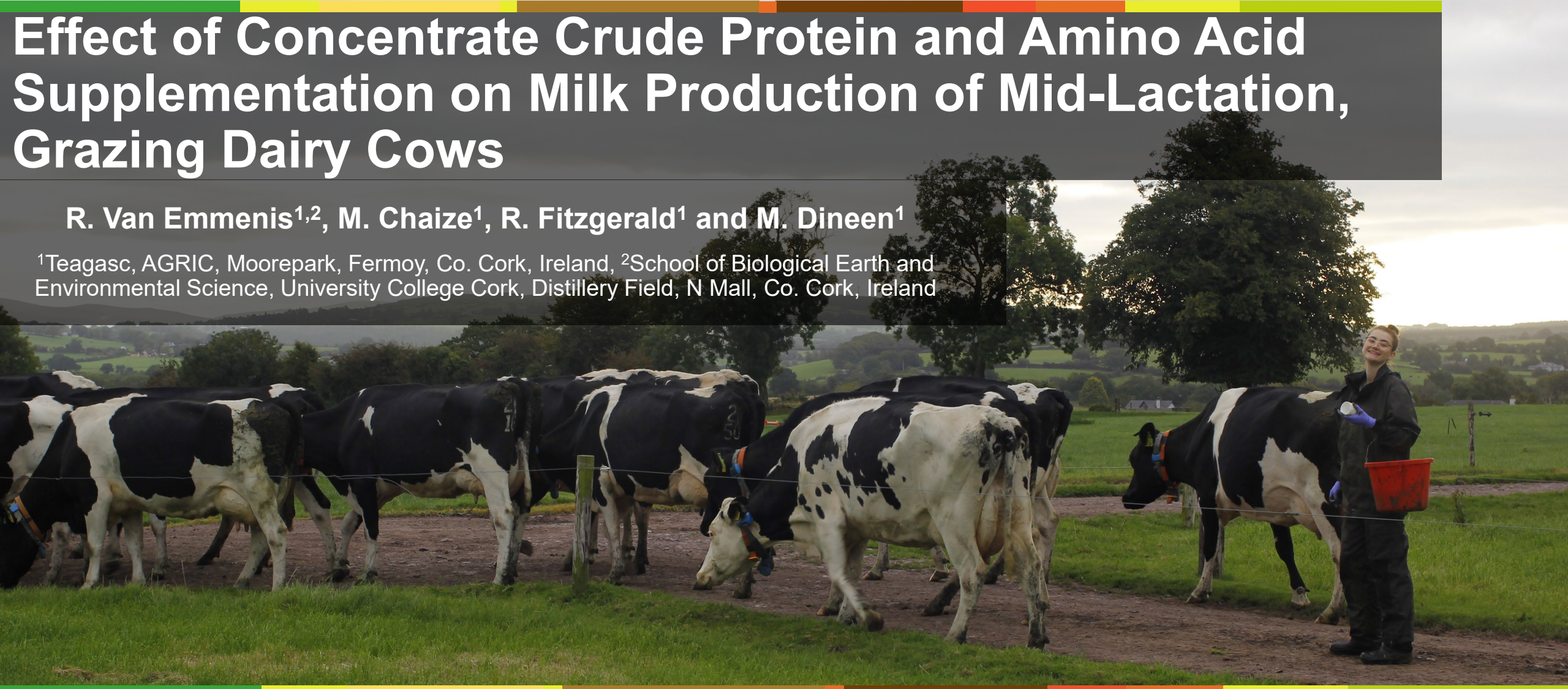
Effect of Concentrate Crude Protein and Amino Acid Supplementation on Milk Production of Mid-Lactation, Grazing Dairy Cows

R. Van Emmenis[1,2], M. Chaize[1], R. Fitzgerald[1] and M. Dineen[1]

[1]Teagasc, AGRIC, Moorepark, Fermoy, Co. Cork, Ireland, [2]School of Biological Earth and Environmental Science, University College Cork, Distillery Field, N Mall, Co. Cork, Ireland



EAAP European Federation of Animal Science

Teagasc Agriculture and Food Development Authority

UCC University College Cork, Ireland Coláiste na hOllscoile Corcaigh

An Roinn Talmhaíochta, Bia agus Mara Department of Agriculture, Food and the Marine

