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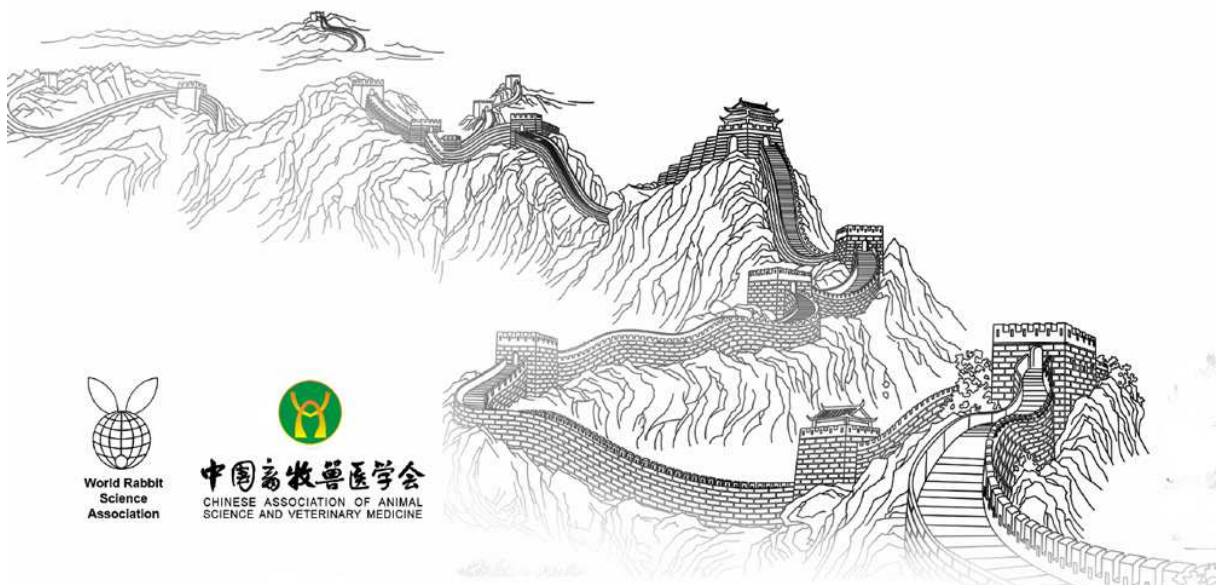
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## PERFORMANCE AND HEALTH STATUS OF PRIMIPAROUS RABBIT DOES HOUSED IN INDIVIDUAL AND COLLECTIVE CAGES

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### ABSTRACT

Nowadays, the search for alternative housing systems to produce rabbit meat has intensified because of animal welfare issue. The aim of this study was to evaluate the performance and health status of rabbit does housed in collective pens, comparing them to those in individual cages. In individual cages 16 rabbit does were examined. In the collective pens, 18 rabbit does were distributed in three pens (six does per pen). They were housed 30 days before the first insemination. In the collective pens, the does were placed into individual cages from 27 days of pregnancy till 18 days of lactation, when they were grouped again. Body weight of does in collective pens was lower at first insemination ( $P < 0.05$ ), later this different disappeared. Rabbits housed in collective pens consumed more feed which influenced the weight of weaned kits being heavier at 28 days of age ( $P < 0.01$ ). Litter size at birth was higher in the individual cages ( $P < 0.05$ ). No differences were observed for perirenal fat thickness, although does in collective housing lost reserves and the does in individual cages gained reserves during the period from parturition until weaning. Some 66% of the does housed in collective pens were injured, which is the main problem of group housing systems. Further research is proposed to evaluate different alternatives such as genetic selection for temperament, presence of hiding places within the cage and the collective rearing of the does from weaning.

**Key words:** Animal welfare, Rabbit breeding, Group-housing, Aggression, Pododermatitis

### INTRODUCTION

There is currently great social pressure regarding animals have to house according to welfare standards, although so far the only mention of rabbits is a statement issued by EFSA (2005). The rabbit is a social animal and lives gregariously in the nature, seeking cooperation and mutual protection. Nevertheless, there are fights among the rabbits until the hierarchy is established (Szendro and McNitt, 2012). Considering the traditional cages, rabbit does are only allowed visual, acoustic and olfactory contacts, without direct social contact (Rommers *et al.*, 2014). In addition, when traditional cages are used there is also a high frequency of stereotypic behaviour (Rommers *et al.*, 2006; Mugnai *et al.*, 2009).

