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AGROVÄST

Protein Quality Dynamics During Wilting and Preservation of Grass-Legume Forage

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Introduction

- The crude protein of plants can be divided into following fractions (CNCPS; Sniffens et al., 1992; Licitra et al., 1996):
- A: Nonprotein nitrogen
- B: True protein
  - B1: Soluble protein
  - B2: Neutral detergent soluble protein
  - B3: Acid detergent soluble protein
- C: Acid detergent insoluble protein

- The rumen undegraded dietary protein (UDP) at a defined rumen passage rate can be calculated from the fibre and CP fractions (Kirchhof et al., 2006, Kirchhof, 2007, Edmunds et al., 2012 (In press)).

Introduction

- **The CP fractions change during wilting and preservation.**
- **Limited information exists**
  - **on the effects of moderate wilting during good conditions on the CP fractions and UDP of forage before ensiling.**
  - **on the effects of storage time and additives on the CP fractions and UDP of silage.**

Objective

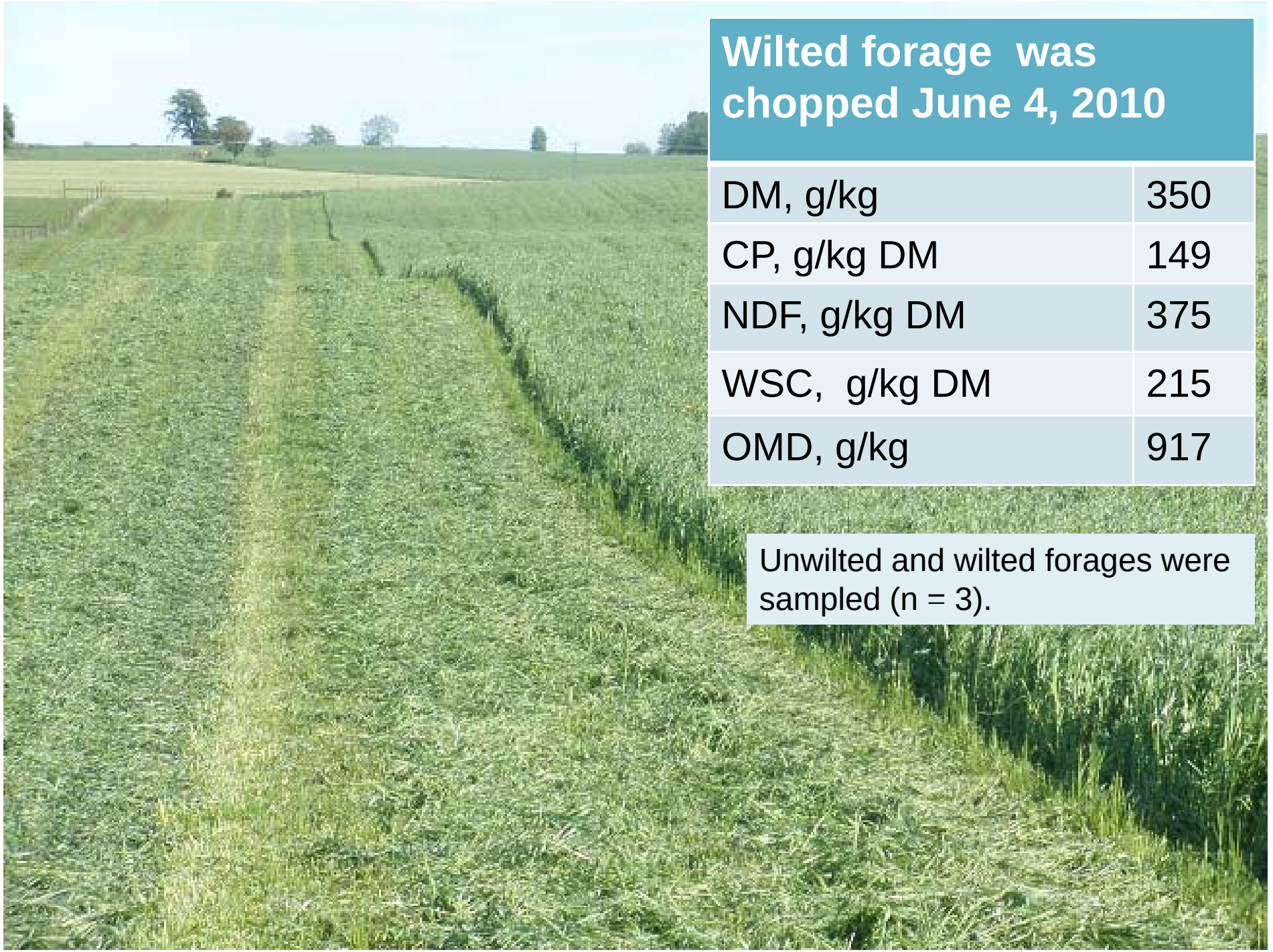
- **To evaluate the effects of**
  - **wilting**
  - **ensiling**
  - **silage additive**

