EVALUATION OF FEATHER MEAL IN THE DIET OF GROWING RABBITS

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ABSTRACT

The aim of this study was to evaluate the effect of an alternative protein source (MM=meat meal and FM=feather meal) and level (17 and 14% CP) on performance and carcass traits in rabbits. For the experiment, 128 New Zealand x Californian rabbits were used, being weaned at 28 days of age. The experimental design was a 2x2 factorial arrangement of two sources of animal protein: MM (meat meal as the control diet) and FM (hydrolyzed feather meal) and two levels of crude protein (CP: 17% and 14% as a control (being an alternative, lower protein requirement in the finishing period)). The digestibility of diets was evaluated based on 10 animals per treatment (between 49 and 56 days of age), using cages provided with individual faeces collectors. Performance traits recorded were daily weight gain, feed conversion ratio, dry matter digestibility, feed cost per rabbit and feed cost per kg of meat produced. Forty animals (10 for each treatment) were slaughtered at 75 days of age, following standard procedures of slaughter. Data were analyzed by ANOVA. The protein level of diet significantly influenced feed intake, DM digestibility, weights at 55 days and at slaughter, rate of feed conversion, percentage of gastro-intestinal tract, weight of the stomach (full and empty), weight of the full caecum, hot carcass weight, and carcass yield. The source of protein significantly influenced actual and dry matter intake levels and feed cost per rabbit. Although the inclusion of FM did not generally affect performance traits, it did affect performance on the protein-restricted diets.

Key words: Rabbits, diet, protein level, protein source, feather meal.

INTRODUCTION

Mineral pollution originated from animal production, especially from nitrogen and phosphorus in the excreta, has become a major problem in high density animal production systems. The reduction of excretions is directly related to the quality and quantity of the feed given. Improvement in the efficiency of nitrogen deposition can be obtained by matching the dietary amino acid composition with the animal's specific requirements. The bio-availability of commercial synthetic amino acids (AA) allows for the use of low protein diets. Metabolically, excess protein is used for energy purposes with a negative impact on the environment (Maertens, 1997).

The demand for quality sources of protein is likely to increase continuously in the future, which can lead to an increased competition between humans and animals for quality sources of AA (Divakala, 2008). The alternative protein sources for animal feeds are either plant or animal origin, but they differ in their feeding values due to variations in their nutrient contents, palatability, handling property, and other factors. Several factors such as economic feasibility, nutritive value, and environmental implications should be considered while choosing an appropriate alternative protein feedstuff.

One of the potential alternative protein sources is hydrolyzed feather meal (FM) because of its high protein content and bio-availability. According to Velazquez (1994), feathers accounted for 18.5% of the residues obtained from poultry slaughter. Nationally, a net increase in annual poultry slaughter reached 678.957.000 total birds in 2011 (SAGPyA, 2012). Feather meal, a high-protein feedstuff rendered from poultry feathers, generally contains 80 to 90% CP (Ssu, 2004). In addition, the protein is highly available (digestibility: 75-80% of CP), has no anti-nutritional factors, and, apparently, no risks of disease transmission. Thus, feather meal can be an attractive alternative protein source for rabbit diets.

The aim of this study was to evaluate the effect of an alternative protein source (meat meal and feather meal) and two levels (170 and 140 g CP) on performance and carcass quality traits in rabbits.

MATERIALS AND METHODS

The trial was conducted in the Experimental Field, Faculty of Agricultural and Forestry Sciences, National University of La Plata, Buenos Aires, Argentina.

Animals and experimental design

One hundred and twenty-eight New Zealand x Californian rabbits, weaned at 28 days of age, were used. Animals were randomly distributed into individual cages. The experimental design was a 2x2 factorial: two sources of animal protein (MM = meat meal as the control diet, and FM = hydrolyzed feather meal) and two levels of crude protein (17% and 14% as 'control' (alternative, lower protein requirement in the finishing period)). All diets had equal energy content (DE = 2,500 kcal/kg). Food was supplied *ad-libitum*. Animals were weighed weekly using a scale with a sensitivity of 10 grams. The DM digestibility of diets was conducted using 10 animals per treatment that were between 49 and 56 days of age, following the methodology proposed by Perez et al. (1996) using cages provided with individual faeces collectors. Performance traits were recorded as daily weight gain (ADG), feed conversion ratio (ICA), dry matter digestibility (DMD), feed cost per rabbit and feed cost per kg of meat produced. At 75 days of age, 40 rabbits (10/treatment) were slaughtered, following the standard procedures of rabbit slaughter and carcass dissection by Blasco and Ouhayoun (1996).

