

REPRODUCTIVE PERFORMANCE OF TWO BREEDS OF RABBIT DOES FED DIET CONTAINING ALGAL BIOMASS

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Abstract

This study was conducted to assess the effect of level of Algal biomass (DHA) on the reproductive performance of two breeds of rabbit does. A total of twenty-four mature female animals (12 chinchilla does and 12 harlequin) were involved. Six mature bucks were procured for the purpose of mating. Data collected were subjected to a 2*3 factorial analysis in a randomized block complete design. Results showed that weight of does at mating, gestation length and kit weaning weight in Harlequin does differed significantly ($p < 0.05$) to those of the Chinchilla breed, while the latter recorded higher ($p < 0.05$) conception rate. The conception rate, kit weaning weight and weight gain were influenced ($p < 0.05$) by the level of Algal biomass DHA. Highest conception rate was obtained in rabbit does fed 1.0% Algal DHA, while rabbit does fed 0.5% DHA recorded the highest values of kit weaning weight (683.7g) and weight gain (632.9g). It was concluded that breed and level of DHA affected the reproductive performance of rabbit does and that Chinchilla breed does fed 1.0% DHA give best production owing it to their high litter size at weaning.

Keywords: Breed, Chinchilla, Harlequin, Algal Biomass, Docosahexaenoic acid

Introduction

Supplementation of the maternal diet with polyunsaturated fatty acids, which include essential fatty acids (EFA) and particularly the long chain omega-3 fatty acid, Docosahexaenoic acid (DHA), has been a particular focus (Edwards *et al.*, 2003). DHA is one of the family members of omega-3 fatty acid that has a 22 carbon chain and six double bonds and is mostly found in seafood and fish oil supplements. The dietary source of DHA for livestock can either come from fishmeal, seafood or certain types of micro-algae. Recent reports suggested that litter sizes are improved upon supplementation with DHA especially during the mating period (Smit *et al.*, 2011), and also that its inclusion in the maternal diet supports a healthy pregnancy, and improves immunity and survivability of neonates as it is transmitted from the mother to the foetus during lactation. The effects of Algal biomass DHA on the reproductive performance of livestock have been the major focus in the past few years (Adeleye *et al.*, 2014). However, the optimum amount to be included in the maternal diet is still unknown and, until an adequate intake is discovered for each breed of animals, further investigation is necessary. Therefore, the present study determined the effect of docosahexaenoic acid (DHA) on reproductive performance of two breeds of rabbit does.

Materials and Methods

The experiment was carried out at the Rabbitry Unit of the Directorate of University Farms, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. A total of twelve Chinchilla does and twelve Harlequin does were used for this experiment. Six bucks were also procured for the purpose of mating. The animals were randomly assigned to six different treatments adhering strictly to a 2*3 factorial layout with breed and inclusion level of DHA as factors. Each treatment contained four replicates of individually-housed rabbit does. Two weeks before mating, does of each breed were allocated to three different diets containing (0%, 0.5% and 1.0%) levels of Algal Biomass (DHA) respectively. Kits produced were nursed by the does for six weeks before they were weaned. Data were collected on weight of the does at mating, gestation length, conception rate, litter size at birth, kit birth weight, litter weaning weight, kit weaning weight, litter size at weaning, kit weight gain and pre-weaning mortality. All data obtained were subjected to two-way analysis of variance in a 2*3 factorial arrangement using SAS, (1999). Significant differences between the dietary treatments were determined at the 5% confidence level, while Duncan's Multiple Range Test of the software package was used to separate the significant means.

Table 1: Ingredient composition (%) and calculated analysis of the experimental diets

Ingredients	Inclusion level % of Algal Biomass (DHA) (Chinchilla does and Harlequin does)		
	0.0	0.5	1.0
Maize	45	45	45
Soya bean meal	24.75	24.37	24
Fish meal (72%)	0.25	0.13	-
Algal Biomass	-	0.5	1.0
Rice husk	25	25	25
Salt (NaCl)	0.25	0.25	0.25
Oyster shell	1.5	1.5	1.5
Bone meal	3	3	3
Vitamin/mineral premix	0.25	0.25	0.25
Total	100	100	100
Calculated Analysis			
Crude protein (%)	15.84	15.65	15.47
Crude fibre (%)	12.51	12.46	12.46
Fat (%)	4.20	4.32	4.45
Ash (%)	7.57	7.50	7.50
Calcium (%)	2.17	2.15	2.14
Phosphorus (%)	0.8	0.8	0.8
Metabolizable energy (kcal/kg)	2602	2609	2616