  on the protein quality of highly digestible grass-legume forage.

Materials and Methods

Silage study at Nötcenter Viken, Falköping, Sweden

Grass (77%) – legume (23%) forage at 150 g DM/kg was mowed as a first harvest June 3, 2010 and wilted for 21 hours.



Wilted forage was chopped June 4, 2010

DM, g/kg	350
CP, g/kg DM	149
NDF, g/kg DM	375
WSC, g/kg DM	215
OMD, g/kg	917

Unwilted and wilted forages were sampled (n = 3).

Harvest

Precision-chopped forage – Claas jaguar chopper

Additives applied to forage on the chopper:

Homofermentative LAB KOFASIL LIFE 400 000 cfu/g f.m.

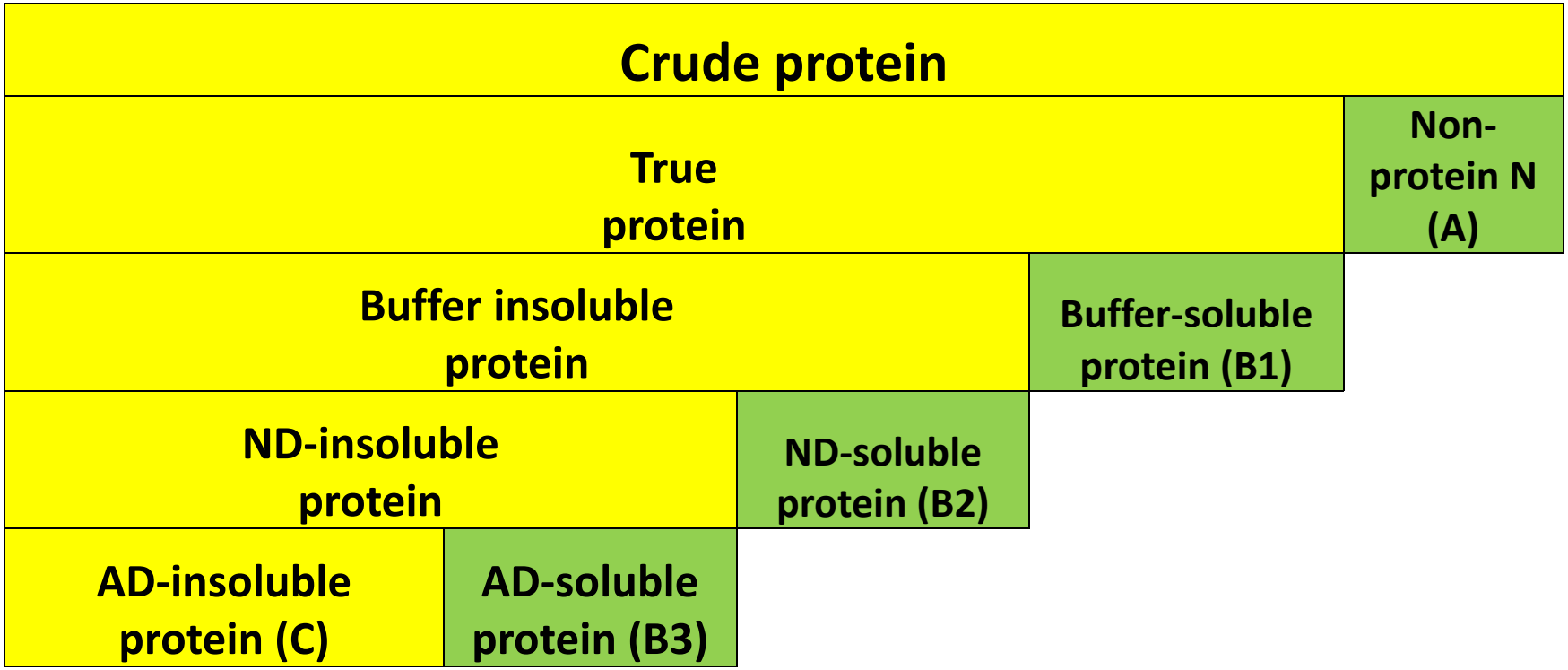
Salt-based additive KOFASIL ULTRA K, 2 l/ton f.m. (ADDCON EUROPE GmbH)

