World Rabbit 2016 Congress
Qingdao, China

PROCEEDINGS OF THE 11th WORLD RABBIT CONGRESS

Qingdao (China) - June 15-18, 2016

ISSN 2308-1910

Session

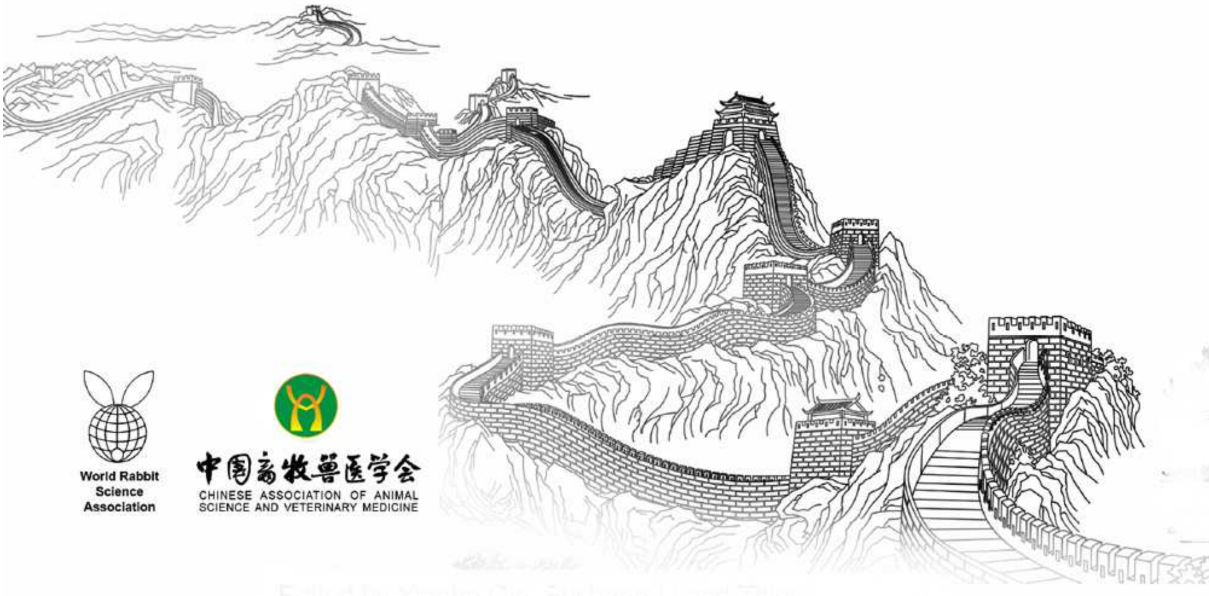
Breeding and Genetics

Oseni S.O., Ajayi B.A., Popoola M.A.

PERFORMANCE INDICES OF NEW ZEALAND WHITE DOES IN SOUTH-WESTERN NIGERIA.

Full text of the communication

How to cite this paper :
Oseni S.O., Ajayi B.A., Popoola M.A., 2016 - Performance indices of New Zealand white does in south-western Nigeria *Proceedings 11th World Rabbit Congress - June 15-18, 2016 - Qingdao - China, 103-106*



World Rabbit Science Association

中国畜牧兽医学会
CHINESE ASSOCIATION OF ANIMAL SCIENCE AND VETERINARY MEDICINE

PERFORMANCE INDICES OF NEW ZEALAND WHITE DOES IN SOUTH-WESTERN NIGERIA

Oseni S.O. [*1], Ajayi B.A. [2], and Popoola M. A[1].

[1]Department of Animal Sciences, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria
[2]Department of Animal Science, Landmark University, Omu-Aran, Kwara State, Nigeria
[*]Corresponding author: soseni2@yahoo.com

ABSTRACT

The New Zealand White (NZW) rabbit is renowned globally as a maternal breed for commercial meat rabbit production. While the performance indices for this breed are well established in temperate regions, severe fluctuations have been reported in the tropics. Our study was designed to establish the extent of fluctuations in the performance indices of NZW does under *on-station* conditions in Ile-Ife, southwest Nigeria. Accumulated data for NZW were used to estimate performance indices for the breed. Specific parameters estimated included prolificacy, weaning traits, average daily gain (ADG), kit survival rate (%), and annual doe productivity indices (number of kindlings and number of weaners/doe/year). Results showed that litter sizes at kindling and at weaning were 5.48 ± 0.64 and 3.25 ± 0.46 kits, respectively. Means for ADG and survival rate to 8 weeks of age were 8.55 ± 0.79 g/d and 58.42 ± 9.38 % respectively. Means for kindling intervals and total number of kindlings/doe/year were 76.76 ± 2.46 days and 4.85 ± 0.14 kindlings respectively. Fixed effects of parity and season and their two-way interaction were not significant for all litter traits and ADG (P>0.05). Doe productivity indices ranged from 10 to 35.9 weaners/doe/year, with an overall mean of 16.58 ± 1.10 weaners/doe/year. These results showed severe proportionate decline (~ 45 to 50%) in the overall performance of NZW, stressing the need for management interventions that would promote adaptation of this breed and contribute to the sustainability of rabbit production in Nigeria.

