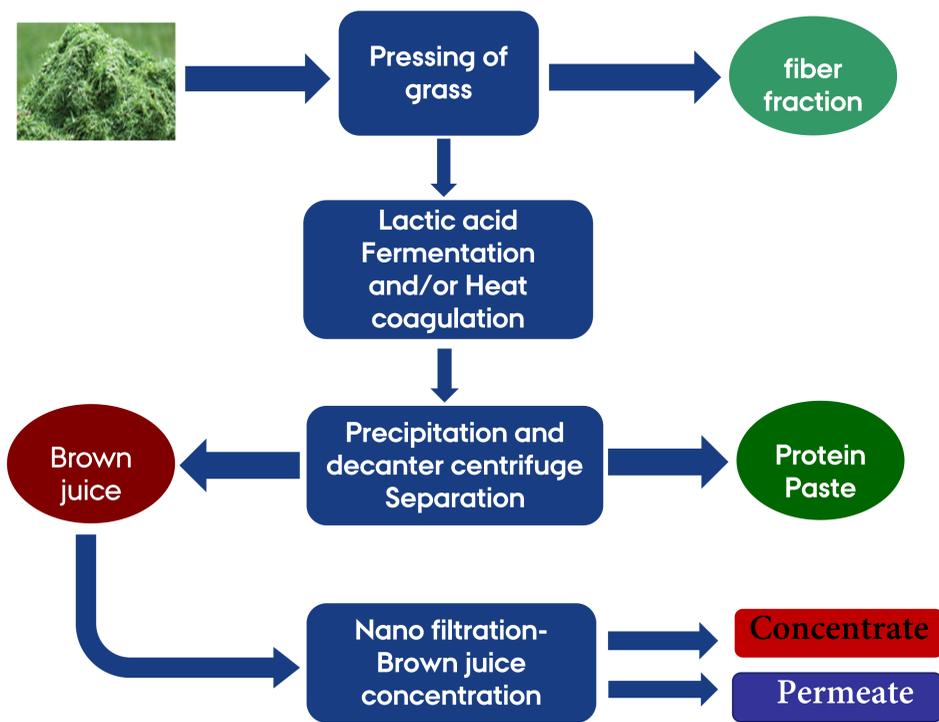


# Concentrating Brown Juice from a Green Biorefinery using NF membranes

## Introduction

The Green Biorefinery residual stream also known as Brown juice contains valuable components such as soluble proteins, sugars and nutrients such as mono, di and multivalent ions. Downstream treatment of the brown juice in a Membrane separation unit allows up-concentration of the soluble solids from about 4% TS to 15-20%TS. The corresponding volume reduction achieved will significantly cut down the cost of transporting the concentrate to a nearby biogas plant. Moreover, the permeate could be used as process water during grass pressing stage as well as for ferti-irrigation application in organic farming to recycle plant nutrients such as potassium and nitrogen.



