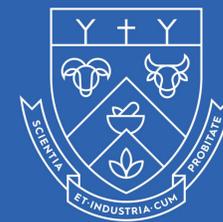


# Plant phytochemistry and its ability to enhance NZ venison production

Anita Fleming, Ella Wilson, Pablo Gregorini

Supported by Agricom, DINZ, AgResearch

Centre of Excellence for Designing Future Productive Landscapes,  
Department of Agriculture and Life Sciences, Lincoln University

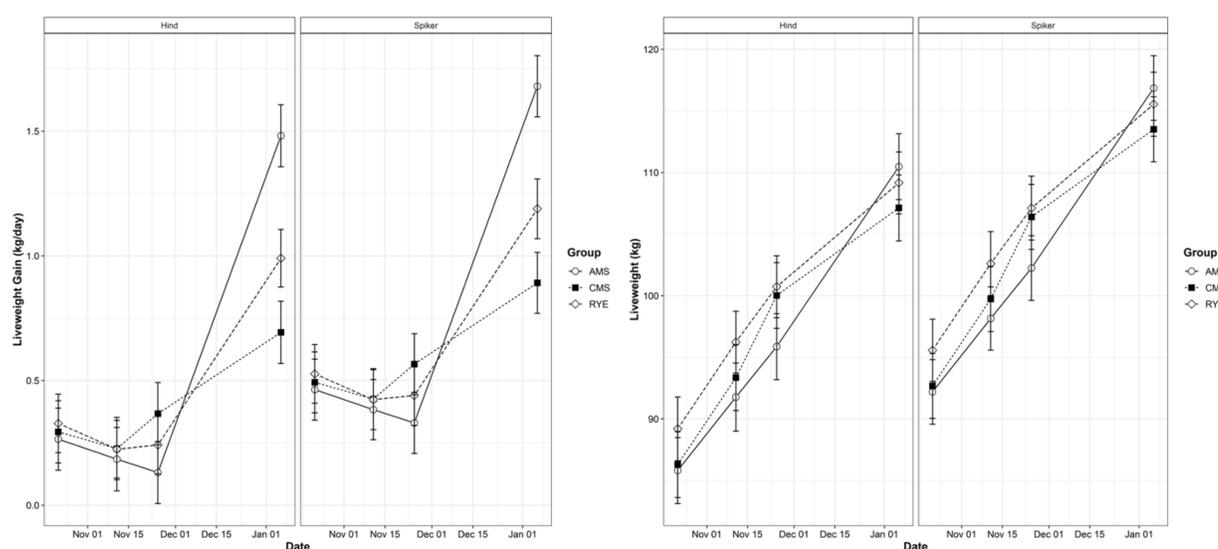


**LINCOLN**  
UNIVERSITY  
TE WHARE WĀNAKA O AORAKI

## Introduction

**Phytochemicals** are a broad spectrum of natural compounds found in plants. Plant phytochemicals are associated with a range of pharmacological actions that can modulate microbial, livestock and human metabolism. **Metabolomics** is the study of low-molecular-weight biochemicals involved in metabolism. Untargeted metabolomics quantifies the products of metabolism which can be used to evaluate the cellular response to environmental factors, such as diet.

The production of phytochemical metabolites present in forage mixtures and their transfer into meat was evaluated for 30 mixed sex yearling red deer finished on different pastures, either traditional perennial ryegrass and white clover (**RYE**), a **complex multi-species mixture (CMS)** where plant species diversity is maximised (23 plant species), or **5 adjacent monoculture strips (AMS)** of ryegrass, lucerne, chicory, plantain, and red clover, a functionally diverse diet in which plant species diversity was optimised.



## Methods

- Liveweight was measured fortnightly
- Forage samples were collected fortnightly for nutritive and metabolomic analysis
- Blood was sampled monthly for plasma metabolite evaluation
- Post-slaughter, meat quality/carcass characteristics, and untargeted metabolomics were measured for each animal

## Results

### Gas chromatography-tandem mass spectrometry

- 161 metabolites were detected
- Pathway mapping suggest that metabolism was altered by the three diets

### Semi polar metabolites

- 1062 features were detected
  - AMS and CMS differed for 71 features
  - AMS and RYE differed for 53 features
  - CMS and RYE differed for 4 features
    - Most differing features were higher in AMS fed deer

## Conclusions

- An AMS pasture diet creates differences in meat composition compared to RYE and CMS pasture
- A number of lipids and semi-polar metabolites do appear to differ based on how pasture is presented to livestock
- AMS improved liveweight gain compared with CMS or RYE diets particularly during early summer, when chicory, lucerne, red clover maintain a high quality and highly digestibility

## References

- De Deyn, G. B., Quirk, H., Yi, Z., Oakley, S., Ostle, N. J., & Bardgett, R. D. (2009). Vegetation composition promotes carbon and nitrogen storage in model grassland communities of contrasting soil fertility. *Journal of Ecology*, 97(5), 864-875.
- Arya, F., Egger, S., Colquhoun, D., Sullivan, D., Pal, S., & Egger, G. (2010). Differences in postprandial inflammatory responses to a 'modern' v. traditional meat meal: a preliminary study. *British Journal of Nutrition*, 104(5), 724-728.
- Carrillo, J. A., He, Y., Li, Y., Liu, J., Erdman, R. A., Sonstegard, T. S., & Song, J. (2016). Integrated metabolomic and transcriptome analyses reveal finishing forage affects metabolic pathways related to beef quality and animal welfare. *Scientific reports*, 6(1), 1-16.

