EFFECT OF STRAIN ON GROWTH, CARCASS CHARACTERISTICS AND MEAT QUALITY OF BROILERS REARED FOR 12 WEEKS.

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ABSTRACT: A study was conducted to evaluate the sensory properties of meat obtained from different broilers strains reared for 12 weeks. One hundred and sixty-two day-old birds as hatched from three commercial broiler strains (Ross, Abor Acres and Anak) were raised to 12 weeks of age. Each strain consisted of 54 birds and each group sub-divided into 3 replicates of 18 birds each. The birds were fed broiler starter diet for 4 weeks and finisher diet for 8 weeks. There were significant ($P< 0.05$) strain differences on body weight gain, dressing percentage abdominal fat and GIT. Differences in the daily feed intake also were significant ($P< 0.05$). Ross and Anak strains were statistically similar in final body weight and dressing percentage ($P < 0.05$). The result showed no significant differences ($P>0.05$) in tenderness, flavour, hedonic score and cooking loss among the strains. [New York Science Journal 2010;3(5):112-116]. (ISSN 1554 – 0200).

Key words: Broiler strain, carcass characteristic, meat quality.

INTRODUCTION

The poultry industry is going through a gradual but definite change in product differentiation in response to consumer and industry demands. To implement these changes, genetic improvements have focused primarily on selection for growth rate, feed conversion efficiency and degree of muscling resulting in gross changes in commercial poultry. During the last 50 years, the amount of time required to reach market weight and the quantity of feed needed to produce a kg of meat have been reduced by 50% (Anthony, 1998). While concomitant significant improvements have been accomplished in husbandry practices, disease prevention and nutrition, it has been estimated that 90% of the phenotypic changes in poultry have come from genetic progress (Havenstein *et al*, 1994 a, b). However, coincident with genetic improvement, other characteristics in live animal performance and meat quality have also changed. Siegel and Dunnington (1987) reported that there has been an increase in physiological breakdowns in meat-type chickens as a result of genetic progress for rapid growth. Sante *et al* (1995) reported that high performance turkey breeds have a higher rate of meat postmortem pH decline compared to slow-growing breeds.

The marketing of poultry has been greatly diversified with a significant increase in cut-up (parts) and processed products (Le Bihan-Duval *et al*, 2001). Demand for high-quality parts and further-processed convenience foods have driven the poultry industry to change its marketing practices (Roenigk and Pedersen, 1987; Watts and Kennett, 1995). Although increasing the market weight of birds generally increases cost of production, the fixed costs of processing are reduced. In addition, only a finite number of birds may be processed in a plant within a given period. Therefore, increasing the market weight of birds allows for increased plant meat yield without increasing the bird capacity of a processing plant (Saleh *et al*, 2004). There is limited published research dealing with birds grown to the weights now demanded for further processing. The objective of this study was to determine the effect of strain on growth rate, carcass characteristics and meat quality of broilers reared for 12 weeks in the tropics.

Materials and Method

Site of Study: The experiment was conducted at the Teaching and Research Farm of the Federal University of Technology, Owerri, Imo State, Nigeria. Owerri is located in the south eastern part of Nigeria within the tropical rain-forest belt. It is at the altitude of 90m and the mean

annual rainfall, temperature and humidity are 2500mm, 26.5-27.5^{0}C and 70-80% respectively. Federal University of Technology, Owerri, is located at latitude 5^o 27N and longitude 7^o 02 E (FDALR, 1985).

Experimental birds and feeding trial: A total of one hundred and sixty-two day-old birds as hatched comprising 54 birds per strain from three commercial strains (Ross, Abor Acres and Anak) were selected randomly for this study. Each group was further sub-divided into 3 replicates of 18 birds each and housed on floor pens using deep litter system. After four weeks of brooding, during which the birds were fed broiler starter diet, each strain was assigned to a commercial finisher diet containing 3012.6 Kcal ME/kg and 20.57% crude protein. Feed intake was determined daily on replicate basis whilst live weight was measured weekly. Throughout the experiment, feed and water were provided *ad-libitu*m. The feeding trial was terminated at 84 days of age (12 weeks).

