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The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

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Milk C18 polyunsaturated fatty acids 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 the C18 polyunsaturated fatty acid (PUFA) content of ruminant products . This study investigated the C18 PUFA of milk from cows grazing three contrasting grass species (perennial ryegrass , PRG ; tall fescue , TF ; and timothy , TIM) over two years .

Materials and methods Three grass genotypes : PRG , TF and TIM were sown in plots (0 .7 ha) in August 2004 . In April 2005 and May 2006 , 12 multi-parous Holstein × Friesian dairy cows in mid-lactation were allocated to treatment at random in a replicate 3 × 3 Latin square design . Each period consisted of 2 weeks grazing followed by a 3 week rest period where all cows grazed together on permanent pasture . Herbage intake was calculated at the end of each grazing period using the differential growth method as assessed by exclosure cages (Lee et al .2001) . Cows at milking received 2 kg/day of standard 18% protein dairy concentrate . Milk yield was recorded across the experiment . Milk from the last two days of each period was sub-sampled and submitted for fatty acid analysis . Fatty acids were extracted and methylated using a single step base (NaOH in methanol) catalysed methylation . Statistical analysis was carried out using a general ANOVA with grass species × year as the treatment and blocking according to cow+period (Payne et al . 2002) .

Results and discussion DM and C18 PUFA intake was significantly lower for TF than the other two grasses and similar across years with the exception of TIM which was lower in 2006 (Table 1) . Milk yields were also lower on TF than the other grasses and higher in 2005 than 2006 . Milk PUFA output was highest in 2006 for all grasses . C18 :2 in milk showed the pattern TIM > PRG > TF , whereas for C18 :3 PRG > TF > TIM and is likely to be associated with a substrate input effect . Conversion efficiency of C18 :2 was significantly higher for TF than the other grasses , it also showed the fastest release rate of lipid in a rumen environment (Kim et al . 2008) . This may facilitate its passage through the rumen and reduce biohydrogenation . However , as to why this response was not seen for C18 :3 requires further investigation .

Table 1 *C18 PUFA intake , milk output and percentage conversion efficiency for the three grasses over two years .*

	Perennial Ryegrass		Tall fescue		Timothy			P		
	2005	2006	2005	2006	2005	2006	s .e .d	G	Y	G* Y
DM Intake (kg/d)	19 .9	20 .6	14 .8	14 .1	18 .3	14 .2	2 .46	***	*	NS
C18 :2 Intake (g/d)	78 .6	86 .9	52 .1	50 .8	109	84 .2	11 .14	***	†	NS
C18 :3 Intake (g/d)	376	361	335	278	320	226	46 .0	*	**	NS
Milk Yield (kg/d)	24 .0	25 .0	20 .9	21 .7	22 .2	25 .8	0 .88	***	†	NS
Milk C18 :2 (g/d)	8 .40	9 .75	8 .15	8 .68	8 .66	9 .80	0 .337	*	*	NS
Milk C18 :3 (g/d)	5 .52	6 .25	5 .23	5 .64	4 .44	5 .16	0 .204	**	**	NS
Conversion C18 :2 (%)	10 .7	11 .2	15 .6	17 .1	7 .94	11 .6	3 .03	*	NS	NS
Conversion C18 :3 (%)	1 .47	1 .73	1 .56	2 .03	1 .39	2 .29	0 .444	NS	†	†

Conclusion Grass species and year can influence the intake and milk output of C18 PUFA . Differences in degree of cell damage may also affect the extent of biohydrogenation of C18 PUFA in different grass species .

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