

## **Digestibility and nutritive value of sugar beet pulp, soybean hulls, wheat bran and citrus pulp in rabbits.**

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### **Abstract**

The aim of the present study was to determine nutrient digestibility and nutritive value of four feedstuffs, each with a different cell wall content. For this purpose, 24 adult male rabbits randomly allotted into four groups A, B, C and D, were used in a two successive periods digestibility trial. Animals were kept indoors in individual wire cages, under natural environmental conditions and a 16h light – 8h dark schedule. During the first period (with a duration of 17 days), all four groups were fed on a basal diet (BD) *ad libitum*. During the second period, each one of the A, B, C and D groups was fed on a diet derived from a 20 % substitution of the BD by sugar beet pulp, soybean hulls, wheat bran and citrus pulp, respectively. Feed intake and faeces production were recorded in both trials. Diet and faeces samples were chemically analyzed (according to Weende and Van Soest – Moore Methods) and their gross energy content was determined with adiabatic calorimetry. Data were analyzed according to ANOVA procedures of SAS/STAT® (1991). Substituting basal diet by 20 % with sugar beet pulp resulted in a significant ( $P<0.05$ ) increase of crude fiber and cell wall content (NDF, ADF, cellulose and hemicellulose) digestibility, while gross energy digestibility was not affected. The substitution of 20% of the basal diet with soybean hulls significantly decreased ( $P<0.05$ ) dry matter, crude protein, ADF, cellulose and gross energy digestibility, while hemicellulose digestibility increased ( $P<0.05$ ). The use of wheat bran also decreased dry matter digestibility ( $P<0.05$ ) of the diet, but crude fiber digestibility was increased ( $P<0.05$ ) by 100 %. Crude protein digestibility was affected negatively ( $P<0.05$ ) when 20% of the basal diet was substituted by citrus pulp. On the contrary, crude fiber digestibility was increased ( $P<0.05$ ). The digestible energy content of the evaluated feedstuffs, as calculated by the difference method, was 12.52, 7.06, 11.21 and 7.23 MJ/kg DM for sugar beet pulp, soybean hulls, wheat bran and citrus pulp, respectively. The digestible energy content of the feedstuffs studied in this experiment can be predicted with sufficient precision using crude fiber, ADF and ADL content of the feedstuffs as sole independent variables. From these results may be concluded that the four feedstuffs used, at the proportion included in the BD, influenced nutrient and energy digestibility. Their use in practice, however, should be based not only on their cell wall content and crude fibre digestibility but on their digestible energy content as well as on other dietary characteristics, such as cell wall fraction which is of great importance, as suggested by recent studies. Thus, it is necessary to further study these parameters because they could explain better the effect of such feedstuffs on the rabbit's digestive system.

## **Effect of dried tomato pulp on fattening quails' diets**

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### **Abstract**

The aim of this study was to investigate: 1. The effect of diet supplementation with dried tomato pulp (DTP) at levels of 5 and 10% on performance and carcass characteristics of fattening quails 2. The energy value of DTP in the diet of fattening quails. A total of 148 quails from the age of 21 to 42 days were used. In the first experiment, the 120 quails used (60 for each sex) were randomly allocated into four groups (A,B,C,D) of 15 males and 15 females each. To meet the nutrient requirements of the birds, a complete regular control diet based on corn, soybean meal and barley was formulated. This diet was given to all groups by the age of 20 days. Birds were fed and watered ad libitum, whereas conventional breeding and management procedures were applied throughout the experiment. On day 21 of age, birds within each group were individually weighed and distributed into five subgroups (replicates) of 3 males and 3 females each. All 20 subgroups were housed in separate wire- suspended cages. From day 21 and thereafter, one of the groups (A) that served as control was kept on the regular diet. The diets given to the other two groups (B,C) were based on the regular diet but contained an additional 5% and 10%, respectively, of DTP replacing 40g/kg soybean meal and 20g/kg barley, and 50g soybean meal and 70g/kg barley, respectively. The quails of group D were fed on a commercial diet. In the second experiment, the energy value of DTP in the diet of the growing quails was estimated. In that experiment, a total of 28 quails were used (12 males and 16 females) and randomly allocated into two groups (M,T) of 6 males and 8 females each. Birds within each group were individually weighed and distributed into 14 separate cages. The quails of group M were fed on the same diet as the quails of group A, while those of group T had been fed on a diet comprised of 90% of the diet of group M and by 10% of DTP. The adaption period lasted 14 days and the collection period 7 days, respectively. The inclusion of DTP in quails' diets up to a level of 10% did not significantly affect daily gain, feed consumption or feed efficiency. In the 1st experiment, the quails of groups B and C showed a darker colouring than the slaughtered ones belonging to groups A and D, with sampling carried out at the thighs and chests of the slaughtered quails. A significant difference was noted in the concentration of arachidonic acid which was statistically lower ( $P<0.05$ ) for group C in comparison to the other groups. The ME of DTP was estimated to be equal to 8.28 MJ/kg DM. The sex had a significant ( $P<0.001$ ) effect on the body weight of the quails.

