



## **Effect of Weaning Age on the Survival Rate and Growth Performance of Rabbits Kept in the Western Highlands of Cameroon**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Author KNCB carried out the survey and monitoring of the animals on the farm, managed the literature searches and wrote the first draft of the manuscript. Author FED designed the experiment, wrote the protocol, performed statistical analysis and contributed to write and revise the manuscript. Author DKP coordinated the entire work and reviewed the manuscript. All authors read and approved the final manuscript.*

### **Article Information**

#### Editor(s):

(1) Dr. Hazem Mohammed Ebraheem Shaheen, Damanhour University, Egypt.

#### Reviewers:

(1) Emre Aydemir, Akdeniz University, Turkey.

(2) D. K. Deokar, Mahatma Phule Krishi Vidyapeeth, India.

(3) Muhammad Zahoor Khan, Agricultural University, China.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/59515>

**Original Research Article**

**Received 24 May 2020**

**Accepted 29 July 2020**

**Published 08 August 2020**

### **ABSTRACT**

A study was conducted at the Nazareth Agro Pastoral Training Centre in Bamenda, Cameroon to determine the effect of weaning age on the survival rate and growth performances of rabbits kept in the Western Highlands of Cameroon. The research lasted for five months starting from April to August 2014 and aiming at looking for the appropriate age of weaning rabbit kits. Live weight and solid feed intake were recorded after every seven days depending on the kindling date of each doe to determine their increase in weight. The litter size, still birth, mortality and weaning age were monitored for all the kits. The rabbits were weighed pre-kindling and on the day of kindling with their kits. The mortality rate was registered as well as the feed consumed during this period. Doe selection was done based on live body weight. The does were grouped into three groups: one

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having does with weights less than 2900g, group two having does with weight ranging between 2900g and 3200g and the last group with does with live weights above 3200g. Weaning was done in three phases 21days, 28days, and 35days, respectively. Data collected from the experiment were subjected to Analysis of Variance and Descriptive Statistics using Microsoft Excel application. The results obtained showed that there was a significant difference ( $P<0.05$ ) among means of average weights of animals weaned at the 21 days, 28 days and 35 days of age. The best survival rates of rabbit kids were obtained when the animals were weaned at 35days of age.

*Keywords: Does; growth performance; kindling date; local rabbits; survival rate; weaning age.*

## 1. INTRODUCTION

Cameroon is a Sub Saharan African country characterized by high population growth of about 2.7 % per year [1]. This leads to ever greater food needs, especially of animal protein origins. Indeed, animal protein intake in Cameroon is just about 17g per day per capita, representing a shortfall of 69% compared to 55g per day per capita recorded in developed countries [2]. This deficit is slightly more than 70% of the population estimated at 20 million people. The solutions to this low protein intake lie in the development of livestock species with short production cycles, such as poultry, pigs, and rabbits.

The domestic rabbit, thanks to its small size, high prolificacy, its rapid growth and low cost of production, is one of the alternatives that can effectively contribute to increasing the available animal protein [3,4]. Since local population of rabbits are products of indiscriminate breeding, some developing minds assumed that rabbit development in the tropics could come from cross breeding exotic breeds with local ones. However, Belabbas et al. [5] found that this approach has not been successful due to numerous reasons attributed to failure of exotic breeds to adapt to local environmental conditions, absence of technical know-how and follow up, proper prophylactic programs, just to mention a few. Meanwhile, rabbit production in Cameroon has received important research attention in areas such as, characterization and performance testing [4], reproduction [6], nutrition and dietary incorporation of local foodstuffs [7,6]. Except for any initial works carried out with unpublished data on rabbits kindling nest management, nothing has been done on the effect of weaning age on the survival and growth rates of rabbit fryers under the conditions of the Western highlands of Cameroon. Since the survival rate of kids is possibly tied up to the appropriate weaning age, this study was carried out to determine the optimum age at weaning of rabbit kits and their

growth performance in the Western highlands of Cameroon.

