Nigerian J. Anim. Sci. 2022, 24 (3): 161-166

Performance of Hubbard and Marshall strains of broiler chickens fed different energy levels in a hot environment

[*]Ogaji, E. O[1]., [**]Sa'adu, A[1]., [***]Abdulkadir, H[1]., [**]Sani, A. A[2]., *Yisah, L. J[3]., & *Enefola, I. M[3].

**Department of Animal Health and Production, Kogi State Polytechnic, Itakpe, Nigeria.*
*** College of Agriculture and Animal Science Wurno, Sokoto, Sokoto State. Nigeria.*
****National Agricultural Extension and Research Liaison Services, ABU Zaria. Nigeria.*

*****[2]Corresponding Author:** shatima2007@gmail.com **Phone Number:** 07038459928*

***Target Audience**: Local farmers and the Academicians.*

Abstract

The study was conducted to determine the performance of Hubbard and Marshall strains of broilers fed with varying energy levels during the hot environment. The two strains were reared for 8 weeks. Three-hundred-day-old birds hatched from two commercial broiler strains (Hubbard and Marshall) were raised to 8 weeks of age. Each strain consisted of 150 birds and each group was sub-divided into 2 dietary treatments, high and low energy levels with 15 replicates each. The birds were fed ad libitum with starter mash (1 - 4 weeks) containing 2,911 and 3282Kcal/KgME (diet 1), 22 and 24% CP as low energy diet at starter phase with the respects of their protein and finisher feed (5-8 weeks) containing 2,827 and 3,178Kcal//KgME (diet 2), also with the respect of their protein 19 and 21%CP. There were no significant (P > 0.05) in strains and energy diet differences on body weight gain at starter phase but at finisher phase there were significant different (P <0.05) at both.

***Key words**: Hubbard; Marshall; Hot Environment; Varying Energy Ratio;*

Description of Problem

It is a common knowledge that, the population is ever increasing and this put a great demand on agriculture to provide food and feed for man and farm animals. While there is genetic contribution in food production, nutrition cannot be undermined (1).

Livestock makes a significant contribution to human nutrition and economic sustenance by providing a substantial amount of high-quality protein. (3) Poultry products such as meat and eggs are considered to be excellent sources of proteins necessary to meet the protein requirements of both infants and the vulnerable people (1). Livestock are also raised for manure and ceremonial purposes (2).

Poultry yield quickest return on investment compared to other livestock species (3). Broiler production offers the most rapid and cost-effective means of making available high quality animal protein to man (3). In Europe and America, poultry meat is favoured over beef due to its high protein and lower calorie content in addition to other favourable meat qualities (3).

Despite the acknowledged importance of poultry production (4). opined that it is characterized by low production level due to limited finance for the procurement of basic poultry equipment. This calls for production in all season to measure up to the ever-increasing population of humans.

Maize proportion in monogastric diets

ranges from 50 – 70% which implies that increasing cost of maize is being currently experienced due to low level of production which invariably leads to increase cost of conventional animal feeds (5). Reduction in feed consumption will reduce the cost of production, and directly increase the profit margin (6).

Feeding strategies in growing broiler chickens should be aimed at optimizing lean carcass meat, feed conversion ratio and the body weight (7).

The most important factor affecting performance of broilers subjected to high temperature is reduced feed intake (8). The process of digestion of food produces body heat and the amount of heat produced will vary according to the nutrient composition of the diet. This is called the heat increment of the diet. In cold temperatures it may be desirable to formulate diets with a higher heat increment and lower heat increment in hot temperatures (9).

Materials and methods

Location of experiment:

The experiment was conducted in the poultry production and research unit of the Department of Animal Science, Faculty of Agriculture, Usmanu Danfodiyo University, Sokoto, at Sokoto State Veterinary Center, Aliyu Jodi Road in Sokoto Metropolis.

Sokoto State is located between latitudes $13^0$05 and $13^0$08 and longitude $5^0$15 and $5^0$25E, within the Sudan Savannah zone, in the extreme north western part of Nigeria and at an altitude of 350m above the sea level (10).

Experimental design and dietary treatments

A total of 300 Day-old broiler birds (150 Hubbard strain and 150 Marshall strain) using completely randomized designed were allotted into two different dietary energy levels which were replicated ten times, such that each replicate contained fifteen birds. The two different energy levels for starter phase were 2911Kcal/kg (ME) 22%CP, 3282Kcal/kg (ME) 24%CP. For finisher phase, 2827Kcal/kg (ME) 19%CP, 3178Kcal/kg (ME) 21%C were considered, respectively.

Experimental birds and management

The 300 Day old chicks of Hubbard strain (HU) and Marshall Strain (MA) were purchased from local hatcheries, and raised on deep litter in separate pens for 56 days (8 weeks). Antibiotics and vitamins were administered as and when due. Also, vaccines against infectious Bursal and Newcastle diseases were given at specified age intervals as recommended by (6). Their beddings were made up of dry wood shavings and high level of hygiene was maintained throughout the experimental period to ensure favorable and conducive environment for growth, and to prevent disease outbreak. Both strains were fed low and high energy diets at both starter and finisher phases.

