Effetto della qualità di oli di origine vegetale e di pesce sulla digeribilità di diete per conigli

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ABSTRACT: Effect of vegetable and fish fat quality on rabbit feed digestibility. The present work aims to evaluate the effect of fish oil quality, oxidation level of fats and the presence of *trans* fatty acids and PAHs on the apparent digestibility coefficients from main nutrients of rabbit feed. Experimental feeds were formulated including 3% of fats, in 4 trials: 1. Palm fatty acid distillate (LT) and its hydrogenated palm fatty acid distillate (HT), 2. Two fish oils with different origin and quality (FO1 and FO2). 3. Two acid oils from chemical refining of olive oil and olive pomace oil, respectively with low (LP) and high (HP) PAHs content. 4. Vegetable oil, fresh (low oxidation; LO) or recycled after using in a commercial frying process (high oxidation HO). A total of 96 rabbits were used for measuring faecal apparent digestibility of nutrients. Neither the type of fish oil nor lipid oxidation had effects on digestibility values. HT diet showed lower EE and GE digestibility coefficients than LT diet, while HP diet showed general impairment of digestibility in comparison with diet LP. Additionally, EE digestibility varied depending on the added fat, averaging 82% when fish or vegetable oils and 73% when palm fatty acid distillate or acid oils. Finally, some digestibility values were lower in PAHs and lipid oxidation trials than in the other two (56.5 *vs* 59.7%, 57.4 *vs* 60.6%, 55.7 *vs* 61.7%, 28.9 *vs* 38.0% and 22.0 *vs* 30.4% for DM, OM, GE, NDF and ADF, respectively), probably as a consequence of in feed antibiotics affecting the caecal microbiota and fermentation.

Key words: Fats, Digestibility, Contaminants, Oxidation, Rabbit.

INTRODUCTION – The characterisation of composition, quality and contamination of fat blends used in animal feeding is one of the most important key points in the assessment of quality and safety of meat production. In rabbits, as in other species, some fat materials obtained from co-products or by-products from the food chain, such as animal fats, fish oils, scid oils coming from refining processes…, are frequently used. However, there is a lack of information about the real nutritional quality of some of these fats for rabbits.

In the context of the European Project Feeding Fat Safety (FFS), targeted to give suitable information on quantitative effects of the presence of some contaminants and lipid degradation products in feeding fats on the quality of meat obtained, as well as data about the repercussions of this presence on animal health and productive parameters, the present work aims to evaluate the effect of fish oil quality, oxidation level of fats and the presence of *trans* fatty acids and Polycyclic Aromatic Hydrocarbons (PAHs) on the apparent digestibility coefficients from main nutrients of feed, to test the impact of their presence on feed nutritive value.

MATERIAL AND METHODS – Diets. Experimental feeds were formulated following the recommendations of De Blas and Mateos (1998) and including 3% of the evaluated fats, in the following way. *Trans fatty acids trial:* a palm fatty acid distillate and its corresponding hydrogenated palm fatty acid distillate, respectively with low (LT) and high (HT) *trans* fatty acid content. *Fish oil quality trial:* two fish oils with different origin (FO1 and FO2), and with apparent quality differences, low and high respectively. *PAHs trial:* two acid oils from chemical refining of olive oil and olive pomace oil, respectively with low (LP) and high (HP) PAHs content. *Lipid oxidation trial:* a vegetable oil, fresh or recycled after using in a commercial frying process and then heated at 165-170 ºC during 8 hours, respectively with low (LO) and high (HO) level of lipid oxidation. Robenidine was included as coccidiostatic and, in the PAHs and lipid oxidation trials, neomycin, oxytetracycline and tiamulin were also included for preventing Epizootic Rabbit Enteropathy.

