

Projektpresentation

Green Valleys er et 3-årigt EU-projekt, hvis formål er at etablere en udviklingsplatform for bioraffinering. Projektet skal via demonstrationsanlæg ved Töreboda i Västra Götaland og ved Foulum i Midtjylland demonstrere, hvordan raffinering af biomassen fra græsmarker kan levere bæredygtigt producerede energiprodukter og proteiner.

Gennem et svensk-dansk forskningssamarbejde kommer vi også til at påvise hvordan cirkulær grøn bioøkonomi kan udgøre et hidtil uudnyttet potentiale for landbruget. Vi undersøger klima og miljøfordele ved regionalt dyrkede græsafgrøder, hvor græsset forarbejdes til bæredygtig energi og foder af høj kvalitet.

Projektpresentation

Green Valleys är ett treårigt EU-projekt med mål att etablera en utvecklingsplattform för bioraffinering. Med en anläggning i Töreboda, Västra Götaland och en i Foulum, Midtjylland kommer vi demonstrera hur bioraffinering kan utnyttja gräsmarker till att leverera hållbart producerade energiprodukter och proteinfoder.

Genom ett svensk-danskt forskningssamarbete kommer vi kunna visa på hur cirkulär grön bioekonomi kan utnyttja lantbrukets potential. Vi undersöker klimat- och miljönyttan i regionalt odlade vallgrödor där gräset förädlas till hållbar energi och högvärdigt foder.

Task 4.2 Optimisation of harvest- and storage systems of herbage for efficient use of energy and protein of the biorefined products

- Responsible: SLU in close collaboration with Västra Götaland Region Naturbruksförvaltning and AU Foulum
- Data for system calculations by Chalmers
- Hushållningssällskapet Sjuhärad and SEGES will disseminate the results.
- Skive municipality will share with us their experiences from their biorefinery utilising grass.

Grass-clover forage Experimental design

- First cut June 4-5 2019 of a sward of timothy, meadow fescue, perennial ryegrass and red and white clover

Wilting treatments

- Direct cut 15% DM ensiled June 4
- Wilited to 26% DM ensiled June 4
- Wilited to 50% DM ensiled June 5



Experimental Design

- First cut June 4-5, 2019 of a sward of timothy, meadow fescue, perennial ryegrass and red and white clover

For each of the wilting treatments:

Additive treatments

- Control wo additive
- Inoculant of homofermentative LAB
- Salt-based additive
- Acid
- 4 replications (silos) per treatment
- A total of 48 silos
- Completely randomized design



Experimental Design

- Second cut July 18, 2019 of a sward of timothy, meadow fescue, perennial ryegrass and red and white clover

Wilted to 37% DM:

Additive treatments

- Control wo additive
- Inoculant of homofermentative LAB
- Salt-based additive
- Acid
- 4 replications per treatment
- A total of 16 silos
- Completely randomized design



