

## **ABSTRACTS OF THE COMMUNICATIONS PRESENTED DURING THE “XXIX SYMPOSIUM DE CUNICULTURA”**

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The XXIX Symposium de Cunicultura was organized in Lugo (Spain) by the Asociación Española de Cunicultura (ASESCU), the Spanish Branch of the WRSA. Several aspects of rabbit production were reviewed by 6 invited speakers, 2 roundtables and 23 communications, which are summarised below. The proceedings (in printed form or on CD) containing the full text of all communications in Spanish, are available at ASESCU (Castañer, 12- 08360 Canet de Mar- Spain) and at [www.asescu.com](http://www.asescu.com)

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### **PRODUCTION AND MEAT QUALITY**

#### **GENERAL VIEW OF INTENSIVE RABBIT FARMING IN THE TRÁS-OS-MONTES REGION**

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The description of rabbit production in Trás-os-Montes e Alto Douro was composed from questionnaires answered by rabbit-breeders of the Bragança and

Vila Real districts.

In this region, the number of active does is close to 26 000 animals, distributed around 40 rabbitries. Sixty five percent of the rabbitries and 70% of the females are located in the district of Vila Real. The municipality of Montalegre has the largest number of rabbitries, with 17% of the breeding farms and the municipality of Vila Pouca de Aguiar has 27% of the total does. Almost half (47,5%) of the active farms were started after 2001.

Most of the farms (40%) have 300 to 500 does, use 3 or 4 types of feed, use artificial insemination (90%) and replace

the does with animals obtained from grandparents (52%). All the farms use a 42-day management system with slaughter of the rabbits at 70 days.

If we assume that the rabbitries have average productivity levels, in Trás-os-Montes e Alto Douro about 2300 tons of live rabbit will be produced annually, which represents approximately 10 to 12% of the Portuguese production.

## PRODUCTION OF QUALITY RABBITS

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The technical and commercial parameters of an alternative production system, adopted by a group of rabbit breeders, have been studied. 55% of the breeders were successful and are increasing their stocks, since the demand is still strong. Rabbits are sold at the very favourable price of € 3.32/kg of live weight to the very demanding customers of organic shops. Considering the use of unmedicated balanced feed, the exclusion of any medical prophylaxis or therapy,

natural mating 11 days after delivery and weaning at 33 days, the mean technical parameters of the three best breeders were: fertility 88,0% (75,5% in summer); born alive/delivery 7,7; weaned/delivery 6,7; weight at weaning g 852; mortality at weaning 12,70%; weaned/doe/year 43,55; mortality during fattening 4,45%; sold/doe/year 41,61; weight at 11 weeks kg 2,52; total feed conversion 5,06.

## GENETICS AND GROWTH

### ESTIMATION OF CROSSBREEDING PARAMETERS. APPLICATION OF SELECTED LINES TO PRODUCE CROSSBRED DOES.

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Crossbreeding parameters for reproductive traits (total number born (NT), born alive (NV) and weaned (ND) from a full diallel schema of two Spanish selected dam lines (UPV-V and IRTA-

Prat) were estimated. Records from 2569 parities were analysed with repeatability mixed models following the Dickerson approach. Differences between direct or maternal genetic effects of the lines and individual heterosis values were estimated. Difference between direct genetic effects was only significant for ND. No difference was found between genetic maternal effects. Values of individual heterosis were significant and higher than 0.8 young rabbits (>9%).

A crossbreeding scheme must be recommended in order to take advantage of heterosis in reproductive traits using specialised lines as parents, selected by numerical traits.

#### GROWTH ALLOMETRIES IN RABBITS SELECTED FOR RAPID GROWTH

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Effect of selection for growth rate on changes in allometric growth of different organs, tissues and retail cuts of the carcass has been studied in 314 animals of both sexes from two groups: a control group and a group selected for 11

generations. Selection has not affected allometric growth of most of the variables. Selected animals showed a later development of loin, hind part of the carcass, hind leg and hind leg bone, and an earlier development of perirenal fat. Selection caused an earlier increase of the meat/bone relation in the hind leg.