**Key words:** Quails, Dried Tomato Pulp, performance, carcass quality, Metabolizable Energy.

## Quality characteristics of pig meat produced by an intensive farm

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The objective of this study was to determine the quality of pork meat that was produced by a typical Greek slaughterhouse. The variables used in order to categorize meat were pH 45 minutes after slaughter ( $pH_{45}$ ) and several colour parameters ( $L^*$ ,  $a^*$ ,  $b^*$ , X, Y, Z) measured at least 24 hours after slaughter. One hundred and fifty two animals were measured for  $pH_{45}$  and seventy-three for the colour parameters mentioned above. Measurements took place at *longissimus dorsi*, between the 13<sup>th</sup> and 14<sup>th</sup> rib. The statistical analysis looked into the influence of sex, month and time of slaughter as well as their interactions. Repeatability coefficients were also calculated for colour measurements.

The procedure that was taking place from the fattening cells till slaughterhouse, in short, was: feed and water was not withdrawn before transportation, pigs were transferred by a company's track for a distance of 100-500 m. The area available per pig was approximately 0.4 m<sup>2</sup>. The workmen, in order to load the pigs faster, sometimes used force. Animals were unloaded at the slaughterhouse by a slight overturn of the carrier.

After the pigs' arrival were arriving at the slaughterhouse the lack of a specific lairage time meant they could be slaughtered after several days or hours. In order to guide the animals to the stunning position through a slightly inclined plane (10 %), workmen used electric stimulators. Pigs were stunned by electronarcosis (70 V, 0.25 A, for approximately 5 secs). Bleeding was effected from a horizontal position.

$pH_{45}$  values varied from 5.34 to 6.87 and the mean value was 6.24. According to many bibliographic references, the value of  $pH_{45}$  is a very useful parameter for categorising meat quality. In particular, pH values under 5.8 or 5.9 are considered as indicators of Pale Soft and Exudative meat, PSE. Using this parameter, only 5 carcasses were characterized as PSE, a percentage of 3.29 %.

Many consider colour parameters  $L^*$ ,  $a^*$ ,  $b^*$  as another useful tool for characterising meat quality and especially  $L^*$ .  $L^*$  values greater than 58 represent meat with PSE characteristics. On the other hand,  $L^*$  values lower than 52 are indicative of Dark Firm Dry meat, DFD. In our survey, the colour of *longissimus dorsi* was at a high percentage (42.47 %) dark, and only two carcasses showed PSE characteristics (2.7 %). The repeatability coefficients for colour parameters were between 0.92 and 0.99.

The increase in percentage of meat with DFD characteristics can be interpreted by the stressful conditions occurring just before slaughter as well as the improper processing of carcasses, as mentioned above.

The extremely low percentage of meat with PSE characteristics can be justified by the absence of the halothane gene, as it was proven by an earlier experiment using the same population.

In order to reduce the occurrence of meat with DFD characteristics, one should try to provide animals with the least stressful environment before slaughter and improve the handling of the carcasses.

## **Review of pcr application in the detection and quantification of genetically modified organisms in feedstuffs**

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### **Abstract**

Labelling of food and feed products produced from Genetically Modified Organisms (GMOs) is one of the major requirements of European legislation. In order to create confidence in the testing procedures and complement enforcement requirements, there is an urgent need for using methods that are validated and officially recognized at an international level. Despite its limitations, PCR has a high degree of sensitivity and specificity and is a reliable method for the detection of GMOs and GMO-derived material in routine controls. The method is based on the detection of a DNA sequence which has been inserted into the recipient organism. The choice of this sequence is the most important controlling factor for the specificity of the PCR reaction and it can be either a promoter, a terminator or a gene. These sequences may be present in more than one GMO and their copy number may also vary from one GMO to another. Because the samples that laboratories receive for analysis are often processed and refined, the quality and quantity of DNA render the PCR method less reliable. Thresholds for labelling of GMOs and products produced from GMOs are currently in place within the European Union, according to Regulation 1829/2003/EC. The success of the labelling requirements, such as these defined in Regulation 1830/2003/EC, is dependent upon the efficiency with which GM-derived material can be detected. In the example illustrated, the whole PCR analytical process is presented as a simplified protocol with specific references to the theoretical background of the PCR reaction and the limitations of the method as well as their consequences on the final result. Samples consisting of soya flour ("A" group of samples) and mix, in unknown ratio, of soya and maize flour ("B" group of samples), were analyzed by PCR, and the presence of 35S-promoter was detected, which originates from CaMV (Cauliflower Mosaic Virus) and is responsible for the regulation of the expression of genes in many genetically modified plants. The quantity of the GMO-derived DNA sequence was estimated by real-time PCR and the detection of PCR product was monitored by measuring the increase in fluorescence caused by the binding of SYBR<sup>®</sup> Green dye to double stranded (ds) DNA. The GMO-derived DNA was estimated at 0.3% for "A" sample group and 0.2% for "B" sample group. The practical detection limit is 0.1% GMO/non-GMO (w/w) corresponding to 596 copies of Roundup Ready<sup>®</sup> soybean haploid genome. Consequently both samples contained less GMO-derived DNA than the defined threshold in Regulation 1829/2003/EC.