UNTREATED CONTROL SILAGE

Ensiling in mini silos

- 3 silos/treatment were opened after 5, 10, 30 och 125 days.
- Silages were analysed for fermentation pattern and protein quality.

Chemical Crude Protein Fractions (Licitra et al., 1996)



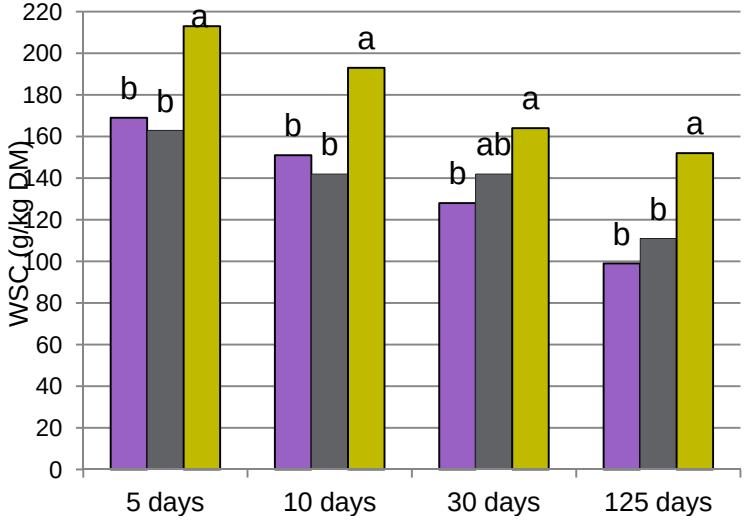
Analysed

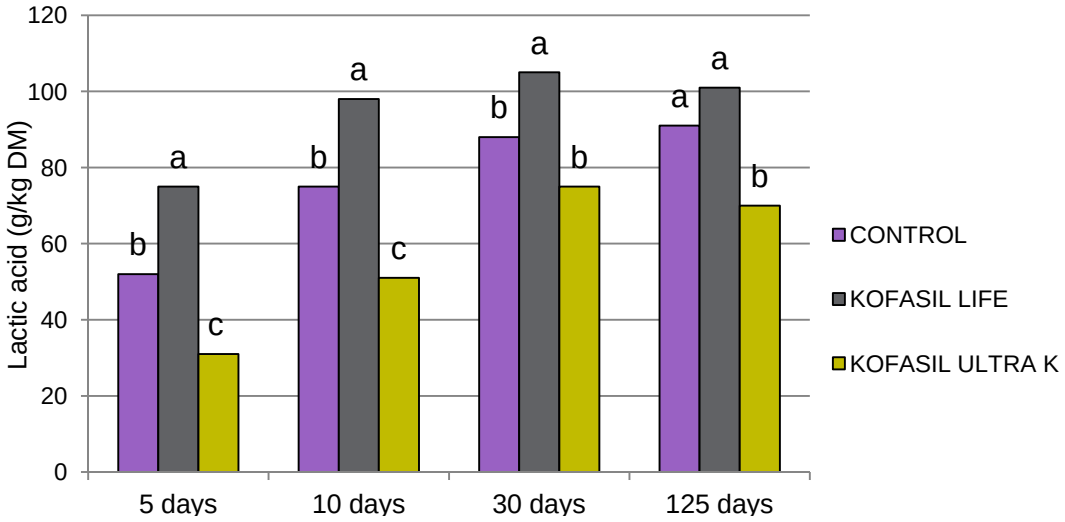