Data collection

The birds under study were served with a known volume of water and quantity of feed respectively at each early morning of the experimental days from which the leftover of both water and feed were used to obtain the water and the feed taken by the chicks by subtracting left over from quantity offered (water and feed). In order to determine the weight gain of the experimental birds, birds in each replicate group were weighed to determine the initial weight at the commencement of the experiment. Subsequently, weekly weight gains were determined by subtracting the last weight recorded from the newly recorded weight. Weight recorded for each replicate

group was divided by the number of the birds weighed to obtained average live weight and hence weight gain per bird. Records of feed intake and weight gain were used to calculate feed conversion ratio (FCR) thus: - FCR = $\frac{\text{Feed intake(g)}}{\text{weight gain(g)}}$

A modern digital wireless thermometer was used for recording the temperature of the experimental pen throughout the study, finally average temperature of the day was used as the temperature of the pen of the birds.

Data analysis: Data generated during the studies were subjected to analysis of variance (ANOVA) using 2x2 factorial arrangement. Least significant different (LSD) was used for means comparison at $P<0.05$

Table 1: **Gross composition of experimental diets**

Diets	**Diet 1**		**Diet 2**	
Ingredient (%)	**Starter**	**Finisher**	**Starter**	**Finisher**
Maize	50.00	45.50	50.00	52.00
Groundnut Cake	14.50	16.00	30.00	28.00
Soya Bean Meal	20.00	11.50	7.50	7.00
Wheat Offal	4.00	10.00	-	5.00
Maize Bran	5.00	12.00	-	-
Blood Meal	1.50	0.25	3.50	-
Limestone	2.00	2.00	2.00	2.00
Bone Meal	1.80	2.00	1.80	1.90
Premix	0.25	0.25	0.25	0.25
Methionine	0.31	0.21	0.30	0.25
Lysine	0.30	0.21	0.30	0.25
Salt	0.30	0.30	0.30	0.30
Oil	-	-	4.00	3.00
Total	**100**	**100**	**100**	**100**
Calculated Analysis				
ME Kcal/kg	2,911	2,827	3,282	3,178
C.P (%)	22.00	19.00	24.00	21.00
P (av)(%)	0.45	0.44	0.40	0.41
Ca (%)	1.27	1.31	1.28	1.29
EE	3.98	4.75	3.02	3.32
C.F	3.98	4.75	3.02	3.32
Methionine	0.60	0.48	0.60	0.53
Lysine	1.36	1.02	1.35	1.06

Table 2 shows the effect of both strains and energy diet and revealed that there is no significant difference ($P > 0.05$) in feed intake, water intake, FRC, body weight gain, and percentage mortality but there is significant difference in final weigh gain on the energy diet, hence the birds that received low energy diet had a high growth rate than those of high energy diets.

The body weight gain is contrary to the study in the previous by (**12 and 13**) who reported marked strain differences for body weight in chicken both at level of significance of ($P > 0.05$).

Strain Effect on Feed Intake and FCR

Marshall recorded the highest mean in feed intake and FCR than Hubbard. There is

no significant difference (P > 0.05) which means they are statistically the same, this is contrary to the research made by (1) at level of significant (P > 0.05) were their report revealed that there is significant difference among the Hubbard, Marshall in their studies.

Result and Discussion

Table 2: Performance characteristics of Hubbard and Marshall Strains of broilers fed high and low energy diets in Sokoto from 0 – 4 weeks (Starter Phase).

	Performance Characteristics					
Factor	**Feed in take (g/bird/d)**	**Water In intake (g/bird)**	**Body weight Gain (g/bird)**	**FCR**	**Mort. (%)**	**Final w (g)**
Strain Effects						
Hubbard	22.018	269.46	170.55	1.38	0.10	219.17
Marshall	28.658	270.53	172.81	1.39	0.13	217.74
SEM	4.22	52.96	16.82	0.16	0.02	14.07
Energy Effect						
High Energy	27.23	220.29	140.60^{b}	1.47	0.11	192.24^{b}
Low Energy	23.45	319.70	202.76^{a}	1.30	0.13	244.67^{a}
SEM	4.22	52.96	16.82	0.16	0.023	14.07
Interaction	NS	NS	NS	NS	NS	NS

ab = means bearing different superscript along the same column differ (P < 0.05)
FCR= feed conversion ratio
Mort. Mortality
Final w= final weight

Table 3: Performance characteristics of Hubbard and Marshall Strains of Broilers fed high and low energy diets in Sokoto from 5 – 8 weeks (Finisher Phase)

