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Growth Performances of Rabbits in Farms in Southern Benin

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Abstract: Growth performances of 343 young rabbits (170♀ and 173♂) born from 79 females (22 primiparous and 57 multiparous) and 5 males were evaluated from August 22 to December 20, 2012 at the breeding farm "CETAVI" located in the town of Abomey-calavi Southeast of Benin. The aim of this study is to appreciate the level of expression of the growth performances of rabbits under the specific conditions of "CETAVI" breeding. The animals are housed in groups of six in wire cages with 80 by 40 cm floor size. They are all from local strain parents. The feed consisting of different types of roughage and concentrate presented in floury form is served at will. Drinking water is served without restriction to all animals. Weaning of young rabbits occurred at 35 days of age with a live weight of 400 g minimum. The mean live weights recorded every 2 weeks from birth to the age of 3 months were, respectively 48.5, 172.62, 541.42, 758.90, 360.76, 983.17 and 1169.22 g. These weights were significantly higher ($p<0.05$) in rabbits from primiparous females with smaller birth size ($p<0.05$) from birth to the age of 2 months. This trend is then reversed until the age of 3 months. No difference ($p>0.05$) was observed between the mean live weight of male and female young rabbits throughout the test. This level of weight productivity was proved globally satisfactory as it is comparable to that of most professional breeding farms.

Key words: Rabbit, growth, performance, Republic of Benin, observed, female young

INTRODUCTION

Breeding of short-cycle animal species is increasingly providing a real opportunity in the fight against food insecurity, particularly in regions with very limited resources. The advantage of these animal species lies in their ability to reproduce more frequently and thus to contribute effectively to the improvement of the availability and accessibility of food proteins of animal origin. Among these animal species can be mentioned the rabbit which enjoys an excellent reputation among consumers (Fagbohoun, 2006). The spectacular evolution of the annual production of rabbit meat in recent decades testifies to the socio-economic importance of the species in the Republic of Benin (Akoutey and Kpodekon, 2012). The rabbit is also known for its precocity and its prolificity clearly above most of the husbandry mammals. The primiparous rabbits are able to have litter sizes of up to eight young rabbits (Coudert and Lebas, 1985) already at the age of 4 months (Lebas and Coudert, 1986). This reproductive potential greatly enhances the level of animal productivity weight of farms. According to Lebas and Sardi (1969) and Zerrouki *et al.* (2010), the rabbits born from large litters are certainly a little lighter but the weight of the litter as a whole, increases linearly with the size. The feeding level of mother is therefore very important on the litter size but also on the weight growth of the young rabbits during the breastfeeding period (Zerrouki *et al.* 2010). During 6 weeks breastfeeding a rabbit multiplies its birth weight by twenty (Lebas and Sardi, 1969). According to Lebas *et al.* (1975), the growth performances of young rabbits mainly reflect their mother's dairy capacities. A good start of the young rabbits during the breastfeeding period ensures optimal and regular weight growth during the next phase. The periodic evaluation of the growth performance of young rabbits can thus be an effective strategy for controlling the level of weight productivity of rabbit farms. The question here is whether the growth performance of rabbits registered at the Technical Center for Poultry and

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Small Animal Production (CETAVI) in Abomey-calavi commune in Southern Benin reflects the actual level of weight productivity of rabbits.

MATERIALS AND METHODS

Framework: The study was conducted in the commune of Abomey-calavi located in the south of Benin. The climate of the subequatorial type is characterized by 2 dry seasons and 2 rainy seasons. The average annual rainfall is about 1200 mm of which 700-800 mm for the first rainy season and 400-500 mm for the second rainy season. The average monthly temperatures vary between 27 and 31°C. The relative humidity of the air, depending on the month, ranges from 65% (January-March) and 95% (June-July). The absolute maxima reached are 100% and are recorded during the rainy months. Absolute minima revolve around 20% and correspond to the great dry season (harmattan period).

Period and duration of study: The study was conducted over a period of 4 months from 22 August to 20 December 2012, corresponding to the end of the short rainy season and the beginning of the dry season. The herbaceous cover at this time of year became less and less luxuriant and offered less abundant forage availability.

Animal materials and experimental design: The animal material used in the present study consists of 343 rabbits (170♀ and 173♂) born from 79 females (22 primiparous and 57 multiparous) and 5 breeding males, all from a breeding centre located in the commune of Abomey-calavi in Southern Benin. All animals are of local strain. The diet of rabbits, irrespective of age, consists of different types of fodder taken from the wild and of locally produced food concentrate and presented in mealy form. The young rabbits are weaned 35 days after birth with a minimum live weight of 400 g. They are housed in groups of 6 in wire cages 80 cm long, 40 cm wide and 40 cm high. The identification numbers of the young rabbits were first noted on the dorsal part during the first 7 days post partum and then inside the right ear with a marker. Drinking water and feed are made available at will.

