Dietary supplementation with olive stone meal in growing rabbits

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ABSTRACT

Olive stone meal is a low-digested fibre source potentially useful in the prevention of digestive troubles in growing rabbits permitting a better balance of dietary fibre fractions. To evaluate its efficacy, three experimental diets containing 0, 3 or 6% olive stone meal were fed to 222 rabbits from weaning (28 d) to slaughter (73 d). Olive stone inclusion increased the proportion of large dietary particles while did not affect growth performance, digestive physiology and carcass and meat quality. Due to optimum health status observed in all experimental groups, the preventive action of olive stone meal against the occurrence of digestive troubles was not proven.

Key words: Rabbits, Olive stone meal, Digestive physiology, Growth performance

Introduction

Digestive troubles of multifactorial ethiology are the first cause of mortality in growing rabbits (Licois, 2004). Besides to characterize the implicated pathogenic agents, it is fundamental to individuate and eliminate the environmental and dietary factors favouring the disease out-break. Adequate levels of indigestible fibre fractions (ADF>20% DM, ADL>5.5% DM) are recommended to improve the digestive health of weaning and growing rabbits (Gidenne, 2003). These concentrations are not easy to be reached in practical formulation without reducing the nutritive value of compound feeds. The dietary inclusion of olive stone meal as a source of indigestible fibre could permit a better equilibrium among the different fibre fractions therefore reducing sanitary risk without impairing growth performance and feed conversion.

Material and methods

At 28 d, 222 rabbits (live weight 676 ± 49 g) were weaned, assigned to three groups of 74 animals and fed ad libitum the experimental diets B0, B3 and B6 containing respectively 0, 3 and 6% of olive stone meal. This feedstuff was grounded roughly and contained (DM basis) CP 5.0%, NDF 78.4%, ADF 64.0% and ADL 33.1%. The compound diets were formulated to have similar digestible protein (DP) to digestible energy (DE) ratio and similar digestible fibre (hemicelluloses and pectins) and ADL concentrations (Table 1). No antibiotics or additives were administered either in feed or water along the trial. At 49 and 66 d, 60 rabbits (10 per diet and age) were sacrificed to sample ileal mucosa and collect caecal content. At 73 d, 120 rabbits (40 per diet) were slaughtered, carcasses were dissected and meat quality was evaluated following the methods described by Xiccato et al. (1994). In vivo nutrient digestibility and chemical composition of diets, faeces and cae-
Results and conclusions

Regardless from some differences in protein and fibre fraction concentrations among experimental diets (Table 1), chemical composition and nutritive value were in agreement with the current recommendations for weaning and fattening rabbits (De Blas and Mateos, 1998). Only the starch level was higher than what recommended for young rabbits (<14% DM). DM digestibility raised from diet B0 to B6, due to the higher starch concentration and the higher digestibility of digestible fibre fractions (hemicelluloses and pectins, data not reported) in comparison with diet B0. With the inclusion of olive stone meal, large particle proportion (>1.18 mm) increased, while the finest particles (<0.30 mm), which are preferentially involved in caecotrophy (García et al., 2000), did not vary.

Although the experimental diets contained high starch concentrations potentially favouring digestive diseases in young rabbits, all animals were in good health during the whole experiment apart from 9 rabbits dead or excluded due to respiratory problems. The optimum initial health condition of weaned rabbits and the balanced levels of dietary fibre fractions (Gidenne, 2003) likely accounted for the absence of digestive troubles. The inclusion of olive stone could have further con-

Table 1. Main ingredients and chemical, physical and nutritive characteristics of experimental diets.