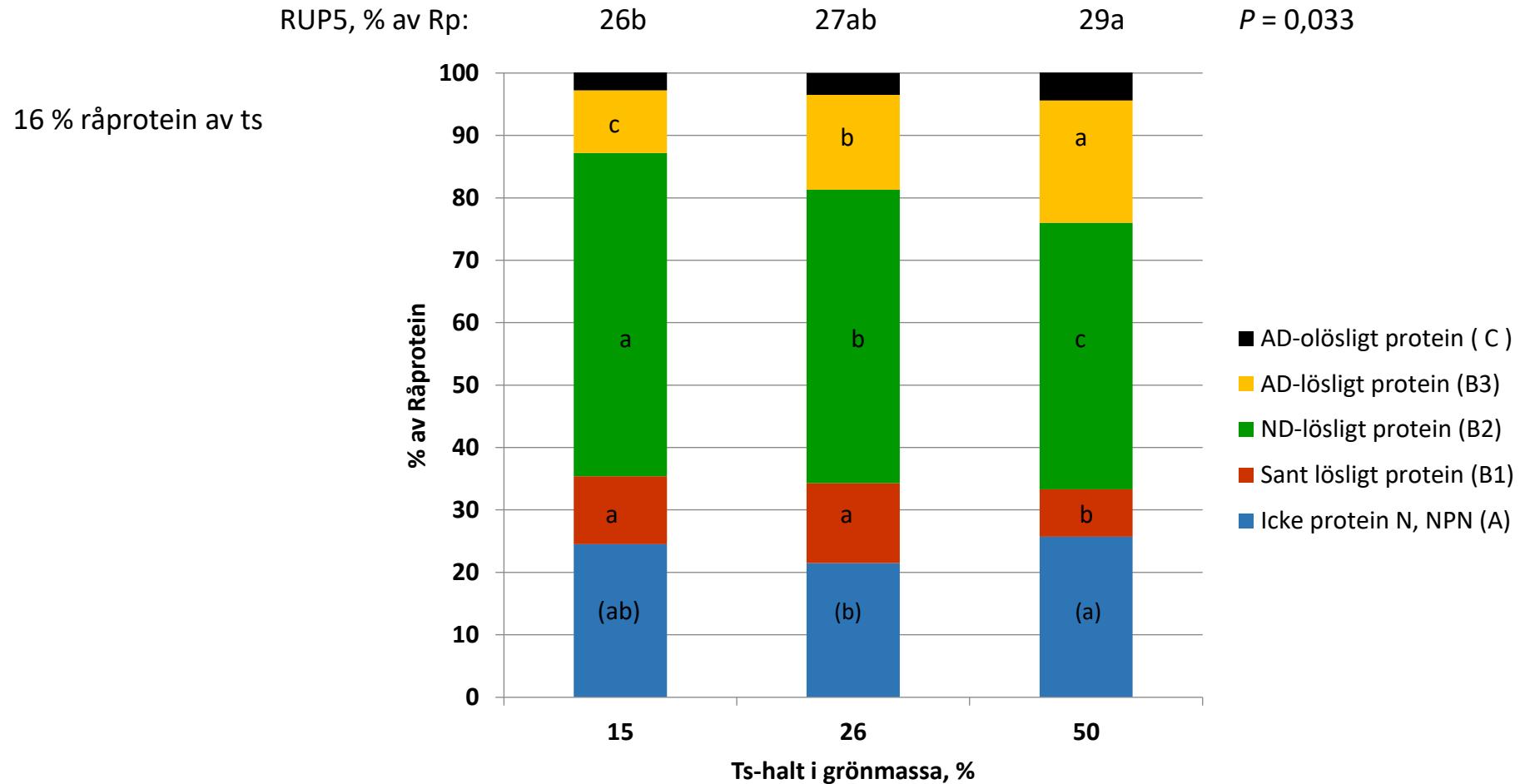
Cornell Net Carbohydrate and Protein System (CNCPS)

Crude protein		
True Protein (TP)		Non-protein N (NPN; A)
Buffer insoluble Protein (BIP)		Buffer-soluble protein (BSP; B1)
ND-insoluble Protein (NDIP)		ND-soluble protein (NDSP; B2)
AD-insoluble protein (ADIP; C)	AD-soluble protein (ADSP; B3)	Rumen undegradable protein (RUP) at a specific rumen passage rate can be calculated based on these CP fractions and fibre contents (Kirchhof et al., 2010).

