

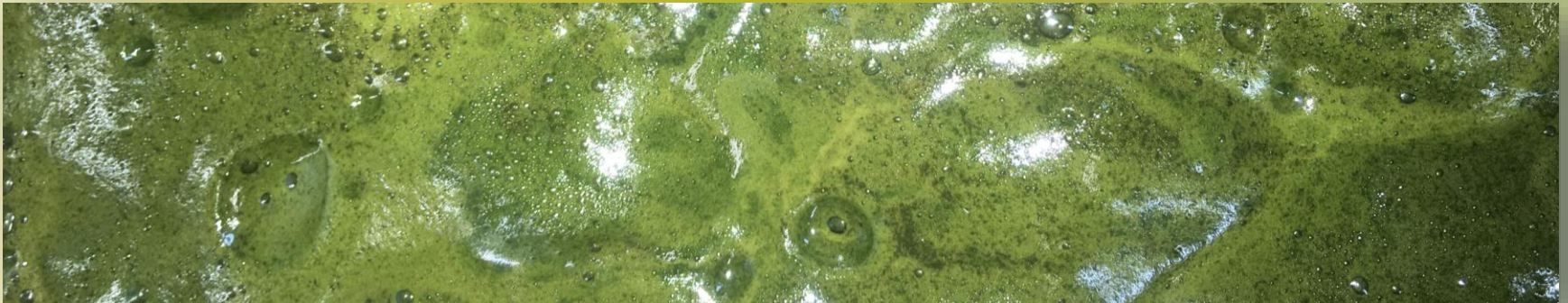


NIBIO

NORWEGIAN INSTITUTE OF
BIOECONOMY RESEARCH

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Fractionation of forage legumes using a screw press



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Introduction

- Protein supplementation is a challenge in organic livestock production
- Forage legumes have high protein yields and balanced amino acid composition
- Forage legumes may be fractionated into protein- and fibre-rich feeds for monogastrics and ruminants
- Replacing up to 8% of broiler feed with grass-clover protein extract did not affect feed intake and performance (Stødkilde et al., 2020)
- Pulp silage compared to whole plant silage fed to dairy cows increased milk yield (Damborg et al., 2019)



CORE Organic Cofund project

ProRefine

Refined forage legumes as local sources of protein feed for monogastrics and high quality fibre feed for ruminants in organic production

The aim is to improve local food systems in organic farming based on fractionation of plant parts of forage legumes.

Duration: 2018-2021



PROREFINE

<https://projects.au.dk/coreorganiccofund/core-organic-cofund-projects/prorefine/>

The CORE organic logo features a stylized green leaf with three veins, positioned above the text "CORE organic" in a white, sans-serif font. The entire logo is set against a dark green background.

CORE organic

Financial support for this project is provided by funding bodies within the H2020 ERA-net project, CORE Organic Cofund, and with cofunds from the European Commission

CORE Organic Cofund project

ProRefine



Participants

INRA

Institut National de la Recherche Agronomique, France

TRUST'ING – ALF'ING, Frankrike

UCSC

Università Cattolica del Sacro Cuore, Italy

AU

Aarhus University, Denmark

NIBIO (coordinator)

Norwegian institute of bioeconomy research

Ruralis

Institute for Rural and Regional Research, Norway

SLU

Swedish University of Agricultural Sciences, Umeå

IARTC

International Agricultural Research and Training Center, Turkey

Objectives

Quantify yields of whole plant, juice and pulp fractions from different forage legums



Field experiment in Rönnebydalen, photo SLU

Materials and methods

Field experiments with forage legumes in Röbbäcksdalen (3 cuts, Sweden) and Tingvoll (4 cuts, Norway) in 2019

