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Milk C18 :1 and conjugated linoleic acid isomers from cows grazed on perennial ryegrass , tall fescue or timothy grass swards

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Key words : C18 polyunsaturated fatty acids ,perennial ryegrass ,tall fescue ,timothy ,milk fat

Introduction Previous work at our institute has shown substantial variation in the degree of cell damage during ingestion and mastication of different grasses , resulting in differences in the release rate of nitrogen and lipid into rumen fluid (Kim et al . 2008) . These differences in the release rate of lipid may influence the extent of biohydrogenation in the rumen and consequently its intermediates C18 :1 and conjugated linoleic acid (CLA) and their concentration in ruminant products . This study investigated the C18 biohydrogenation intermediates of milk from cows grazing three contrasting grass species (perennial ryegrass , PRG ; tall fescue , TF ; and timothy , TIM) over two years .

Materials and methods The experimental design and statistical analysis were described by Lee et al . (2008) . In short 3 grass genotypes : PRG , TF and TIM were grazed by 12 multi-parous Holstein × Friesian dairy cows in a replicate 3 × 3 Latin square design over two years (2005/06) . Each period consisted of 2 weeks grazing followed by a 3 week rest period . Milk from the last two days of each period was sub-sampled and submitted for fatty acid analysis .

Results and Discussion The milk from cows grazing TF had a higher concentration of C18 :1 trans 4 , 9 , total trans , C18 :1 cis 9 , 15 and total cis (Table 1) than milk from cows grazing the other grass swards . This maybe related to differences in the biohydrogenation pathway of C18 PUFA when cows graze TF as the supply of C18 PUFA substrate on this diet was lower than the other two diets (Lee et al . 2008) . Year differences were seen for C18 :1 trans 4 , 13+14 , total trans and C18 :1 cis 15 . Interaction effects were also seen for numerous isomers . CLA content showed no discernable pattern between grass species or year with interaction effects for all isomers .

Table 1 Milk C18 :1 and CLA isomers (mg/100ml) from cows grazed on three grasses over two years .

	Perennial Ryegrass		Tall fescue		Timothy		S.E.D	P		
	2005	2006	2005	2006	2005	2006		G	Y	G*Y
C18 :1 trans 4	0.36	0.47	0.38	0.55	0.33	0.46	0.069	*	*	NS
5	0.30	0.34	0.32	0.43	0.31	0.46	0.064	*	†	†
6+7+8	5.90	6.19	6.73	7.65	6.00	5.92	0.563	***	NS	*
9	9.24	8.65	10.8	9.90	9.27	8.15	0.770	***	NS	NS
10	7.59	7.38	9.12	7.89	9.84	7.84	1.164	*	NS	†
11	130	87.3	132	110	125	93.7	13.8	*	*	†
12	7.16	9.47	7.81	8.95	7.46	9.04	0.642	NS	*	†
13+14	16.6	2.69	16.1	2.69	19.2	2.69	2.659	NS	***	NS
16	11.7	13.1	12.4	12.7	12.3	11.3	1.22	NS	NS	NS
Total trans	189	136	196	160	190	140	16.2	*	**	NS
C18 :1 cis 9	856	886	977	976	876	818	68.0	***	NS	NS
11	12.8	19.7	18.0	23.2	15.0	18.0	2.45	***	*	†
12	2.46	3.15	2.75	2.88	2.70	3.09	0.330	NS	NS	NS
13	2.18	2.99	2.76	2.34	0.24	0.22	0.366	***	NS	***
15	4.83	3.94	5.61	4.33	4.60	2.80	0.394	***	***	NS
Total cis	878	916	1010	1010	901	844	69.9	***	NS	NS
trans 10 cis 12	0.20	0.11	0.13	0.12	0.13	0.11	0.055	NS	*	†
trans 11 trans 13	1.98	1.45	1.84	1.61	1.30	0.64	0.295	*	***	***
trans 9 trans 11	1.09	1.54	1.11	1.52	1.06	0.75	0.169	***	NS	***
cis 9 trans 11	57.6	39.3	56.7	48.9	57.3	39.7	6.52	†	*	*
Total CLA	60.9	42.4	59.8	52.2	59.8	41.2	6.70	†	*	*

Conclusion Grass species and year can influence the C18 :1 and CLA isomers in milk , which may be due to differences in biohydrogenation pathways induced by differential breakdown properties of the grass species .

References

- Kim et al 2008 Investigation of the effect of grass species on the release of cell contents during bolus formation . *Proceedings of the British Society of Animal Science* . In press .
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