## 2. MATERIALS AND METHODS

### 2.1 Description of Study Site

The study was carried out at Nazareth Agro Pastoral Training and Production Centre located in Menteh, Nkwen village, some 2 km from mile four in the Bamenda III sub-division Mezam Division, North West Region of Cameroon. The centre is situated at latitude 6°N of the equator and longitude 10° E of the Greenwich meridian and at an altitude of 900 m above sea level. It is found in the Western Highlands of Cameroon, characterized by two seasons, a dry season and a wet season with an average annual rainfall of about 2230 mm, uniformly distributed from mid-March to mid-November. The other months are virtually void of rain. The average maximum and minimum temperatures are respectively 25°C and 14°C. The average relative humidity is 52% in the dry seasons and 70% in the wet seasons [8].

The human population of the North West Region is estimated at some 1.82 million inhabitants with an annual growth rate of 3.1% [9]. It is also estimated that 72% of the population is involved in agriculture with a small proportion of this population involved in rearing of animals like rabbits, sheep, goats, poultry and cattle [8].

### 2.2 Experimental Animals

The trial involved a total of 14 Cross-bred rabbits from New Zealand White, Chinchilla, and Californian with at least two parities. All the animals were obtained from the Nazareth Centre.

#### 2.2.1 Housing

These animals were housed in Iron cages, with feeding troughs and watering nipples connecting water supply pipe associated to the chained iron cages (Figs. 2 and 3). These cages were mounted in a house constructed with the lengths

in the east west direction. The cages were mounted on a floor with sharp doom-shapes with evacuation gutters running along to the outside, through which refuse were evacuated during cleaning. The house had two doors and several windows for ventilation. Roofing was done with aluminum roofing sheets.

Fryer cages as well as cages for the bucks are formed in the same way but for the fact that they don't have nesting boxes.

The animals were of two parity and above, water was provided all through by automatic nipple drinkers, cleaning equipment such as brooms, and squeegee were used to clean the rabbits pens daily. An electronic scale, was use for weighing animals, and the kindling boxes

measuring 5cm by 10cm was introduced 7days before kindling.

### 2.2.2 Feeding

Experimental animals were fed with both complete feed as well as withered forage. The forage comprised graminiae and legumes shrubs, as well as grasses, like *Pennisetum purpureum*, *Brachiaria* spp, *Ipomea batatas* vines, *Trypsacum laxum*, *Stylosanthes* spp. etc. The composition and nutrient content of the complete feed are given in Table 1.

Feed was served alongside the withered forage *ad libitum* to both gestating and nursing does and weaned fryers. Watering was through automatic nipples.



Fig. 1. Sketched map of the North West region of Cameroon  
[https://upload.wikimedia.org/wikipedia/commons/4/4d/Northwest\\_Cameroon\\_divisions.png](https://upload.wikimedia.org/wikipedia/commons/4/4d/Northwest_Cameroon_divisions.png)

