

Green Protein

-High quality protein from green biomass

Presentation

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Overall purpose of green protein project

- Suitable alternative to soy bean
- Availability
- High quality
 - Protein content
 - Amino acid composition
 - Nutritional value



Project 1

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*Protein Yields and Amino
Acid Characterization of Juice
and Pulp from White Clover,
Red Clover, Lucerne and
Ryegrass*



Master's Thesis | Vinni Kragbæk Damborg Jensen
Supervisor: Senior Researcher Anders Peter S. Adamsen – Dept. of
Engineering
Co-supervisor: Senior Researcher Søren Krogh Jensen – Dept. of Animal
Science

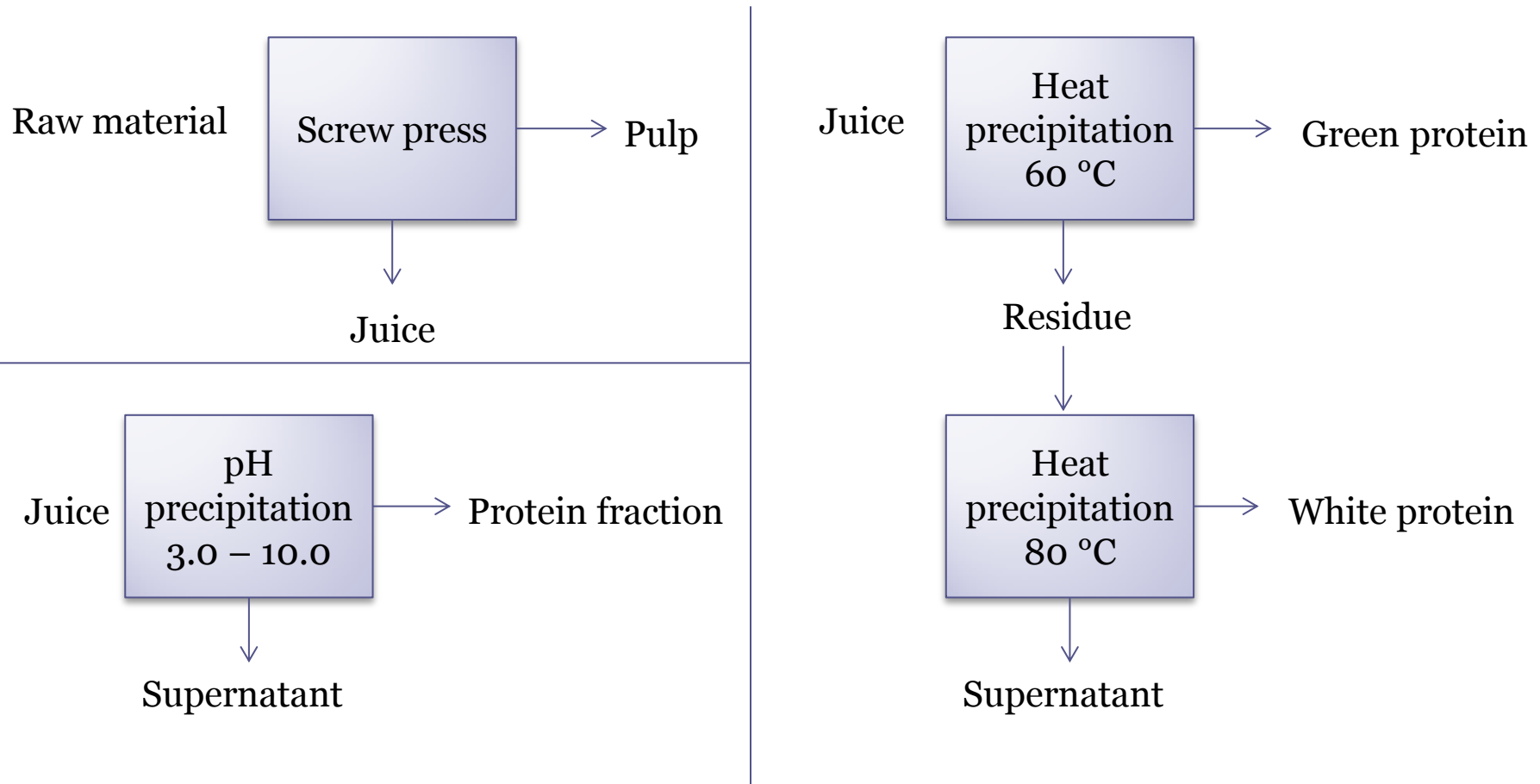
Purpose

- Examination of extraction and recovery of protein from locally grown crops
- Analysis of the recovered protein
 - Amino acid content
 - Amino acid distribution
- Most suitable crop
- Most feasible method of recovery