Measuring and collecting data: The data collected and analyzed in this study focused on the individual weights of the young rabbits. They are recorded every 2 weeks in the mornings at the same hour before serving the feed. A precision balance of 500±0.1 g for pre-weaning and another of 5 kg ±1 g for post weaning was used, respectively for the recording of live weights.

Data analysis: The statistical analysis of the collected data was carried out using SAS Software Version 9.2 (Statistical Analysis System, 9.2). Dependent variables that were selected included; bi weekly live weight and Daily Average Gain (DAG) of the young rabbits. These variables were previously subjected to the normal distribution test to ensure that they were consistent with an analysis of variance that was performed using the Proc GLM (General Linear Model) procedure. The statistical model that was used for the analysis of variances is as follows:

$$Y_{ijk} = \mu + A_i + B_j + C_k + e_{ijk}$$

Where:

Y_{ijk} = Observed value of the studied dependent variable Y
μ = General mean of the studied dependent variable Y
A_i = Fixed effect of sex (i = 1, 2); 1 = male; 2 = female
B_j = Fixed effect of litter size (j = 1, 2, 3); (1: j<4); (2: 4≤ j≤6); (3: j> 6)
C_k = Fixed effect of parturition frequency (k: = 1, 2); 1 = primiparous; 2 = multiparous
e_{ijk} = Residue of variance

RESULTS

Weight growth of young rabbits: The results of significance tests of the variation factors on the weights at a typical age of the young rabbits as well as the weight growth are presented, respectively in Table 1 and Fig. 1. Table 1 shows that sex had no significant effect ($p>0.05$) on the live weight of the young rabbits throughout the trial. The Litter Size (LS) of the rabbits on the contrary, exerted a highly significant influence ($p<0.001$) on the live weight of the rabbits during and after breast feeding. The parturition frequency of rabbits had no influence ($p>0.05$) on the live weight of young rabbits from birth until 10 weeks of age. In the first 6 weeks of life, all young rabbits, regardless of sex and parturition frequency, recorded an average weight gain of 490.92 g or 9.72 times their birth weight (Fig. 1). The average weight of young rabbits passed to 1269.22 g at 12 weeks of age an increase of 157.9% in 6 weeks. Young rabbits born from small Litter Size (LS <4) have shown with 66.45 g, respectively 27.1% and 30.85% more ($p<0.001$) body weight at birth, than those born from medium (4≤LS≤6) and high (LS >6) litter size. The weight difference increased to 27.25 and 37.97%, respectively, between low and medium litter size and between low and the high litter size at the 6th week. At the 12th week, these values were 13.98 and 15.84%, respectively (Fig. 2). The primiparous rabbits gave birth to young rabbits weighing on average 51.23 g against

Table 1: Influence of the variation criteria on the weights (P_0....P_{90}) at age of the rabbits

	Level of significance						
Criteria for variation	P_0	P_{15}	P_{30}	P_{45}	P_{60}	P_{75}	P_{90}
Sex	NS	NS	NS	NS	NS	NS	NS
Litter size	***	***	***	***	***	***	**
Frequency of parturition	NS	NS	NS	NS	NS	NS	*

Table 2: Influence of the variation criteria on the Average Daily Gain (ADG) of young rabbits

	Level of significance					
Criteria for variation	ADG_{0-15}	ADG_{15-30}	ADG_{30-45}	ADG_{45-60}	ADG_{60-75}	ADG_{75-90}
Sex	NS	NS	NS	NS	NS	NS
Litter size	***	**	***	**	*	NS
Frequency of parturition	NS	NS	NS	NS	**	***

NS: Not Significant; *p<0.05; **p<0.01; ***p<0.001

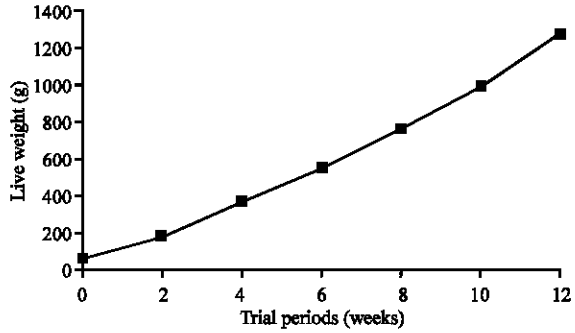

Fig. 1: The weight growth of young rabbits

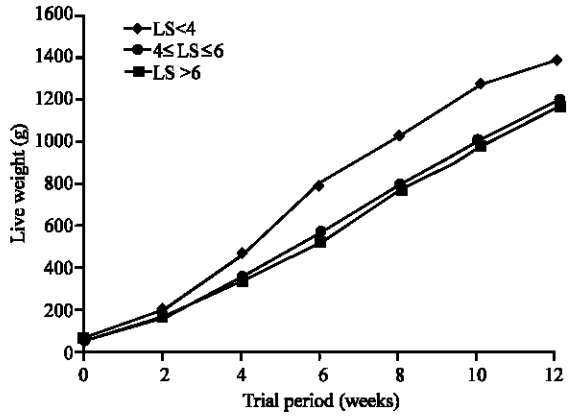

Fig. 2: Changes in weight of young rabbits according to the Litter Size (LS) of mothers