Key words: New Zealand White, prolificacy, doe productivity indices, kindling interval, tropics

INTRODUCTION

The New Zealand white (NZW) rabbit has been described as a commercial meat rabbit breed that was listed as one of the most common imported breeds of rabbit introduced into many developing countries (Lukefahr and Cheeke, 1991b). In particular, the breed is renowned as a suitable dam breed on account of its excellent maternal and prolific traits. Fluctuations and severe depressions in the performance of this breed have been reported. For instance, while Liang (1996) reported litter size at kindling (LSK) of 7.50 kits, other researchers (Iraqi *et al*, 2008) reported LSK of 6.60 kits. In particular, Owen (1976) reported annual commercial-scale meat rabbit production goals of 60 offspring reared per doe (involving eight litters, with does' recording a mean kindling interval of 46 days). With each fryer weighing 2 Kg by 8 to10 weeks of age, this translates to 120 Kg of rabbit market fryers/doe/ annum, thereby show-casing the potentials of commercial meat rabbit breeds like the Californian and the NZW.

The reports above raise pertinent questions about the performance of NZW in the humid tropics. For instance, to what extent are such high performances in temperate regions replicated under hot and humid tropical conditions? In particular, what is the proportionate decline in performance of NZW under the hot and humid conditions of Ile-Ife, south-western Nigeria? Our study examined accumulated records of NZW rabbits kept under *on station* conditions to address these questions.

MATERIALS AND METHODS

Animals and experimental design

The study used accumulated rabbit data from the Rabbit Unit, Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife, Nigeria. These records were derived from 48 breeding does and 10 bucks maintained at the Unit for a period of two years, from 2008 to 2010. The initial foundation stocks of New Zealand White were sourced from ROA Farms, Ibadan, Nigeria. These rabbit stocks were maintained as a rabbit colony across several generations as part of a research project funded by the International Foundation for Science (IFS), Sweden. Detailed procedure for this study has been described in Oseni and Ajayi (2010). In all, the dataset covered two years, across 7-8 parities per doe and involved a total of 331 records.

Animal Care and Management and Routine Data Collection

The animals were housed in cages made of wood and galvanized chicken wire mesh with each hutch measuring 76 × 62 × 42 cm and raised with wooden stands 90 cm high from concrete floor. The pen house was covered with chicken wire mesh at the sides and planks at one end, and a store for feed at the other end, and roofed with asbestos sheets. Two clay pots for feed and water were placed in each hutch. Animals were fed concentrates (18% Crude protein) in addition to forages of *Asipilia africana* and *Tridax procumbens.* Water was made available always.

A summary of the records included number of matings to conception, gestation length, and live litter size at kindling and subsequently at weekly intervals till weaning at 5 weeks and thereafter, up to 8 weeks of age. In addition, records of litter weights, weekly gains and survival rates across the same intervals were taken consistently across parities and seasons.

Statistical Analysis

Data were analysed using the General Linear Model Procedure of SAS® (1998). The model included the fixed effect of doe parity and season of kindling and two-way interaction, with prolificacy, litter traits, at kindling, weaning and week 8, survival rates and average daily gain to week 8 as response variables. Doe productivity indices were calculated as number of kindlings/doe/year (= 365/kindling interval) and number of weaners/doe/year (=number of kindlings/doe/year × mean litter size at weaning)

RESULTS AND DISCUSSION

Table 1 shows the least squares means and standard errors of live litter sizes at kindling (LSK) and at weaning (LSW), average daily gain and survival rate from kindling through week 8. Means for LSK and LSW were 5.70$\pm$0.25 and 3.59$\pm$0.21 kits, respectively. The mean of LSK and LSW were low when compared to LSK and LSW means of 6.74 kits and 5.23 weaners reported by Iraqi *et al*. (2008). Parity (and season of kindling, and their two-way interactions) had no significant effect on prolificacy and litter traits at kindling and at weaning, including survival rates and ADG (P>0.05). Das and Yadav (2007) reported that LSK was significantly higher in the 3rd parity (e.g. 6.80) when compared with means of 6.08 for 1st and 2nd parities, in contrast to the findings of our study. While prolificacy and litter traits are known to improve with doe age and parity, this was not evident from our study.