Simplified flow diagram of Green protein biorefinery

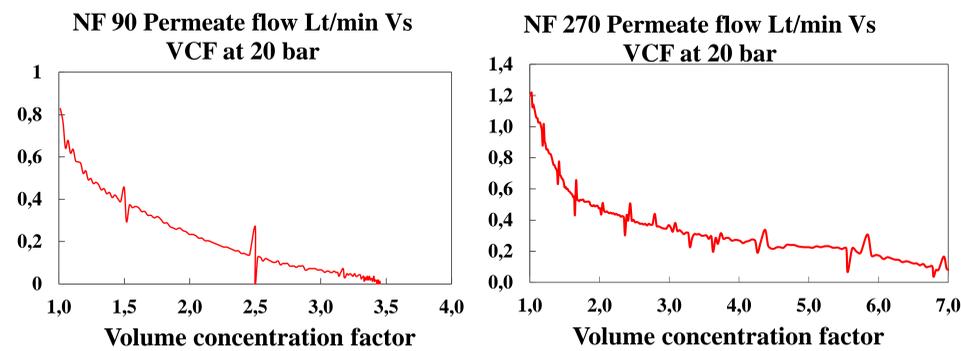
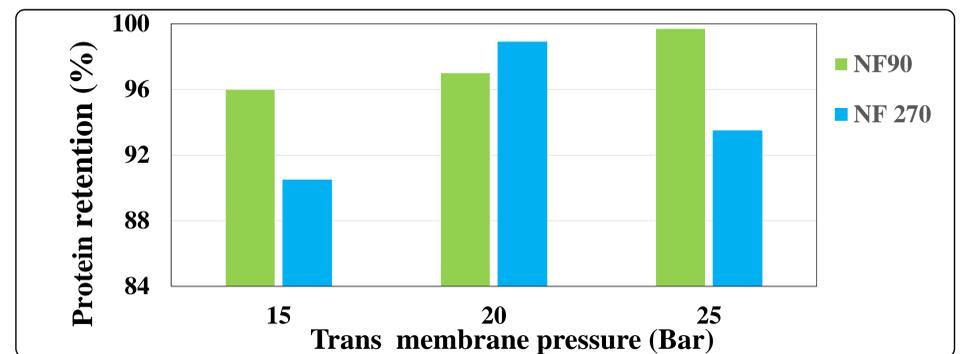
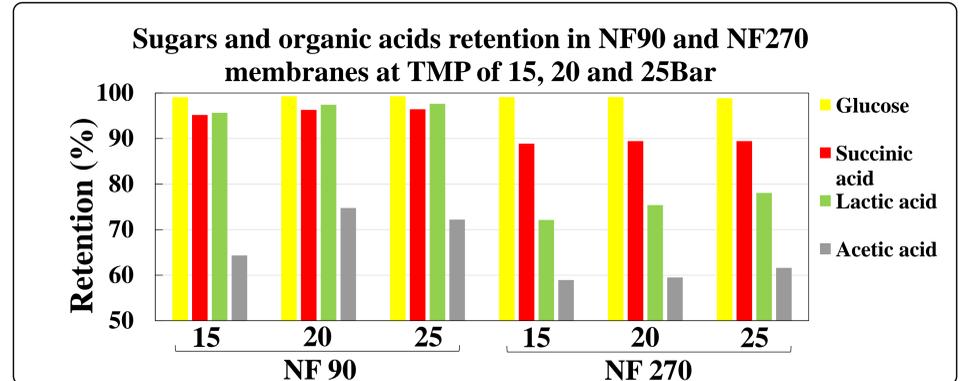
## Methods

The Brown juice up-concentration experiment was carried out in a pilot scale crossflow membrane filtration unit. Two types of spiral wound Nano-filtration membranes (NF 90 and NF 270) were tested for their filtration capacity(flux) and degree of components retention (rejection) at three different trans membrane pressures (15, 20 & 25 Bar).



- ❑ The filtration was conducted in a Pilo mem II membrane pilot plant provided with 2.5 m<sup>2</sup> membrane area.
- ❑ Sugar and organic acids in the various streams were analyzed using HPLC.
- ❑ Ninhydrin analysis for crude protein determination

## Results



## Conclusions

- ❑ Both NF 90 and NF 270 membranes achieved above 98% retention of sugars(glucose). Similarly, crude protein retention above 90% was possible under all test conditions.
- ❑ The volume reduction factor achieved for NF90 membrane was 3.5 while that of NF 270 was close to 7.

## Ongoing research



- ❑ Upscaling of brown juice concentrating research to a 100 m<sup>2</sup> membrane area Nano-filtration plant.
- ❑ Recovery of valuable organic and inorganic fractions from HTL waste water

## Acknowledgement

This research is funded by Promilleafgiftsfonden under the project titled "Produktion, anvendelse og økonomisætning af koncentreret restsaft fra produktion af græsprotein"