47.43 g for the multiparous rabbits. At 12 weeks of age, young rabbits of multiparous mothers showed with 1282 g an average body weight 6.42% significantly ($p<0.05$) higher than young rabbits of primiparous mothers (Fig. 3).

Average Daily Gain (ADG) of rabbits: The results of the significance tests of the factors of variation on the average daily gain of young rabbits are presented in

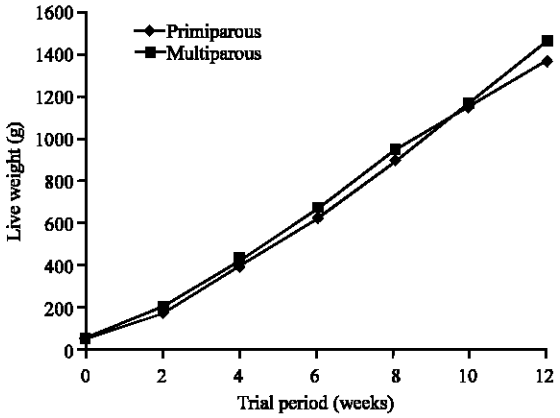

Fig. 3: Changes in the weight of young rabbits as a function of the parturition frequency of mothers

Table 2. No significant difference ($p>0.05$) of ADG was recorded between male and female rabbits throughout the trial. The litter size in contrary had a highly significant effect ($p<0.001$) on the ADG of young rabbits beyond weaning. The significant effect of litter size was gradually decreased to completely fade over the last 2 weeks of the test. The parturition frequency of mothers had no significant effect ($p>0.05$) on the ADG of young rabbits during the first 8 weeks of the study. The last 4 weeks were marked by a highly significant influence ($p<0.001$) of the parturition frequency on the ADG of the young rabbits.

Young rabbits with a low Litter Size (LS <4) had an ADG of 9.19 g in the first 2 weeks of life. Those with medium litter size between 4 and 6 gained 8.79 g daily while the others with higher Litter Size (LS >6) grew daily by 7.78 g. From one class of young rabbits to another, differences in GMQ were highly significant ($p<0.001$) (Fig. 4). Between 2 and 4 weeks, young rabbits born from mother with low Litter Size (LS<4) gained an average 14.17 g daily. This rhythm of growth was 16.87% significantly ($p<0.01$) higher than that of young rabbits

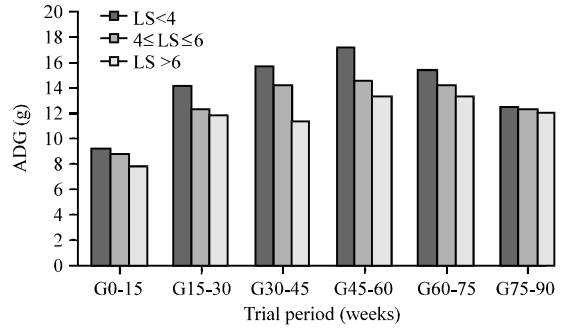

Fig.4: Average Daily Gain (ADG) of young rabbits according to litter size

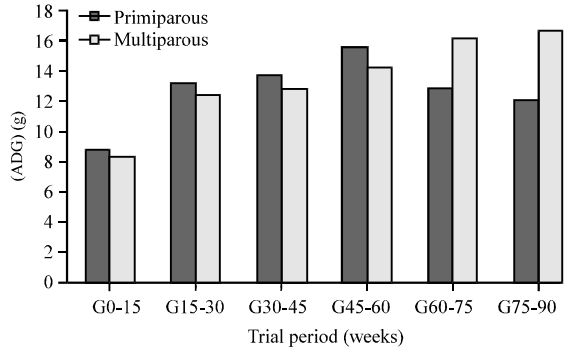

Fig. 5: Average Daily Gain (ADG) of young rabbits as a function of the maternal parturition frequency

born from mother with high Litter Size (LS>6) and 13.27% higher than that of young rabbits born from mother with medium litter size (4≤LS≤6). At 6 weeks of age, the respective values were 15.7 g, 27.77 and 9.87%. Differences between the different categories of rabbits remained highly significant ($p<0.001$). The ADG at the twelfth week were 12.51, 12.29 and 12.06 g, respectively for young rabbits born from mother with low (LS <4) medium (4≤LS≤6) and high (LS>6) litter size (Fig. 4).

