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Effect of Age at Weaning on Growth Performance and Post-Weaning Survival Rate of Different Rabbit Genotypes in South-Eastern Agro-Ecological Zone of Nigeria

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ABSTRACT

This study evaluated the influence of age at weaning on post-weaning growth performance and survival rates of different rabbit genotypes – New Zealand White (NZ), Chinchilla (CH), NZ×CH and CH×NZ in a completely randomized design. The weaning ages considered as treatments across the genotypes were 28 (T28), 42 (T42) and 56 (T56) days, respectively. Data from 67 kits NZ (19), CH (15), NZ×CH (17) and CH×NZ (16) were used for the study. Measurements taken from each genotype for 7 weeks after each weaning age include body weight (BW), body weight gain (BWG), feed efficiency (FE) and survival rate (%). The analysis of variance showed that there were significant differences ($P < 0.05$) among the different weaning ages on the growth parameters. Kits weaned at day 28 had significantly ($P < 0.05$) higher values for BW and BWG as well as better feed efficiency index followed by those weaned at 42 days and then 56 days. Estimates of BW both at the initial and final weeks were: NZ – 414, 809 (T28), 380, 766 (T42) and 234 ,447 (T56), CH – 443, 935 (T28), 436, 751 (T42) and 302, 500 (T56), NZ×CH – 432, 834 (T28), 394, 678 (T42) and 241, 417 (T56) and CH×NZ – 436, 917 (T28), 425, 717 (T42) and 261, 462 (T56). Significant ($P < 0.05$) differences were only observed for survival rate at the final week of measurement for the crossbred genotypes. Generally, however, the survival rates of kits of the different genotypes across all weaning ages were quite high. It ranged from 72.00 – 100 % (NZ), 75.00 – 100 % (CH), 87.70 – 100 % (NZ×CH) and 85.70 – 100 % (CH×NZ). Results of this study highly encouraged weaning at 28 days for optimum production efficiency in the study region. Weaning traits such as weights and survival/mortality rates are not affected greatly by additive gene action and thus can be improved by good management decisions among which is age at which rabbits are weaned.

Keywords: age, genotype, growth traits, Rabbit, survival rate, weaning.

INTRODUCTION

The growth and development of animals as well as their survival depend greatly on the genotype and management practices adopted during the production cycle. Age at weaning is a management practice that influences an animal's growth, production and reproduction. Oshinowo *et al.,* (1993) reported that weaning traits such as weaning rate and weaning weight as well as weaning age influenced herd productivity in goat. Weaning age was also reported to have influenced growth performance and survival of guinea pigs (Fonteh *et al.,* 2005).

In the domestic rabbit, Afifi and Emara (1988) and McNitt and Lukefahr (1996) identified weaning age among other factors as influencing post-weaning growth performance of rabbits. The economics of livestock production actually depends on post-weaning growth performance of young animals as this affects the rate of attainment of market weight.

Xiccato *et al.,* (2003) also noted that weaning age affected growth performance, body composition and caecal fermentation. In their experiment, the authors also found that weaning age influenced body energy balance of weaned kits. Xiccato *et al.,* (2000) and Trocina *et al.,* (2001) in their respective studies compared kits weaned at different ages (21, 25, 28 and 32 days). The authors observed that kits weaned at 21 and 25 days of age had lower weight gain than their counterparts weaned at 28 and 32 days. Studies relating the age of weaning to growth performance and survival of kits are very minimal in literature, particularly in this study region.

Hoon *et al.,* (2010) stated that weaning is normally a stressful period in the life of young animals and is often characterized by a decrease in weight gain, weight loss, and total cease in growth and in some cases death. However, they pointed out that the level or degree of this response known as weaning shock depends on age and body weight of young animals as well as the feeding regime before weaning. From the above statement, it is obviously true that age at weaning affects not only growth performance but also the rate of survival of rabbit kits.

In Nigeria, indiscriminant weaning ages is common among farmers and researchers. This practice influences production output adversely. Therefore, streamlined investigation is necessary to help determine the optimum age at which rabbit genotypes could be weaned for increased productivity. This would find useful application in selection programmed for optimum genetic performance.

The objective of this study was to ascertain the optimum age for weaning rabbit genotypes for efficient growth and survival in the study region.

MATERIALS AND METHODS

Experimental site

The study took place at the Rabbi try Unit of Michael Okpara University of Agriculture, Umudike Teaching and Research farm. Umudike is located on 05° 29' N and longitude 07° 33' E and at approximately 122 m above sea level. It has minimum and maximum daily temperature ranges of 20 - 26°C and 27 - 36°C, respectively with relative humidity of 57 – 91% and annual rainfall of 2177 mm.

