EVALUATION OF PERFORMANCE AND HEALTH STATUS OF DWARF RABBITS FROM WEANING TO MATURITY

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ABSTRACT

This study was carried out to follow the body development of dwarf rabbits from weaning to adult age, according to their gender. One hundred and forty five "coloured dwarf" rabbits of six wk of age weighing 514±27 g were used. The animals were housed in individual cages and were fed *ad libitum* with a commercial pelleted diet. Individual body weight and feed consumption were measured twice a week to determine weight gains, feed intake, and feed conversion index. Health status was monitored daily in order to identify animals that were losing weight, diarrhoea events, or with teeth problems. At 20 and 45 wk of age, the animals' fatness was evaluated by measuring their skin fold width. From 19 wk of age onwards, the live weight of females (F) was significantly heavier than that of males (M) ($P<0.05$). Up to 20 wk of age, the feed intake levels were higher and weight gains more rapid in F than M, whereas from 40 wk of age onwards, the situation was reversed. At 45 wk of age, the skin fold width was significantly thicker in M than in F (4.28 *vs* 3.56 mm, respectively; $P<0.001$). During the first 20 wk of age, 9 rabbits died for digestive problems, whereas 13 were excluded for sickness and 5 for overgrowth of teeth. The teeth problems were also observed in 42 other rabbits at the end of the trial, but it did not lead to animal's culling. These results showed a clear sexual dimorphism in live performances, resulting in heavier live weights in F than M at adult age. For this reason, feed companies should consider diversified diets according to the gender. The live weight at 45 wk of age exceeded the standard values of the reference dwarf breed.

Key words: Dwarf rabbit, maturity, growth, health status.

INTRODUCTION

In recent years, the rabbit is becoming more popular as pet animals. In Germany, UK, and USA, many dwarf breeds of rabbits are also being used as companion animals (Santomá *et al.*, 1989). Also, the breeding of pet rabbits has become very advanced. However, in Italy, the breeding of these animals is quite new and there is a lack of knowledge. Information on feeding practices is usually obtained from commercial rabbit breeding, even though commercial animals have a much shorter lifespan than that of pet rabbits. The pet rabbit has a life expectancy of 8-12 years and has been regarded as the "classic" pet for children. This special relationship affects also the nutritional management in terms of both normal and abnormal feeding practices (Ricci *et al*., 2010).

The companion rabbit, like the broiler rabbit, has nutritional requirements that change with its physiological state, and the diet plays a particular role for the animal development. Information on the nutrient requirements and feeding are often based on studies that relate to the rabbit as a laboratory animal (NRC,1977) or as farmed for meat (Lebas, 1987); little information is available for dwarf rabbits (Lowe 2010).

The study of the development of the live performances of dwarf rabbits, such as for growth and fatness to maturity, considering also the gender influence, could represent a useful tool for feed manufacturers to design specific diets for dwarf rabbits with the aim of maintaining animal health and well-being.

Therefore, the aim of this study was to measure the live performances and the feed intake level, and to monitor the health status of dwarf rabbits of both sexes from weaning to maturity.

MATERIALS AND METHODS

Animals and experimental design

The study was carried out at the experimental rabbitry of the University of Padova (Italy) that involved the live performances and the health status of "coloured dwarf" (nomenclature of Fédération Française de Cuniculiculture) rabbits of both sexes during the growing period (6 to 21 wk of age; n=145) and during the adult period (28 to 45 wk of age; n=118).

During the growing period, animals were housed individually in wire cages for fattening rabbits, whereas during the second maturity period, they were housed individually in pens of 3000 cm^2. Before the beginning of the second period, animals had an adaptation period to pens and to the new environmental conditions. All animals were fed *ad libitum* a commercial diet (16.8% CP, 16.6% CF, 9.6% starch, 10 MJ DE/kg and 12.2 g DP/kg). Feed was weighed and distributed twice a week. The unconsumed feed was weighed before offering the new meal to determine actual feed consumption. Twice a week, each rabbit was weighed to determine weight gains. Feed intake and feed efficiency were then calculated.

Health status was monitored daily, including examination of the teeth at the time of animal weighing. Each animal's fattening status was evaluated by measuring the skin fold width with a digital caliper (0-150 mm - Juwel).

