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USE OF GROWTH MODELS TO PREDICT THE BODY WEIGHT OF FUNAAB ALPHA (Fα) BROILER, ITS CROSSBREDS AND TWO OTHER EXOTIC BROILER CHICKENS AT EARLY STAGE OF GROWTH

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ABSTRACT

Body weight is one of the most important phenotypic parameters in poultry production as heavy meat birds attract good market value compare to their light breed counterpart. Growth models can be used to determine the growth pattern of chicken at the early stage of growth in order to assist the poultry farmers during the rearing stage. A total of 300 Oba Marshall, 300 Arbor Acre, 300 Fα broiler, 300 Fα X Ms, 300 Fα X AB, 300 Ms X Fα and 300 AB X Fα crossbred chicks of both sexes were used to evaluate variations in the body weight of Fα broiler, its crossbreds and two other exotic chickens using Gompertz and Von Bertalanffy growth models. Body weights of the chicks were taken on weekly basis using sensitive weighing balance till they attained 10 weeks of age. The two Non-Linear Models were fitted to the weight-age data from day old till 10 weeks of age for each bird using 'Doesn't Use Derivative method of SAS (2002) to estimate parameters of all the models in order to predict the weight of the birds at early stage. Results revealed that body weight was influenced ($P<0.05$) by genotype and sex. Arbor Acre chicken had the heaviest ($P<0.05$) body weight at ten weeks of age and Gompertz model had a better estimation with reasonable Coefficient of Determination (R^2). The study concluded that chickens with higher R^2 values has the potentials to grow faster and mature earlier than those with the lower R^2 values.

Keywords: Fα, Gompertz, Von Bertalanffy, Doesn't Use Derivative

INTRODUCTION

Poultry production has undergone an enormous expansion and development during the past half century throughout the country (Peters *et al*., 2002). Nigeria poultry keepers has made poultry business one of the most popular enterprise adopted by all those in the rural and urban setting (Idowu *et al*., 2005). Recently, a new breed of chicken called 'FUNAAB Alpha' chicken was developed at the Federal University of Agriculture, Abeokuta and approved by the Federal Government of Nigeria. This chicken is an improved Nigerian Indigenous breed of chicken that was generated through the continual and untiring efforts of scientists in the Department of Animal Breeding and Genetics, Federal University of Agriculture, Abeokuta (Udoh, 2014). The growth performance of the FUNAAB Alpha Broiler breed was compared with that of Arbor Acre and Marshall exotic Broiler breeds of chickens.

The attention of producers has been integrally glued to chicken with only minimal attention to any other poultry species (Monsi, 1994). The new regulations to satisfy consumer demands in terms of environmental and welfare priorities have necessitated new practices to raise other birds coupled with the selection of fast growing birds. These procedures may directly or indirectly affect overall production efficiencies in broiler breeds and justify the interest in novel approaches to satisfy consumers′ demand (Yang, 2006).

Knowledge of growth curves is important to all animal scientists who are concerned with the effects of their research and recommendations on lifetime production efficiency (Fitzhugh, 1976). Some Non-Linear models are used to describe lifetime relationships between individual's inherent impulse to grow and mature in all body parts. This relationship for growing animals, called a smooth S-shaped curve, are obtained from Non-Linear models such as Brody, Von Bertalanffy, Gompertz, Richards or Logistic (Koops, 1986). These curves start at some fixed point and increase their growth rate up to an inflection point; after this point, the growth rate decreases to a final value (Ratkowsky, 1983).

The aim of every farmer is to minimize cost and maximize profit. In order to achieve this objective, there is need to keep healthy stock of chickens that are highly prolific in terms of meat or egg production depending on individual's choice. Hence, this study investigated the use of growth models to determine the growth pattern of birds at their early stage of growth to prevent poultry farmers from raising unproductive chickens.

MATERIALS AND METHODS

Study Location

The research was carried out at the Poultry Breeding Unit of the Federal University of Agriculture, Alabata, Abeokuta, Nigeria. Alabata (7'10°N and 3°2°E) is in Odeda Local Government Area of Ogun State, Nigeria. The area lies in the South-Western part of Nigeria and has a prevailing tropical climate with a mean annual rainfall of about 1037mm. The mean ambient temperature ranges from 28°C in December to

36°C in February with a yearly average of 34°C. Relative humidity ranges from 60% in January to 94% in August with a yearly average of about 82%. The vegetation represents an interphase between the tropical rainforest and the derived Savannah (Goggle Earth, 2018).