Raw Material

- White clover, red clover, lucerne and ryegrass
- High yields
- High dry matter content
- High crude protein content

Flow Chart

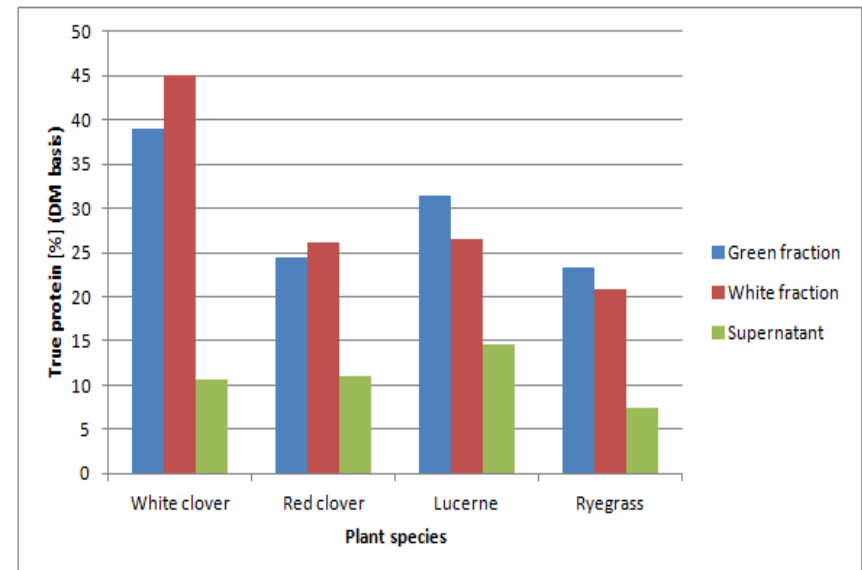
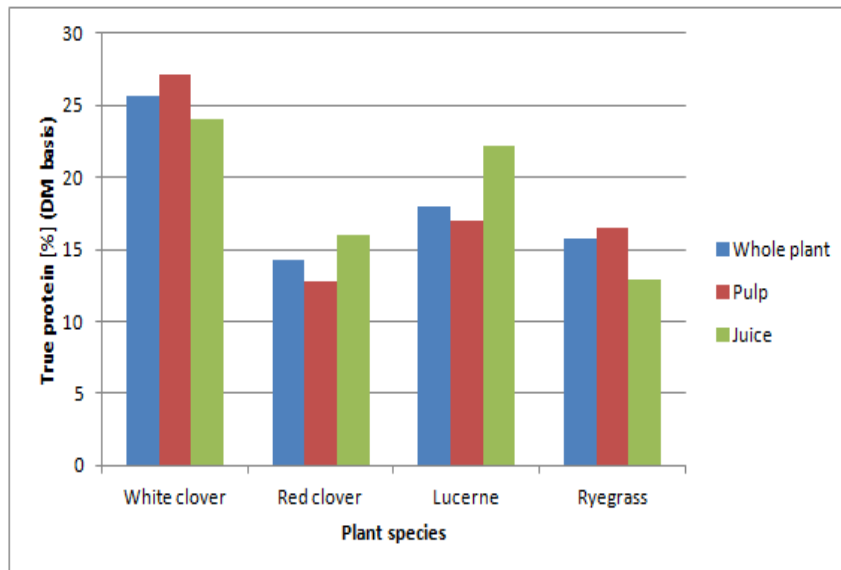


Materials and Methods

- Nitrogen
 - Dumas
 - Kjeldahl
- Crude protein
 - $N \times 6.25$
- True protein
 - Sum of amino acids



Results - True Protein



Project 2

Protein extraction from green biomasses with emphasis on protein quality in relation to nutritional value and functionality

Purpose

A nutritional evaluation of extracted protein fractions from different plants in relation to monogastric animals (and humans)