The trends for kit survival rates post-kindling (%) and ADG are shown in Figures 1a and 1b respectively. For kit survival rates per litter, the trend showed a steep loss of kits from kindling through the first 4 weeks of age, where almost 32% of the kits were lost (range 0 to 84% survival rates). After the 4th week and through weaning at the 5th week and subsequently, up to the 8th week, kit survival rates were higher (overall mean = 91.32$\pm$6.24%), compared with survival rates from kindling to the 4th week of age of the litter (overall mean = 64.61$\pm$8.89%).

Average daily gain showed a rising trend from kindling through the 8th week of age. While pre-weaning ADG ranged from 3.97 to 18.84g/day, with an overall mean of 7.61$\pm$0.46g/day, post-weaning ADG showed improved performance with a range of 5.23 to 21.81g/day and an overall mean of 10.13$\pm$1.04

g/day. These values for ADG are low when compared to ADG range of 26.3 to 40.3g/day and 21.8 to 28.6 g/day for NZW kits as reported by Linga and Lukefahr (2000) and Nguyen *et al*. (2013) respectively.

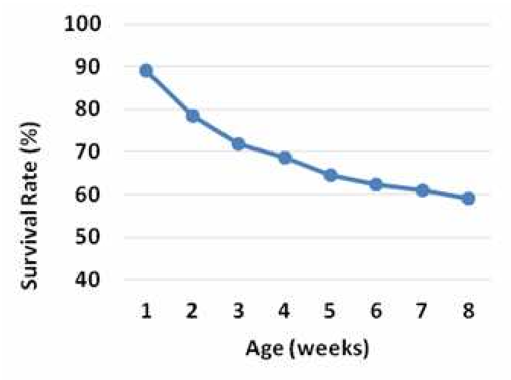


Figure 1a : Kit survival (%) from kindling to 8th week of age for New Zealand White rabbits

Figure 1b: Average daily gain of kits from kindling to 8th week of age for New Zealand White rabbits

Means (and ranges) for kindling interval (KI, days), number of kindlings per doe per annum (nKindling) and annual doe productivity (ADP) were 76.76±2.39 (59 to 99 days), 4.85±0.14 (3.69 to 5.98 kindlings/doe/year) and 16.58±1.10 (10 to 35.90 weaners/doe/year) respectively (Table 2). Mean KI were long and nkindlings per doe per year were low when compared to the near biological limit reported by Cheeke (1976, cited by Lukefahr and Cheeke, 1991a) that indicated 8 kindlings per doe per year, with 7.5 weaners/litter to make a total of 60 weaners/doe/annum. The same authors however, summarized reports from less developed countries as follows: 4-5 litters/doe/annum, live litter size at birth of 5.96 kits per litter and 25.2 total weaners/doe/annum. The authors attributed such differences in performances to sub-optimal planes of nutrition, breeding, health, housing and management.

Table 1: Means (±SE) of litter traits, average daily gain, kit survival and doe productivity for New Zealand White does

Trait	Parity 1	Parity 2	Parity 3	Overall Mean
LSK	5.51±0.57	5.40±0.43	5.53±0.87	5.48±0.64
LS_Wk5	3.47±0.43	3.11±0.31	3.18±0.55	3.25±0.46
LS_Wk8	3.20±0.40	2. 60±0.29	2.84±0.49	2.88±0.41
Surv_wk5(%)	64.48±8.18	62.37±6.36	63.50±10.01	64.61±8.99
Surv_wk8 (%)	59.16±7.82	53.32±6.07	57.10±10.03	58.42±9.38
Surv_K_W (%)	64.48±8.18	62.37±6.36	63.50±10.01	64.61±8.89
Surv_W_Wk8 (%)	90.10±4.52	87.09±6.09	92.279±6.13	91.32±6.24
Adg_wk5 (%)	5.94±1.14	8.41±0.91	8.57±1.48	7.61±1.06
Adg_wk8 (%)	7.97±1.02	9.04±0.82	8.81±1.33	8.55±1.09
Adg_K_W (g/d)	5.94±1.14	8.41±0.91	8.57±1.48	7.61+1.09
Adg_W_Wk8 (g/d)	11.35+2.71	10.08+2.17	9.19+3.52	10.13+2.91

LSK = Litter size at kindling; LS_Wk5,8 = Litter sizes at weeks 5 or 8; Surv_wk5,8 = Survival rate from kindling to weeks 5 and 8 post-kindling; Surv_K_W=survival from kindling to weaning at week 5; Surv_W_Wk8 = survival from weaning to week 8; Adg_wk5,8 = average daily gain at weeks 5 and 8 post-kindling; Adg_K_W = ADG from kindling to weaning at week5; Adg_W_Wk8 = ADG from weaning to week 8. All means showed no significant difference (P>0.05)

Overall, when compared to Owen (1976, cited by Lukefahr and Cheeke, 1991a), the performance of NZW rabbits showed proportionate decline in performance for number of kindlings/doe/annum (~5 vs. 8 or ~ 40% decline). Similarly, number of weaners/doe/annum (~16 vs. 8 or ~75% decline).