Animals. Apparent digestibility coefficients of DM, organic matter (OM), ether extract (EE; only for trans fatty acids trial), crude protein (CP), NDF, ADF and gross energy (GE) were determined for each diet using 12 three-way crossbred rabbits (a total of 96 animals), aged 42 days. The rabbits were housed in metabolic cages and feed and water were offered *ad libitum* during the experimental period. Following an adaptation period of 7 days, the faeces collection lasted 4 days (Perez *et al.*, 1995). Faeces were individually analysed for DM, OM, CP, EE and GE, while NDF and ADF of faeces were determined in a pool from the animals given the same diet.

Statistical analysis. Digestibility data for DM, OM, CP and GE were statistically analysed according to a general linear model (GLM) procedure by SAS (1996).

RESULTS AND CONCLUSIONS – Results on digestibility of the different experimental diets are presented in Tables 1 to 4. Neither the type of fish oil nor lipid oxidation had effects on digestibility values. On the other hand, diet HT showed lower EE and GE digestibility coefficients than diet LT, while diet HP showed general impairment of digestibility in comparison with diet LP. Additionally, EE digestibility varied depending on the added fat, averaging 82% when fish or vegetable oils and 73% when palm fatty acid distillate or acid oils. Finally, digestibility values for DM, OM, GE and, overall, fibre fractions were lower in PAHs and lipid oxidation experiments than in *trans* fatty acids and fish oil experiments (56.5 *vs* 59.7%, 57.4 *vs* 60.6%, 55.7 *vs* 61.7%, 28.9 *vs* 38.0% and 22.0 *vs* 30.4% for DM, OM, GE, NDF and ADF, respectively; P<0.001), probably as a consequence of in feed antibiotics affecting the caecal microbiota and fermentation.

Table 1. Faecal apparent digestibility (%) of diets low (LT) or high (HT) in *trans* fatty acids

	LT	HT	SE	*P*
Dry matter	59.1	58.4	0.79	0.502
Organic matter	60.1	59.1	0.78	0.383
Gross energy	60.5[b]	58.2[a]	0.73	0.025
Crude protein	66.1	66.7	1.08	0.651
Ether extract	73.3[b]	56.7[a]	2.18	<0.0001
Neutral detergent fibre	38.3	36.4	-	-
Acid detergent fibre	30.0	28.5	-	-

Table 2. Faecal apparent digestibility (%) of diets low (FO1) or high (FO2) in contaminants

	FO1	FO2	SE	*P*
Dry matter	60.8	60.6	0.96	0.886
Organic matter	61.7	61.5	0.95	0.842
Gross energy	62.3	62.2	0.92	0.913
Crude protein	69.1	68.6	0.90	0.671
Ether extract	82.7	80.5	-	-
Neutral detergent fibre	37.8	39.6	-	-
Acid detergent fibre	29.6	33.5	-	-

Table 3. Faecal apparent digestibility (%) of diets low (LP) or high (HP) in PAHs

	LP	HP	SE	*P*
Dry matter	56.1	52.3	1.52	0.079
Organic matter	56.9	53.1	1.55	0.086
Gross energy	55.3	52.1	1.32	0.095
Crude protein	66.0	63.1	1.40	0.145
Ether extract	76.8	70.6	-	-
Neutral detergent fibre	27.1	23.6	-	-
Acid detergent fibre	22.0	17.7	-	-

Table 4. Faecal apparent digestibility (%) of diets low (LO) or high (HO) in lipid oxidation

	LO	HO	SE	*P*
Dry matter	56.1	57.3	1.17	0.471
Organic matter	56.9	58.5	1.19	0.341
Gross energy	54.9	56.9	1.15	0.221
Crude protein	66.3	65.2	1.27	0.509
Ether extract	84.5	80.3	-	-
Neutral detergent fibre	30.0	29.5	-	-
Acid detergent fibre	21.0	23.0	-	-

In conclusion, although the quality of fish oil and the level of fat oxidation did not seem to affect the nutrient apparent digestibility coefficients of feeds, the presence of PAHs, and especially, the content on *trans* fatty acids of fats could reduce significantly the nutritive value of rabbit feeds.

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