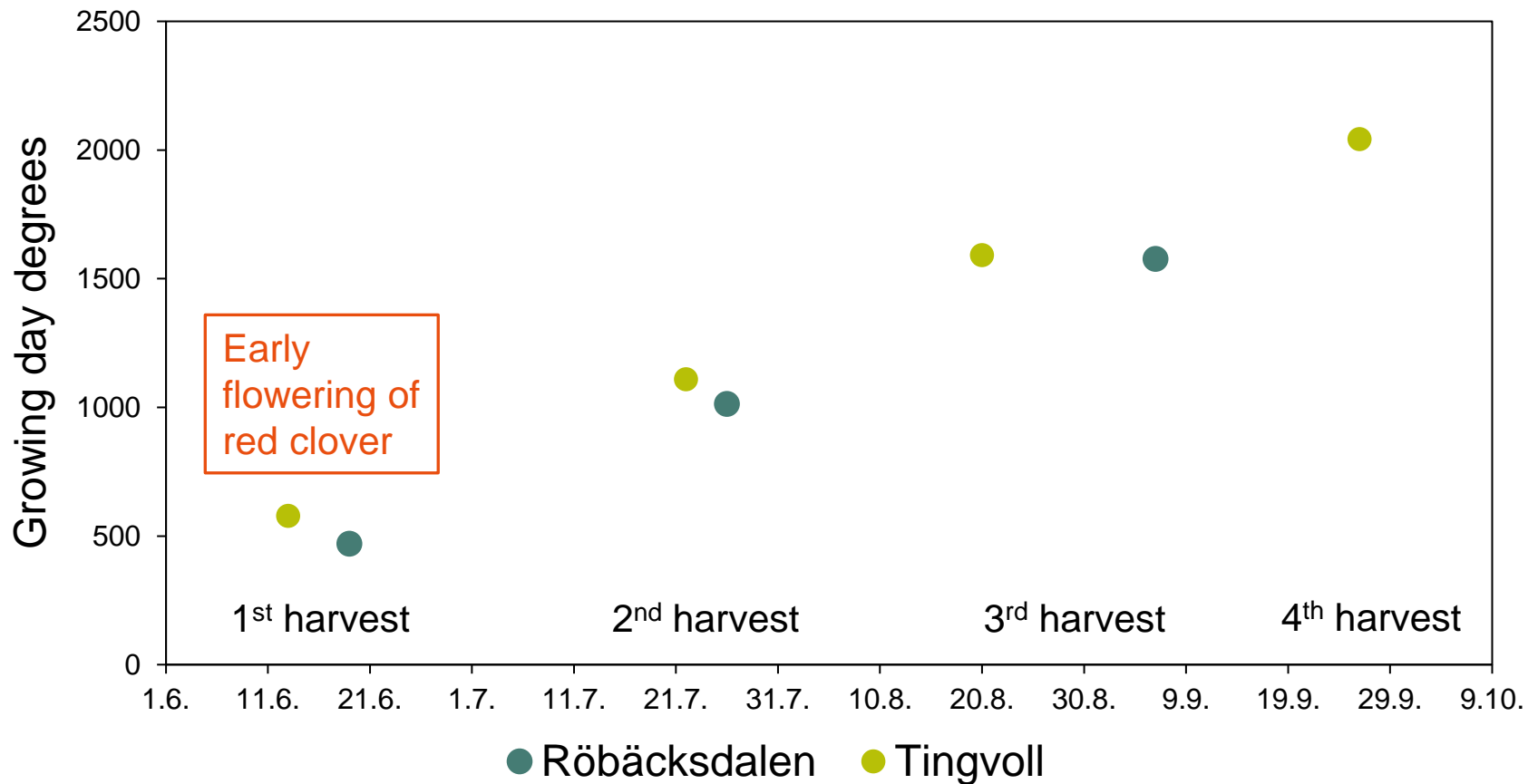
Species/variety	Röbbäcksdalen	Tingvoll
Lucerne (<i>Medicago sativa</i>)*	Ludvig	Ludvig
	Karlu	-
Red clover (<i>Trifolium pratense</i>)	Gandalf**	Gandalf**
	Lars***	Lars***
Alsike clover (<i>Trifolium hybridum</i>)	Frida	Frida



*Inoculated with rhizobium bacteria; ** Diploid; *** Tetraploid.