### PATHOLOGY

#### TECHNIQUES FOR THE ISOLATION OF *Clostridium spiroforme* FROM CASES OF RABBIT ENTERITIS

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Presumptive diagnosis of rabbit enterotoxemia caused by *C. spiroforme* *Iota* toxin-producing strains (SMD), is based on the demonstration of the presence of the bacteria in the intestine of the affected animals. The observation of Gram positive, round or spiral shaped bacteria in a caecal smear is the routine technique. Nevertheless, the final diagnosis of the SMD should be based on the isolation and the identification of the

bacteria and its toxin. The objective of this study was to compare 4 techniques for the detection or the cultivation of *C. spiroforme* from feces of rabbits with or without enteritis. 54 clinical cases (1 to 5 rabbits less than 60 days old) from diverse rabbit colonies of Catalonia, the Eastern Mediterranean coast, Aragon and Portugal, were submitted to necropsy between July 2002 and December 2003. The following procedures were carried out in the necropsy: a) Appraisal of the enteric lesions; b) bacterial cultures, c) smear from the caecal contents and d) collection of caecal contents. In the laboratory, after centrifuging the caecal contents (4°C, 20,000x, 15 min.), a second smear and a second bacterial culture were carried out of the surface of the pellet. The cultivation and bacterial identification, as well as the detection of *Eimeria* sp. were carried out by means of standard protocols. Of the 54 clinical cases analyzed for the presence of *C. spiroforme*, 30 (55.5%) were negative and 13 (24.1%) were simultaneously positive for all 4 techniques. Centrifuging the caecal contents increased the proportion of positive smears by 14.8%. Nevertheless, in none of those cases, was it possible to isolate *C. spiroforme*. In the necropsy, 44 cases with macroscopic lesions and 9 without were observed (one

case was not documented). Of the latter, 1 (a group of 3 animals) was positive to *C. spiroforme* in the smear after centrifuging. This result agrees with other studies that reported the presence of *C. spiroforme* in apparently healthy animals. The results obtained corroborate the usefulness of centrifuging caecal contents for improving success in the detection of *C. spiroforme*, but not for increasing viable bacteria for cultivation.

#### IMPROVEMENT IN MORTALITY AND PRODUCTIVITY WITH NATURAL ALTERNATIVES TO ANTIBIOTIC GROWTH PROMOTERS

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In this work, latest results obtained at the unit of rabbits of ENCAP, an ITPSA's subsidiary company, in reference to two new products, CUNICAP L10 and CUNICAP E10, and their effects on productivity and mortality of recently weaned and fattening rabbits, respectively, are shown.

In a first assay, CUNICAP E10 at

different feed inclusion rates (1, 2 and 4 kg/T) was compared with a supplement based on apramycin (0.1 kg/T). The assay began just after weaning, at 35 days of age, and lasted for 28 days. Body weight, feed consumption and mortality rate were measured for the duration of the assay. The Commercial Productivity Index, an indicator that relates productivity with mortality, was also calculated. The group receiving CUNICAP E10 at 4 kg/T showed the better growth and feed conversion rate. Nevertheless, the highest Commercial Productivity Index was obtained using the 2 kg/T supplementation rate, due to the low mortality in this group. This product was more effective during the fattening period, from the 14<sup>th</sup> to the 28<sup>th</sup> days of the trial.

In a second assay, the same product was compared with another similar, CUNICAP L10; with another formula based on organic acids plus calcium butyrate, all of them at 2 kg/T inclusion rate; and with another feed supplemented with apramycin (0.1 kg/T). Weaning time and duration of the trial were the same as the previous assay. Results showed that the product CUNICAP L10 was the most effective during the post-weaning period, from day 1 to 14 of the trial, although results obtained during the fattening period were better for the animals

receiving CUNICAP E10.