Calculated

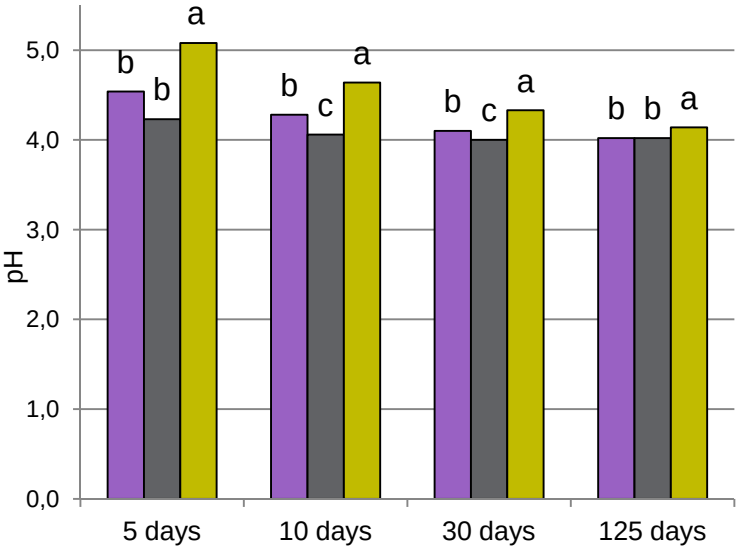
UDP at a specific rumen passage rate can be calculated based on these CP fractions and fibre contents (Kirchhof et al., 2006; Edmunds et al, 2012 (In press)).

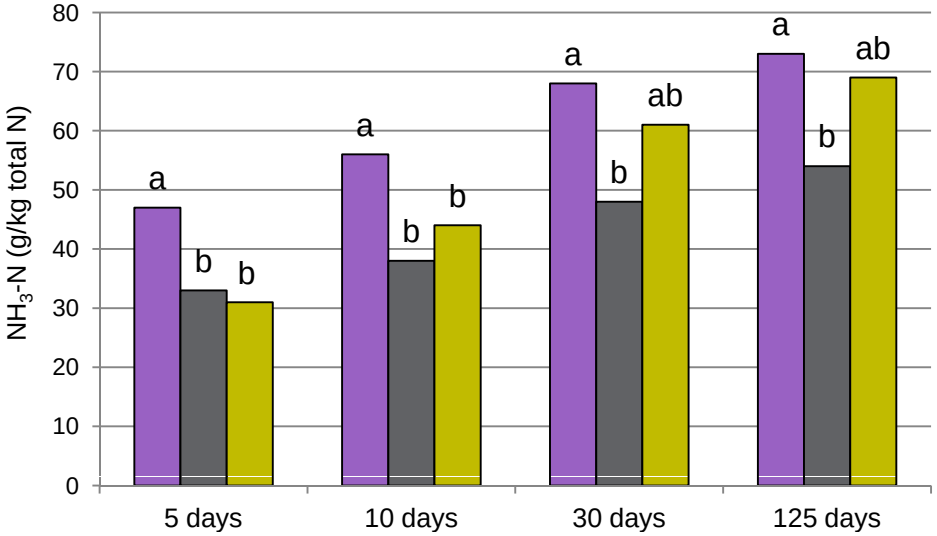
Fermentation characteristics

Statistical comparisons within storage time, n = 3.