Experimental animals and their management

Four rabbit genotypes were considered: New Zealand White (NZ), Chinchilla (CH), NZ×CH and the reciprocal (CH×NZ). Sixteen breeding rabbits comprising of 12 does and 4 bucks were used to generate progeny for this study. Does were flushed for 2 weeks before mating. Mating was done in the morning hours by introducing the females into the buck's pen. Mating ratio was 1 buck: 3 does. Abdominal palpation was done 14 days *post coitus*. Pregnant does were moved to separate hutches while non-pregnant ones were left with the bucks until pregnancy occurred. A total of 67 kits survived and were used for the study. All routine management operations and medications were duly observed. Fresh clean water and feed were given *ad libitum* all through the experimental period. The feed composed of a concentrate ration of 18 % CP and 2700 Kcal/kgME supplemented with *Panicum maximum* and *Centrosema pubescens*. The animals were reared in individual hutches in row cages made of metal and wire guaze.

Experimental Treatment and Data Collection

Three weaning ages were adopted as treatments:
T28 = weaning at 28 days of age (4 weeks)
T42 = weaning at 42 days of age (6 weeks)
T56 = weaning at 56 days of age (8 weeks)
Data were collected on body weight (g), body weight gain (g), feed conversion ratio and survival rate (%) from each genotype. The measurements lasted for 8 weeks from weaning.

Experimental Design and Statistical Analysis

The experimental was a completely randomized design (CRD) with age at weaning as factor of interest. The statistical model used is as follows:
$Y_{ij} = \mu + T_i + E_{ij}$
Where,
Y_{ij} = parameter of interest
μ = overall mean
T_i = mean effect of the i^{th} age at weaning (i = 1 – 3)
E_{ij} = random error [iind(0, δ^2)]

Data collected were subjected to analysis of variance (ANOVA) using SPSS (1999) analytical package. Significant means were separated with Duncan's New Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

For ease of presentation, only results of initial and final weeks of measurement were presented for all the traits studied.

Effect of Weaning Age on Growth Performance of Kits

The analysis of variance indicated significant differences ($P < 0.05$) among the weaning ages for the growth parameters measured in the different genotypes. Means of the growth performance traits at the different weaning ages for NZ×NZ, CH×CH, NZ×CH and CH×NZ are as shown in Tables 1, 2, 3 and 4, respectively.

Table 1: Effect of weaning ages on post-weaning growth performance of NZ×NZ genotypes at initial and final weeks of age

Week	Parameter	Weaning Ages		
		T28	T42	T56
Initial	BW (g)	414.00 ± 27.31^a	380.83 ± 11.29^a	234.25 ± 8.52^b
	BWG (g)	44.00 ± 5.79^a	28.75 ± 4.27^b	22.50 ± 1.71^b
	FE	0.15 ± 0.01^a	0.28 ± 0.04^b	0.31 ± 0.04^b
Final	BW (g)	809.00 ± 4.58^a	766.00 ± 16.31^a	447.50 ± 18.87^b
	BWG (g)	90.00 ± 1.58^a	64.10 ± 13.07^a	11.25 ± 4.27^b
	FE	0.04 ± 0.02^a	0.25 ± 0.01^b	0.35 ± 0.01^c

$^{a-c}$ Means with different superscripts within the same row are significantly different ($P < 0.05$)
BW = body weight, BWG = body weight gain, FE = feed efficiency, T28 = weaning at 28 days, T42 = weaning at 42 days, T56 = weaning at 56 days, NZ = New Zealand White.

Kit of the four genotypes weaned at 28 days recorded significantly (P < 0.05) higher body weight body weight gain and better feed efficiency ratio followed by those of T42 and while T56 kits had the lowest values.