Raw material

- White clover
 - Entire plant
 - Leaves
- Casein control

- Entire plant/leaves
- Pulp
- Protein fraction (pH-precipitated juice)

Freeze-dried, grinded. Analyzed for N and DM

- White clover
- Red clover
- Lucerne
- Ryegrass

- Entire plant
- Pulp
- Protein fraction (pH-precipitated juice)

Freeze-dried, grinded. Analyzed for N and DM

Rat model

- Requirements: 1.5% Nitrogen, 12 g DM/day/rat
- N exclusively from plant fractions
- 5 rats in each experimental group
- 4 days of adaptation
- 5 days of collection
- Collect urine, feces
- Measure weight and food intake



Rat Facility



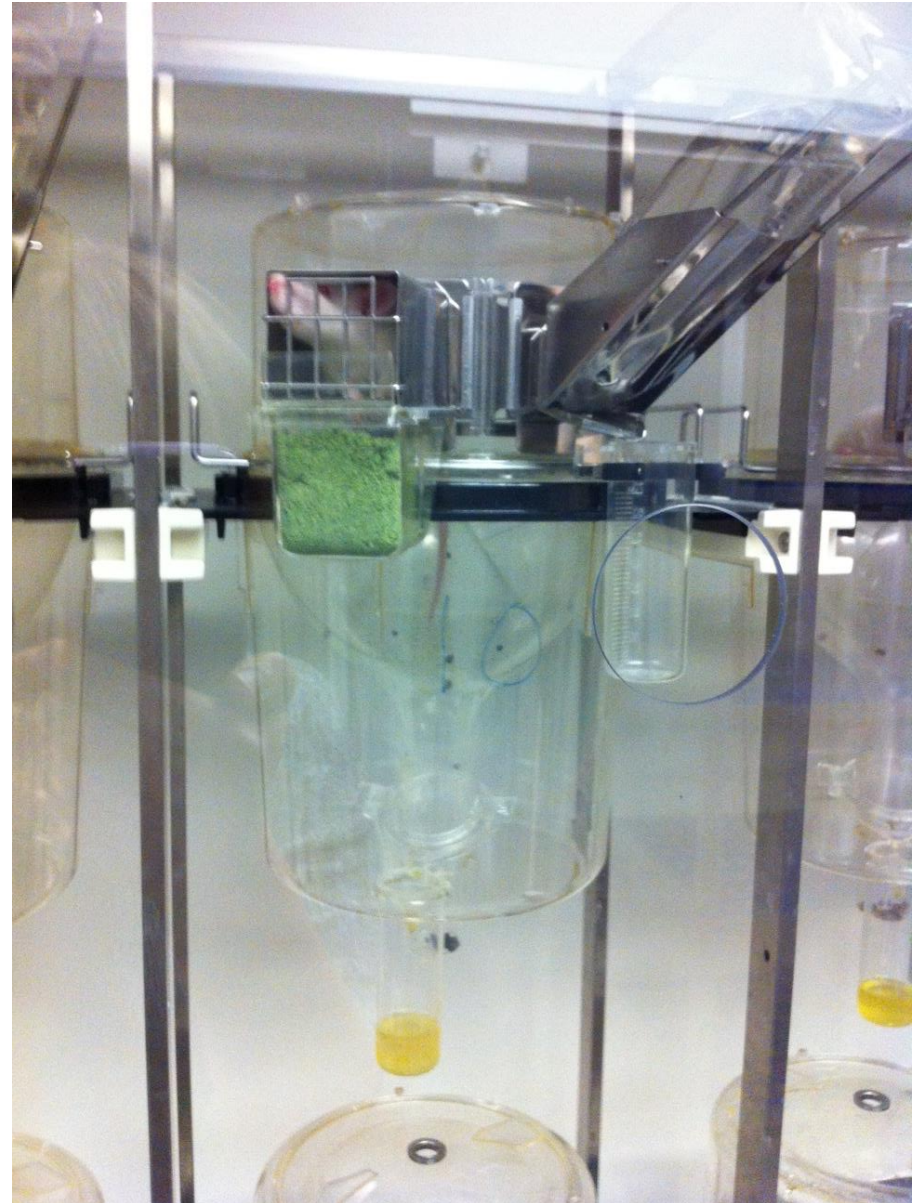
- Controlled environment
 - Light/dark
 - Temp
 - Humidity
- Individual cages