To improve does' welfare, several authors have been investigated the group housing systems (Rommers *et al.*, 2006; Mugnai *et al.*, 2009; Maertens and Buijs, 2013; Rommers *et al.*, 2014; Buijs *et al.*, 2015) realising, among other factors, that aggressiveness was frequently observed in pre- and post-parturition days, with high infanticide rates. Nowadays some authors (Maertens and Buijs, 2013; Rommers *et al.*, 2014; Buijs *et al.*, 2015; Maertens *et al.*, 2015) have investigated the semi-group housing systems where does were separated at 28 days of gestation and regrouped again at 18 days of lactation. The effects on the prolificacy are until unclear and the high aggression between animals remain as the main issue. The aim of this study was to compare the productive and reproductive performance as well as the health status of group and individually housed primiparous does.

## MATERIALS AND METHODS

### Animals and experimental design

The trial took place during the months between September and November with temperatures between 18.6 and 23.3°C, and the daily lighting period was 16 hours. A total of 34 does (16 weeks of age, crossbred of maternal lines H and LP, Polytechnic University of Valencia) were allocated randomly one month before the first insemination into two housing systems: collective (n=18 does, six does/pen) and individual (n=16 does).

Does were artificially inseminated using fresh mixed semen. Four days before parturition, the does from the collective pens were housed individually separating the pens by wire walls into cages, and providing nest boxes. After 18 days post parturition, the wire walls were removed, creating collective pens again, and 4 to 6 does and their kits till 28 days of age were housed in groups. Three does from the collective pens were not pregnant. The dimensions of the collective pens were 240 x 100 x 80cm (width, length and height) and the individual cages were 38 x 71 x 57cm; a wire mesh platform (26 x 38cm) was installed at 24 cm height. All cages had a plastic footrest to prevent the occurrence of footpad injuries. The animals had *ad libitum* access to fresh water through automatic drinkers and a commercial pelleted feed (18% CP and 17% ADF).

### Performance and health status evaluation

All does were weighed on the first day of the experiment (30 days before the first insemination), at insemination, at 27 days of pregnancy, at parturition and at 18 and 28 days after parturition. Number and weight of live and stillborn kits, feed intake and perirenal fat thickness (Pascual *et al.*, 2004) were collected and measured. After parturition the litters were standardised to nine kits. The health status of does was also recorded, such as occurrence of pododermatitis (Rommers and De Jong, 2011), injuries (0 – 3 scale, being 0: for without injuries, 1: scratched, 2: injuries and 3: injuries with presence of abscesses), dirtiness of does and number of cage cleanings.

### Statistical Analysis

The data were analysed by ANOVA, considering two different housing systems and days of measurements using the Statgraphics Centurion program. The number of kits was used as a covariate to analyse the litter weight. Frequency of occurrence of health status parameters was analysed descriptively.

## RESULTS AND DISCUSSION

There was significant difference in the does' weight at first insemination ( $P<0.05$ ), suggesting that the does had a lower growth as a result of housing more does in a pen (Table 1). No differences were found in body weight in the following times, suggesting that there was recovery and adaptation to the collective pens. Mugnai *et al.* (2009) also found no differences in the weight of does when collective pens were used.

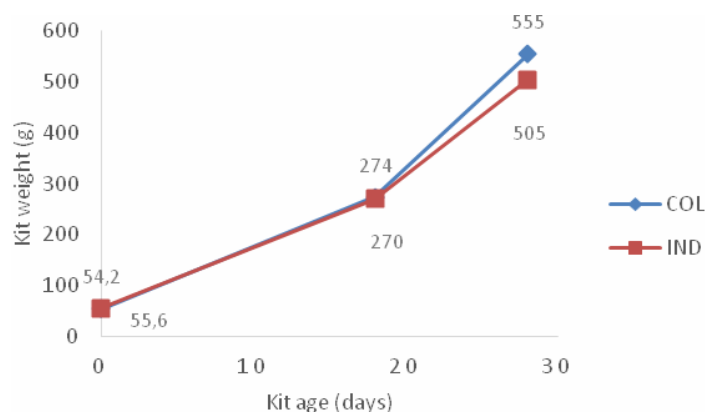
The weight loss between 18 and 28 days of lactation ( $P<0.01$ ) was very close to those reported by Buijs *et al.* (2015), who established that the does in collective pens lost more weight in the first reproductive cycle. Feed intake was similar until parturition, but it was higher in periods between parturition and 18 days, and 19 and 28 days of lactation in collective pens than in individual cages. Perirenal fat thickness of the does did not differ in the two groups, although opposite trends were observed in change of fat thickness from 18 to 28 days of lactation ( $P=0.056$ ), where the does in collective pens lost some fat reserves and the does in individual cages gained a little fat reserves.