The daily growth rate during the first two weeks of life was 8.67 and 8.18 g for the rabbits of primiparous and multiparous mothers respectively (Fig. 5). This growth rate increased to 13.5 and 12.63 g, respectively in the 6th week. From the tenth week on, the young rabbits of primiparous mothers grew less rapidly than their congeners of multiparous mothers. Indeed, the latter showed with 16.01 g an average daily gain 3.7 g higher ($p<0.01$) than those of primiparous rabbits. At 12 weeks of age, young rabbits of multiparous mothers showed with 16.44 g an average daily gain of 27.22% significantly ($p<0.001$) higher than young rabbits of primiparous mothers.

DISCUSSION

The local strain of rabbits in this study varied from 48 g at birth to 541.42 g at weaning 5 weeks later. Akoutey and Kpodekon (2012) recorded an average live weight of 458.5 g at 35 days with the same local strain. In rabbits of local strain in Algeria, the average live weights were 52.1 g at birth and 650 g at weaning at 35 days (Fellous *et al*., 2012). Lebas and Serdi (1969) obtained on the other hand, a weight change of the young rabbits from 54 g at birth to 1026 g, 6 weeks later at the time of weaning in the Fauve de Bourgogne breed. It is clear from the above that traditional local rabbit strains have a relatively low average live weight at birth and weaning compared to exotic improved strains. The growth of most animal species depends on the genotype but also on environmental factors such as feeding. The weight development of young rabbits, especially during breast feeding is mainly determined by the amount of breast milk consumed. The quantity of milk consumed by young rabbits depends in turn on the level of production of the mothers and the size of her litter. A rabbit with a high litter size will offer less milk than a rabbit with a smaller litter size. Lebas and Sardi (1969) observed that the amount of milk consumed by a rabbit is lower in a large litter than in a litter with a smaller number. The individual weight development of the young rabbits in this study was inversely proportional to the litter size from which they originated. Those with a litter size <4 were significantly faster in weight growth than their congeners from higher litters throughout the trial. Brun and Ouhayoun (1994) observed that an increase in litter size resulted in an individual reduction in weight at weaning. Bolet *et al*. (1996) also noted that the total litter weight increases significantly with the number of rabbits while the average weight decreases. The same observation was made by Bignon *et al*. (2013) who found that the mean live weight and viability between birth and weaning were significantly lower in young rabbits with a litter size situated between 9 and 11. Overall, the present study shows that young rabbits in all categories experienced less accelerated weight growth during pre-weaning than post-weaning. From 0-6 weeks, young rabbits increased by 492.92 g against 727.8 g of 6-12 weeks. Only rabbits from a litter size smaller than 4 saw their weight increase in pre weaning exceeded that in post weaning. This seems to confirm the observation by Rochambeau (1989) that the growth of young rabbits is accelerating between birth and weaning. According to the same author, the pre-weaning growth of the young rabbits would depend on the mother as well as on the size of the litter. The weight difference

between male and female rabbits remained statistically insignificant throughout the trial. According to Rochambeau (1989) males and females have similar growth up to an age of 10-20 weeks. Beyond that the females become heavier. Male and female rabbits aged 35-40 days, and fed for 8 weeks in the study conducted by Dahouda *et al.* (2013) showed no significant difference between their respective live weights.

The frequency of parturition of rabbits does not appear to significantly affect the live weight of young rabbits during this study. However, an exception was observed in the 12th weeks when the young rabbits from multiparous mothers had a higher average live weight than those from primiparous mothers. Mean birth weight and weaning weights were lower in rabbits from primiparous mothers in the study conducted by Fellus *et al.* (2012). In conclusion, the growth performances displayed by the young rabbits in the present study were found to be sufficiently close to those obtained by most authors. The improvement of breeding conditions in general and those of feeding in particular including satisfaction of nutritional needs during different physiological stages will undoubtedly significantly improve weight performances of rabbits.

CONCLUSION

The assessment of the growth performance of young rabbits at the Technical Center for Poultry Production and Small Animal Production (CETAVI) in southern Benin helped to appreciate the level of productivity by weight up to 12 weeks of age. This level of productivity by weight was generally satisfactory as it is comparable to that of most professional breeding farms. However, an improvement in the feeding conditions of the rabbits before breeding and during gestation but also during breastfeeding should be considered. This is to allow rabbits to fully express their potential for weight gain. The aim is to achieve the most rapid growth during the pre-weaning period, contrary to what has been the case in this study.

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