*Key - words: Feed, Genetically Modified Organism, 35S-promoter, Lectin, PCR, real-time PCR*

## **Effect of enzyme supplementation on nutrient digestibility of growing pig diets**

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### **Abstract**

Cereal grains and their by-products are the main raw materials for pig diets. They contain variable amounts of non-starch polysaccharides (NSPs) that can cause digestive disorders. The appropriate enzyme supplementation may prevent these disorders by producing a positive effect on the digestion of these feeds. With this aim, two digestibility experiments were conducted on 12 growing pigs that were allotted to 2 treatments, C and E. In experiment I, group C, pigs were fed a mash diet consisting of maize (18 %), wheat (34.3 %), wheat middlings (15 %), wheat bran (6.0 %), soybean meal (22.2 %) and a mineral and vitamin premix (4.5 %). Pigs in group E were fed the same diet plus enzymes 0.1 % (b-glucanase, xylanase, pectinase and  $\alpha$ -amylase). In experiment II, the above groups were fed the same diets after pelleting. The data were analysed using the GLM procedures of SAS (1990). The results showed that the enzyme supplementation in the mash diet improved the digestibility of NFE by 2.64 % ( $P < 0.001$ ), of OM by 3.0 % ( $P < 0.01$ ) and of DM, NDF, hemicellulose, total NSPs, soluble and insoluble NSPs and of gross energy by 3.66, 5.54, 4.93, 5.57, 5.14, 7.34 and 3.94 % respectively ( $P < 0.05$ ). For the other nutrients such as crude protein, ether extract and crude fiber, the digestibility was higher in the diet with multi-enzyme supplementation but not significant. In experiment II, in which the pigs were fed the same diet after pelleting the digestibility of nutrients DM, OM, CF, hemicellulose, total NSPs, soluble NSPs, and the gross energy were significantly ( $P \leq 0.05$ ) higher for the diet with multi-enzyme supplementation than for the control diet. This experiment also indicated that the apparent digestibility coefficients of nutrients for the pelleting diet were higher in comparison with the mash diet as regard the control diet as for the diet with multi-enzyme supplementation. This may be due to the pelleting processing of the diet and/or because of the pigs' age which was increased in the second experiment. In conclusion, the enzyme supplementation improved the nutritive value of pig diets but, additionally, the feed cost and pig performance must be taken into account.

## **The effect of reducing the number of boars, according to their sexual status, on the reproductive efficiency in a dynamic service system**

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The effect of male team size on the extent of sexual competition between individuals has not been examined in the recently developed group mating systems for pigs, such as the Dynamic Service System for gilts (DSS). The main objective of the present study was therefore to examine the effect of boar sexual status on the sexual activity of individuals and the influence of boar team size on the reproductive output of a DSS.

In the present DSS, gilts were introduced in groups of four at weekly intervals into the study service pens containing a resident boar team and 16 gilts at different reproductive stages, and copulations took place under no supervision. The gilts underwent synchronised puberty stimulation at 200 days and 105 kg, using exogenous gonadotrophin and were planned to be served at their second post pubertal heat, 4-5 days after entry into the service pens. The reproductive behaviour and performance of 72 gilts mated with a four-boar team (4B) were compared with that of 64 gilts mated with a two-boar team (2B). The male sexual hierarchy was defined by using quantitative behavioural criteria (i.e. mating frequency and quality), and the social status in a feed competition test. Each team was observed under 4B and 2B conditions for a four week period, and four replicates were used throughout the study. The behaviour of the sexual partners was observed continuously (24 hrs/day) using video recording equipment.

Males of different sexual status differed significantly in both mating quality and frequency ( $p < 0.05$  and  $p < 0.01$ , respectively), but this was unrelated to social status. The removal of two boars from each team significantly improved overall mating quality ( $p < 0.001$ ) and reduced the mating replacement frequency (i.e. where one boar displaced a team-mate from the back of the gilt and took his position; 26% for the 4B vs. 12% for the 2B teams,  $p < 0.001$ ). However, individual boars tended to perform more frequent services under 2B than 4B conditions (7.5/week vs. 5.1/week, respectively,  $p = 0.08$ ). Gilts mated by a 4B team exhibited oestrus two days earlier after boar contact than their 2B counterparts (4.5 vs. 6.6 days, respectively,  $p < 0.01$ ). The number of boars per service pen did not influence gilt oestrus duration and conception rate at first service, nor the number of piglets born alive nor total litter size.

In the short term, there are no risks involved for the reproductive efficiency of a DSS by reducing the number of boars from four to two per service pen. However, longer term evaluation of this strategy is required to support the conclusion before recommendations are commercially implemented.