Growth Performance and Feed Utilization Potential of Horasi Chicken Ecotype During Starter and Grower Phases

Mpemba, C., E. Goromela, A. Mtambuki, S. Kafuku, M. Chando, M. Mwanibanza, A. Burilo and O. Robert

Tanzania Livestock Research Institute (TALIRI) P.O. Box 1425, Mtwara, Tanzania

*Corresponding author e-mail: *charlesmpemba@gmail.com;* Phone: +255 783 811 637

Abstract

The study was conducted with the aim of evaluating the growth and feed utilization potentials of Horasi chicken ecotypes during starter and grower phases under intensive management system at Tanzania Livestock Research Institute (TALIRI) Naliendele Centre, Southern Zone of Tanzania. Three batches of Horasi chicken were collected from six districts namely Uyui and Igunga (Batch 1), Nzega and Msalala (Batch 2) and Shinyanga and Ushetu (Batch 3). The chicken were evaluated on station for growth performance and feed utilization for 16 weeks. At the age of 8 weeks Batch 1chicks had significantly higher (P<0.05) weight gain, Average Daily Gain (ADG) and Total Feed Intake. There was no significant difference on Average Daily Intake at this age. Feed Conversion Ratio (FCR) was significantly higher in Batch 3 and Batch 2 of 4.9 g and 4.8 g of feed per unit of gain respectively at this age. At the age of 9–16 weeks of age there was no significant difference in weight gain, ADG, Total Feed Intake and Average Daily Feed Intake between Batch 1 and Batch 2. Batch 3 had the highest feed requirement per unit of gain at the age of 16 weeks.The observed differences in the performance between the batches was probably due to difference in the origin of the batches; as they were collected from different places. Based on the findings from this study, it was concluded that Horasi chicken ecotype shown high superiority in growth performance and feed utilization potentials. Therefore further studies need to be done to compare the performance of these chickens at farmer's environments.

Keywords: average daily gain, feed conversion ratio, growth rate, productivity, total feed intake

Introduction

Chickens are widely kept and most numerous livestock species in Tanzania. National Bureau of Statistics (NBS, 2018) has estimated that Tanzania had about 40 million local chicken and commonly found in rural and peri-urban areas where they play the important role of income generation, food security and social aspect (Moreki *et al.,* 2010; Ngongolo *et al.,* 2021). There is an increase in demand of local chicken meat and eggs due to their good taste compared to exotic breed products. Although there is high demand for local chicken products, their productivity indices are low. Various studies have been conducted with the aim of identifying and improving the productivity of local chicken in Tanzania. Msoffe *et al.* (2001) evaluated the productivity and reproductive performance of the free range local domestic chicken ecotypes in Tanzania.

Also Mwalusanya *et al.* (2001) evaluated the productivity of local chickens under village management conditions. Results from these studies have shown the existence of many genotypes, phenotypes and large variations in production and reproduction of local chicken (Msoffe *et al.,* 2004). The opportunity for improvement of the genetic potential through mass selective within and between local chicken ecotypes is highly encourage and recommended.

Horasi ecotype is one among the local breed available in Tanzania and has shown the dual potential for meat and eggs production (Magonka *et al.,* 2016), and are mainly found in traditional production systems in Central and Lake Zones of Tanzania. However, little studies have been conducted on the performance of these chickens under different production

system and geographical areas. Tanzania Livestock Research Institute (TALIRI) has recently initiated research on developing a dual purpose chicken through mass selection using Horasi chicken ecotype. Therefore the objective of the study was to evaluate the growth and feed utilization potentials of Horasi chicken ecotypes during starter and grower phases under intensive management system at TALIRI Naliendele, Mtwara.

Materials and methods

Description of the study area

The study was conducted at Tanzania Livestock Research Institute (TALIRI) Naliendele Centre, Southern Tanzania. The centre lies between latitude 10°21'S and longitude 40°9'E and it lies on 38metres above sea level. The average temperature is 26.3°c and December being warmest month with temperature of 27.7°c and lowest temperature is in July with around 24.5°c. The annual precipitation is 1024 mm and it commence from November to May.

Study chicken and their management

This study involved Horasi chicken ecotypes, which originated in regions of Tabora and Shinyanga. The chickens hatched were grouped in three batches, each batch collected in different areas of the two regions. Eggs were collected from representative villages of Uyui and Igunga districts (Batch 1), Nzega and Msalala districts (Batch 2) and Shinyanga and Ushetu districts (Batch 3). Horasi eggs were purchased from individual households and eggs were transported to Msigani Hatchery Farm at Dar Es Salaam for hatching. Hatched chicks (Day Old Chicks) were transported to TALIRI Naliendele centre, where they were tagged and weighed followed by periodic measurements every week.

