

## ABSTRACT

The aim of the present thesis was to evaluate the potential use of distillers dried grains with solubles (DDGS) of barley, corn and wheat available in the Iberian Peninsula in the feeding of growing rabbits. For this task, it has been determined DDGS' nutritive value, as well as their effect on growth performance, carcass characteristics and quality of meat of growing rabbits. In the first experiment the chemical, amino acid and fatty acid composition of eight DDGS batches (2, 2 and 4 from barley, corn and wheat grains, respectively) was analyzed. Five diets were formulated to determine the nutritive value of DDGS in growing rabbits: a control diet and 4 experimental diets containing 200 g of the DDGS/kg dry mater (DM) [DDGS from national barley, national corn, Brazilian corn and national wheat grains]. Sixty three-way crossbred fattening rabbits aged 42 days were used in the digestibility trial. DDGS can be characterized as a raw material rich in crude protein (CP), neutral detergent fibre and neutral detergent soluble fibre (on av. 318, 352 and 208 g/kg DM, respectively). Barley DDGS had higher fibre and lower protein contents than wheat DDGS (+25 g of acid detergent fibre and -91 g of CP/kg DM, respectively;  $P < 0.05$ ). Corn DDGS had intermediate fibre and protein values between barley and wheat DDGS, but were the richest in ether extract (on av. +70 g/kg DM). DDGS' protein was richer in proline, phenylalanine, valine and arginine for barley DDGS, in leucine, alanine and histidine for corn DDGS, and in glutamic acid for wheat DDGS. Barley DDGS was richer in saturated (SFA; 267 g/kg total fatty acids), corn DDGS in monounsaturated (MUFA; 278 g/kg total fatty acids) and wheat DDGS in polyunsaturated fatty acids (PUFA; 615 g/kg total fatty acids). Barley DDGS had the lowest nutritive value traits for rabbits (11.9 MJ of digestible energy (DE) and 168 g digestible protein (DP)/kg DM). No significant differences for the nutritive value between both corn DDGS were observed (on av. 15.3 MJ DE and 208 g DP/kg DM), and wheat DDGS might be considered as the DDGS with the highest nutritive value (15.7 MJ DE and 263 g DP/kg DM). In the second experiment, and to evaluate how the dietary inclusion of DDGS could affect the performance and caecal environment of growing rabbits, four experimental diets were formulated from a control diet without DDGS (C), including 20% of barley DDGS (Db<sub>20</sub>), 20% of wheat DDGS (Dw<sub>20</sub>) and 20 (Dc<sub>20</sub>) or 40% (Dc<sub>40</sub>) of corn DDGS. Performance trial was done using 475 three-way crossbred weaned rabbits of 28 d of age individually housed. Caecal fermentation traits were determined on 20 animals per diet and age at 42 d (using 200 rabbits housed in collective cages) and at 59 d of age (from the performance trial). In the whole period and respect to the control group, animals fed with Db<sub>20</sub> showed higher DM and DE intake (+6 and +12%, respectively;  $P < 0.05$ ), but similar daily weight gain (DWG) and increased feed conversion ratio (+9%;  $P < 0.05$ ). In this same way, and independently of its inclusion level, the increase on DE intake on animals fed with corn DDGS (+9 kJ/d, respectively;  $P < 0.05$ ) did not result in a significant increase of DWG. In the

contrary, higher DM and DE intake of animals feed with Dw<sub>20</sub> (+8; P<0.05) resulted in the highest DWG registered (+2.8 g/d; P<0.05) than the control group. Although inclusion of DDGS at 20% did not affected main caecal parameters controlled at 42 d, caecum of animals fed with the diet Dc<sub>40</sub> was characterized by greater N-NH<sub>3</sub> and valeric acid, and lower total volatile fatty acids and acetic acid concentrations (P<0.05). Increased values of caecum DM, propionic and valeric acids and reduced values of total volatile fatty acids and acetic/propionic rate were observed at 59 d for DDGS inclusion at 20% (P<0.05) and for the linear inclusion of corn DDGS (P<0.05). Animals given Dc<sub>40</sub> were also characterized for a greater caecum N-NH<sub>3</sub> content (P<0.05) at 59 d of age. Finally in the third experiment, the effect of diets of the second experiment (C, Db<sub>20</sub>, Dw<sub>20</sub>, Dc<sub>20</sub> and Dc<sub>40</sub>) on some carcass characteristics, meat quality, chemical composition and fatty acid composition of *Longissimus* muscle of 100 growing rabbits at 59 days of age was studied. No effect of the inclusion of DDGS on the hot carcass weight, cold carcass weight (CCW), drip loss percentage, full digestive tract percentage, liver weight percentage, dressing-out percentage and color of the carcass was found. The fat percentage in the different fat depots was affected by the diet, resulting in a higher dissectible fat percentage when including of barley and corn DDGS (on av. +0.7% CCW; P<0.05). No effect of DDGS on texture parameters, cooking loss, water holding capacity and intramuscular fat of the loin meat was found. Instead, the redness of the meat, pH, protein content and the concentration of SFA and PUFA in the loin meat depended on the diet. The PUFA:SFA and SFA:unsaturated fatty ratios and the atherogenic and thrombogenic indexes were improved from the health point of view when including corn DDGS 40%. The results of the present thesis reveal that the inclusion of DDGS up to 20% in balanced diets for growing rabbits, independently of their grain source (barley, wheat or corn), could be an interesting alternative, allowing an adequate growing performance without any negative consequence on the carcass and meat quality.

**Keywords:** distillers dried grains with soluble; chemical composition; digestibility; growing rabbits, cecal environment, meat quality