COMMUNICATION

Growth performance and N excretion of double muscled Piemontese bulls fed low protein rations with or without the addition of rumen protected conjugated linoleic acid

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ABSTRACT - Growth performance and N excretion of double muscled Piemontese (DMP) bulls were investigated. Forty-eight DMP bulls (LW 279 kg), divided in 4 groups, housed in 12 pens, were fed 2 rations (TMR) differing for crude protein density (diets HP: CP=14.7% DM; diets LP: CP=11.0% DM) and top dressed with 80 g/d of rumen protected CLA ($_{CLA}$) or with 65 g/d of hydrogenated soybean oil ($_{HSO}$). DM intake was measured, weekly and on pen basis, from the weights of feed distributed and orts. Bulls were weighted monthly. Trial lasted 334 d. Data were analysed by ANOVA. Over the whole trial, no effects due to CP, to additive (A) or to CPxA were found on final LW (670 kg), average daily gain (1.187 kg/d), DM intake (8.50 kg/d), and on SEUROP (5.2 points) and cold dressing (67.3%). Interaction CPxA affected (P<0.05) feed conversion ratio and N efficiency. With respect to HP, LP reduced (P<0.01) N excretion from 57 to 40 kg /head. On DMP bulls a reduction of 29% of N excretion can be achieved by using low protein TMR without negative consequence on growth performance and carcass traits.

Key words: Piemontese, Bulls, Growth performance, Nitrogen excretion.

Introduction – 1) Small information are available from literature about the growth performance and DM intake of double-muscled Piemontese bulls (DMP) kept on corn-silage based total mixed rations (TMR). 2) The increasing public concern about N excretion from livestock requires investigations about possible effects of low protein rations on growth performance and carcass quality at slaughter (Xiccato *et al.*, 2005). 3) In Italy, some farmers are experiencing low protein rations plus rumen-protected conjugated linoleic acid (CLA) for reducing N excretion; on monogastric animals it was found that CLA improved growth performance feed efficiency (Pariza *et al.*, 2001). Thus, the aim of this paper was to investigate the effect of corn-silage based TMR with conventional and reduced CP level with or without the addition of rumen protected CLA on growth performance, DM intake, N excretion and carcass traits at slaughter of DMP bulls.

Material and methods – After 29 days of transition, 48 DMP bulls were divided in 4 groups homogeneous for LW (279±24kg). The bulls of each group were housed in 3 pens, still homogeneous for LW (light, medium and heavy of 253±19, 282±9 and 301±11kg LW, respectively). Bulls were fed 2 total mixed rations (TMR) differing for crude protein density (diets HP: CP=14.7% DM; diets LP: CP=11.0% DM) and top dressed with 80 g/d of a rumen protected CLA mixture ($_{CLA}$) or with 65g/d of hydrogenated soybean oil ($_{HSO}$). The 2 TMR contained the same ingredients, with the exception of soybean meal, the which proportion was increased from 3.3 to 12.6% DM with LP and HP, respectively. The lipid encapsulated CLA mixture contained 9.9 % of C18:2 *cis* 9- *trans* 11 and 9.6% of C18:2 *trans* 10- *cis* 12 isomers, 8.5% of C18:1 *trans* 9, and the remaining part by C18:0 and C16:0. The dose of CLA mixture was 1% of the expected DM intake, the same to that used by Poulson *et al.* (2004), about half to that used by Gillis *et al.* (2004), but 10 fold higher than that commonly used in the practice. DM intake was measured, weekly and on pen basis, from the amounts of feed distributed and the orts. Bulls were individually weighted monthly. Trial lasted 334 d. At slaughter cold dressing percentage was measured and SEUROP conformation (P=1,…, S=6; with 3 sub-classes for each point) and fatness (very lean=1,…,very fat=5) scores were evaluated (EU Rule 1208/1981 and EU Rule 1026/1991, respectively). N excretion was computed by following a mass balance approach (ERM, 2001) as consumption minus retention. N excretion was expressed on annual basis by multiplying N excretion for the correction factor: (365/permanence time +14 days for empty times), and N in slurry was computed by discounting total N excretion for 30% of losses (Italian Ministerial Decree MIPAF, 7/4/2006). Data of LW, average daily gain (ADG), conformation and fatness scores, over the whole trial, were analysed with the model: $y_{ijk}=\mu+T_i+C_j+ e_{ijk}$, where y_{ijk} was the experimental observation, T was the treatment effect (i=1,…,4) and C was the effect of the sub-group of pens with the same initial LW (light, medium and heavy) (j=1,…,3): C was equally represented in each treatment. The experimental unit was the individual. A similar model was applied for DM intake, feed conversion ratio (FCR), total N excretion, N in slurry, and LW production per unit of N excreted, but using the pen as experimental unit. Orthogonal contrasts were run to evaluate the effects due to the CP level, the additive (A) and their interaction CPxA.

Results and conclusions – Over the whole trial, no significant effect due to CP or A were found on performance and feed intake (Table 1). ADG and DMI averaged 1.166 and 8.79 kg/d, respectively. FCR was affected by CPxA (P<0.05): on HP the use of CLA increased FCR from 7.2 to 7.7 kg/kg growth, whereas on LP the use of CLA reduced FCR from 7.9 to 7.5 kg/kg. No effect due to CP, to A or to CPxA were observed for carcass traits; cold dressing was comparable to that found by De Campeneere *et al.*, (1999) on double-muscled Belgiam Blue bulls. The reduction of the CP density decreased (P<0.001) N excretion from 57.2 to 40.8 kg per head (-29%) and N in slurry from 42.0 to 29.9 kg/place/year. A lowered CP density significantly increased the LW produced per unit of total N excreted, from 6.9 to 9.5 kg growth/kg N. For this index a significant effect (P<0.05) due to CPxA was found, too: LP_{CLA} treatment showed the highest value. It can be concluded that 1) lowering the dietary CP density from 14.7 to 11.0% can reduce N excretion of about 29%, without negative consequence on growth performance and carcass traits; 2) the prolonged exposition of bulls to high dosage of CLA do not exert considerable effect on growth performance and carcass traits, even if the significant CPxA interaction evidenced as the use of CLA on LP ration could improve FCR and N efficiency, but still not convenient in the practice.

Table 1. In vivo performance, carcass traits and N excretion over the whole trial.

	Treatment					P		
	HP_{HSO}	HP_{CLA}	LP_{HSO}	LP_{CLA}	RMSE	CP	A	CP x A
In vivo:								
Initial LW, kg	281	280	276	277	15			
Final LW, kg	692	657	655	670	59			
Average daily gain, kg/d	1.228	1.129	1.132	1.174	0.151			
DM intake, kg/d	8.82	8.66	8.94	8.76	0.27			
FCR, kg DM/kg growth	7.18	7.68	7.90	7.48	0.30			*
Carcass traits:								
Cold dressing, %	67.7	67.6	66.8	67.2	1.3			
SEUROP score	5.17	5.30	5.27	5.11	0.58			
Fatness score	1.93	1.86	1.86	1.83	0.17			
N excretion:								
N excreted (Nex), kg/head	57.4	57.0	41.5	40.0	1.3	***		
N in slurry, kg/place/year	42.1	41.8	30.4	29.4	1.0	***		
N efficiency:								
LW produced /Nex, kg/kg	7.16	6.62	9.12	9.84	0.45	***		*

****=P<0.001; *=P<0.05; RMSE=root of mean square error; CP=effect of Crude Protein level; A=effect of Additive.*

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