Chicks were placed in deep litter pens heated by electric bulbs of 100 Watts until 8 weeks of age when they were transferred to a rearing house till they were 16 weeks of age. Wood shavings were used as litter materials. Each batch was kept separately in a well-ventilatedopen sided house. The experimental chicks were vaccinated against Newcastle disease on day 7, 21 and 60 with Lasota strain; Gumboro vaccine on day 14 and Fowl Pox on day 35. Antibiotics and vitamins were supplied for all chicken flocks under study when disease was suspected in a pen, while treatment was given based on the recommendations. Other normal managerial practises were followed including deworming after every three months and provision of compounded rations according to body requirements.

Chicken Feeding

The compounded feeds are shown in Table 1. Chicks were fed a diet containing 21.7% CP and 2784.1 Kcal ME/Kg from day one, while a grower's ration contained 18.3% CP and 2613.5 Kcal ME/Kg and was fed from 9 weeks to 16 weeks of age.Chicken were fed twice daily at 7:00 and 13:00 h and the diets offered were weekly adjusted according to the actual feed intake and water was provided daily at adlibitum.

Table 1: Shows the compounded feeds which were given to the experimental animals

Ingredients	Starter	Grower
Maize	33	32
Maize bran	23	16
Rice Polish	5	16
Soya Meal	22	21
Sunflower Meal	13.5	11.5
DCP	1	1
L-lysine	0.1	0.1
DL Methionine	0.1	0.1
Limestone	1	1
Bone Meal	1	1
Salt	0.3	0.3
TOTAL	**100**	**100**

Measurements taken were feed intake in which feed and refusals were collected and weighed daily in the morning; Growth rate and feed conversion ratio (FCR) in whichthe birds were weighed weekly. FCR was calculated as the ratio of feed offered to weight gain.

Chemical analysis

Feeds offered were analysed for chemical composition as shown in Table 2, by standard AOAC methods (AOAC, 2000).

Table 2: Nutrient composition of starter and grower diets (% DM)

Diets	DM	CP	Ca	P	ME (Kcal/KgDM)
Starter Feed	91.6	21.7	1.47	0.35	2784.1
Grower Feed	92.0	18.3	1.47	0.41	2613.5

Data analysis

Analysis on the collected data was carried out using GLM procedure of SAS (2006) software package, and Duncan's Multiple Range Test of the same software was used to separate the means.

The statistical model used was:

$Y_{ij} = \mu + B_i + e_{ij}$

Where;

Y_{ij} = individual growth performance and feed efficiency

μ = Population Mean

B_i = Effect of Batch

e_{ij} = Residual Effect

Results

Performance of chicks from day old to eight weeks of age

Table 3 shows the least square means of performance from day old to eight weeks of age. Batch had a significant effect ($P<0.05$) on weight gain and average daily gain. The highest weight gain and average daily gain was observed in Batch 1. Feed consumption level was affected by the batch, as Batch 3 and Batch 2 had higher total feed intake ($P<0.05$) as compared to that of Batch 1. Also feed conversion ratio was significantly affected by batch ($P<0.05$). The highest feed requirement per unit gain was recorded for Batch 3 followed by chicks from Batch 2 with feed conversion ratio of 4.9 g and 4.8 g feed per unit of gain respectively.

Performance of chicks from nine weeks to sixteen weeks of age

Table 4 shows the least square means of performance from 9 weeks to 16 weeks of age. Batch had a significant effect ($P<0.05$) on weight gain and average daily gain. The highest weight gain and average daily gain was observed in Batch 1 and Batch 2. Feed consumption level was affected by the batch, as Batch 3 had higher total feed intake ($P<0.05$) as compared to that of Batch 1. Also Feed conversion ratio was significantly affected by batch ($P<0.05$). The highest feed requirement per unit gain was recorded for Batch 3 with feed conversion ratio of 6.7 g of feed per unit of gain.

Performance of chicks from day old to sixteen weeks of age

Table 5 shows the least square means of performance from day old to sixteen weeks of age. Batch had a significant effect ($P<0.05$) on weight gain and average daily gain. The highest weight gain and average daily gain was observed in Batch 1 and Batch 2. Feed consumption level was affected by the Batch, as Batch 3 had higher total feed intake ($P<0.05$) as compared to that of Batch 1. Also Feed conversion ratio

Table 3: Least square means for the performance of Horasi chicken under management conditions in Tanzania (0 – 8 weeks of age)