Experimental Birds and Management

A total of 300 Oba Marshall, 300 Arbor Acre, 300 Fα broilers, 300 Fα X Ms, 300 Fα X AB, 300 Ms X Fα and 300 AB X Fα crossbred chicks of both sexes were used. The exotic breeds were sourced from a commercial hatchery while the Fα broiler breed was hatched at the hatchery unit of PEARL (Programme for Emerging Agricultural Research Leaders) farms of the Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. All the chicks from the respective genotypes were tagged for identification purpose. The chicks were brooded for four weeks and other vaccinations and medications were also given to them during the study. The birds were raised on a dip litter system and fed at *ad-libitum* using a commercial feed (Top feed) for a period of 10 weeks at different phase of growth; starter phase (0-4 weeks) and finisher phase (5-10 weeks). The birds were also allowed to have free access to fresh and clean water throughout the period of experiment.

Mating design

(a) Line Mating: Arbor Acre (AB) x Arbor Acre (AB)
Marshall (Ms) x Marshall (Ms)
FUNAAB Alpha (Fα) x FUNAAB Alpha (Fα)

(b) Cross Mating: Arbor Acre (AB) x FUNAAB Alpha (Fα)
Marshall (Ms) x FUNAAB Alpha (Fα)
FUNAAB Alpha (Fα) x Marshall (Ms)
FUNAAB Alpha (Fα) x Arbor Acre (AB)

Data Collection

Body Weight

Body weight of the chicks was taken on weekly basis using sensitive weighing balance until they reached 10 weeks of age. This was measured with the use of sensitive balance with a maximum capacity of 5kg.

Statistical Analysis

Analyses of growth data

Data obtained were analyzed using the General Linear Model (SAS, version 9.0). The model is as specified below:

$Yijk = \mu + Bi + Fj + (BF)ij + \Sigma ijk$

Where:

Y_{ijk} = Individual observation
μ = Overall mean for the trait of interest
B_i = Fixed effect of the ith genotype (i=1-3)
F_j = Fixed effect of the jth sex (j=1-2)
$(BF)_{ij}$ = Interaction effect of the ith genotype and jth sex
Σ_{ijkl} = Random error associated with each record

Means were separated using Duncan's Multiple Range Test (Gomez and Gomez, 1984).

Growth model

Two Non-Linear Models were fitted to the weight-age data from day old till 10 weeks of age for each bird using 'Doesn't Use Derivative' (DUD) method of SAS (2002) to estimate parameters of all the models to predict the weight of the birds at maturity.

The models that were used for this purpose are shown below:

Gompertz: $$W_t = A\exp\left(-Be^{-kt}\right)$$

Von Bertalanffy: $$W_t = A\left(1 - Be^{-kt}\right)^3$$

Where the parameters:

- W_t is the observed body weight of the birds at age t expressed in weeks.
- A is the asymptotic limit of the weight when age (t) approaches infinity. This doesn't mean that A is the heaviest body weight attained by the chickens, but it rather indicates the average weight of a mature bird, independent of short-term fluctuation in weight due to temporary environmental effects.
- B is the proportion of the asymptotic mature weight to be gained after birth, established by initial values of W and t, it is also a constant of integration.
- k is a function of the ratio of maximum growth rate to mature weight and it is commonly called maturing rate. Large k values indicate early maturing animals,

- e is Napier's base for natural logarithms (Brown *et al*., 1976).

Assessment of goodness of fit

The goodness of fit of each model was assessed using higher Coefficient of Determination, lower Akaike's Information Criteria, Mean Square Error and Root Mean Square Error. Also, the goodness of fit parameters was estimated as: Coefficient of Determination, Mean Square Error and Root Mean Square Error. All these were used to compare the accuracy of prediction. The mathematical representation of these parameters are shown below:

$$\text{Akaike Information Criteria (AIC)} = \text{n}.\ln\left(\frac{ss\ error}{n}\right) + 2K \qquad (Akaike, 1974)$$

$$\text{Co efficient of Determination } (R^2) = 1 - \left(\frac{ss\ error}{SS\ total}\right)$$

$$\text{Mean Square Error (MSE)} = \frac{ss\ error}{n-K}$$

$$\text{Root Mean Square Error (RMSE)} = \sqrt{\frac{ss\ error}{n}}$$

RESULT AND DISCUSSION

Effect of genotype on the body weight (g) of Fα broiler, its crossbreds and the two exotic chickens

Genotype significantly (P< 0.05) affected the body weight of all the chickens used for the study across all the ages (Table 1). Out of the two exotic breeds, AB X AB chicken had a higher value of (2693.50±6.40g) for body weight compared to the Oba Marshall broiler that had the value of (2262.53±12.64g) for body weight. AB X Fα line had the mean value of (1682.53±.7.61g) while Fα x MS showed a value of (1429.55±8.40g) among the crossbreds. Fα X Fα a purebred of an Improved Indigenous Chicken breed displayed the value of (1680.53±6.41g) at 10 weeks of age.