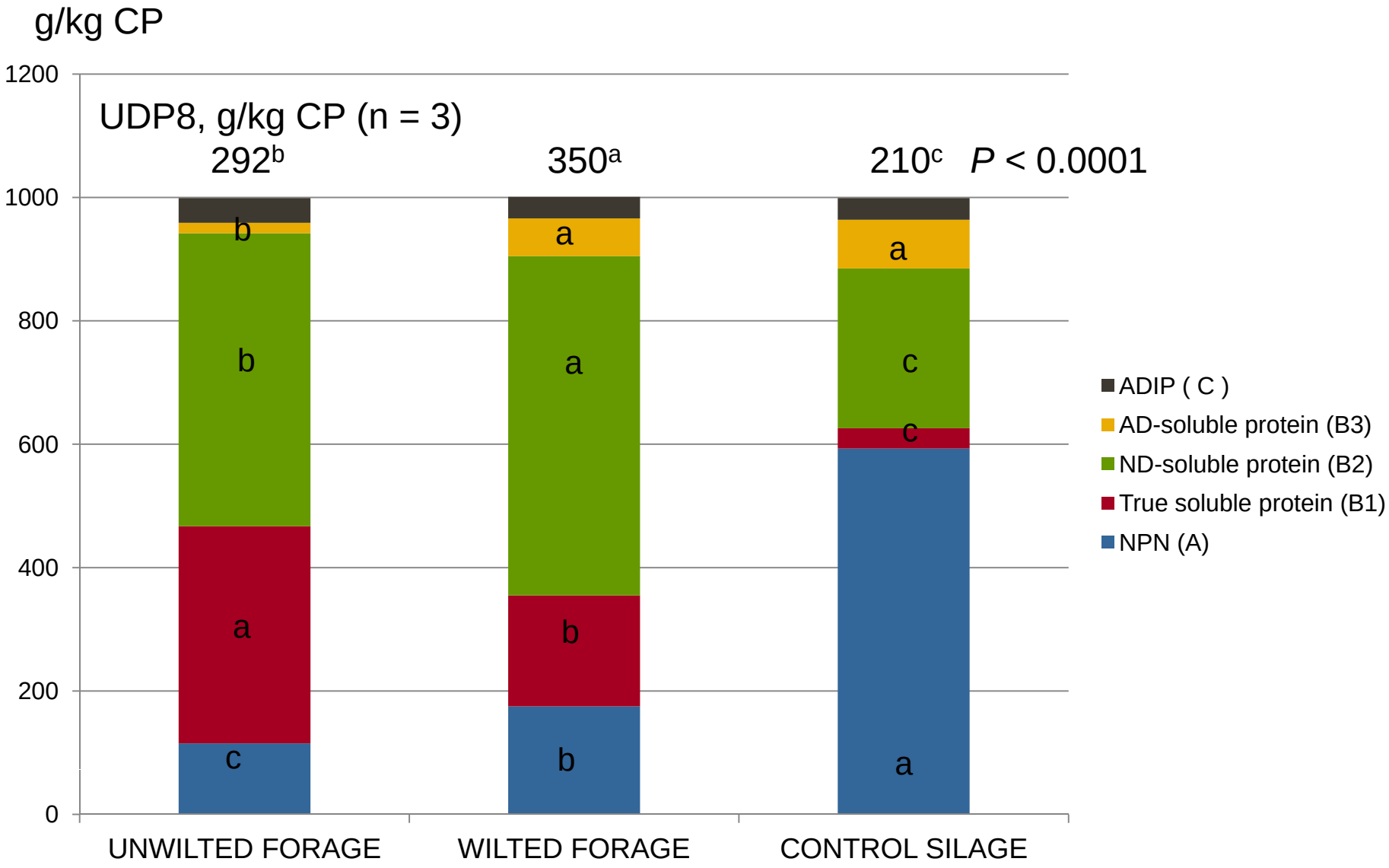




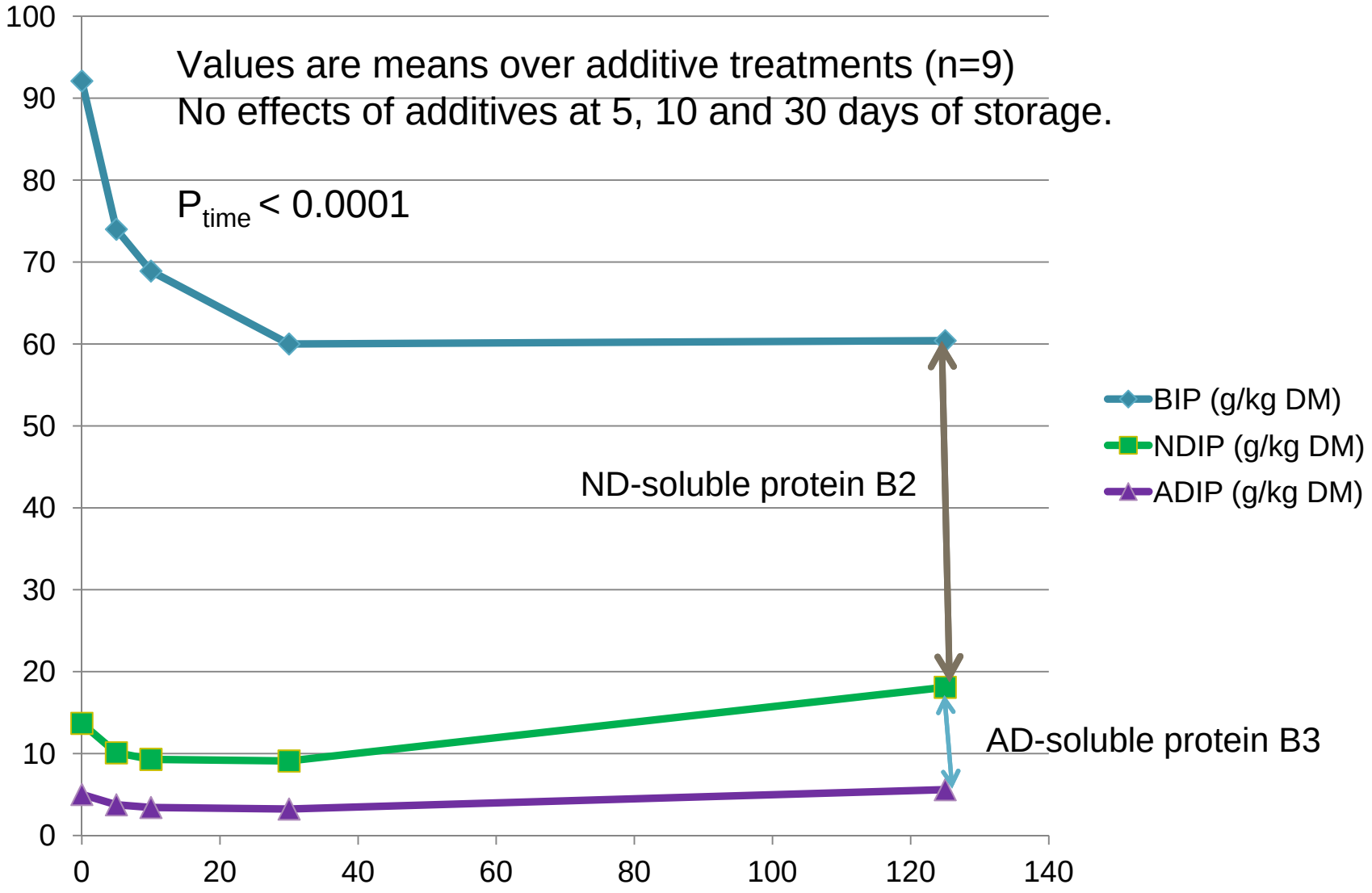