Table 2: Effect of weaning ages on post-weaning growth performance of CH×CH genotypes at initial and final weeks of age

Week	Parameter	Weaning Ages		
		T28	T42	T56
Initial	BW (g)	443.33 ± 18.01[a]	436.25 ± 13.48[a]	302.00 ± 28.53[b]
	BWG (g)	37.50 ± 2.81[a]	32.00 ± 5.83[a]	27.50 ± 2.31[b]
	FE	0.22 ± 0.02[a]	0.24 ± 0.05[a]	0.37 ± 2.81[b]
Final	BW (g)	935.50 ± 20.18[a]	751.00 ± 10.54[b]	500.00 ± 24.90[c]
	BWG (g)	60.00 ± 15.60[a]	55.37 ± 15.96[b]	35.00 ± 4.36[c]
	FE	0.06 ± 0.12[a]	0.26 ± 9.18[b]	0.31 ± 0.05[c]

[a-c] Means with different superscripts within the same row are significantly different (P < 0.05)
BW = body weight, BWG = body weight gain, FE = feed efficiency, T28 = weaning at 28 days, T42 = weaning at 42 days, T56 = weaning at 56 days, CH = Chinchilla

The result of this study is in agreement with the report of some researchers. In an experiment with rabbits weaned at 28 and 63 days, Marongiu *et al.*, (2006) obtained at 83 day of assessment significant (P < 0.05) higher live body weight (2167 g) and body weight gain (28.4 g) for the 28 day kits compared to 1837 g and 18.0 g, respectively of the 63 day weaned kits. They also reported a better (P < 0.05) feed conversion index for 28 day kits (3.979) as against the 63 day kits which had a value of 4.439.

Table 3: Effect of weaning ages on post-weaning growth performance of NZ×CH genotypes at initial and final weeks of age

Week	Parameter	Weaning Ages		
		T28	T42	T56
Initial	BW (g)	432.00 ± 19.30[a]	394.29 ± 14.93[a]	241.25 ± 4.27c
	BWG (g)	41.00 ± 4.00[a]	35.00 ± 2.04[a]	22.86 ± 2.86b
	FE	0.18 ± 0.02[a]	0.25 ± 0.02[b]	0.29 ± 0.02b
Final	BW (g)	834.00 ± 15.28[a]	678.30 ± 22.12[b]	417.50 ± 8.54[c]
	BWG (g)	137.00 ± 9.30[a]	80.80 ± 3.27[b]	46.20 ± 2.39[c]
	FE	0.06 ± 0.01[a]	0.33 ± 0.01[b]	0.51 ± 0.03[c]

[a-c] Means with different superscripts within the same row are significantly different (P < 0.05)
BW = body weight, BWG = body weight gain, FE = feed efficiency, T28 = weaning at 28 days, T42 = weaning at 42 days, T56 = weaning at 56 days, NZ = New Zealand White, CH = Chinchilla.

For carcass conformation score (using a 5 ± score evaluation scale), the 28 day kits were better in relation to the score for the 63 day weaned kits. Fortun-Lamothe *et al.,* (2002) observed that early weaning provided higher viability and fastest growth in rabbits. Early weaned rabbits had also been reported to compare favourably in post-weaning body weight (Chen *et al.,* 1978) and live weight (Túmova *et al.,* 2006) with those weaned at a later age. In a similar work but with guinea pig kids, Manjeli *et al.,* (1998) and Fonteh *et al.,* (2005) independently reported significantly (P < 0.05) higher daily weight gain for kids weaned at 11 days of age in comparison with those weaned at 84 days. Henry *et al.,* (2012) observed that juvenile grass cutters (pups) weaned at 6 weeks (WA_6), which had longer suckling period did not show better post-weaning growth and carcass performance than those weaned at 4 weeks (WA_4) and 2 weeks (WA_2), respectively.

Table 4: Effect of weaning ages on post-weaning growth performance of CH×NZ genotypes at initial and final weeks of age

Week	Parameter	Weaning Ages		
		T28	T42	T56
Initial	BW (g)	436.00 ± 17.78[a]	425.71 ± 17.90[a]	261.25 ± 10.87[b]
	BWG (g)	50.00 ± 7.36[a]	40.83 ± 2.01[a]	27.86 ± 2.86[b]
	FE	0.22 ± 0.02[a]	0.26 ± 0.02[a]	0.42 ± 0.06[b]
Final	BW (g)	917.50 ± 15.85[a]	717.14 ± 6.16[b]	462.50 ± 8.54[c]
	BWG (g)	95.00 ± 8.27[a]	75.00 ± 2.89[b]	47.50 ± 3.23[c]
	FE	0.03 ± 0.02[a]	0.13 ± 0.01[b]	0.33 ± 0.24[c]

[a-c] Means with different superscripts within the same row are significantly different (P < 0.05)
BW = body weight, BWG = body weight gain, FE = feed efficiency, T28 = weaning at 28 days, T42 = weaning at 42 days, T56 = weaning at 56 days, NZ = New Zealand White, CH = Chinchilla.

