AMINO ACIDS IN LUCERNE SILAGE: 2. EFFECTS OF INOCULATION

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INTRODUCTION

- Lucerne (*Medicago sativa*) has a low sugar content and high buffering capacity making it difficult to ensile.
- Inoculation with a homofermentative bacteria can help achieve a rapid pH drop and reduce the rate of proteolysis.
- We investigated the effect of using a silage inoculant on the amino acid profile of lucerne silage.

MATERIALS AND METHODS

- Lucerne cut & wilted for 24 h and chopped to 12mm theoretical length.
- Ensiled in triplicate 2 L silos either untreated or inoculated with *L. plantarum* Ecosyl 100.
- WSC, NDF, N, Soluble N, lactate, VFA, pH and ethanol content was determined.
- Free and total amino acid (AA) determined by ion exchange chromatography.

RESULTS

- Inoculation improved fermentation lowering pH, acetate, ethanol & ammonia-N and increasing lactate (Table 1).
- Inoculation resulted in higher total and total essential amino acids (EAAs), including higher total free AAs ($P < 0.001$) but when free AAs were determined as % of total AAs, inoculated silage had lower free AAs (57.0 v 61.6; $P = 0.005$) and lower free EAAs (33.4 v 41.5; $P < 0.001$).
- Inoculation therefore also reduced free EAAs as % of total essential AAs (66.1 v 76.2; $P < 0.001$).

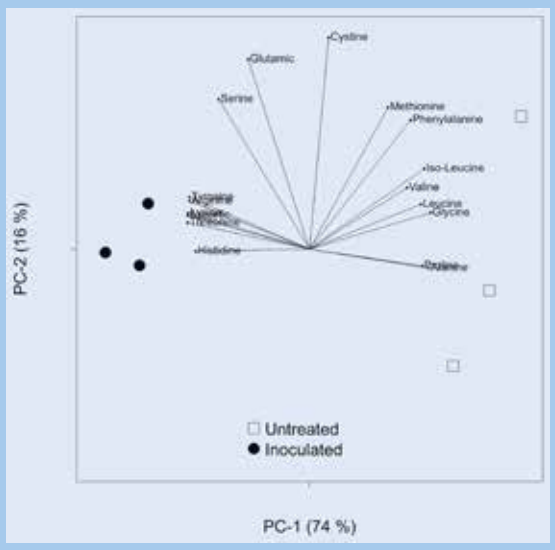

Fig 1. Total concentrations (g/kg DM) of AAs.

Table 1. Chemical composition of lucerne silage after 96 days (g/kg DM unless otherwise stated).

	Untreat.	Inoc.	s.e.m.	Prob
FD DM (g/kg)	317.4	325.1	2.51	0.096
WSC	18.0	18.0	0.56	0.952
NDF	380.7	365.0	12.86	0.436
pH	5.45	4.40	0.043	<0.001
Lactate	41.2	79.6	1.04	<0.001
Acetate	24.4	18.4	0.50	0.001
Ethanol	5.83	2.85	0.314	0.003
Total N	32.8	32.1	0.35	0.237
Soluble N (g/kg N)	839.3	807.5	13.75	0.177
Ammonia (g/kg N)	224.2	92.5	4.83	<0.001
Amino acids				
Total	134.8	165.4	1.44	<0.001
Total essential	73.4	83.6	0.73	<0.001
Total Free	83.1	94.2	0.19	<0.001
Free essential	56.0	55.2	0.10	0.007

- Total concentrations (g/kg DM) of EAA's threonine, histidine, lysine and arginine & non-essential aspartic and tyrosine were higher ($P < 0.05$), whilst EAA's iso-leucine and leucine and non-essential glycine, alanine and proline were lower ($P < 0.05$) in inoculated silage (Fig 1).
- In the free form, the % EAA's methionine, valine, iso-leucine, leucine, phenylalanine, histidine as well as the non-essential cystine, glutamic, glycine, alanine, and proline were lower ($P < 0.01$), whilst EAA's threonine, lysine and arginine and non-essential aspartic, serine and tyrosine were higher ($P < 0.05$) in inoculated silage.

ACKNOWLEDGEMENTS

The GrOw Wales Green project was funded through the Welsh Gov Rural Communities – Rural Development Programme 2014-2020, funded by the Welsh Government and the European Union.

CONCLUSIONS

The use of a homofermentative silage inoculant resulted in a silage with higher concentrations of total and essential amino acids of lucerne silage, significantly increasing threonine, histidine, lysine and arginine essential amino acids.