Statistical analysis

Collected data were analyzed by ANOVA using the GLM procedure of SAS (2004) for a factorial model (sources and levels of protein and their interaction). Mean differences between treatments were compared using the Tukey test ($P<0.05$).

RESULTS AND DISCUSSION

Table 1 shows the effect of the level and source of protein on the performance traits and dry matter digestibility. The protein level of diet significantly influenced feed intake, digestibility, weights at 55 days and at slaughter, and rate of feed conversion with heavier weights and better use food found at the highest protein level. The protein source did not influence performance traits, except for feed intake and digestibility of dry matter, which tended to be higher in the hydrolyzed feather meal diets ($P<0.10$).

Results for slaughter traits are shown in Table 2. The protein level significantly influenced the weight of full gastro-intestinal tract (%LW), weight of the stomach (full and empty), weight of the full caecum, hot carcass weight, and carcass dressing percentage. The protein source tended to affect ($P<0.10$) the dressing percentage, which was lower in the case of feather meal diets.

Table 1: Effect of the level and source of protein on performance traits and dry matter digestibility.

Trait	Source		Protein level		Prob.			SE
	MM	FM	14%	17%	Source	Level	Source x Level	
Weaning weight (g)	572	568	568	572	0.8241	0.8380	0.9362	12
Weight at 55 days (g)	1507	1532	1460	1579	0.5138	0.0026	0.9815	27
Weight at slaughter (LW,g)	2380	2412	2357	2436	0.3123	0.0152	0.3183	22
ADG (g)	29.34	29.85	28.91	30.29	0.4798	0.0562	0.7021	0.5
ICA	4.36	4.71	4.99	4.08	0.1354	0.0002	0.3255	0.2
Feed intake/ rabbit (28-75 d, kg)	6.99	7.64	7.73	6.90	0.0179	0.0025	0.0635	0.2
Dry matter intake (28-75 d, g)	6061	6754	6824	5992	0.0060	0.0010	0.1785	175
DMD (%)	62.32	66.83	61.89	67.25	0.0523	0.0223	0.8867	1.6

Table 2: Effect of the level and source of protein on the carcass yield traits.

Trait	Source		Protein level		Prob.			SE
	MM	FM	14%	17%	Source	Level	Source x Level	
Blood (%LW)	2.10	2.10	1.97	2.23	0.9743	0.0648	0.6605	0.1
Skin and feet (%LW)	18.50	18.09	18.95	18.40	0.2480	0.5674	0.1935	0.2
Full gastro-intestinal tract (%LW)	18.64	19.40	19.96	18.09	0.1138	0.0003	0.0870	0.3
Full stomach (%LW)	5.16	5.34	5.69	4.81	0.4212	0.0002	0.9482	0.1
Empty stomach (%LW)	1.04	1.07	1.13	0.99	0.4063	0.0001	0.4712	0.02
Full caecum (%LW)	5.77	5.89	6.08	5.57	0.5507	0.0165	0.0308	0.1
Empty caecum (%LW)	1.58	1.53	1.56	1.55	0.5675	0.9707	0.1724	0.06
pH of caecum	6.33	6.31	6.38	6.26	0.7397	0.0595	0.3256	0.04
Hot carcass weight (g)	1118	1102	1073	1147	0.4393	0.0010	0.6700	15
Dressing percentage (%)	59.59	58.48	58.17	59.91	0.0719	0.0062	0.5414	0.4

Table 3 shows the economic results for the two protein sources and two CP levels on growing rabbit performance. The protein level did not significantly influence the economic traits, while the source did result ($P < 0.10$) in a slightly higher cost for feather meal-based diets.

Table 3: Effect of the level and source of protein on economic traits.

Trait	Source		Protein level		Prob.			SE
	MM	FM	14%	17%	Source	Level	Source x Level	
Feed cost per rabbit ($)	3.40	3.73	3.53	3.59	0.0105	0.6376	0.0980	0.9
Feed cost per kg of meat ($)	2.61	2.89	2.76	2.74	0.0516	0.8463	0.2860	0.1

Feed cost (US$/kg): MM17: 2.23; FM17: 2.22; MM14: 1.96; FM14: 1.97.

CONCLUSIONS

Although the inclusion of hydrolyzed feather meal did not affect performance traits, the economic results were not as expected due to higher feed intake levels, so the inclusion of feather meal in the diet appears to be the subject of the cost of this by-product. The lower percentage of protein in the diet affected the performance traits, although the cost of feed ingredients in the protein-restricted diets was lower.

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