|          | Diet B0 | Diet B3 | Diet B6 |
|----------|---------|---------|---------|
| **Main ingredients (%):** |         |         |         |
| Olive stone meal       | 0       | 3       | 6       |
| Dehydrated alfalfa meal, CP 17% | 38      | 33      | 28      |
| Barley (six rows)      | 15      | 15      | 15      |
| Wheat bran and middlings | 25     | 26      | 27      |
| Beet pulp              | 6       | 8       | 10      |
| Soybean meal, CP 44%   | 0       | 5       | 10      |
| Sunflower meal, CP 30% | 12      | 6       | 0       |

| **Chemical composition (% DM):** |         |         |         |
| Dry matter               | 90.2    | 90.3    | 90.3    |
| Crude protein            | 17.2    | 17.5    | 18.0    |
| NDF                     | 42.1    | 40.2    | 39.2    |
| ADF                     | 22.5    | 21.3    | 19.5    |
| ADL                     | 5.9     | 5.8     | 5.7     |
| Digestible fibre (hemic.+pectins) | 20.9 | 21.0    | 20.6    |
| Starch                  | 18.6    | 19.5    | 20.4    |

| **Digestibility and nutritive value:** |         |         |         |
| DM digestibility, %           | 59.6    | 61.2    | 63.9    |
| DE, MJ/kg DM                  | 11.2    | 11.1    | 11.6    |
| DP to DE ratio, g/MJ          | 11.7    | 11.7    | 11.8    |

| **Particle size distribution (%):** |         |         |         |
| > 1.18 mm                      | 6.8     | 9.0     | 11.0    |
| 0.60 to 1.18 mm                | 14.5    | 13.6    | 13.0    |
| 0.30 to 0.60 mm                | 12.4    | 11.3    | 10.6    |
| < 0.30 mm                      | 66.3    | 66.1    | 65.4    |
tributed to compensate the supposed negative effect of the higher starch concentration in diets B3 and B6 in comparison with diet B0. Daily weight gain and final live weight were not affected by olive stone meal inclusion, whereas daily feed intake decreased and consequently feed conversion improved (P<0.001) from diet B0 to diet B6 (Table 2).

Caecal fermentation (Table 3) was not modified by the dietary treatment nor at 49 or 63 d of age, with pH, ammonia and total volatile fatty acid (VFA) concentrations typical of healthy rabbits (Gidenne, 2003, Xiccato et al., 2003). Differently, the proportions of acetate decreased and conversely that of butyrate increased in rabbits fed diet B6 in comparison with diets B0 and B3 (P≤0.05), to be ascribed to the higher dietary starch concentration. The morphology of ileal mucosa was not influenced by the dietary treatment. Similarly, carcass traits and meat quality were not affected.

In conclusion, olive stone meal can be included in diets for growing rabbits increasing fibre supply and permitting a suitable balance among more and less digestible fibre fractions. In the present study, the inclusion of roughly-grounded olive stone increased the proportion of large dietary particles, but did not affect growth performance, digestive physiology and meat quality. Further research under unfavourable health conditions is needed to demonstrate the hypothesised positive effect of olive stone in the prevention of digestive diseases.

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**Table 2. Growth performance from 28 to 73 d of age.**

| Diet   | B0  | B3  | B6  | Prob. | RSD |
|--------|-----|-----|-----|-------|-----|
| Rabbits | n. | 49  | 53  | 51    |     |
| Initial live weight | g  | 677 | 673 | 677   | 0.90| 49 |
| Final live weight      | "  | 2593| 2571| 2594  | 0.71| 173|
| Daily weight gain       | g/d| 42.6| 42.2| 42.6  | 0.76| 3.5|
| Daily feed intake       | "  | 125 | 120B| 117   | <0.001| 10 |
| Feed conversion         | "  | 2.95 | 2.85B| 2.74  | <0.001| 0.16|

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**Table 3. Caecal fermentation activity and ileal mucosa morphometry (mean of 49 and 63 d values).**

| Diet   | B0  | B3  | B6  | Prob. | RSD |
|--------|-----|-----|-----|-------|-----|
| Rabbits, n. | 49  | 53  | 51  | 0.90  | 49  |
| Initial live weight | g  | 677 | 673 | 677   | 0.71| 173|
| Final live weight      | "  | 2593| 2571| 2594  | 0.76| 3.5|
| Daily weight gain       | g/d| 42.6| 42.2| 42.6  | 0.76| 3.5|
| Daily feed intake       | "  | 125 | 120B| 117   | <0.001| 10 |
| Feed conversion         | "  | 2.95 | 2.85B| 2.74  | <0.001| 0.16|