Materials and methods

Field experiments with forage legumes in Tingvoll (4 cuts, Norway) and Rübäcksdalen (3 cuts, Sweden) in 2019



Materials and methods

Registrations and measurements

- Stage of plant development
- Whole plant yield
- Botanical composition

Fractionation

- Yield of juice
- Yield of pulp

Statistical analysis

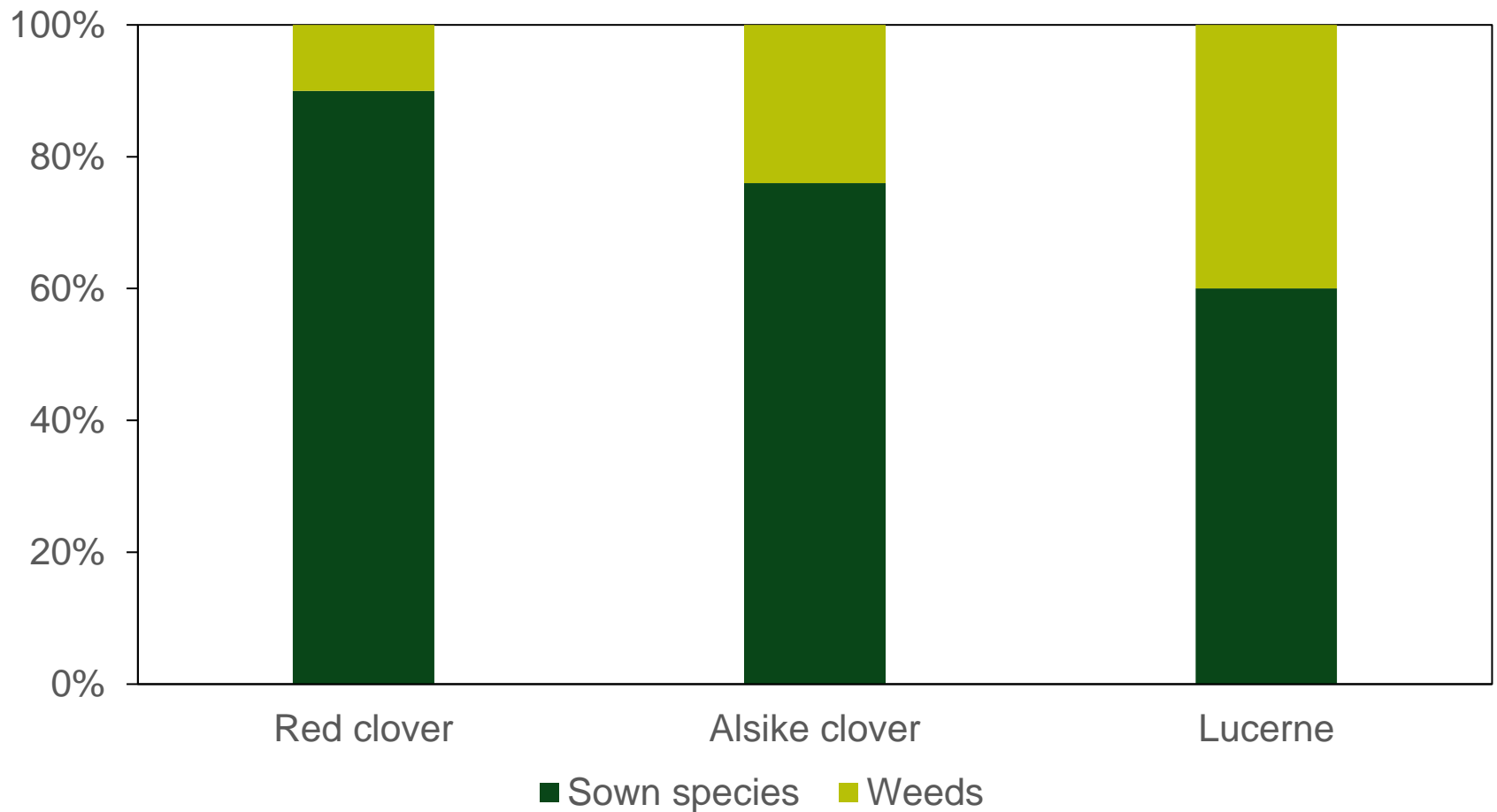
- PROC MIXED procedure in SAS
- Block and variety were treated as fixed effects