Introduction

- Nitrogen emissions from grazing dairy cows can lead to reduced water and air quality, as well as increased Green House Gas (GHG) emissions
- The European Green Deal and Farm to Fork Strategy has set a target for ≥ 50% reduction in nutrient loss by 2030
- Agricultural emissions account for 38% of total GHG emissions
- Agriculture decreases water quality via chemical and organic (manure and urine from livestock) fertilizer (NO_3^-)
- EU Nitrates Directive (91/676/EEC) → National NAPs

(DAFM, 2022; EPA, 2024)

Introduction

- Irish NAP :
  - Manure management
  - Pasture management
  - **↓ dietary Crude Protein (CP)% in supplementary feeds to a max. of 17% (DM-basis)**

- Grazed grass = 75-90% of DMI in summer
- Concentrate supplements
- Lactating dairy cows require 15-17% CP
- Grazed grass CP varies across seasons with ca. 18% CP in summer

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Objectives and Hypotheses

➢The objectives of this experiment were to investigate the effects of;

1) decreasing the concentrate supplement CP%..
2) including rumen-protected amino acids in low CP feeds..

on milk production in lactating, grazing dairy cows

- HA_1: Decreasing th ed supplemented to the lactating grazing milk production
- HA_2: The addition o acids to a low CP concentrate feed, **m** n of lactating grazing dairy cows

(Lee et al., 2015; Reid et al., 2015; Zhang et al., 2023)

Mid-Lactation Experimental Design

- 2-wk covariate period followed by 8-wk experimental period
- Conducted from late June 2023 – early September 2023
- 100 Holstein Friesian dairy cows
  - n = 25 per treatment x 4 dietary treatments
  - Spring calving, 24% were 1st lactation cows,134 DIM
  - 530 kg BW and 3 BCS
  - Mean EBI €222
  - Daily milk production yields at randomisation:
    - 23 kg daily milk
    - 1.85 kg milk solids
    - 1.05 kg fat
    - 0.80 kg protein

Treatments

1.79 kg of DM per day

17% CP kg^{-1} of DM (H)

13% CP kg^{-1} of DM (M)

9.5% CP kg^{-1} of DM (L)

9.5% CP kg^{-1} of DM containing rumen-protected methionine and lysine (L-AA)

Grazing Management

- Predominantly perennial ryegrass (*Lolium Perenne* L.) swards
- Weekly visual assessments of farm herbage cover were conducted and recorded
- Pre-grazing herbage mass quantified for paddocks to be grazed
- 24-36-hr residency time or post-grazing compressed sward height ranging from 4 to 4.5 cm




(O'Donovan et al., 2002; Kennedy et al., 2009; Wims et al., 2014; Hanrahan et al., 2017)

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Milk Data Collection

- Individual milk yields (kg) were recorded
- Successive Monday p.m. and Tuesday a.m. milk samples were taken
- Milk solids yield = kg fat + kg protein

Milk Production Results

Items	H	M	L	L-AA	SEM	*P*-value
Milk yield, kg d^{-1}	20.2^{ab}	20.4^{a}	20.0^{ab}	19.7^{b}	0.17	0.04
Fat, %	4.82^{a}	4.95^{a}	4.65^{b}	4.95^{a}	0.04	< 0.001
Protein, %	3.84^{ab}	3.88^{ab}	3.81^{b}	3.91^{a}	0.02	< 0.01
Fat, kg d^{-1}	0.96^{b}	1.00^{a}	0.92^{c}	0.97^{ab}	0.01	< 0.001
Protein, kg d^{-1}	0.77^{ab}	0.79^{a}	0.76^{b}	0.77^{ab}	< 0.01	0.04
Milk solids, kg d^{-1}	1.73^{ab}	1.79^{a}	1.68^{b}	1.74^{ab}	0.02	< 0.001

[1]Dietary treatments were concentrates supplemented to pasture, differing in CP with concentrations of; 17% CP (H); 13% CP (M); 9.5% CP (L); and a 9.5% CP containing rumen-protected Met and Lys (L-AA)

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Conclusion

On a DM-basis

- Recommended maximum of 17% CP is possible
- Reduce concentrate CP to 13% for mid-lactation, grazing dairy cows
- Reducing to 9.5% with rumen-protected Met and Lys has additional considerations…

Thank you

✉ Rochelle.R.vanEmmenis@teagasc.ie

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An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

UCC
University College Cork, Ireland
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