## REPRODUCTION

### PRODUCTIVE DATA ON RABBIT LITTERS OF DOES SUBJECTED TO DIFFERENT METHODS OF SYNCHRONISATION OF OESTRUS.

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Application of different methods to stimulate sexual activity is necessary in artificially inseminated lactating does. The temporary doe-litter separation technique on day 9 post-partum has been shown to increase fertility of artificially inseminated lactating does without affecting the viability of young rabbits. The aim of this study was to determine the viability and growth of young nursing rabbits, when four different methods to stimulate ovarian activity are applied to their mother on day 4 post-partum. Treatments studied were: a transient doe-litter separation (48 or 24 hours), a

hormonal treatment (25 UI PMSG) and no stimulation. A total of 644 litters were weighed at 4 and 25 days old in order to study body weight evolution of young rabbits. Significant differences were observed in the body weight of young rabbits (473.6 g, 438.3 g, 401,9 g and 401,8 g, respectively,  $P < 0,0001$ ). Highest body weights were obtained in the second, third and fourth parturition;  $P < 0,0001$ ). Also, mortality rate was affected ( $P < 0,006$ ) with higher values at first, sixth, seventh and eighth parturition. With regard to treatments, *BIO48* group had the highest mortality rate followed by *BIO24*, *PMSG* and *CONTROL* groups (18,2% vs 9,5%, 13,3% y 9,7%, respectively;  $P < 0,03$ ).

Milk production and feed intake were determined from day 1 to 21 days post-partum using 16 multiparous does per group with 8 to 10 pups per doe. Groups were distributed in the same four treatments mentioned above. No significant differences were detected in total milk production and feed intake between groups.

With regard to results obtained, since weight at 25 days and viability of kits is not affected, we can conclude that a transient doe-litter separation of 24 hours could be an alternative method to PMSG treatment for lactating rabbit does on day

4 post-partum.

#### REPRODUCTIVE PARAMETERS OF RABBIT DOES SUBJECTED TO DIFFERENT METHODS OF SYNCHRONISATION OF OESTRUS.

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The use of synchronization methods is required when artificial insemination (A.I.) is applied in lactating rabbit does in order to assess fertility results. The present study was undertaken to investigate the effect of PMSG treatment and two different intervals of doe-litter separation methods to synchronise oestrus in rabbit does with intensive reproductive rhythms during a productive cycle.

A total of 137 rabbit does were inseminated on day 4 post-partum and weaned at 25 days. The experimental groups were: *BIO48* (separation mother-young for 48 hours before A.I.), *BIO24* (separation for 24 hours before A.I.), *PMSG* (25 UI 48 hours before A.I.) and

CONTROL (without treatment). Only the inseminations performed on lactating does were considered for the statistical analysis. Mean conception rate was 73.27%. High conception rates were obtained in primiparous does of PMSG and BIO24 groups compared to BIO48 and control group (79.31 % y 69.57 % vs 33.33% y 53.57 %, respectively,  $P<0.05$ ). Doe-litter separation for 24 or 48 hours before artificial insemination was a method that offered similar results to the PMSG treatments in does from third parturition.

Reproduction rate (number of pups born alive at parturition) was higher in does separated for 24 hours and in the PMSG group compared to control group (8.56 y 8.37 vs 7.55,  $P<0.05$ ). Nevertheless, the highest number of pups born dead was observed in PMSG does (0.82 vs 0.28, 0.46 y 0.29;  $P<0.05$ ). With regard to parity number, reproduction rate of primiparous does was the lowest. Although positive results were obtained with transitory separation methods, further research will have to be carried out in order to take advantage of intensive rhythms using synchronization treatments that take animal welfare into account

## DESCRIPTIVE STUDY OF REPRODUCTIVE SYSTEMS OF RABBIT DOES SUBJECTED TO DIFFERENT METHODS OF SYNCHRONISATION OF OESTRUS.