The significant higher post-weaning body weight and body weight gain observed in this study for the T28 kits could possibly be attributed to high feed intake of the kits, although this parameter is not presented in our work and efficient utilization of the much consumed feed. Gallois *et al.,* (2003, 2004) demonstrated that feed consumption was significantly higher for early weaned rabbits in comparison to those weaned at 35 days of age. Piattoni *et al.,* (1999) stated that weaning at 18 days of age caused a rapid increase in feed consumption of the young rabbits after 1 – 2 days of withdrawal. Feed efficiency explains the difference in body weights and body weight gains resulting from feed intake. According to Fonteh *et al.,* (2005) early weaned guinea pig kids overcame weaning stress and developed the capacity to efficiently handle solid and fibrous feed earlier in life than the late-weaned ones and that this gave them an initial advantage in feed conversion efficiency which was maintained throughout the growth period. Again, they stated that the physiological changes that took place with early weaning might have also exposed the early-weaned kits to a longer period of compensatory growth than those weaned late. Similar reasons could be adduced for observations made in this study using rabbits.

Effect of Weaning Age on Post-Weaning Survival Rate of Kits

The post-weaning survival rates (%) at both the initial and final weeks of measurement of the different rabbit genotypes based on the weaning ages studied is given in Table 5. Generally, the post-weaning survival rates of the different genotypes were high across all weaning ages. They range from 93 – 100 %, 83.4 – 100 % and 75 – 100 % for kits weaned at 28, 42 and 56 days, respectively. No significant (P > 0.05) differences were observed among the weaning ages in all the genotypes at the initial week. Trocina *et al.,* (2001) and Xicatto *et al.,* (2003) recorded no mormatility of rabbit kits among the different weaning ages studied.

Henry *et al.,* (2012) observed similarity in survival of juvenile grasscutter pups weaned at 2, 4 and 6 weeks respectively by recording no mortality among pups of the different weaning ages. However, at final week significant (P < 0.05) differences existed among the weaning ages for NZ×CH and CH×NZ genotypes. Here, kits of T28 had significantly (P < 0.05) higher rates of survival – 100 %, 85.7 % and 90.0 % (NZ×CH) and 100 %, 95.2 % and 87.7 % (CH×NZ) for T28, T42 and T56, respectively. From our result, even where differences existed (numerically or statistically), T28 kits exhibited higher survival rates followed by T42 kits while the lowly survived were those of T56 kits. Fonteh *et al.,* (2005) reported highest mean survival rate with 21 day (87.49 %) weaned guinea pig kids which was closely followed by those weaned at days 16 (83.33 %) and 11 (82.43 %) while 84 day weaned kids recorded the lowest value (62.64 %). However, when average of early (11 and 16) and late (21 and 84) days were compared, the authors observed a difference of 15.63 % in favour of early weaning. These results clearly indicated the increased ability of early weaned kits to easily overcome shock and survive the extra-maternal environment after weaning irrespective of regions. The result of our study is in corroboration with the fact that survival/mortality rates are not greatly influenced by additive gene action but by management decisions.

Table 5: Influence of weaning age on post-weaning survival rates of the different rabbit genotypes at initial and final weeks

Genotype	Weaning age	Survival rate (%)	
		Initial	Final
NZ×NZ	T28	100.00	97.40
	T42	100.00	83.40
	T56	100.00	72.00
CH×CH	T28	100.00	93.00
	T42	98.00	83.40
	T56	96.00	75.00
NZ×CH	T28	100.00	100.00[a]
	T42	100.00	95.20[a]
	T56	100.00	87.70[b]
CH×NZ	T28	100.00	100.00[a]
	T42	95.20	90.00[b]
	T56	97.70	85.70[b]

[a-b] Means with different superscripts within the same row are significantly different ($P < 0.05$)
T28 = weaning at 28 days, T42 = weaning at 42 days, T56 = weaning at 56 days, NZ = New Zealand White, CH = Chinchilla.

CONCLUSION

The result of this study indicated that kits weaned at 28 days of age had better post-weaning growth performance in terms of body weight, body weight gain and feed efficiency followed by those weaned at 42 and 56 days of age, respectively. Although the survival rates of kids of all the genotypes studied were very high, yet kids weaned at T28 had higher survival which was closely followed by T42 and then T56. It therefore suggests that late weaning apart from being inconveniencing to the farm economy, will not improve rabbit production better than early weaning and thus should be avoided. Apart from lowering the intensive management of the rabbits through shorter rearing period, weaning of kids at 28 day of age will optimize production efficiency thereby improving animal welfare which is of paramount interest to several consumers of nowadays.

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