Effect of sodium bentonite and vegetable oil blend supplementation on growth, carcass quality and intramuscular fatty acid composition of lambs

Eliana Jerônimo\textsuperscript{a, b}, Susana P. Alves\textsuperscript{a, b}, Susana V. Martins\textsuperscript{c}, José A.M. Prates\textsuperscript{c}, Rui J.B. Bessa\textsuperscript{a, b, c, d}, José Santos-Silva\textsuperscript{a}

\textsuperscript{a} Unidade de Investigação em Produção Animal, INIBIS, Ponte Bonita, 2005-046 Vale de Santarém, Portugal
\textsuperscript{b} SEQUIMB, ICIMAS, Instituto de Ciências Biomédicas Abel Salazar, Universidade do Porto, Campus Agrário de Vairão, 4445-661 Vairão VC, Portugal
\textsuperscript{c} CHISA, Centro de Investigação Interdisciplinar em Saúde Animal, Faculdade de Medicina Veterinária, Pêlo Universitário do Alto da Ajuda, 1300-477 Lisboa, Portugal

\textbf{A R T I C L E  I N F O}

Article history:
Received 25 September 2009
Received in revised form 12 April 2010
Accepted 14 April 2010

Keywords:
Carcass composition
Fatty acids
Lamb
Linseed oil
Sodium bentonite
Sunflower oil

\textbf{A B S T R A C T}

The effect of dietary sodium bentonite and a blend of sunflower and linseed oils at 1:2 (v/v) on growth, carcass and meat quality and fatty acid (FA) composition of longissimus dorsi muscle of lambs was studied. Thirty-two Merino Branco lambs with initial live weights (LW) of 16.2 ± 2.93 kg were divided according to a completely randomized experimental design within a 2 x 2 factorial arrangement of treatments in order to evaluate effects of the vegetable oil blend supplementation (0 g/kg versus 60 g/kg DM) and sodium bentonite inclusion in diets (0 g/kg versus 26 g/kg DM). The basal diet consisted of pellets with 750 g dehydrated lucerne/g DM and 250 g manioc/kg DM. The experimental period was 6 weeks. Bentonite affected neither daily LW gain, dry matter (DM) intake, nor carcass composition. However, bentonite decreased the 4\textsuperscript{th} meat colour parameter (redness; \textit{P}<0.004). Oil supplementation affected neither daily LW gain, nor DM intake. However, it increased fat proportion in chump and shoulder cuts (\textit{P}<0.001), as well as kidney and knob channel fat (\textit{P}<0.001) while it decreased muscle proportion in the dissected cuts (\textit{P}<0.001). Oil supplementation increased intramuscular fat (\textit{P}<0.001) and most meat FA. Polyunsaturated FA (PUFA) increased 23% with oil supplementation (\textit{P}=0.007), mostly by increasing proportions of n-3 PUFA and biohydrogenation derived PUFA. Oil supplementation decreased n-6 long chain PUFA (\textit{P}=0.001). The proportion of n-3 long chain PUFA was not affected by oil supplementation, so the increase in n-3 PUFA from 1.99 g/100 g of total FA to 4.23 g/100 g of total FA (\textit{P}=0.001) was mainly due to the increase of \textit{ω}-linolenic acid (\textit{P}<0.001). However, when expressed in mg/100 g of meat, oil supplementation increased n-3 long chain PUFA concentration from 20 to 31 mg (\textit{P}<0.001). All biohydrogenation intermediates (BI) increased with oil supplementation, except for cis-11 18:1 which decreased, and cis-13 18:1 and trans-9, cis-10 18:2 which were unchanged. Conjugated linoleic acid increased with oil supplementation from 0.50 to 1.72 g/100 g of total FA (\textit{P}<0.001). Bentonite did not affect most meat FA, although effects occurred on some BI. Bentonite increased trans-11

\textit{Abbreviations}: BI, biohydrogenation intermediates; CLA, conjugated linoleic acid; CP, crude protein; DHA, docosahexaenoic acid; DM, dry matter; DPA, docosapentaenoic acid; EFA, essential fatty acid; EP, eicosapentaenoic acid; FA, fatty acids; FAME, FA methyl esters; KDCF, kidney and knob channel fat; LC-PUFA, long chain polyunsaturated FA; LW, live weights; MLFA, monounsaturated FA; NDF, neutral detergent fibre not assayd with a heat stable amylase and expressed inclusive of residual ash; PUFA, polyunsaturated FA; SFA, saturated FA.

* Corresponding author at: Faculdade de Medicina Veterinária - Universidade Técnica de Lisboa, Pêlo Universitário do Alto da Ajuda, 1300-477 Lisboa, Portugal. Tel.: +351 213 052 271; fax: +351 213 352 889.
E-mail address: rjbessa@fvm.utl.pt (R.J.B. Bessa).

\textsuperscript{0}S77-8401/10 – see front matter © 2010 Elsevier B.V. All rights reserved.
doi:10.1016/j.anifeedsci.2010.04.010
18:1, but prevented the increase of trans-10 18:1 in meat from oil supplemented lambs \((P<0.001)\). Trans-11, cis-15 18:2, cis-9, cis-15 18:2 and cis-9, trans-11, cis-15 18:3 increased with dietary bentonite inclusion.