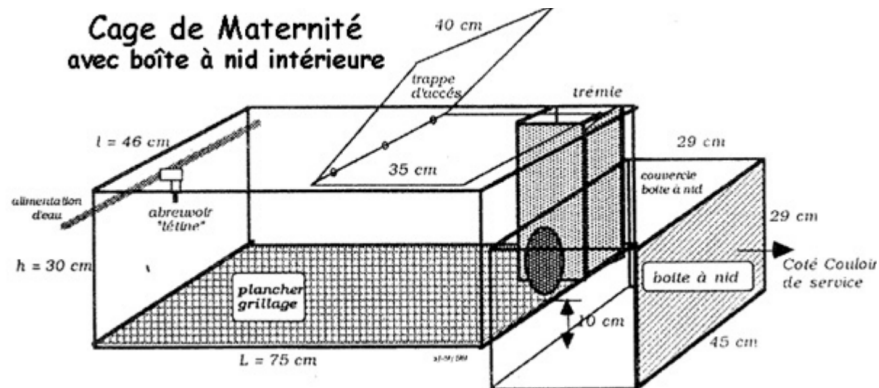


Fig. 2. Sketch of a typical maternity cage used at Nazareth Centre

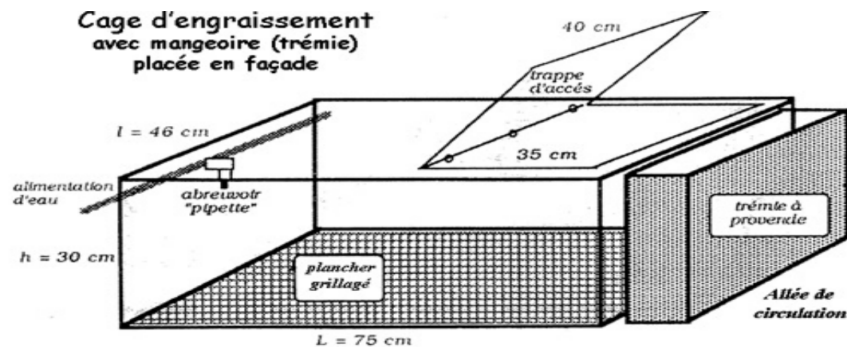


Fig. 3. A typical buck and fryer cage used at Nazareth Centre

Table 1. Composition and nutrient content of the complete feed for experimental animals

Ingredient	Percentage in the feed (kg)
Maize	40
Rice bran	21
Soybean cake meal	7
Cotton seed cake meal	5
Palm kernel cake meal	25
Kitchen salt (NaCl)	0.5
Premix corrector <sup>a</sup>	0.2
Aroma <sup>b</sup>	0.1
Lysine	0.1
Di Calcium Phosphate	1.5
Total	100.4
Digestible energy (Kcal/kg)	2665.99
Crude protein (%)	18
Calcium (%)	3,381
Phosphorous (%)	0.4111

### 2.2.3 Health management

All necessary preventive and curative measures ranging from deworming, anticoccidia, antibiotics to vitamins were administered as from the first day of the research and during the experimental period.

### 2.2.4 Experimental design, data collection and statistical analysis

The animals were distributed in a Completely Randomized Design according parity and live weight. Data collection was carried out on 14 does pre-selected for the research from the beginning as from June 2014. Doe selection was done based on live body weight. The does were grouped into three: group one having does with weights less than 2900 g, group two having does with weight ranging between 2900 g and 3200 g and the last group with does with live weights

above 3200 g. Gestating does were weighed before and after kindling using a 5000 g electronic scale. Live weight and solid feed intake were recorded after every seven days depending on the kindling date of each doe. At kindling the weight of the nursing doe was measured as well as the live body weight of individual kits though the kits were not identified. Subsequently, the weight of the doe and the kits were taken after seven days to determine their increase in weight. The litter size, still birth, mortality and weaning age was monitored for all the kits. Data collected were organized and subjected to Descriptive Statistics and Analysis of Variance (ANOVA) with one factor and two factor models, with replication and without replication ( $P < 0.05$ ) using Microsoft office excel 2010 in order to compare the means of litter size, weaning age and weaning weight on the growth performance of fryers.

## 3. RESULTS AND DISCUSSION

### 3.1 Effect of Weaning at 21, 28 and 35 Days on Kits Growth Performances from Birth to 6 Weeks

The results showed in Table 2 that there was a significant difference ( $p < 0.05$ ) between the average weights of kits weaned at 21 days, 28 days and 35 days for the second and third weeks as well as from the 5<sup>th</sup> to the 7<sup>th</sup> week after kindling. There was however no significant difference between the average weights at birth of the animals as well as at 4 weeks of age. The means of the kits at 3 weeks were very highly significantly different.

From Fig. 4, it can be observed that the live body weights increase progressively with increase in age of the rabbit kits. However minor discrepancies are observed as the profiles are not identical. It can be observed that after 3

weeks of age the weights of the kits weaned at 21 days drastically drops compared to the other later weaning ages before rising to meet the weights of the animals weaned at 28 days. As for the weaning at 35 days of age, the curve maintains a continuous profile showing that the live body weights of the kits were increase more uniformly as from 2 weeks of age.