Performance Characteristics						
Factor	**Feed in take (g/bird/day)**	**Water In intake (g/bird)**	**Body weight Gain (g/bird)**	**FCR**	**Mort. (%)**	**Final w (g)**
Strain Effect						
Hubbard	74.03	2076.10	483.58	1.431	0.04	667.73
Marshall	76.74	2118.32	477.10	1.64	0.004	638.80
SEM	1.85	57.22	40.64	0.159	0.009	29.33
Energy Effect						
High Energy	65.73^{b}	1892.70^{b}	406.13^{a}	1.55	0.014	596.25^{b}
Low Energy	85.04^{a}	2301.72^{a}	554.55^{b}	1.522	0.029	710.28^{a}
SEM	1.85	57.22	40.64	0.159	0.01	29.33
Interaction NS	NS	NS	NS		NS	NS

ab = means bearing different superscript along the same column differ (P < 0.05)
NS = means there is no significant difference along the same column differ (P > 0.05)
FCR= feed conversion ratio
Mort. Mortality
Final w= final weight

Table 3 indicated that there is no significant change (P > 0.05) in feed intake, water intake, body weight gain, FCR, mortality and final weight gain on the effect of the strains. However, there is significant difference (P < 0.05) feed intake, water intake, body weight gain and final weight on the energy diet. Hence, those that received the low energy diet performed better than the high energy diet, this is contrast to the previous studies by (14) reported that performance of broilers fed high diets energy levels perform better than those fed with low energy diet level.

Conclusion and Application:

1. The study showed that birds fed with low energy diet performed better than birds fed with high energy diet.
2. Its recommend that birds to be raised within Sokoto State metropolis between March and June should be fed with low energy diet. However further research should be carried out in order to ascertain the best energy level for broiler rearing in the study area.

References

1. Olawumi, S. O., Fajemilehin S.O., and Fagbuaro S.S (2012). Genotype and sex interaction effects on carcass traits of three commercial Broiler chickens. *Journal of World Poultry Research*, 2(1): 21-24
2. Touray, O., Ceesay, M., Njai, O. (2010) Review of livestock sector with respect to smallholder dairy and livestock and meat sub – sectors development in West Africa. The Gambia country report, Draft report, FAO.
3. Gefu, J.O., Adeyinka I.A., and Sakoni A.A., (Eds) (2002). Poultry production In Nigeria. *A Training manual on Nation Training Workshop on poultry production in Nigeria held 1-6 september2002, Shika, Zaria, Nigeria. Published by The National Animal Research Institute, Ahmadu Bello University, Shika, Zaria, Nigeria.*
4. Akanni, I.A., (2007). "Effect of micro-Finance on Small Scale Poultry business in South Western Nigeria" Emirate Journal of Food and Agriculture. 19(2): 38-47 http://www.cfa.uaeu.ac.ae
5. Salami, R. I. and Odunsi A.A., (2003) Evaluation of processed cassava peel meals as substitute for maize in the diet of layers. International Journal Poultry Science, 2: 112 – 116
6. Oluyemi, J. A. and Robert, F. A., (2000). Poultry production in warm wet climate. Revised edition Spectrum Books Ltd. Pg. 60: 143 - 155
7. Teimouri, A., Razaei, J., Pourreza, J., Sayyazadeh, H. and Waldroup, P. W. (2005) Effect of diet dilution in starter period on performance and carcass characteristics of broiler chicks. *International Journal of poultry science, 4 (12): 1006 – 1011*
8. Charles D.R, (2002). *Response to thermal environment* in: Charles and Walker (eds) poultry environment problems a guide to solution. Nottingham university press, UK, 1-16
9. Zaman, Q., Mushtag, T., Nawaz, H., Mirza, M., Mahmood, S., Ahmad, T., Babar, M. And Mushtag, M. (2007). Effect of Varying Dietary Energy and Protein on Broiler Performance in Hot Climate. *Animal Food Science and Technology*. 146 (3-4): 302-312
10. Mamman, A.B., Oyebanji J.O., and Peter S.W., (2000). Nigeria: A people united, a future assured. Survey of state. Vol 1 (12). Gabumo publishing co.Ltd., Calabar, Nigeria
11. Han Y., and Baker D.H., (1993). Effect of sex, heat stress, body weight, and genetic strain on the dietary lysine requirement of broiler chicks. Poultry. Science. 72:701708.
12. Lesson, S ., L. Caster and J.D. Summers, 1997.Commercial Poultry Nutrition.(2nd

edition). University Books, Onatatrio, Canada Pp.50-66.

13. Furan, M. T., Khalil, R. F., Uwayjan, M. G. and Ashkarian, V. M (2000). Performance and carcass quality of Commercial broiler strains. Journal of Applied Poultry Research, 9: 252-257.
14. Donaldson, 1985 ., Keshvarz, (1991). Waldgoup et al (1990) Considired with growth rate did not affected by diet energy levels.