Determination of carcass characteristics and organoleptic quality: The procedures for the measurement of carcass, organ weights and assessment of organoleptic quality were as described by Okeudo *et al* (2005). Briefly, 27 birds (3 from each replicate) were selected after the termination of the feeding trial and sacrificed. Birds of similar final live weights were selected, except when none was available. Birds were starved overnight and thereafter slaughtered and dressed following conventional procedure. The weights of the carcasses and the organs were recorded. One drumstick from each carcass was used for the determination of cooking loss. Drumsticks were packaged individually in double layer polythene bags and boiled in water for 30 minutes. The difference in weight of the drumstick before and after cooking was expressed as a percentage of the weight before cooking and referred to as the percent cooking loss. Approximately one half of the flesh from each of the remaining 27 drumsticks were obtained and used for the assessment of organoleptic quality. Samples were washed individually in clean water, immersed for a few seconds in a brine solution (containing super-saturated brine diluted with an equal volume of water), packed in a transparent double layer polythene bag and tagged for identification. Thereafter, they were boiled in water for 30 minutes, cooled under room temperature and served to a panel of 9 assessors previously trained in basic organoleptic assessment procedure. Each panelist was required to masticate one sample per treatment and score each for tenderness, juiciness, flavor and degree of likeness using the 9 points category rating scale (AMSA, 1978). The remaining flesh from the second drumstick was scraped off and the weight of the bone determined. The weight of the bone expressed as a percentage of the fresh drumstick weight was regarded as percent bone content.

Statistical analyses: The analysis of variance test was conducted for each parameter using the completely randomized design. Mean separation was achieved by the least significant difference (LSD) test as described by Little and Hills (1978).

Results and Discussion

The chemical composition of the broiler finisher diet used in the experiment is shown in Table 1. At 12 weeks, there was a significant difference in live weight ($P< 0.05$) between Abor Acres and the other 2 strains, Ross and Anak strains. There were also significant ($P< 0.05$) differences in some of the internal organ parameters measured, which include the abdominal fat, feathers and intestine (Table 3). Abor Acres strain accumulated abdominal fat almost twice the value for Ross and Anak. This result is in agreement with Sonaiya (1983) who noted that Anak is a light strain and it can be reared longer than 8 weeks without excess fat deposition. The high abdominal fat in Abor Acres broiler at 12 weeks showed that even though live weight was rising, a high percentage of the energy from the feed consumed was deposited as fat. The result showed that the three strains had not reached plateau stage in their growth curve by 8 weeks of age. Sonaiya and Okeowo (1983) reported that Anak, a lean strain had lower body weight and fat accumulation at all ages from 10 to 16 weeks than cobb, a fat strain. There were significant differences ($P < 0.05$) in average feed intake across the strains. Ross consumed the highest quantity of feed (179.91g/bird/day), followed by Anak (165.05g/bird/day) while Abor Acres consumed least quantity of feed (147.72 g/bird/day). The result agrees with the observation of Mitchel (1980) and Smith (1990) that broilers tend to consume more feed with age. Stickland (1995) reported that within a strain, muscle fibers increase as the average daily gain and feed conversion rate increases. It is known that as broiler grows older and larger they

consume more feed to meet the increasing requirement for maintenance, growth and fat deposition (Felt-Well and Fox, 1979). The feed conversion ratio increased with age which indicates a reduction in feed efficiency. Thus birds require more energy to grow and probably deposit fat.

Results on cooking loss and organoleptic quality are presented in Table 4. None of the parameters showed strain related differences ($P > 0.05$). The hedonic scores showed no strain related differences ($P > 0.05$). The result demonstrated that the panelists "liked moderately" to "liked very much" the meat samples from the three strains. This result is in agreement with Okeudo *et al* (1998) who demonstrated that Nigerians actually enjoy eating older broiler meat.