Statistical analysis

All data were statistically analysed using SAS (2004) software package (version 9.2) and analysis of variance was used to determine the effect of sex for all traits measured.

RESULTS AND DISCUSSION

Figure 1 reports the live weight development of males (M) and females (F). Up to 18 weeks of age, no gender effect was evidenced, but afterwards the live weights of F was significantly higher than that of M ($P<0.05$) and the difference was maintained until the end of the trial. This finding supports findings observed on hybrid commercial rabbits (Ouhayoun, 1984), but rabbits for meat production are slaughtered around 10-12 wk of age, which is before the onset of the sexual dimorphism. It should be noted that the live weights at 45 wk of age exceeded the standard values of the considered dwarf breed.

Figure 1: Live weight during the trial

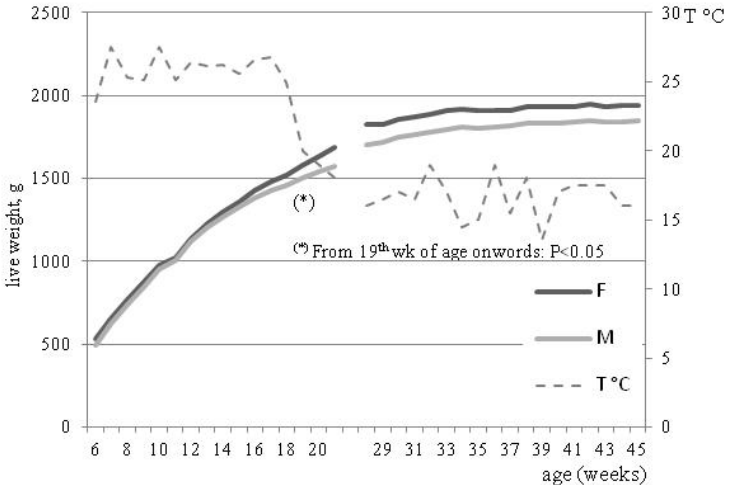

Figure 2: Feed intake during the trial

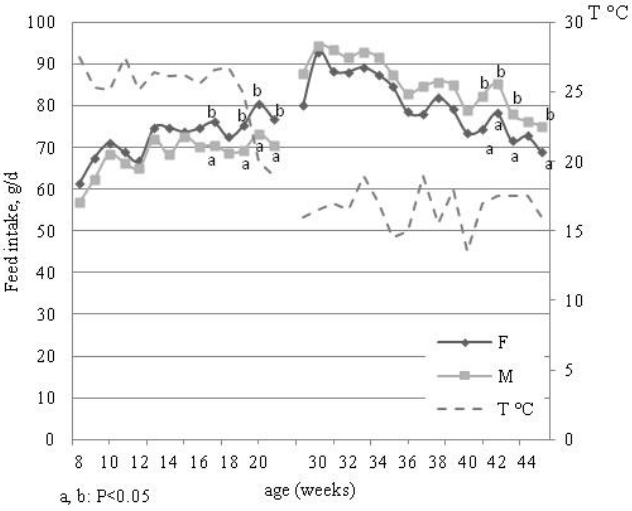

Figure 2 highlights feed intake levels during the first period of the trial (6-21 weeks). The F consumed more feed than M rabbits with the difference being statistically significant between the 17th and the 21st wk of age (P<0.05). In the second period (29-45 wk), and particularly from 40 wk of age onwards, the situation was reversed, indicating a different gender precocity effect.

Weight gains linearly decreased up to 35 wk of age, then stabilised (Figure 3). Gender differences were observed only at the beginning of sexual development and specifically between the 16th and the 19th wk of age. However, afterwards animal fatness developed differently (as indicated by the skin fold width measured at 45 wk of age), where M had thicker skin fold width than F (4.28 *vs* 3.56 mm, respectively; P<0.001) and the width increase was 14.5 *vs* 3.7% (P<0.05; Table 1).