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There are various systems to synchronize oestrus in lactating does. Among them, PMSG and “bioestimulation” methods are mostly used in farms. In the present work, we used adult does, with more than seven parturitions and inseminated after four different synchronization treatments: control, bioestimulation 48h (doe-litter separation 48h before AI), bioestimulation 24h and PMSG (25 UI 48 h before AI). At the end of the experimental period, does were sacrificed and their ovaries and uterus removed for microscopy analysis. Results showed no differences in total number of ovarian follicles, hemorrhagic follicles, ovary and uterus size and weight among the treatments used. In conclusion, the different methods of oestrus synchronization did not alter the ovarian

physiology of these adult does.

## NUTRITION

### FIRST RESULTS OF ARTIFICIAL INSEMINATION OF WILD RABBITS IN CAPTIVITY.

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Cynegetic farming of wild rabbits in Spain is an activity that is on the increase with the aim of re-stocking hunting lands and protecting endangered predators, thereby preserving the diversity of the Mediterranean ecosystem. To apply the benefits of the artificial insemination technique in cynegetic rabbitries a preliminary study of the seminal parameters of wild male rabbits reared in captivity is necessary. In this study we determine seminal parameters of crossbred wild rabbits, semen collection frequency and the effect of cooling on the semen quality and fertility *in vivo* .

### ORGANIC RABBIT BREEDING. A COMPARATIVE STUDY BETWEEN A GRANULATED AND A NON- GRANULATED ECOLOGICAL FEED.

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The study in organic rabbit breeding began by using whole grain, hay and dried forage in animal feeding. The experiment took place from March 2003 to November of the same year. The objective was to observe the tendency of the rabbits to take an unbalanced diet, comparing reproductive results and weight. The animals were given two types of feed *ad libitum*, of identical composition, and different only in that one consisted of whole grains while the other was pelleted. In both cases the rabbits had free access to hay, also *ad libitum*.

The experimental group of twenty females and three males was divided in two; 10 were fed with whole grains and

the others were given granulated feed. Kits were given the same feed as their mother.

The statistical analysis of the results shows that the group fed on pellets had a higher weight increase, while the reproductive parameters were similar in both cases.

#### EFFECT OF CARBOHYDRATE TYPE ON MILK PRODUCTION AND CAECAL ENVIRONMENT IN LACTATING RABBITS

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Dietary effect on caecal environment and several reproductive parameters was estimated in 32 white New Zealand rabbit does randomly allotted to four experimental diets based on two sources of fibre (alfalfa hay, AH, or sugar beet pulp, SBP) combined with two sources of starch (maize or wheat). Average weight loss over the whole lactation was 149 g, and mean dry matter intake, 205 g/d, being higher when does were fed AH diets

than does given SBP diets. However, SBP diets were better digested than the AH ( $P < 0.001$ ), therefore no difference in digestible organic matter intake was observed between the two fibre sources. Daily mean milk yield was higher in animals receiving diets formulated with AH than those rabbits fed diets with SBP ( $P < 0.05$ ), probably due to the greater feed intake of the former.

SBP fibre was accumulated in the caecum, the animals fed these diets showing a heavier caecum than those consuming diets with AH as main source of fibre. But pH and VFA level were not affected by experimental treatment. Caecotrophe excretion (17.6 g DM/d) was lower than usual values in lactating animals, which may have been due to the poor adaptation of the animals to the collar.