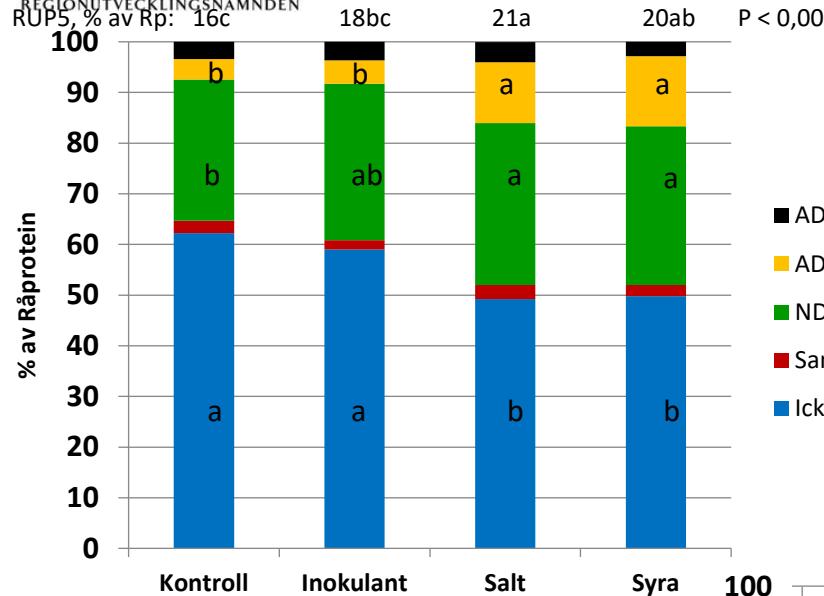
Analysed

Calculated

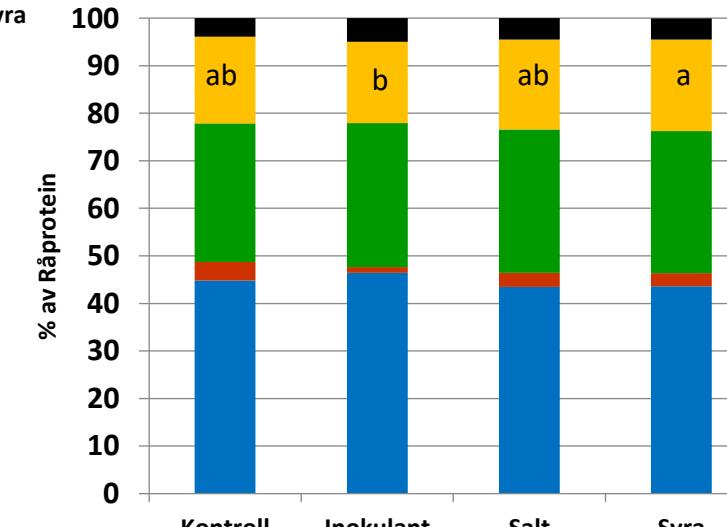
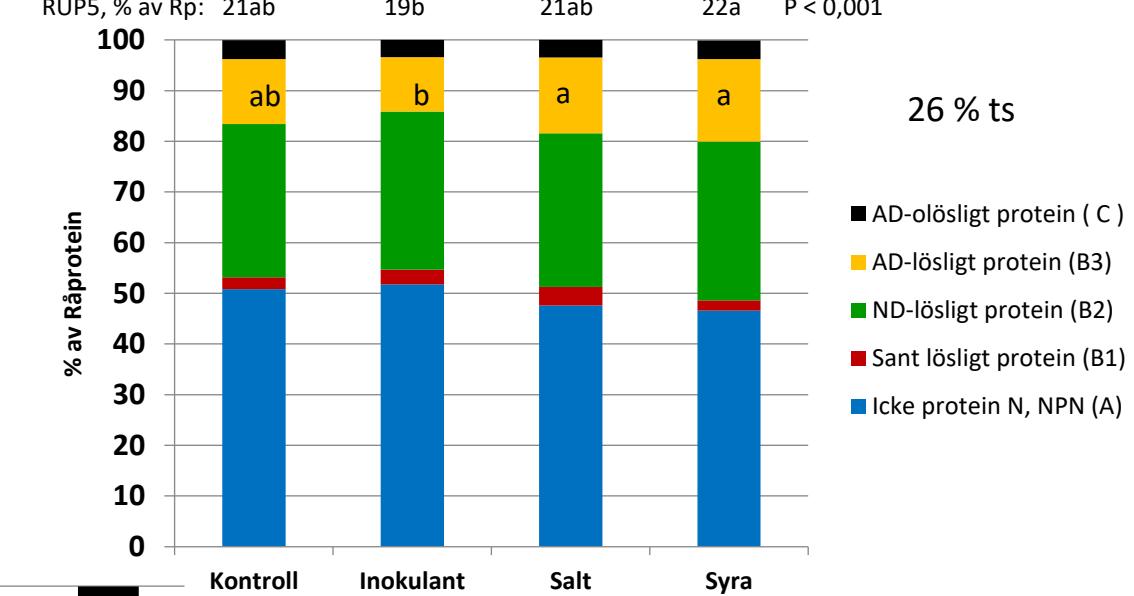
Results First cut Herbage