Results and Discussion

The main effects of breed and inclusion level of Algal DHA on the reproductive performance of rabbit does are presented in Table 2. The weight at mating, gestation length and kit weaning weight were higher ($p < 0.05$) in Harlequin does compared to the Chinchilla does. Lazzaroni *et al.* (2012) reported that breed, as a factor, directly or indirectly influenced reproductive performance of rabbits. A higher ($p < 0.05$) conception rate was noticed in Chinchilla does compared to the Harlequin. The varying levels of DHA had significant ($p < 0.05$) effects on the conception rate, kit weaning weight and kit weight gain. Rabbit does fed the diet containing 1.0% Algal DHA had the highest conception rate. This affirmed the position of Zeron *et al.* (2001) that animals fed higher levels of omega-3 fatty acids got pregnant faster and experienced fewer metabolic disorders. However, rabbit does fed 0.5% DHA recorded the highest values of kit weaning weight and kit weight gain. The interaction between the breed and level of Algal biomass DHA on the reproductive performance of rabbit does (Table 3) affected all the performance indices measured except litter size at birth and kit birth weight. Harlequin rabbits fed 1.0% DHA had the highest gestation length compared to other groups. The higher ($p < 0.05$) mortality (%) recorded in Chinchilla does fed 0.5% DHA and Harlequin does fed 1.0% DHA could be an indication of poor mothering ability (Rodel *et al.*, 2009), genotype and pathological causes

(Szendro and Barna, 1984). Chinchilla rabbit does fed the diet containing 1.0% Algal DHA were better compared to their counterparts, as they recorded the lowest mortality rate (25%) and highest litter size at weaning (3.50). This could be an indication of efficient intake of DHA. However, the litter size at weaning (3.50) obtained for Chinchilla does fed diet containing 1.0% DHA in this study was similar to the (3.6) litter size at weaning recorded by Orunmuyi *et al.* (2006). In conclusion, the results of the present study indicated that the Chinchilla breed appears the most suitable breed as far as reproductive performance is concerned due to their high litter size at weaning and low mortality rate at 1.0% level of Algal DHA.

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Table 2 : Main effect of breeds and varying levels of Algal Biomass (DHA) on the reproductive performance of rabbit does

Parameters	Breeds			Level (%) of Algal DHA		
	Chinchilla	Harlequin	0	0.5	1.0	
Weight of does at mating (g)	1705.0±41.15 ^b	1906.6±57.20 ^a	1702.0±46.14	1822.5±57.35	1875.0±94.17	
Gestation length (days)	31.6±0.33 ^b	33.5±0.15 ^a	32.5±0.42	32.7±0.41	32.5±0.57	
Conception rate (%)	83.3±7.11 ^a	63.89±7.90 ^b	70.83±11.25 ^{ab}	62.50±8.18 ^b	87.50±8.18 ^a	
Litter size at birth	4.8±0.47	3.8±0.47	4.0±0.71	4.7±0.73	4.2±0.31	
Kit birth weight (g)	42.0±2.55	44.7±3.45	44.0±3.77	44.0±4.45	42.1±3.10	
Litter size at weaning	2.2±0.56	1.0±0.24	1.3±0.62	1.3±0.31	2.3±0.68	
Kit weaning weight (g)	525.8±31.02 ^b	630.8±18.32 ^a	516.8±28.16 ^b	683.7±11.38 ^a	534.2±30.25 ^b	
Kit weight gain (g)	477.7±30.47	493.6±68.45	334.0±76.45 ^c	632.9±11.59 ^a	490.1±29.92 ^b	
Mortality (%)	47.2±12.45	59.7±10.90	50.0±18.90	64.5±9.55	45.8±13.64	

a, b, c: Means in the same row not sharing common superscript are significantly different (p<0.05)

Table 3: Interactive effect of breeds and varying levels of Algal Biomass (DHA) on the reproductive performance of rabbit does

Parameters	Chinchilla			Harlequin		
	0	0.5	1.0	0	0.5	1.0
Weight of doe at mating (g)	1700.0±98.15 ^b	1745.00±89.49 ^b	1670.00±5.77 ^b	1740.00±5.77 ^b	1900.00±57.74 ^{ab}	2080.00±115 ^a
Gestation length (days)	31.5±0.29 ^{cd}	32.5±0.87 ^c	31.0±0.00 ^d	33.50±0.29 ^{ab}	33.00±0.00 ^{ab}	34.00±0.00 ^a
Litter size at weaning	2.0±1.15 ^{ab}	1.0±0.58 ^b	3.5±0.87 ^a	0.5±0.29 ^b	1.5±0.29 ^{ab}	1.0±0.58 ^b
Kit weaning weight (g)	443.8±2.18 ^c	655.0±1.23 ^a	478.5±44.98 ^c	590.0±11.43 ^b	712.5±7.22 ^a	590.0±13.17 ^b
Kit weight gain (g)	395.5±0.00 ^{bc}	602.5±0.20 ^{ab}	435.3±46.59 ^{bc}	272.5±157.33 ^c	663.4±3.10 ^a	575.0±0.00 ^{ab}
Mortality (%)	50.00±28.87 ^{bc}	66.67±19.25 ^a	25.00±14.43 ^c	50.00±28.87 ^{bc}	62.50±7.22 ^{ab}	66.67±19.25 ^a

a, b, c, d: Means in the same row not sharing common superscript are significantly different (p<0.05)