Table 2: Means of Kindling interval, number of kindlings/doe/annum and doe productivity for NZW

Trait	Mean	SE	Minimum	Maximum
KI (days)	76.76	2.46	26.34	99.00
n_kindling	4.85	0.14	3.69	5.98
Doe_PI_WEANERS	16.58	1.13	10.11	35.90

KI= kindling interval; n_kindling = total number of kindlings per doe per annum; DOE_PI_WEANERS = doe productivity index

Reasons for this could be poor stock adaptation and sub-optimal levels of management. Lukefahr and Cheeke (1991b) noted that, while some decline in performance have been noted among imported commercial meat rabbit breeds, many have been reported to perform well as long as proper nutrition, housing and healthcare and general management are consistently practiced. In addition, Iraqi *et al*. (2008) suggested that traits related to doe body weight, litter size and weight at kindling could be improved by culling strategies of does due to the high repeatability estimates for doe body weight in particular. Since heritability (and by extension, repeatability) estimates for litter traits are low, multiple records are needed for decision. In particular, knowledge of genetic parameters in specific environments (e.g. humid tropical conditions under which our study was done) are needed for selection and culling decisions to be made

CONCLUSIONS

Accumulated records of NZW rabbits showed proportionate decline in performance with respect to prolificacy, litter survival, ADG and annual doe productivity indices. Possible strategies to improve performance are discussed. Authors agree that inferences drawn from this study may not necessarily reflect the overall performance of NZW, especially where management is excellent.

ACKNOWLEDGEMENTS

International Foundation for Science (IFS), Sweden (Grant B3871-1 to the first author) for the Rabbit Research Facility at the Teaching & Research Farm, Obafemi Awolowo University, Ile-Ife, Nigeria.

REFERENCES

Das S.K., Yadav B.P.S. 2007. Effect of mating system, parity and breed on the reproductive performances of broiler rabbits under the agro - climatic condition of Meghalaya. *Journal of Livestock Research And Rural Development, 19(2). Accessed at: http://www.lrrd.org/lrrd19/2/das19025.htm.*

Iraqi M. M. 2008. Estimation of heritability and repeatability for maternal and milk production traits in New Zealand White rabbits raised in hot climate conditions. *Livestock Research for Rural Development, 20 (8). Accessed at: http://www.lrrd.org/lrrd20/8/iraq20133.htm*

Liang Q. 1996. Evaluation of litter size traits. *In: Proc. 6th World Rabbit Congress, Toulouse, France, July 9-12, Vol. 2, 315-318*

Linga S.S., Lukefahr S. D. 2000. Feeding of alfalfa hay with molasses blocks or crumbles to growing rabbit fryers. *Livestock Research for Rural Development, 12 (4) Accessed at: http://www.lrrd.org/lrrd12/4/ling124.htm*

Lukefahr S.D., Cheeke P.R. 1991a. Rabbit project development strategies in subsistence farming systems. 1. Practical considerations. *World Animal Rev., 69, 26-35.*

Lukefahr S.D., Cheeke P.R. 1991b. Rabbit project development strategies in subsistence farming systems. 2. Research applications. *World Animal Rev., 69, 60-70.*

Nguyen Thi Duong Huyen., Nguyen Xuan Trach., Preston T. R . 2013. Effects of paddy rice on feed utilization and growth of New Zealand White rabbits fed basal diets of water spinach (*Ipomoea aquatica*) or sweet potato vines (*Ipomoea batatas. Livestock Research for Rural Development, 25 (6) : Accessed at: http://www.lrrd.org/lrrd25/6/huye25100.htm*

Oseni, S. O. and Ajayi, B. A. 2010. Descriptive characterization of a Nigerian heterogeneous rabbit population – Factors affecting litter traits. *World Rabbit Science, 18, 111-116.*

Owen J.E. 1976. Rabbit production in tropical developing countries: a review. *Trop. Sci., 18, 203-210.*SAS. 1998.

SAS/STAT User's Guide (Release 6.03). *SAS Inst. Inc., Cary NC, USA*

=================