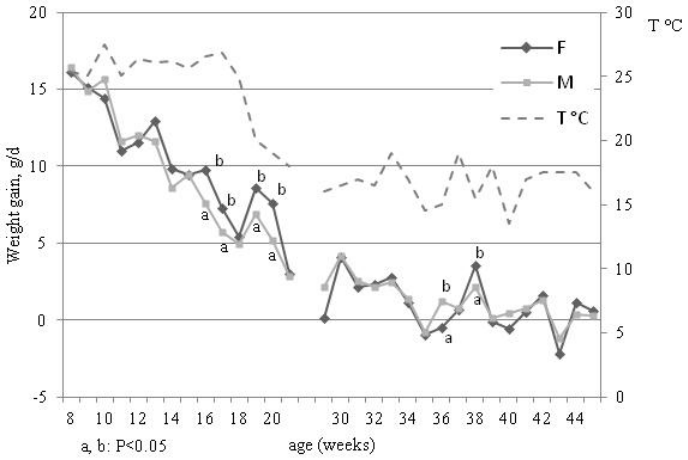

Figure 3: Weight gains during the trial

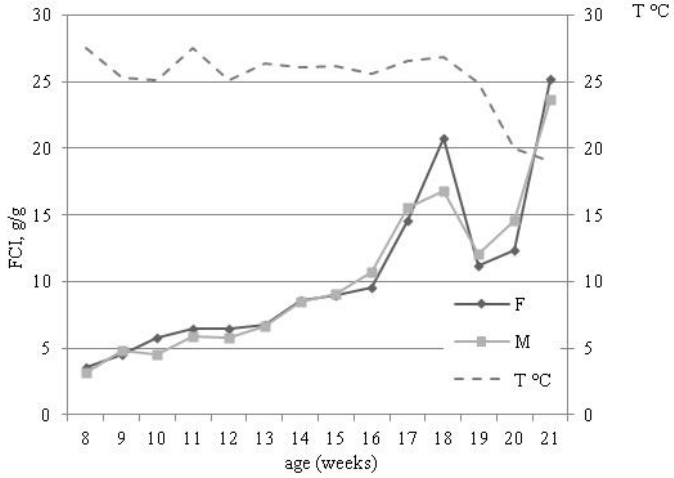

Figure 4: Feed conversion at 6-21 wk of age

The gender difference for the feed conversion index (FCI) was not remarkable during the first period (10.3 *vs* 10.1 g/g for F and M, respectively; Figure 4). From 16th wk of age onwards, while FCI worsened the gender difference was not observed, even though significant differences were observed in FI and live weights.

This study showed that growth of dwarf rabbits stops around 30 wk of age and that F are more precocious and reach a heavier adult live weight than M. However, M fattened more that F dwarf rabbits with risks to animal health and reproduction. The dietary characteristics and composition are assumed to be one of the factors involved in obesity (Martinez 2000). Based upon these findings, the feeding of dwarf rabbits should be specific according to their physiological state and also gender.

Table 1: Skin fold width measured at 20 and 45 weeks of age

	Sex (S)			**RSD**
	F	**M**	***P*-value**	
Skin fold width at 20th weeks (mm)	3.62	3.76	NS	0.70
Skin fold width at 45th weeks (mm)	3.56	4.28	<0.0001	0.53
Skin fold width change (mm)	-0.01	0.48	<0.001	0.71
Skin fold width change (%)	3.7	14.5	<0.05	21.3

No. of rabbits: 136 at 20 and 116 at 45 weeks of age.

Table 2 reports the health status of rabbits during the first 20 wk of age. Among the culled rabbits, 5.5% were F and 13.1% were M. Nine rabbits (3 F and 6 M) died from digestive problems (*E. Coli* and *Clostridium* infections), whereas 13 rabbits were culled for sickness and 5 rabbits for overgrowth of teeth. The teeth problems were also seen in 42 other rabbits (19 F and 23 M) at the end of the trial, but it did not lead to an animal being culled. Dental diseases seen in companion rabbits are attributed either to excessive inbreeding of the animals or an inadequate nutrient supply (Ricci *et al*., 2010).

Table 2: Causes of culling dwarf rabbits from 7 to 21 weeks of age

		Sex (S)	
	Total	F	M
Rabbits, No.	145	65	80
Culled, No.	27	8	19
Culled, %	18.6	5.5	13.1
Reason for culling:			
Death, No.	9	3	6
Sickness, No.	13	3	10
Teeth problems, No.	5	2	3

CONCLUSIONS

The results showed a clear sexual dimorphism in live performances, resulting in heavier live weights in F than M at adult age. For this reason, feed companies should consider diversified diets according to gender. Moreover, appropriate selection of animals, together with the culling of poor performing or sick rabbits, could improve the live performances and health of animals.

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