Effect of sex on the body weight (g) of Fα broiler, its crossbreds and the two exotic chickens

Sex significantly (P<0.05) affected the body weight of the chicken used (Tables 2). The male line displayed higher mean value compared to their female counterpart.

Effect of chicken genotype by sex interaction on the body weight (g) of Fα broiler, its crossbreds and the two exotic chickens

Interaction between Genotype and Sex significantly (P < 0.05) affected the body weight (g) of Fα broilers, its crossbreds and the other two exotic chickens (Table 3). The male line of all the genotypes used had higher mean values for body weight than their female counterpart throughout the period of the study.

Growth models for body weight of Fα, its crossbreds and two other exotic chickens at 10 weeks of age

The Mean Square Error, Root Mean Square Error, Parameter Estimates, Coefficient of Determination and Akaike Information Criteria of Non-Linear functions fitted to body weightage of the various lines were used for the study and result for the predicted body weight (g) of the birds at ten (10) weeks of age are presented in tables (4) and (5).

The parameter estimate A, is an estimation of the mature weight of the birds and it appeared to be closer to the observed body weight for some of the lines particularly for Gompertz model while the Parameter Estimate (A) was more than the observed weight for Von Bertalanffy function. The B estimate for Gompertz function ranged from 3.30 to 4.03 while Von Bertalanffy function ranged from 0.71 to 2.84 for the Fα broiler and the two exotic chickens. Also, the values of B estimate for the Fα crossbreds are 1.44 to 3.92 for Gompertz and 0.57 to 2.71 for Von Bertalanffy models.

Gompertz model gave the predicted values for body weights of AB X AB and Fα X Fα which was seen to be the highest and lowest among the straight cross as 3824.7g and 1320.5g respectively and Von Bertalanffy model gave the predicted values for body weights of AB X AB chicken as 3692.5g and that of Fα X Fα chicken as 2362.3g respectively. Von Bertalanffy over-estimated the body weight of both sexes for AB X Fα, Fα X MS, AB X AB and Fα X Fα while it under estimated the body weight of the female lines of MS X Fα.

The two exotic lines (AB X AB and MS X MS) chickens had the highest value of Coefficient of Determination (R^2) and that is 90% and 95% respectively while the crossbreds and the Fα birds maintained an average value of 50% to 65%. The Akaike Information Criteria (AIC) values, Mean Square Error (MSE and the Root Mean Square Errors for the male chickens are higher than the values of the female chickens across the various lines. Gompertz function gave the growth curve that is closer to the observed body weight in all the genotypes used while Von Bertalanffy over-estimated the body weight of most of the genotypes.

Table 1. Effect of genotype on the body weight (g) of Fα broiler, its crossbreds and the two exotic chickens (LSM±SE)

Genotype		MS X MS	AB X Fα	MS X Fα	Fα X MS	AB X AB	Fα X Fα	Fα X AB
Week	**N**	300	300	300	300	300	300	300
2		403.53 ± 1.20^{b}	348.20 ± 2.73^{c}	311.46 ± 2.60^{d}	310.81 ± 1.84^{d}	468.10 ± 2.92^{a}	349.87 ± 1.30^{c}	278.24 ± 2.60^{e}
4		784.74 ± 3.76^{b}	647.46 ± 3.14^{c}	580.15 ± 3.31^{d}	582.53 ± 2.70^{d}	887.53 ± 4.20^{a}	648.72 ± 2.40^{c}	484.57 ± 3.43^{e}
6		1268.59 ± 5.83^{b}	922.83 ± 3.27^{c}	879.53 ± 4.23^{d}	877.59 ± 4.56^{d}	1378.51 ± 4.64^{a}	921.59 ± 4.52^{c}	720.53 ± 3.20^{e}
8		1723.83 ± 9.20^{b}	1422.59 ± 4.37^{c}	1198.32 ± 6.56^{d}	1196.33 ± 5.26^{d}	1989.64 ± 5.30^{a}	1420.43 ±5.40^{c}	1097.53 ±5.78^{e}
10		2262.53 ± 10.70^{b}	1682.53 ± 7.61^{c}	1428..53 ± 7.20^{d}	1429.55 ± 8.40^{d}	2693.50 ± 6.40^{a}	1680.53±6.41^{c}	1364.75±7.27^{e}

