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## Influence of dietary forages on the fatty acid profile of rumen digesta , milk and meat

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**Key words :** biohydrogenation ; botanically diverse forages ; fatty acids ; plant secondary metabolites

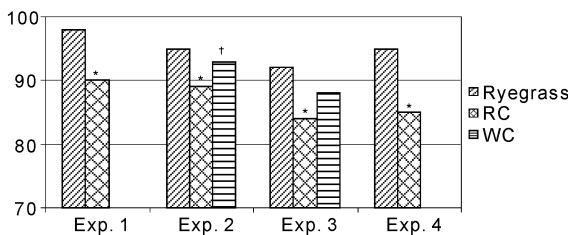
**Introduction** Forage feeding increases the n-3 polyunsaturated fatty acid (PUFA) content in milk and meat . In particular , clover and botanically diverse forages have the potential to improve the milk and intramuscular (IM) fatty acid (FA) profile in terms of human nutritional recommendations (Lourenço et al . , 2007) . Here , we intend to integrate literature results on milk and IM FA of dairy cows or lambs fed leguminous rich or botanically diverse forages as compared to forage products from more intensively managed grasslands . Information on rumen FA is used to suggest potential explanations for differences in FA end product composition .

**Materials and methods** Milk FA results (proportion of milk total FA) were divided into three data sets : 1) red clover (RC) (n =6) vs . ryegrass based diets (n=6) ; 2) white clover (WC) (n=7) vs . RC forages (n=7) and 3) botanically diverse (BD) (n =7) vs . grass based diets (n=6) , which were compared statistically using a mixed model with study as a random effect and weighing of the variables by the number of observations in each study (St-Pierre , 2001) . Studies on dietary forage type in relation to rumen biohydrogenation (4 experiments) and intramuscular FA profile (6 experiments) were too few and diverse to integrate in an overall statistical analysis and are summarised to give an overview of general trends . The reader is referred to Lourenço et al . (2007) for the complete reference list of the individual studies .

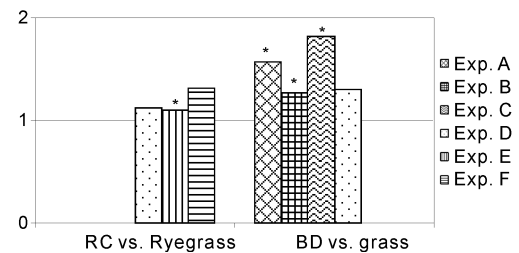
**Results and discussion** In general , RC forages resulted in lower C18 :3 n-3 apparent biohydrogenation (Figure 1) , which was reflected in higher milk C18 :3 n-3 proportions compared to ryegrass forages (Table 1) , despite the similar C18 :3 n-3 intake . Nevertheless , long chain PUFA in IM fat remained similar in ruminants fed RC and ryegrass diets (Figure 2) . Compared to grass based diets , feeding BD forages resulted in higher C18 :3 n-3 milk proportions (Table 1) and IM fat long chain PUFA proportions (Figure 2) , although rumen C18 :3 n-3 apparent biohydrogenation did not differ (data not shown) . Moreover , higher rumen C18 :1 t11 proportions were found for ruminants fed BD forages (4 .59 g/100 g FA) compared to ruminants fed grass based forages (2 .72 g/100 g FA) . It is evident that feeding BD forages affects rumen FA metabolism , but changes could not always be associated with differences in the proximate chemical composition of the pastures or their PUFA content . Other factors might play a role , such as plant secondary metabolites , but only few for e .g . polyphenol oxidase in RC-have been studied for their effect on rumen FA metabolism .

**Table 1** C18 :3 n-3 intake (g/d) and milk C18 :3 n-3 proportions (g/100 g total milk FA) in the milk of dairy cattle fed either botanically diverse forage based diets , intensive ryegrass , red or white clover products († P<0 .1 ; \* P<0 .05) .

	Ryegrass	RC	WC	RC	Grass based	BD
Intake C18 :3 n-3	92 .1	115 .6	136	171†	147	116
Milk C18 :3 n-3	0 .555	1 .05*	0 .956	0 .893	0 .788	1 .06*



**Figure 1** C18 :3 n-3 apparent biohydrogenation (g/100g) for ryegrass , RC and WC forages (adapted from Lourenço et al . , 2007) † P<0 .1 ; \* P<0 .05 .



**Figure 2** Ratio of the proportions of total PUFA in the IM fat of animals fed RC to ryegrass and fed BD to grass based forages (adapted from Lourenço et al . , 2007)\* P<0 .05 .

**Conclusions** Botanically diverse forages have the potential to change the PUFA content of ruminant products , which is associated with changes in the rumen and animal endogenous FA metabolism . Plant secondary metabolites are hypothesized to cause the observed differences , but more research on this topic is needed .