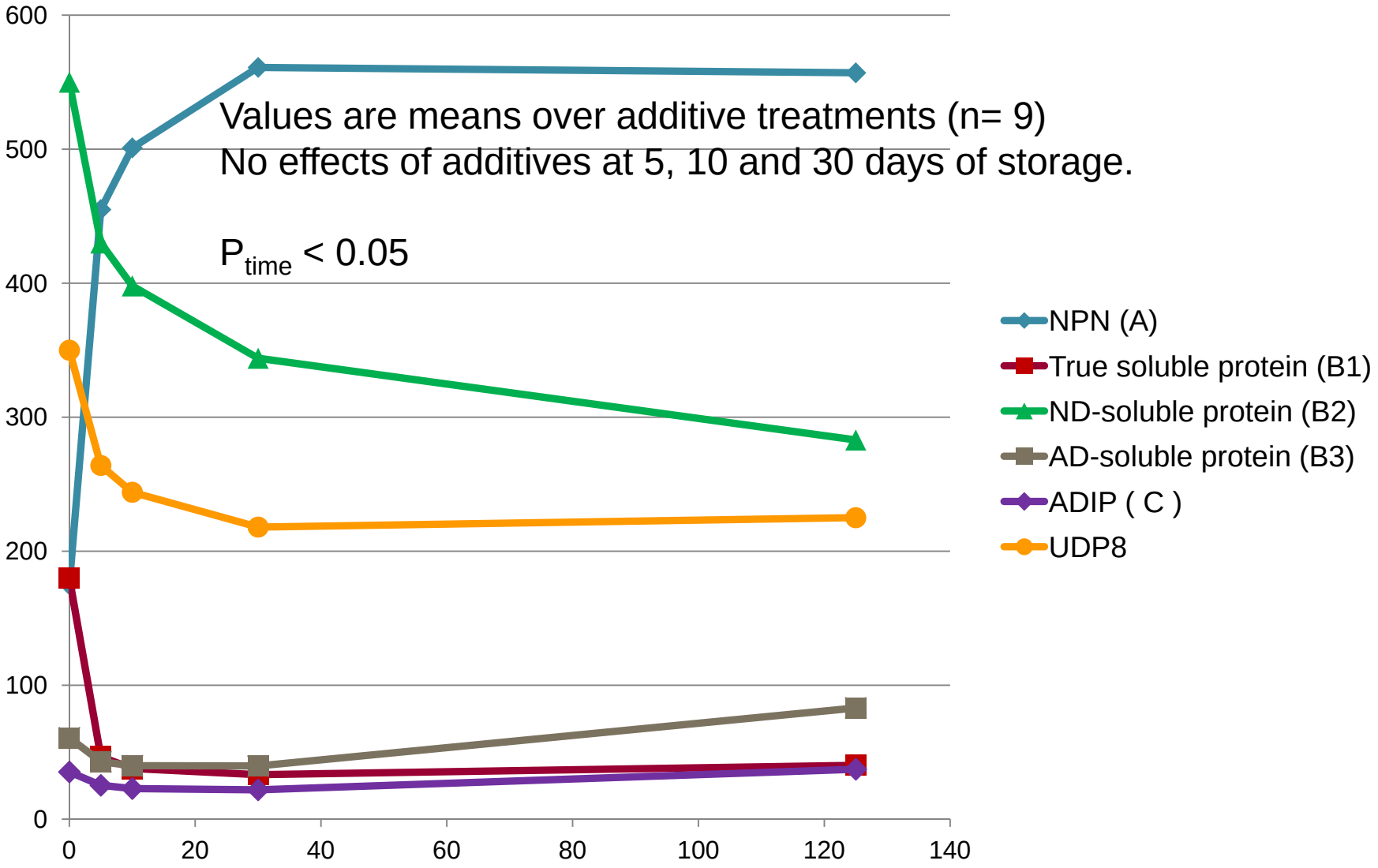
Protein quality changes in forage during wilting for 21 hours and ensiling for 125 days