AB X AB- Arbo Arcre x Arbor Arcre,
Fα x Fα - FUNAAB Alpha x FUNAAB Alpha.
MS X Fα Marshal x FUNAAB Alpha
AB X Fα Arbor Arcre x FUNAAB Alpha
Fα X AB FUNAAB Alpha x Arbor Arcre
N No of birds per line

Table 2. Effect of sex on the body weight (g) of Fα broiler, its crossbreds and the two exotic chickens (LSM±SE)

Sex	**N**	**Age (Weeks)** 2	4	6	8	10
Male	350	409.24±2.70^{a}	689.03±4.17^{a}	990.26±6.08^{a}	1339.13±8.27^{a}	1762.17±10.19^{a}
Female	1750	260.36±1.28^{b}	464.07±2.36^{b}	774.06±4.06^{b}	963.30 ±6.29^{b}	1309.20±8.47^{b}

*mean within a colum with different superscripts are significantly different (P<0.05)

Table 3. Effect of chicken genotype by sex interaction on the body weight (g) of FUNAAB Alpha, its crossbreds and the two exotic chickens (LSM±SE)

		Age (Weeks)				
Genotype	**Sex**	**2**	**4**	**6**	**8**	**10**
MS X MS						
	Male	394.53±3.20[a]	690.19±6.24[a]	1168.59±9.03[a]	1639.83±12.37[a]	2002.53±15.70[a]
	Female	256.39±4.10[b]	600.56±5.26[b]	924.10±7.34[b]	1213.50±9.71[b]	1736.23±12.76[b]
AB X Fα						
	Male	300.01±1.64[a]	592.36±2.11[a]	836.94±2.36[a]	1302.29±2.37[a]	1519.57±2.67[a]
	Female	282.27±0.78[b]	454.17 2.16[b]	774.00±2.12[b]	1013.50 ±2.71[b]	1317.30±2.46[b]
MS X Fα						
	Male	313.00±0.71[a]	497.21 ± 0.19[a]	723.07 ± 1.35[a]	1083.24 ± 1.29[a]	1335.24 ± 1.35[a]
	Female	272.36 ± 0.70[b]	402.36 ± 0.16[b]	634.70 ± 1.37[b]	893.56 ± 1.71[b]	1127.13 ± 1.27[b]
Fα X MS						
	Male	319.42±0.34[a]	494.26 ± 1.69[a]	720.27 ± 1.93[a]	1085.63 ± 1.20[a]	1337.35 ± 1.70[a]
	Female	280.1 ± 0.72[b]	423.40 ± 1.16[b]	643.19 ± 1.42[b]	849.39 ± 1.48[b]	1220.33 ± 1.20[b]
AB X AB						
	Male	406.70±1.02[a]	802.03 ± 1.37[a]	1290.19 ± 1.64[a]	1802.24 ± 1.24[a]	2436.19 ± 1.21[a]
	Female	369.34±0.42[b]	708.35 ± 1.26[b]	1110.27 ± 1.37[b]	1528.45 ± 1.70[b]	1907.53 ± 1.49[b]
Fα X Fα						
	Male	326.07±0.30[a]	572.37 ± 0.42[a]	805.62 ± 0.50[a]	1319.00 ± 0.40[a]	1548.13 ± 0.41[a]
	Female	290.39±0.42[b]	480.09 ± 0.07[b]	750.25 ± 0.14[b]	990.04 ± 0.11[b]	1280.29 ± 0.20[b]
FαX AB	**Male**	240.30±0.60[a]	374.19 ± 0.65[a]	690.14 ± 0.14[a]	969.07 ± 0.32[a]	1283.29 ± 0.24[a]
	Female	209.17±0.97[b]	343.02 ± 0.24[b]	524.14 ± 0.37[b]	829.39 ± 0.48[b]	1037.13 ± 0.29[b]

Table 4: Predicted maturity weight (g) of the Fα broiler, its crossbreds and two other exotic chickens at 10 weeks of age using Gompertz and Von Bertalanffy models