Parameters	Batch 1	Batch 2	Batch 3
Gain (g/bird)	466.7 ± 11.2^{a}	429.7 ± 10.4^{b}	431.8 ± 10.9^{b}
Average Daily Gain (g)	8.3 ± 0.9^{a}	7.7 ± 0.6^{b}	7.7 ± 0.4^{b}
Total feed intake/bird (g)	1978.2 ± 139.2^{a}	2081 ± 142.7^{b}	2099 ± 138.3^{b}
Average daily feed intake (g)	35.3±0.2	37.2±0.1	37.5±0.1
FCR (feed: gain)	4.2 ± 0.1^{a}	4.8 ± 0.1^{b}	4.9 ± 0.2^{b}

^{ab} Means within a row followed by different superscripts are significantly different, FCR= Feed Conversion Ratio

was significantly affected by batch (P<0.05). The highest feed requirement per unit gain was recorded for Batch 3 with feed conversion ratio of 6.0 g feed per unit of gain.

of chicken. The birds in this study were reared under intensive management system that led to good performance as compared to those reared under farmer's conditions (extensive system).

Table 4: Least square means for the performance of Horasi chicken under management conditions in Tanzania (9–16 weeks of age)

Parameters	Batch 1	Batch 2	Batch 3
Gain (g/bird)	783.7±8.1[a]	817±7.9[a]	667.8±7.5[b]
Average Daily Gain (g)	14.0±0.4[a]	14.6±0.2[a]	11.9±0.2[b]
Total feed intake/bird (g)	4168.6±123.2[a]	4293.2±112.8[a]	4500.2±112.6[b]
Average daily feed intake (g)	74.4±0.6[a]	76.7±0.3[a]	80.5±0.3[b]
FCR (feed: gain)	5.3±0.2[a]	5.3±0.1[a]	6.7±0.2[b]

[ab] Means within a row followed by different superscripts are significantly different, FCR= Feed Conversion Ratio

Table 5: Least square means for the performance of Horasi chicken under management conditions in Tanzania (0 – 16 weeks of age)

Parameters	Batch 1	Batch 2	Batch 3
Gain (g/bird)	1250±69.7[a]	1247.3±71.3[a]	1099.6±70.5[b]
Average Daily Gain (g)	11.2±0.3[a]	11.1±0.1[a]	9.8±0.3[b]
Total feed intake/bird (g)	6146.8±102.2[a]	6374.2±122.3[a]	6600.0±123.4[b]
Average daily feed intake (g)	54.9±0.3[a]	56.9±0.4[a]	58.9±0.3[b]
FCR (feed:gain)	4.9±0.1[a]	5.1±0.1[a]	6.0±0.2[b]

[ab] Means within a row followed by different superscripts are significantly different, FCR= Feed Conversion Ratio

Discussion

Growth performance

Results from this study show slight variation in growth performance between the batches. Although the batches were of the same strain but they originated from different localities. This slight difference in the performance among the batches could be due to differences in the origin of the batches, as there are differences in management of these animals in different areas as has been reported by Guni *et al.* (2013). The results of weights from this study are slightly different from those reported by Magonka *et al.* (2016) who reported the weight of 349.26 g and 899.51 g at the age of 8 weeks and 16 weeks respectively. Also the results are higher than those reported for Horasi reared under farmer's management conditions in Southern Highland Zone of Tanzania (Guni *et al.,* 2013). These differences in performance of Horasi chicken could be due to differences in the management

This is in agreement with the study by Tadelle *et al.* (2003) and Lwelamira *et al.* (2008) who reported that changing the management could bring measurable changes in the growth performance of local chicken. Also it has been found that the growth rate of chickens is influenced by a number of factors such as genotype, system of production, age and sex, diet and stocking density (Magala *et al.,* 2012 and Nakkazi *et al.,* 2015).

Feed utilization potential

Horasi chicken has shown an average daily feed intake of 56.9 g that illustrates strong relationships that exist in average daily body weight gain. The average daily body weight gain of 10.7 g is the fastest growing and recorded highest feed intake per bird per day. The findings of feed conversion ratio from this study are in agreement with other studies, which have shown that indigenous birds have higher feed

conversion ratio, perhaps due to their smaller maintenance requirements (Tadelle *et al.,* 2003). Study by Sanka *et al.* (2020) has shown similar results for Kuroiler and Sasso strains, as those in this study. Therefore this confirms the differences in feed utilization potentials in different strains kept under different management system as reported by Dong and Nguyen (2021).

Conclusion

Based on the findings from this study, Horasi chicken ecotype shows high superiority in growth performance and feed utilization potentials compared to other local strains. Therefore there is a need of genetic improvement of this strain through mass selection, and hence further studies need to be done to compare the performance of these animals at farmer's conditions.