#### EFFECT OF TYPE OF LACTATION CURVE ON THE PHYSICAL CONDITION OF DOES.

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537 lactations from 134 does (until the fifth lactation) were fitted to a beta-

modified function in order to discover the effect of the lactation curve shape on the performance and body condition of reproductive rabbit does. A close correlation was found between the lactation curve shape (equation parameters: K, a and b) of the physical condition of the reproductive does and the main productive parameters: higher energy intake and live weight in each period (0-21 days and 21-28 days of lactation) led to higher milk production in this same period. The time (beginning or ending of lactation) of the does' physical improvement is correlated to the milk production at this time. Furthermore it would be interesting to achieve a management which leads to a high production at the beginning of the lactation period (lower "a" and higher "b") in order to avoid an excessive mobilisation of reserves at the end of lactation and improve the survival rate of the litter.

## EFFECT OF PARITY NUMBER ON PHYSICAL CONDITION AND PRODUCTIVITY OF LACTATING DOES.

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A total of 166 reproductive rabbit does were used to study the evolution of the body condition by ultrasound throughout 5 reproductive cycles, and its relationship with main performance traits. The live weight of does at parturition increased linearly until the 6<sup>th</sup> cycle. Adult voluntary feed intake, body condition and milk yield were not finally reached until 3<sup>rd</sup> lactation. As consequence of the greater milk yield, pups showed a higher daily weight gain as females reached the 3-4 reproductive cycles. Reproductive does seem to show a clear mobilisation of reserves around parturition and weaning time, presenting a negative balance during the 1<sup>st</sup> and 2<sup>nd</sup> lactation, not evident in the third. The animals which reached the 6<sup>th</sup> parturition showed clear reserve recuperation after 1<sup>st</sup> and 2<sup>nd</sup> weaning, unlike those animals that were eliminated before 4<sup>th</sup> lactation, which

were characterised by non-recuperation. Therefore, the results of the present work demonstrate that the reproductive does did not reach their final voluntary feed intake, live weight and body condition until 3<sup>rd</sup>-4<sup>th</sup> reproductive cycle, and the management of body reserves up to this point could be related to their condition of health and their potential longevity.

#### EFFECT OF THE RELATIONSHIP BETWEEN DIGESTIBLE FIBRE/ STARCH AND THE FAT CONTENT OF STARTER FEED ON THE MORTALITY RATE OF RABBITS.

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Ten experimental diets were formulated according a factorial design with 5 digestible fibre/starch ratios and 2 levels of fat. Four hundred young rabbits were fed on each one of these diets between 17 to 42 days old and then switched to a commercial feed until day 63. Mortality throughout the trial was high (40.5%) and diet-dependent. Digestible

fibre/starch ratio of starter diet had an effect on total mortality: it decreased linearly (45.6%, 45.0%, 38.9%, 37.1% y 35.8%) as digestible fibre/starch ratio increased; this effect started in 4<sup>th</sup> to 6<sup>th</sup> week period, when differences in mortality were very pronounced (37.6%, 31.0%, 25.4%, 20.1% y 14.3%). Moreover, the level of added fat in the starter diet does not seem to affect total mortality but does affect its distribution in the two periods considered; thus, in 4<sup>th</sup> to 6<sup>th</sup> week period mortality was higher in the high-fat diets (27.6% vs 23.8%,  $P < 0.01$ ), the opposite occurring in 7<sup>th</sup> to 9<sup>th</sup> week period (13.1% vs 16.6%,  $P < 0.01$ ). According to these results, in rabbit starter diets the starch level should be severely restricted while the inclusion of digestible fibre should be encouraged, a considerable increase of its fat content not being advisable.

SPECIFIC IMMUNE RESPONSE TO FEEDS IN YOUNG RABBITS.