GENOTYPE	SEX	MODEL	Observed	Parameter Estimate	B	K
MS X MS	**Male**	Gompertz		2650.3	3.30	1.31
	Female			2440.0	3.01	1.19
	Male	Von Bertallanffy	2262.53	3692.5	0.91	0.54
	Female			2523.6	0.71	0.26
AB X AB	**Male**	Gompertz		3824.7	3.70	1.49
				2260.9	3.53	1.25
	Female					
	Male	Von Bertallanffy	2693.50	3692.6	2.84	1.60
	Female			3946.0	1.98	1.35
Fα X Fα	**Male**	Gompertz		1320.5	3.92	0.13
	Female			1250.0	3.00	0.10
	Male	Von Bertallanffy	1680.53	2362.3	2.71	0.05
	Female			1890.4	0.71	0.04
MS X Fα	**Male**	Gompertz		1699.3	3.42	0.18
				1325.4	3.12	0.17
	Female					
	Male	Von Bertallanffy	1428.53	2003.7	0.74	0.12
	Female			1563.5	0.63	0.01
AB X Fα	**Male**	Gompertz		1850.5	1.49	0.08
	Female			1436.0	1.44	0.04
	Male	Von Bertallanffy	1682.53	3394.3	1.75	0.06
	Female			2106.5	1.00	0.04
Fα X MS	**Male**	Gompertz		1700.3	3.92	0.13
	Female			1429.4	3.00	0.11
	Male	Von Bertallanffy	1429.55	2362.3	2.71	0.05
	Female			1890.4	0.71	0.11
Fα x AB	**Male**	Gompertz		1680.0	3.60	0.27
	Female			1569.5	3.15	0.03
	Male	Von Bertallanffy	1364.75	2236.2	0.67	0.02
	Female			1735.0	0.57	0.93

Genotype / Week	MS X MS	AB X Fα	MS X Fα	Fα X MS	AB X AB	Fα X Fα	Fα X AB
N	300	300	300	300	300	300	300
2	402.53 ± 1.20^{b}	348.20 ± 2.73^{c}	311.46 ± 2.60^{d}	310.81 ± 1.84^{d}	468.10 ± 2.92^{a}	349.87 ± 1.30^{c}	278.24 ± 2.60^{e}
4	784.74 ± 3.76^{b}	$647.46, \pm 3.14^{c}$	580.15 ± 3.31^{d}	582.53 ± 2.70^{d}	887.53 ± 4.20^{a}	648.72 ± 2.40^{c}	484.57 ± 3.43^{e}
6	1268.59 ± 5.83^{b}	922.83 ± 3.27^{c}	879.53 ± 4.23^{d}	877.59 ± 4.56^{d}	1378.51 ± 4.64^{a}	921.59 ± 4.52^{c}	720.53 ± 3.20^{e}
8	1723.83 ± 9.20^{b}	1422.59 ± 4.37^{c}	1198.37 ± 6.56^{d}	1196.33 ± 5.26^{c}	1989.64 ± 5.30^{a}	1420.43 ± 5.40^{c}	1097.53 ± 5.78^{e}
10	2262.53 ± 10.70^{b}	1682.53 ± 7.61^{c}	1428.53 ± 7.20^{d}	1429.55 ± 8.40^{d}	2693.50 ± 6.40^{a}	1680.53 ± 6.41^{c}	1364.75 ± 7.27^{e}

*mean within a row with different superscripts are significantly different (P<0.05). *MS x MS - Marshall X Marshall,

Table 5: The goodness of fit for the Fα broiler, its crossbreds and two other exotic chickens at 10 weeks of age using Gompertz and Von Bertalanffy model