Acknowledgements

The authors acknowledge the African Chicken Genetic Gains (ACGG) project in Tanzania sponsored by Bill and Melinda Gates Foundation (Grant Agreement OPP1112198) for funding this study. Director of TALIRI Naliendele for facilitation, Commission of Science and Technology (COSTECH) and other staffs of TALIRI Naliendele for their support.

References

Association of Official Analytical Chemists (2000). Official Methods of Analysis, 5th edition, AOAC, Arlington, Virginia, USA. pp. 807–809.

Guni F.S., Mwakilembe P.A.A., Kimbi E.C., Kallomo J. and Mwaipopo L. (2013). Identification, characterisation and performance evaluation of indigenous chicken ecotypes in the Southern Highlands of Tanzania. Proceedings of collaborative research workshop under Zonal Agriculture Research and Development Fund. Livestock Research Commodity 1: pp. 106-120.

Lwelamira, J., Kifaro, G.C. and Gwakisa, P.S. (2008). On station and on-farm evaluation of two Tanzania chicken ecotypes for body weights at different ages and for egg production. *African Journal of Agricultural Research* 3(12): pp. 843-851.

Magala, H., Kugonza, D.R., Kwizera, H. and Kyarisiima, C.C. (2012). Influence of varying dietary energy and protein on growth and carcass characteristics of Ugandan local chickens. *Journal of animal production Advances,* 2(7): pp. 316-324.

Magonka, J.M., Sendalo, D.S., Goromela, E. H., Malingila, P.B. and Daniel, E. (2016). Production performance of indigenous chicken under semi intensive management conditions in Central Tanzania. *Journal of the open university of Tanzania* 22(1). https://www.ajol.info/index.php/huria/article/view/152641

Moreki, J.C., Dikeme, R. and Poroga B. (2010). The role of village poultry in food security and HIV/AIDS mitigation in Chobe District of Botswana. Livestock Research for Rural Development, 22(3): http://www.lrrd.org/lrrd22/3/more22055.htm

Msoffe, P.L.M., Minga, U.M., Olsen, J.E., Yongolo, M.G.S., Juul-Madsen, H.R., Gwakisa, P.S. and Mtambo, M.M.A. (2001). Phenotypes including immunocompetence in scavenging local chicken ecotypes of Tanzania. Tropical Animal Health and Production 33.pp. 341-354.

Msoffe, P.L.M., Mtambo, M.M.A., Minga, U.M., Olsen, J.E., Juul-Madsen, H.R., Gwakisa, P.S., Mutayoba, S.K. and Katule, A.M. (2004). Productivity and reproductive performance of the free-range local domestic fowl ecotypes in Tanzania. Livestock Research for Rural Development 16(9). http://www.lrrd.org/lrrd16/9/msof16067.htm

Mwalusanya, N.A., Katule, A.M., Mutayoba, S.K., Mtambo, M.M.A., Olsen, J.E. and Minga, U.M. (2001). Productivity of local chickens under village management conditions. Tropical Animal Health and Production. 33:pp. 405-416.

Nakkazi, C., Kugonza, D.R., Kayitesi, A., Mulindwa, H.E. and Okot, M.W. (2015). The effect of diet and feeding system on the on-farm performance of local chickens during the early growth phase. Livestock Research for Rural Development 27(10). http://www.lrrd.org/lrrd27/10/nakka27204.html.

National Bureau of Statistics (2018). Trends in food insecurity in mainland Tanzania. Food security and nutrition analysis of Tanzania Household Budget Surveys 2000-1 and 2007, National Bureau of Statistics, Dar es Salaam.

Ngongolo, K., Kitojo, O. and Chota, A. (2021). Social–economic impact of chicken production on resource–constrained communities in Dodoma, Tanzania. Poultry Science 100(3). https://doi.org/10.1016/j.psj.2020.12.019

Nguyen Thi Kim Dong and Nguyen Van Thu (2021). Effects of dietary supplementation levels of coconut oil in crossbred Noi chicken on nutrient intake, growth performance, carcass values. Livestock Research for Rural Development 33(5). http://www.lrrd.org/lrrd33/5/3363ntkdn.html

Sanka, D.Y., Mbaga, S.H., Mutayoba, S.K., Katule, A.M. and Goromela, E.H. (2020). Evaluation of growth performance of Sasso and Kuroiler chickens fed three diets at varying levels of supplementation under semi – intensive system of production in Tanzania. Tropical Animal Health and Production, 52. pp. 3315 – 3322. https://doi.org/10.1007/s11250-020-02363-x

SAS (2006). SAS Users Guides Version 9.1 for windows, SAS Institute Inc. North Carolina

Tadelle D., Kijora C. and Peters K.J. (2003). Indigenous Chicken Ecotypes in Ethiopia: Growth and Feed Utilization Potentials. *International Journal of Poultry Science,* 2(2): pp. 144–152.