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In this study, six young rabbits, 21 days old and deprived of feed until then, were used. Animals were identified and fed *ad libitum* on diet A throughout the experiment, until they were 60 days old. At the beginning and the end of the experiment, samples of blood were taken from each animal, as well as from their mother. Dot-immunoblotting technique was carried out to asses the existence of anti-feed antibodies in blood serum, using soluble fractions from the *in vitro* digestion of diets A, B (formulated without including any raw material contained in diet A) and N (commercial diet consumed by the rabbit doe) as dietary antigens. The rabbit doe showed high reactivity to all tested diets, in both initial and final samples. The serum of 21 day-old rabbits also showed high reactivity to all tested diets, whereas clear reduction of levels of antibodies against

diets B and N, and maintenance or even increase in levels of antibodies against diet A were observed in serum of these animals when they were 60 days old. These results point to the existence of anti-feed IgG antibodies in the blood of adult rabbit does, transferred to the litter, as well as a specific immune response of young rabbits to the feed they consumed around weaning.

EARLY WEANING OF YOUNG RABBITS: EFFECT OF AGE AND WEIGHT AT WEANING AND FAT CONTENT IN FEED.

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Ninety litters of ten kits were used to evaluate the effects of weaning age (21 vs 25 d) and weight (light vs heavy rabbits) and of increasing vegetable fat level in the weaning diet (ether extract 5.0% vs 6.5% DM) on productive performance and mortality of kits in the post weaning period (21 to 32 d). At 18 d, half litters received the diet G1 (EE: 5% DM; DE: 11,79 MJ/kg DM), the remaining half the diet G2 (EE: 6,5% DM; DE: 12,35 MJ/kg DM). Each litter was

then divided into two cages, separating the five lightest kits (L) from the five heaviest (P). Within the weaning diet, the litters were weaned at 21 (D21) or 25 d (D25) of age.

The weaning age did not affect live weight at 25 d of age, while at 32 d the D21 rabbits were lighter compared to the D25 group ( $P<0.01$ ). Feed intake from 21 to 32 d was higher in the earliest weaned rabbits, which also showed a less favourable feed conversion ( $P<0.01$ ). The lightest rabbits at the beginning of the trial also showed the lower live weight at 32 d, with lower daily weight gain and feed ingestion. Therefore, the difference in weight measured at 21 d (57 g between L and P rabbits) increased at the end of the experimental period (79 g). Feed conversion was similar, while mortality was slightly higher ( $P=0.10$ ) in L litters, with the final number of live kits per litter equal to 4.93 vs 4.99 recorded in P litters. Neither live weight nor daily weight gain were affected by the dietary fat level, while feed intake was lower ( $P=0.02$ ) in G2 litters. At the end of the trial, the number of live kits per litter was lower in G2 litters (4.99 vs 4.93;  $P=0.09$ ).

## EFFECT OF FIBRE TYPE IN THE FEEDING OF EARLY WEANED YOUNG RABBITS.

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The effect of the source of fibre on digestion efficiency and growth performance in early weaned rabbits (25 days of age) at the starter period (25-39d) was investigated. Three diets with different levels of soluble fibre (7.1%, 9.3% and 11.7%) were formulated to meet or exceed essential nutrient requirements for growing rabbits. In order to achieve this graduation of soluble fibre, oat hulls, alfalfa hay and a mix of sugar beet and apple pulp were used as the main source of fibre in each experimental diet, respectively. In the growth performance trial, 41 rabbits per diet were fed with the experimental diets during the postweaning period (two weeks), thereafter all the animals received a common feed until 60 days of age. Fecal and ileal apparent digestibility were determined at 35 days of age in fourteen and seven animals per diet, respectively. The source of fibre had a significant effect on fecal and ileal

digestibilities. The inclusion of sugar beet and apple pulp improved dry matter ( $P=0.002$ ), gross energy ( $P=0.003$ ), FND ( $P=0.001$ ) and FAD ( $P=0.001$ ) digestibility, whereas fecal protein digestibility was not affected by treatments (78.8% on average). In the ileum, only significant differences were

appreciated in starch digestibility, which increased with higher levels of soluble fibre. The inclusion of sugar beet and apple pulp increased feed efficiency with respect to the diets with oat hulls (0.618 vs 0.554,  $P=0.001$ ) and reduced mortality rate (5.3 vs 14.4,  $P=0.05$ ).

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