Conclusion

The results demonstrated that the Ross and Anak strains were statistically similar ($P < 0.05$) in final live weight and bigger than the Abor Acres. However, Ross consumed significantly more feed than Anak and Abor Acres and gained more weight. Therefore, based on final live weight gain, Ross and Anak strains are preferred to Abor Acres. On the basis of feed intake and profitability, Anak strain appeared preferable to Ross strain. Since it ate less feed than the Ross and still both were similar in final live weight.

Table 1: Nutrient Composition of Experimental Diets.

Nutrient contents	Starter	Finisher
Crude protein, %	21.00	20.57.
Fat., %	6.05	6.91
Fibre, %	5.00	8.41
Calcium, %	1.20	0.92
P(available), %	0.45	0.50
Lysine, %	1.04	1.01
Methionine, %	0.52	0.41
Metabolizable energy(kcal/kg)	2800.00	3012.50

Table 2: Feed intake, live weight gain and feed cost per gain as affected by strain.

	Strians.			
Parameters	Ross	Abor Acres	Anak	SEM
Initial live weight (g)	805.50[a]	827.67[a]	782.33[c]	16.03
Final live weight (g)	2927.50[b]	2671.67[a]	2906.67[b]	76.98
Average feed intake (g/bird/day)	179.91[c]	147.72[a]	165.05[b]	2.97
Average weight gain (g/day)	75.79[a]	65.86[b]	75.87[a]	3.50
Feed conversion ratio	4.65	4.47	4.38	0.11

[a, b,c] Means within a row with different superscripts are significantly different ($P < 0.05$).

Table 3: Dressing percentage and organ proportions

Parameter	Strians. Ross	Abor Acres	Anak	SEM
Dressing percentage	69.75[b]	67.40[ab]	66.63[a]	1.15
Organ proportions (%)				
Head	2.30	1.96	2.10	0.35
Neck	4.20	4.49	3.80	0.29
Shank	3.20	3.25	3.39	0.10
Heart	0.54	0.59	0.53	0.05
Intestines	6.30[b]	5.90[a]	5.95[a]	0.21
Gizzard (empty)	2.80	2.60	2.80	0.12
Drumstick	9.80	9.63	9.90	0.18
Liver & gall bladder	2.41	2.35	2.18	0.11
Bone	23.15	21.67	24.13	1.45
Abdominal fat	0.93[b]	1.67[a]	0.60[b]	0.49
Wing	8.10	8.10	7.90	0.11
Feather	5.60[a]	7.40[b]	8.60[b]	1.06

[a,b] Means within a row with different superscripts are significantly different ($P < 0.05$).

Table 4: Cooking loss and organoleptic quality

Parameters	Strains Ross	Abor Acres	Anak	SEM
Cooking loss (%)	9.25	10.56	9.57	1.62
Tenderness	7.56	7.56	8.00	0.30
Juiciness	7.00	7.22	7.22	0.30
Flavour	7.56	7.00	7.22	0.35
Hedonic scores	7.44	7.89	7.33	0.25

Scoring was based on the 9 point category rating scale: 1Extremely (tender / juicy /flavoured) = 9; very (tender / juicy / flavoured) = 8; moderately (tender / juicy / flavoured) = 7; slightly (tender / juicy / flavoured) = 6; neither (tender / juicy / flavoured) nor (tough / dry / unflavoured) = 5; slightly (tough / dry / unflavoured) = 4; moderately (tough / dry / unflavoured) = 3; very tough / dry / unflavoured) =2; extremely (tough / dry /unflavoured) = 1. Hedonic scoring: Like extremely = 9; like very much = 8; like moderately = 7; like slightly = 6; neither like, nor dislike = 5; dislike slightly = 4; dislike moderately = 3; dislike very much = 2; dislike extremely = 1.

Acknowledgement:
I acknowledge the Department of Animal Science and Technology, Federal University of Technology, Owerri Imo State for providing me with the necessary facilities for effective execution of this research work.

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13/04/2010