for both species were obtained, and the Page and Weibull models best described the data. A drying air temperature increase from 40 to 70˚C decreased drying time by 62.4% and 61.7% for A. esculenta and P. palmata, respectively. Desorption isotherms were obtained between 25 and 70˚C and showed Brunauer Category III shapes, with water activity increasing with temperature for a fixed moisture content. Net heats of desorption were obtained, with drying to an equilibrium moisture content of 0.01 kgwater kgd.b.–1 requiring 18.1 and 3.94 kJ mol–1 K–1 for A. esculenta and P. palmata, respectively.
The research paper is available here: https://doi.org/10.1080/26388081.2022.2027216
Lews Castle College, University of Highlands and Islands have also confirmed that their drying rig is completed, calibrated, and ready to receive seaweed for drying once the wild harvesting season commences. The rig provides weight (+/- 0.15 g) and temperature (temperature variation between trays max +/- 0.15 degC and thermocouple accuracy +/- 0.05 degC) accuracy using flow straightening honeycomb to minimise flow nonuniformities. A paper on the use of meteorological reanalysis software for energy modelling is imminent and will feed into the bigger goal of developing free online software that allows SMEs to size renewable energy systems for seaweed drying.

HATCHERY AND PRODUCTION FACILITY

TARI Faroe Seaweed has started seaweed production in an old smolt hatchery.

TARI is establishing a new hatchery and production facility in a small village on the west coast of Suðuroy. The production started in December 2021 and the first production round of seeded ropes and the AkvaNest product that TARI supplies to the salmon aquaculture industry are deployed.

The new production facility is an old smolt hatchery that closed down some 20 years ago. The facility has good access to clean and nutrient rich seawater that is pumped into the production building. The seawater goes through a cleaning system before it enters the tanks where it supplies nutrients to the growing algae.

The next milestone in TARI's production setup is to install a water turbine that will run on water supplies from Kirkjuvatn which is a lake situated on the mountain above the production building. In a few months TARI aims to run the land-based part of the seaweed production on renewable energy.