GENOTYPE	SEX	MODEL	R^2	AIC	MSE	RMSE
MS X MS	Male	Gompertz	0.90	1580.28	346089.8	580.91
	Female		0.73	1340.28	311028.9	560.25
	Male	Von Bertallanffy	0.56	1360.90	396808.4	780.40
	Female		0.49	1260.90	388076.2	760.00
AB X AB	Male	Gompertz	0.95	1625.75	365790.0	680.40
	Female		0.80	1593.47	300806.6	629.50
	Male	Von Bertallanffy	0.75	1485.27	408654.3	737.05
	Female		0.68	1379.20	328076.2	693.25
Fα X Fα	Male	Gompertz	0.57	1239.17	311569.2	405.80
	Female		0.50	1078.06	302218.6	400.95
	Male	Von Bertallanffy	0.50	1469.05	398095.7	490.35
	Female		0.49	1007.39	374178.4	450.25
MS X Fα	Male	Gompertz	0.59	1380.04	346123.7	505.08
	Female		0.48	1276.39	329809.5	510.29
	Male	Von Bertallanffy	0.50	1287.09	408654.3	658.00
	Female		0.46	1200.16	328076.2	557.19
AB X Fα	Male	Gompertz	0.50	1290.06	329019.5	502.70
	Female		0.45	1060.95	319000.8	490.25
	Male	Von Bertallanffy	0.47	1460.00	330025.5	638.40
	Female		0.40	1409.35	308019.7	590.60
Fα X MS	Male	Gompertz	0.58	1406.13	368569.2	569.36
	Female		0.50	1305.19	324218.6	540.03
	Male	Von Bertallanffy	0.48	1290.60	400095.7	670.80
	Female		0.42	1167.94	384178.4	620.07
Fα x AB	Male	Gompertz	0.68	1269.45	290805.3	602.50
	Female		0.56	1205.39	287906.0	505.30
	Male	Von Bertallanffy	0.53	1485.27	309859.4	645.39
	Female		0.49	1379.20	290570.5	585.45

Body weight of the Fα broilers, Fα crossbreds and the two exotic chickens were influenced by genotype. This is in agreement with the finding of Ibe (1993) who reported that body weight of an individual is used as a measure of growth in farm animals and often determined by its own rate of growth. The body weight of Fα broiler chicken was close to the body weight of Oba Marshall broiler chicken at 10 weeks of age. The superiority observed in the body weight of Arbor Acre broiler compare to the body weight of Oba Marshall chicken breed is in agreement with the report of (Razuki *et al*., 2011) who recorded significant differences on the effect of genotype and sex on the body weight of the breeds of chicken.

Higher body weight was observed in AB x Fα broiler chicken among the crossbreds while the lowest value for body weight was discovered in Fα X AB broiler chicken. This implies that the Arbor Acre male chicken was able to pass onto its progenies the genes for fast growth thereby exhibiting the positive effect of crossbreeding.

The male chickens used showed a remarkable and better body weight than their female counterparts at various ages. The sexual dimorphism observed in favor of the male chicken had been reported by several authors among which are (Adeleke, 2005; Ige *et al*., 2006; Adedeji *et al*., 2008; Fayeye *et al.*, 2006). It is evident from this study that the Fα broiler chicken possesses great potentials for genetic improvement through breeding programs and policies. This is in agreement with the findings of (Ajayi, 2010) which stated that low genetic potential of local chicken could be improved substantially through crossbreeding programs with the exotic chicken breeds.

Convergence of Iteractive solution for each of the model was determined with the use of

Doesn't Use Derivative (DUD). Convergence of Iteractive solution was not attained for the body weight of some of the lines when Von Bertalanffy model was used but Convergence was achieved for all the lines when Gompertz model was used. The lack of solution according to Ozoje *et al.* (2007) attributed the reason for lack of solution to either the Non-Convergence from the Iteractive procedure or large number of Iteractions needed.

Ozoje *et al*. (2007) further explained that the value of any growth function in the study of weight-age relationship depends upon the accuracy with which it describes the observed data. The A values of Von Bertalanffy model was too high and differed much from the observed value. The limited range in the magnitude of B according to Brown *et al.* (1976) is largely due to the magnitude and non-variability of the exponent.

The K estimate is normally referred to as the maturing rate and this varies for all the genotypes used for this study. The two exotic lines mature early compare to the other genotypes. The K value for Gompertz function showed that Arbor Acre chickens had the value of 1.49 while Fα broiler had 0.13, Fα X AB had 0.27 and Ms X Fα had 0.18. The K value obtained in this study contradicts the study of Ozoje *et al.* (2007) who reported that large value of K indicates early maturing animals and vice versa.

Takma *et al.* (2004) explained that the model that has the smallest Residual Mean Square and highest Coefficient of Determination is assumed to give the best fit. Ozoje *et al.* (2007) also reported that the fit with the lower Residual Mean Square was in principle superior. The Coefficient of Determination values were higher in this study for the Gompertz model indicating a significant relationship between age and weight among the genotype.

CONCLUSION

Based on the results of this study, Gompertz model gave the best description of parameter estimate A, it had the least Residual Mean Square of prediction, higher Coefficient of Determination and it also displayed a better goodness of fit for all the genotypes used. Hence, Gompertz model is recommended for the prediction of body weight of Fα, its crossbreds and the two exotic broiler chickens at the early stage of growth.

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