**Table 1:** Productive and reproductive performance and condition of does housed in individual and collective cages.

Traits	Collective	Individual	S.E.	P group	P day	P gxd
Body weight (g)	4134	4194	34.65	0.214	<0.001	0.571
At beginning	3193	3208	97.17	0.909		
At first insemination	3810	4005	68.21	0.049		
At 27 d of pregnancy	4302	4403	65.88	0.279		
At parturition	3912	3950	65.84	0.676		
At 18 d of lactation	4240	4200	71.32	0.689		
At 28 d of lactation	4082	4223	73.84	0.178		
Feed intake (g DM/d)	241	224	3.43	0.004	<0.001	<0.001
Until 27 days of pregnancy	125	125	4.23	0.905		
From 27 days to parturition	72.1	77.7	6.05	0.510		
Parturition until 18 days of lactation	307	282	7.49	0.024		
From 19 to 28 days of lactation	460	411	8.86	<0.001		
Perirenal fat thickness (mm)	6.51	6.61	0.087	0.408	0.180	0.060
At parturition	6.53	6.37	0.107	0.288		
At 18 d of lactation	6.74	6.70	0.153	0.829		
At 28 d of lactation	6.27	6.78	0.185	0.056		
Standardised litter weight (g)	2619	2465	43.04	0.013	<0.001	0.007
At parturition	487	500	11.66	0.430		
At 18 d of lactation	2451	2425	49.32	0.714		
At 28 d of lactation	4916	4473	121	0.016		
<b>Original litter at parturition</b>						
Number of live kits	8.80	10.94	0.56	0.011		
Number of kits in the entire litter	9.20	11.25	0.61	0.022		
Weight of live kits (g)	515	541	13.27	0.188		
Weight of entire litter (g)	528	554	14.01	0.214		

There were differences in the number of kits born ( $P < 0.05$ ), the individual caged group showed better result, similarly to the findings of Mugnai *et al.* (2009). These authors housed the does in collective pens and achieved a lower number of kits born (6.2). In contrast, Rommers *et al.* (2006) and Maertens and Buijs (2013) did not notice differences in the number of kits born. In relation to litter weight, no differences were observed when the number of kits was used as a covariate.

The does and their litters housed in collective pens ingested greater amounts of feed ( $P < 0.001$ ) between 19 and 28 days of lactation, resulting in increased supply of nutrients to the kits, which presented higher weight at 28 days ( $P < 0.01$ , Figure 1). Similar result was published by Mugnai *et al.* (2009) and it was opposite to that observed by Rommers *et al.* (2006).



**Figure 1:** Evolution of kit weight during lactation. COL: collective housing; IND: individual housing

The health status of rabbit does was worse in the collective pens. A high frequency of injuries (66%; 62% with score 2) was observed, as a result of aggression when does were housed collectively. Rommers *et al.* (2006); Mugnai *et al.* (2009); Rommers *et al.* (2014); Maertens *et al.* (2015) and Buijs *et al.* (2015) also observed injured rabbits among group housed does. This is the main problem of the collective pens which has not yet been solved. All individually housed does had facial alopecia, in contrast to 33% of the rabbits housed in collective pens. No differences were observed for the incidence of pododermatitis (13%, score 1) and does' dirtiness (16%). Moreover, 40% of the collective pens had to be cleaned at least once (only in the period when they were separated), and the same figure in the individual cages was 19%. This behaviour was striking in some animals; only 2 does caused half of the cleanings.

## CONCLUSIONS

The litter size at parturition was larger in individual cages than in collective pens. However, the kits in collective pens were heavier, mainly due to higher feed intake of the does and their litters. The frequency of injured does was very high because of the aggressiveness of the rabbit does when housed collectively.

It is necessary to test new alternatives, such as genetic selection for temperament, presence of hiding places within the pen or the collective housing of female rabbits from weaning.

## ACKNOWLEDGEMENTS

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