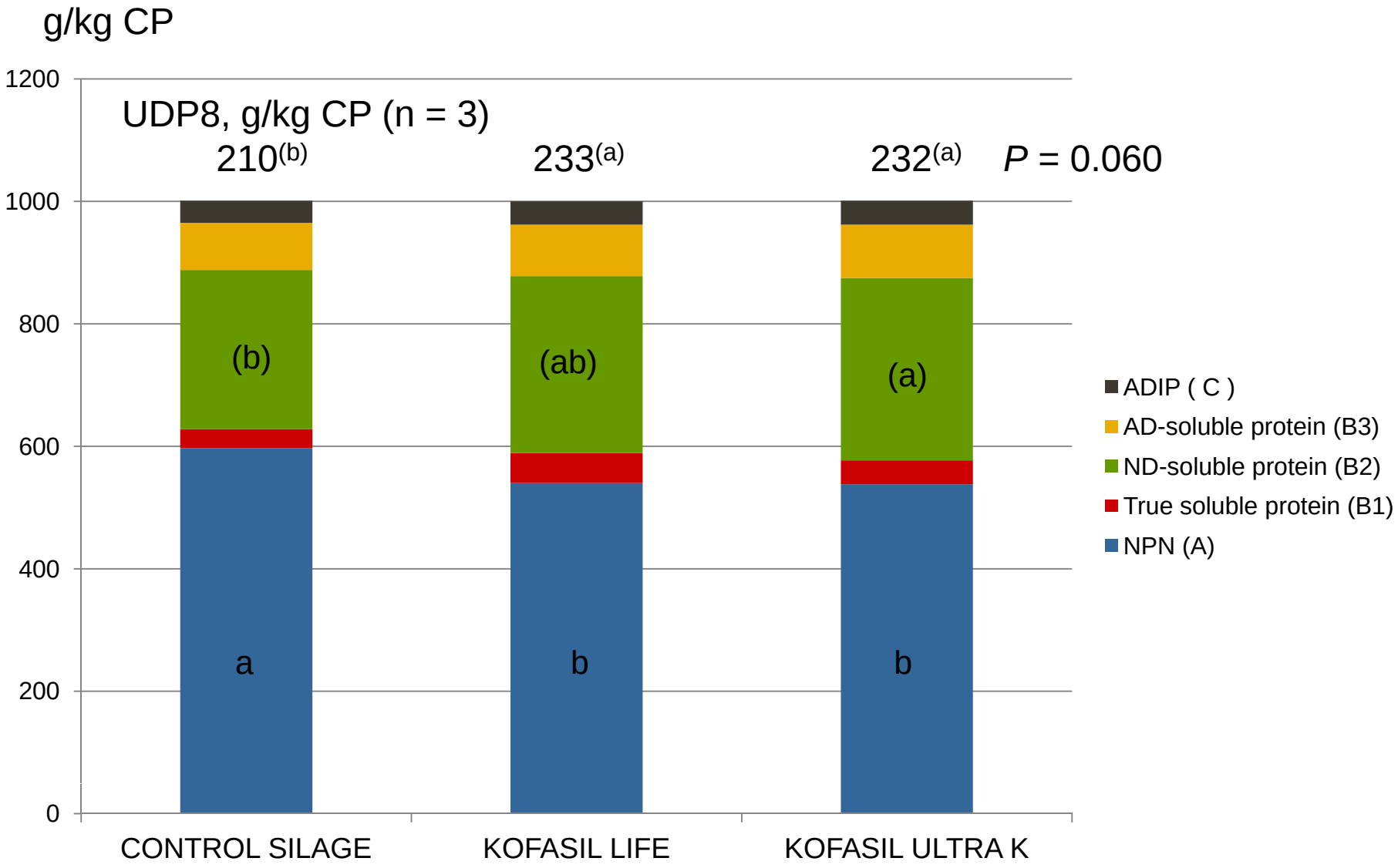
Protein quality changes in silage



Protein quality changes in silage



Additive effects on protein quality of silage after 125 days of storage



Effect of silage UDP on a dairy cow diet containing 12 kg DM silage and 9 kg DM concentrate

	CONTROL silage, 210 g UDP/kg CP	KOFASIL LIFE or KOFASIL ULTRA K treated silage, 232 g UDP/kg CP
CP, g/kg DM	173	173
RDP, g/kg DM	112	110
UDP (RUP), g/kg DM	61	63
NDF, g/kg DM	340	340
Starch, g/kg DM	144	144

The increase in diet UDP corresponds to ca 0.5 kg DM concentrate per cow and day.

Conclusions

- **Moderate wilting to ca 350 g DM/kg during good weather conditions improved forage protein quality.**

- **NPN increased rapidly during early fermentation while the AD-soluble protein increased later during fermentation and storage.**

- **The decrease in UDP during silage fermentation occurred early.**

Conclusions

- **Effects of additives on protein quality occurred late during silage storage (>30 d).**

- **KOFASIL LIFE and KOFASIL ULTRA K decreased NPN production and tended to maintain more of the ND-soluble protein in the wilted forage compared to the control silage, resulting in increased silage UDP from 210 to 232 g/kg CP.**

- **By increasing the UDP from silage, more of the silage protein can be used in cattle diets resulting in savings of concentrate.**

Acknowledgements

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