Angel 7500, Angel CO., LTD., Korea

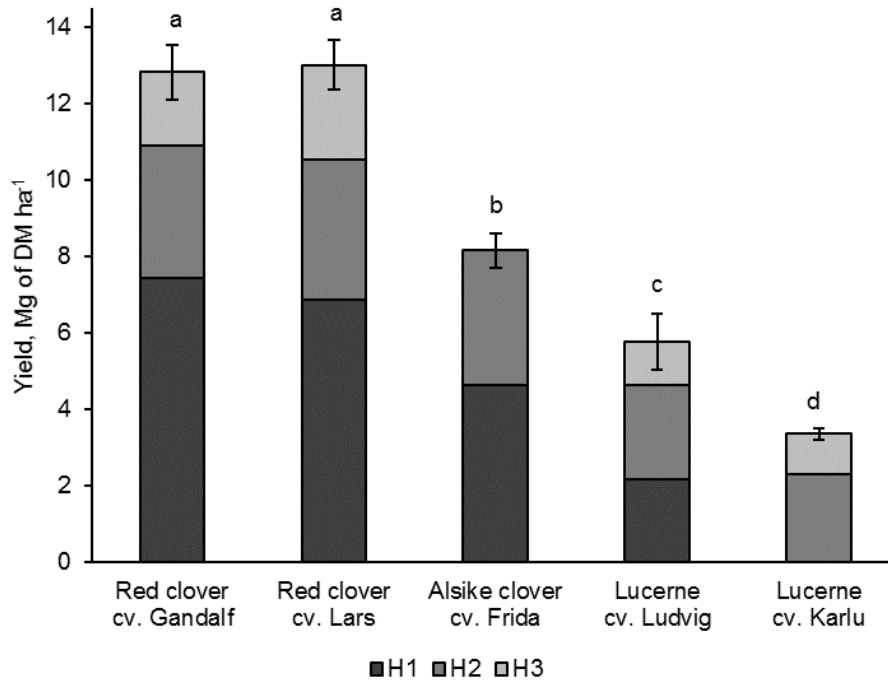
Results and discussion

Botanical composition across all harvests and both fields

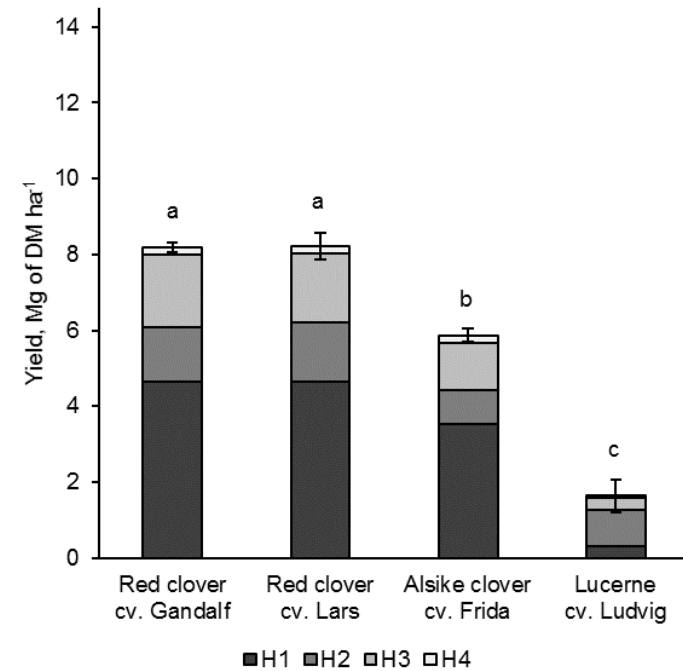


Results and discussion

Yields per harvest



Röbbäcksdalen



Tingvoll

Results and discussion

Yields of juice and pulp fractions



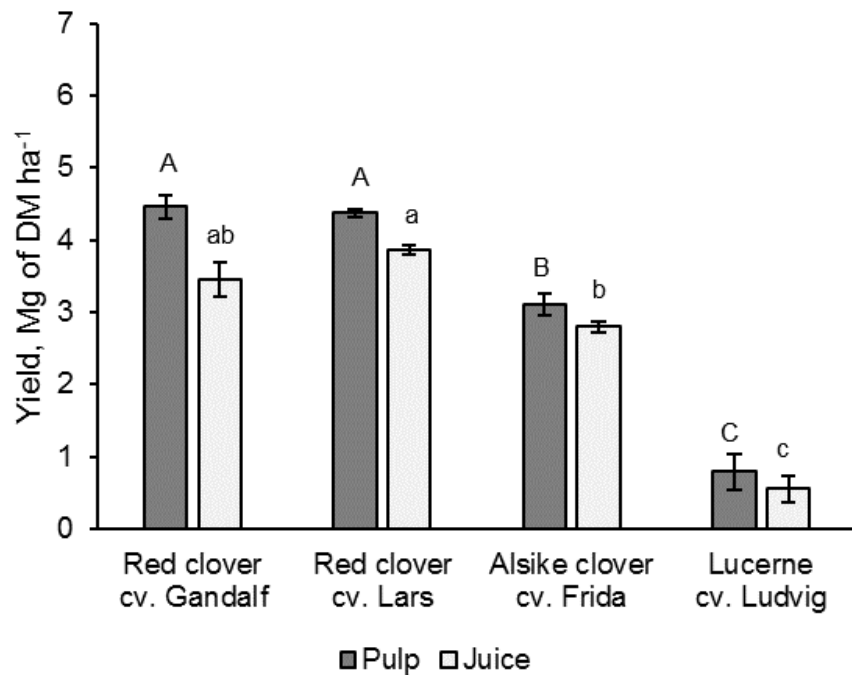
Juice



Pulp

Results and discussion

Yields of juice and pulp fractions



Tingvoll (4 cuts)



Tingvoll, fourth harvest 2019

Results and discussion

Pulp:juice ratio

Pulp:juice ratio (3 harvests, Tingvoll) was affected by plant species ($P = 0.001$), but not by harvest number.

Red clover cv. Gandalf had higher pulp:juice ratio than alsike clover and lucerne.

Quality analysis will be carried out to estimate the feed value of both pulp and juice.

Pulp:juice ratio

LU Ludvig	1.11
RC Gandalf	1.53
RC Lars	1.28
AC Frida	1.09
Mean	1.24 (SD 0.306)

Results and discussion

Forage legume yields and juice yields are highly dependent on climate and growing conditions.

The ProRefine field in Turkey with two lucerne varieties was irrigated and harvested seven times in 2019.



Photo: IARTC, Menemen, Tyrkey

Conclusions

- Red clover had higher yields than alsike clover
- Both clover species yielded more total plant mass and juice and less pulp compared to lucerne
- Mean pulp:juice ratio was 1.24 on dry matter basis

ProRefine field with lucerne in Izmir, Turkey

ProRefine - New methods for producing high quality feed locally

**Thank you for
your attention!**