Rat Facility

- Rat is placed on grate
- Free access to water/feed
- Separate collection of urine and feces



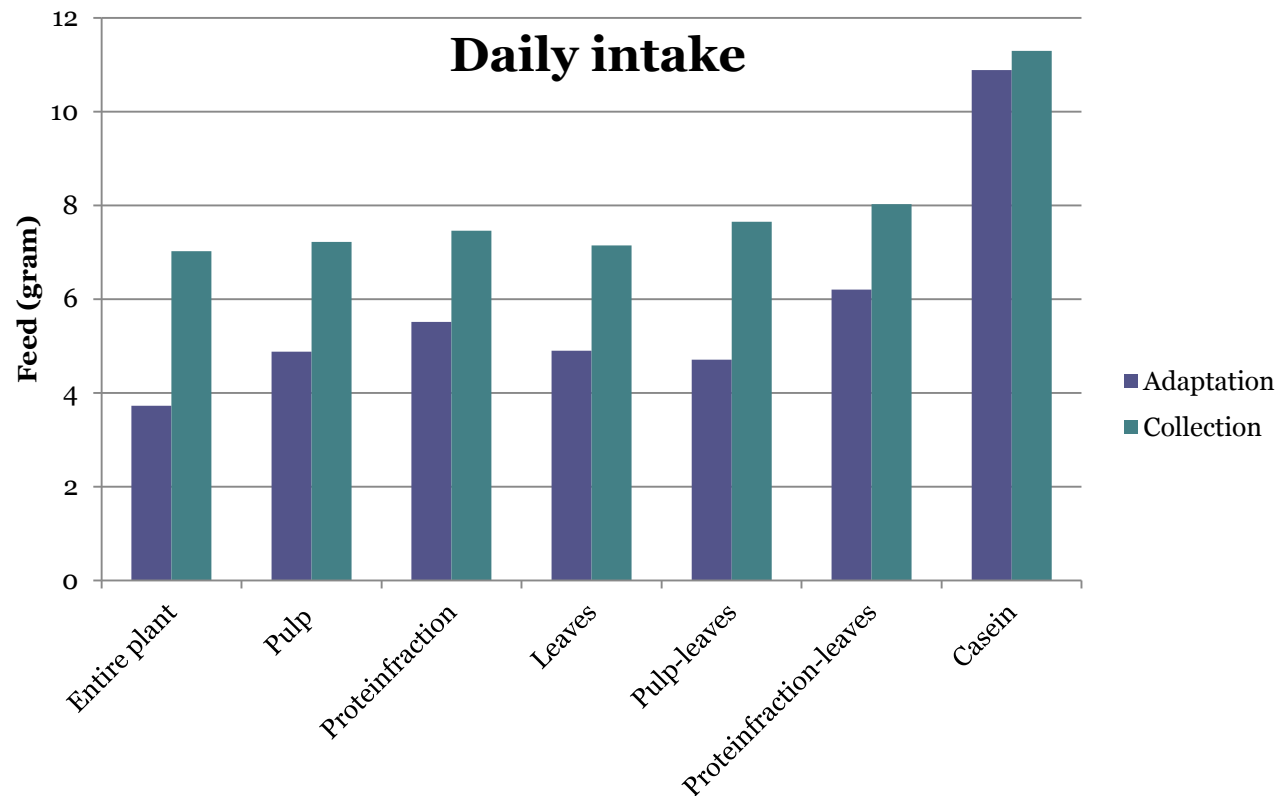
Rat Facility



Analyses and Calculations

- Analyze N-content in urine, feces
- Based on intake and output, calculate:
 - True digestibility of plant protein
 - Biological value of feed (fraction of absorbed protein retained in the body for maintenance and growth)
- Evaluate the nutritional value of the individual plant fractions

Raw data



Future experiments and perspectives

- Optimization of extraction techniques
 - Nutritional value of green biomass in polygastric animals
 - Analyses of specific proteins in feed and output
 - Organ-specific analyses of green biomass proteins.
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- Great perspectives for animal and human nutrition if the limitations can be overcome
 - Breeding of applicable crops
 - Alternative to soybean for special applications.

Thank you for your attention!

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