The results revealed that weaning age had a significant effect on the average weight gain of rabbit kits. Early weaning (at 21 days) had a rather negative effect on the average daily weight gains. This is probably because the kits' digestive tracts are not yet fit to digest and assimilate concentrates. These findings agree with the results of Kovacs et al. [10] who reported that by the age of 35 days, the body weight of animals weaned at 35 days of age had increased by 14 and 10% ( $P < 0.05$ ) as compared to those weaned at 21 and 28 days of age, respectively, whereas by the age of 42 days it increased by 10%. It was also observed that weaning at 28

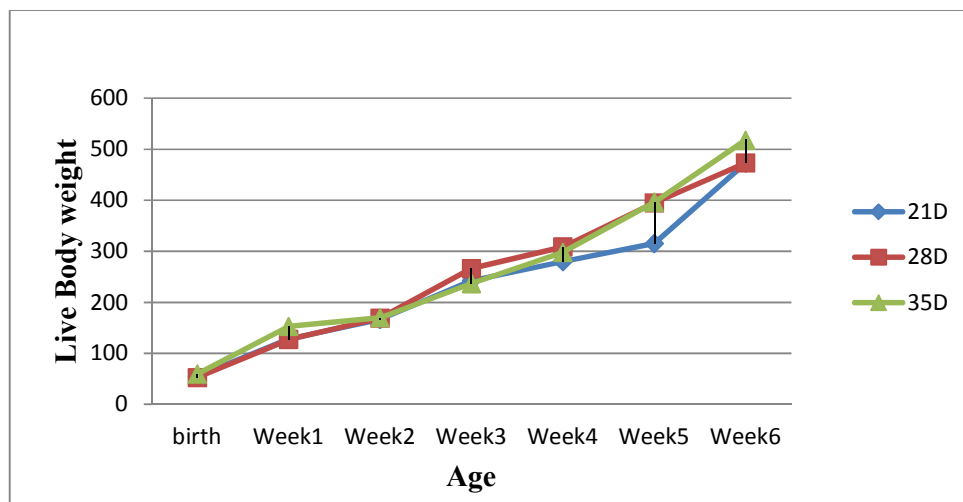
days was appropriate when litters are small and also when management was strictly intensive with rich concentrate feeding. Moreover, under semi intensive management systems which are more or less what is practiced at Nazareth Centre, weaning at 35 days gave the best results in terms of growth rate though very late weaning of six weeks and beyond is not economically profitable as it reduces the number of production cycles per doe per annum [11].

### 3.2 Effect of Weaning Age on the Liveability of Rabbit Kits

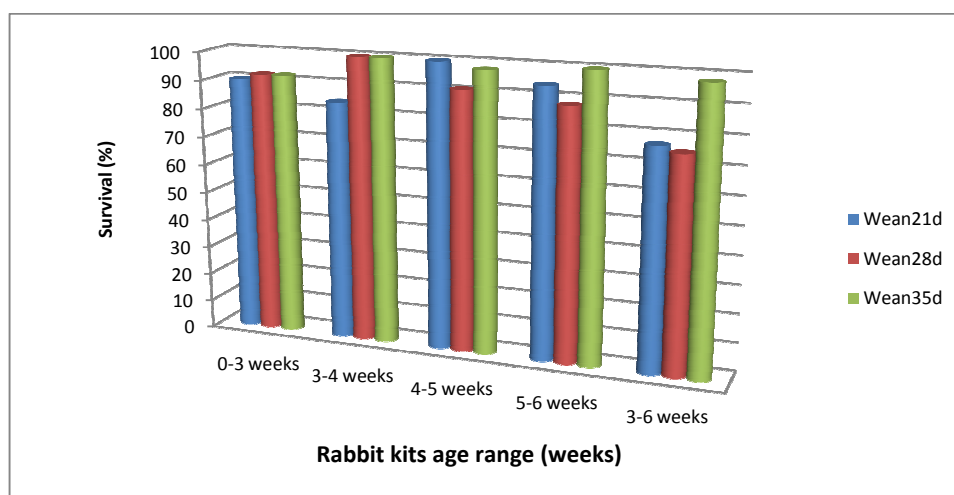
From the Fig. 5 it's observed that the survival rates are highest for all three categories of weaning's (21 days, 28 days and 35 days) between the fourth and the fifth weeks. It is also observed that weaning at 21 days show a comparatively lower survival rate compared to kits weaned at 28 days and 35 days. Weaning at 35 days gave the best survival rate when compared to other early ages of weaning.