RUP5, % av Rp: 16c



RUP5, % av Rp: 21ab



Results First cut Silage

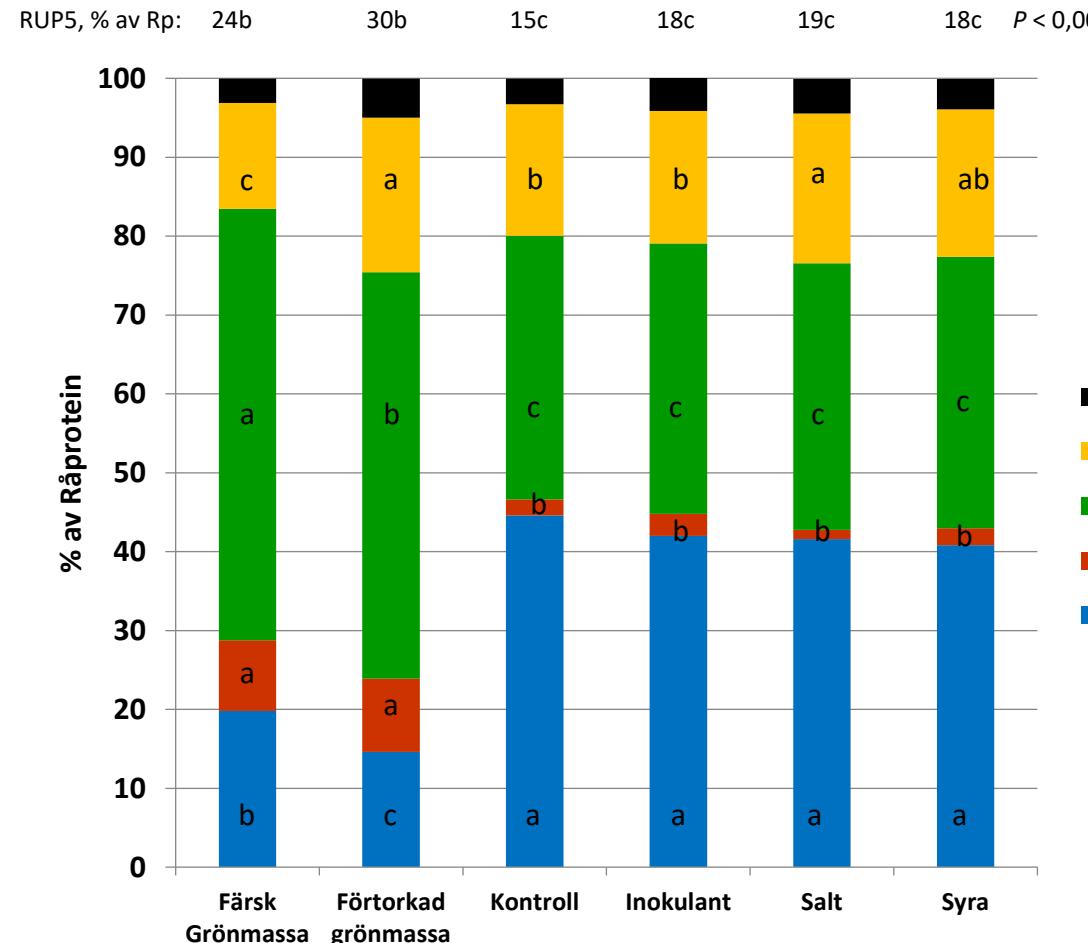
	Kontroll	Inokulant	Salt	Syra	SEM	P-värde
korrTS, %	14,6	14,6	14,7	14,7	0,12	0,84
WSC, % av ts	0,9d	1,9c	6,2b	12,1a	0,19	<0,001
Fructan, % av ts	0,56	0,586	0,539	0,561	0,012	0,12
NH ₄ -N, % av total N	10,5a	8,4b	3,7d	5,6c	0,31	<0,001

Grönmassa: 18 % WSC (vattenlösliga kolhydrater, socker) av ts

	Kontroll	Inokulant	Salt	Syra	SEM	P-värde
korrTS, %	26,2b	26,0b	26,6a	26,1b	0,09	0,008
WSC, % av ts	2,7b	3,8b	3,6b	13,1a	0,58	<0,001
Fructan, % av ts	0,768b	0,823a	0,714c	0,733bc	0,01	<0,001
NH ₄ -N, % av total N	7,8a	7,8a	5,1c	6,2b	0,02	<0,001