**Table 2. Effect of weaning age on average weekly weight gain**

Age (weeks)	Weaning age			Probability level
	21 days	28 days	35 day	
1	55.1±2.25	52.5±2.06	59.6±2.29	0.055
2	128.3±11.39	127.3±3.81	152.8±7.44	0.521*
3	166.5±27.07	169.1±4.82	169.9±7.1	0.979*
4	242.5±26.58	266.2±14.98	236.8±7.68	0.323
5	279.9±26.79	308.6±14.41	298.1±12.12	0.545*
6	315.3±27.4	395±19.02	396.7±20.99	0.546*
7	473.0±56.77	473.4±29.75	517.8±27.56	0.525*



**Fig. 4. Effect of weaning at 21, 28, and 35 days on the growth (g) of rabbit kits up to six weeks of age**



**Fig. 5. Effect of weaning age on the survival rate of rabbit kits**

**Table 3. Some zoo technical information on the experimental animals**

Parameters	21d	28d	35d	Psf
Length of Gestation	31±0.58	30.8±0.58	31.2±0.67	0.864
Litter size at birth	5.6±0.33	6.0±0.63	6.4±0.74	0.787
Kit body mass at birth (g)	57.75±4.25	56.8±14.4	60.1±6.3	0.525
Weight range of research animals	<2900g	2900<x<3200	>3200	
Kit body mass at birth (g)	55.7±3.91	54.3±4.43	61.56±5.62	0.524

The results showed that the survival rate of rabbit kits was very much higher and more stable for kits that were weaned at 35 days of age compared to weaning at 21 days or 28 days of age. It was also observed that the survival rate of kits weaned at 28 days of age declined as from weaning and continued till 6 weeks of age. This observation was the same for kits weaned at 21 days, however, the drop in their survival rate started as from week five. This is a reflexion of young animals vulnerability to microbial infections especially in the gastrointestinal and respiratory tracts as a result of the very cold weather in the western highland zone of Cameroon and it tallies with the findings of. Zita et al. [12] who mentioned the fact that weaning is a very stressful period for rabbit kits which involves the separation of kits from the doe and the adaptation to solid feed. They also reported that their digestive tracts are not yet very well developed and this poses a problem as they are obliged to consume concentrates and forage which evidently leads to complications like sneezing and diarrhea which are clear symptoms of gastro intestinal and respiratory infections. On the other hand, Gallois et al. [13,14] reported that early weaning was less problematic when young rabbits showed a slight solid feed consumption which led to earlier development of their

digestive tracts. They went ahead to say that digestive tract development does not have any effect on feed consumption in early and traditionally weaned rabbits [15].

#### 4. CONCLUSION

It was concluded that age at weaning of rabbit kits affects the growth performance as well as liveability either positively or negatively. Weaning at five weeks of age (35 days) under the semi intensive or extensive rabbits production systems was the most appropriate weaning age to adopt in the western highlands of Cameroon. Nevertheless, weaning at 28 days could also be practiced if followed up by intensive zoo hygienic norms of nutrition, sanitation and health care.

#### DISCLAIMER

The products used for this research are commonly and predominantly found in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

## ETHICAL APPROVAL

Animal ethic Committee approval has been collected and preserved by the author.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:  
The peer review history for this paper can be accessed here:  
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