	Kontroll	Inokulant	Salt	Syra	SEM	P-värde
korrTS, %	49,6	49,6	49,5	49,4	0,16	0,704
WSC, % av ts	6,5bc	6,0c	6,7b	13,9a	0,12	<0,001
Fructan, % av ts	0,781b	0,841a	0,769bc	0,738c	0,009	<0,001
NH ₄ -N, % av total N	7,5a	7,7a	6,2b	7,4a	0,20	<0,001

Results Second cut Herbage and Silage



	Färsk Grönmassa	Förtorkad Grönmassa	Kontroll	Inokulant	Salt	Syra	SEM	P-värde
korrtS, %	15,6b	36,1a	36,2a	36,3a	36,1a	35,9a	0,15	<0,001
WSC, % av ts	11,9a	11,4a	2,9cd	2,4d	3,3c	6,5b	0,13	<0,001
NH ₄ -N, % av total N	1,2d	1,0d	7,0a	5,3c	5,6bc	5,9b	0,14	<0,001

- AD-olösligt protein (C)
- AD-lösigt protein (B3)
- ND-lösigt protein (B2)
- Sant lösigt protein (B1)
- Icke protein N, NPN (A)

Conclusion

- Moderate prewilting and use of chemical additives improve the protein quality of herbage and silage to be used for biorefinery.
- Acid-treated silage have more residual sugar.



Task 4.4B Biogas test at HS Sjuhärad

Treatments

- Fresh grass-clover forage
- Biorefined press cake from fresh grass-clover forage
- Ensiled grass-clover forage
- Biorefined press cake from ensiled forage
- Co-digestion with cattle manure November 2020 – April 2021
- Biogas production of the single substrates in a bioprocessor batch system



Task 4.5 Trials for optimal utilisation of the biorefined products for feeding of farm animals

- Responsible: SLU in close collaboration with Västra Götaland Region Naturbruksförvaltning, AU Foulum and Hushållningssällskapet Sjuhärad
- Data for system calculations by Chalmers
- Hushållningssällskapet Sjuhärad, Aarhus University and Skive municipality will disseminate the results
- Feed values of herbage, silage and biorefined press cake will be produced with wethers (sheep) as model animals.
- Dairy cows at Sötåsen will be fed silage or biorefined presscake in their diets to compare milk yield and milk composition by the cows fed the different diets.

Task 4.5 Trials for optimal utilisation of the biorefined products for feeding of farm animals

Forage harvest at Sötåsen 2020



Feed evaluation trial with wethers at SLU Götala Beef and Lamb Research, Skara



Treatments

- Fresh grass-clover forage harvested 2020
- Biorefined press cake from fresh grass-clover forage harvested 2020
- Ensiled grass-clover forage harvested 2020
- Biorefined press cake from ensiled forage harvested 2020

Fed to 8 wethers (2 wethers/feed)
in a duplicated 4 x 4 Latin square
Latin square, each period 1 month
All animals get all feeds

Intake

Total collection of faeces and urine
Digestibility of feeds
Protein utilisation by ruminants



Dairy cow trial at Sötåsen, Töreboda

Treatments

- Grass-clover silage from 2020
- Biorefined press cake from the same silage 2020

Indoor period 2000/2001

Half of the cows (30) get the silage

Half of the cows (30) get the press cake

+ rolled grain, field bean, purchased protein concentrate

Feed intake on group level

Individual milk yield

Individual milk composition

BW, BCS

Silages

1st cut: 110 g CP, 430 g NDF and 11.5 MJ ME/kg DM

2nd cut: 130 g CP, 470 g NDF and 10.5 MJ ME/kg DM

3rd cut: 150 g CP, 435 g NDF and 10.0 MJ ME/kg DM



Task 4.5 Trials for optimal utilisation of the biorefined products for feeding of farm animals

Anna Wallenbeck, researcher, SLU

- The biorefined liquid fraction will be evaluated in comparison to an organic commercial standard feed in a production trial with growing pigs at Sötåsen

Hushållningssällskapet Sjuhärad

- Test of different storage possibilities of the liquid fraction for stable storage 2020/2021.

Troels Kristensen, Aarhus University

- Upscaling of the results from the trials to farm level, bringing in previous experiments from Denmark and from the literature.