Production Performance of Indigenous Chicken under Semi Intensive Management Conditions in Central Tanzania

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Abstract: *A study to evaluate four indigenous chicken – namely: Horasi, Kuchi, Naked neck and Frizzled in order to obtain grand-parent and parent stocks was carried out at Tanzania Livestock Research Institute, Mpwapwa district of Dodoma, Tanzania. The perfomance of the ecotypes were compared so as to come out with the best indigenous chicken among the four. A total of 548 indigenous chicken including Horasi (162), Kuchi (253), Naked neck (81) and Frizzled (52) were used in the study. All chicken were treated equally in terms of management under semi intensive system. Data were collected on body weight, external egg characteristics, day old chick weight, body weight gain, weight at 4, 8, 12, 16, 20, 24 weeks of age for each ecotype. Age at first egg and egg number were also determined. The collected data was analysed using General Linear Model of SAS (2006). The results showed that there were significant differences in mature body and egg weight between the ecotypes. The mature body weight and egg weight respectively were 2075g, 2070g, 1792g , 1622g and 44.73g, 45.94g, 38.28g, 38.08g for Horasi, Kuchi, Naked neck and Frizzled respectively. Day old chick weight were 34.26g, 36.26g, 31.99g and 29.02g for Horasi, Kuchi, Naked neck and Frizzled respectively. Average growth rate per day in grams for Horasi and Kuchi was 3.67g and 3.96g per day from day old chick to week 4 and 6.83g and 8.25g per day from week 5 to week 8, respectively. Average egg numbers per clutch for Horasi and Naked neck were 16 and 18 eggs respectively. Average body weight at week 24 for naked neck and Horasi (F1) were 1427g and 1572.8g respectively. Average ages at first egg for Horasi and Naked neck (F1) were found to be 15 weeks and 16 weeks, respectively. The study reveals that, Horasi and Naked neck ecotypes under semi intensive system perform better than Frizzed. It was conclude that, Horasi and Naked neck can be used at farm level for egg production and Kuchi could be used to improve meat production on other indigenous chicken hence increase income of smallholder farmers.*

Keywords: Indigenous chicken, productivity, semi-intensive management

INTRODUCTION

Tanzania has about 54 million chicken where 35 millions are indigenous chicken which provide almost all the poultry meat in the rural areas and also contribute almost 100% and 20% eggs consumed in rural and urban areas respectively (MLFD, 2011; Guni *et al.*, 2013). Nearly 90 percent of the indigenous chicken are raised by smallholder farmers in the rural areas under traditional free-range system. The flock sizes mostly ranges from 5-15 chicken with an average of 10 chicken per household making it difficult to have a viable commercialized indigenous chicken enterprise. On the other hand, the demand for indigenous chicken meat and eggs has been increasing and yet the supply side has continued to depend largely on these smallholder famers. In general, poultry products (egg and meat) constitute 30 percent of all animal protein consumed worldwide, while consumption of meat and eggs in Tanzania are reported to be 12 kg and 75 eggs per annum respectively which is very low compared to the world average which is 50 kg of meat and 300 eggs (MLDF, 2010).

Indigenous chicken production in rural areas plays a significant role in contributing to nutritional status of human being and source of income. This is due to advantages over other species of livestock which include short generation interval, prolificacy, low initial cost

and maintanance cost compared to other livestock (Mengesha, 2012). Another advantage is their fast reproductive rates, ability to be raised even under limited land spacing per household, however their production are still fairly poor due to inadequate skills on management.

Previous effort in improving indigenous chicken production over years were through crossbreeding with exotic breeds especially the Rhode Island Red (RIR). Studies show that crossbreds could not perform well due to lack of management skills that were needed for the crossbreds and the management changes that should be adopted by the rural people (Goromela, 2009). As a result most of these crossbreds died due to diseases and nutritional-disorders despite their higher egg-laying and faster growth (Theerachai, 2006).

Another initiative through private sector was to commercialize indigenous chicken; however there has been a shortage of quality day old chicks because there are no grand-parent and parent-stock farms in the country (Vera, 2010). Currently, there is no farm or institution raising indigenous chicken grandparent or parent stocks. Also, management system at farm level is free range which promote random mating hence become difficult to identify a pure line and their performance. This study was therefore conducted to evaluate the performance of four indigenous chicken kept under semi intensive management. It was expected that the results from this study would come out with recommended ecotype which perfom better and could be promoted for production of day old chick at large scale for commercialization.

MATERIAL AND METHODS

The study was carried out at Tanzania Livestock Research Institute (TALIRI) Mpwapwa, which is central part of Tanzania. The area lies between 900 and 1,000 metres above sea level. The mean temperature is about 26.5°C, but at certain times temperature can go down to as low as 11°C. The coolest dry weather occurs from January to June when temperature reads between 20°C - 33°C. The main rainy season is from November to April with an annual average rainfall of 500 to 800 mm.

A total of 548 indigenous chicken of four (4) ecotypes namely Horasi, Kuchi, Naked neck and Frizzled were collected from Shinyanga, Tabora, Singida and Dodoma and were kept at the station. Each ecotype was kept separately in a well ventilated open sided house. Perches and nests placed in the the chicken houses and a fence separating chicken houses by ecotypes and biosecurity was put in place. Chicken were vaccinated against Gumboro and Newcastle and normal managerial practices were followed. These included deworming after every three months and provision of compounded rations according to body requirements. Adult chicken were given 100 - 120gm per day, with clean water throughout the day.

Data collection

Body weight of chicken collected from farmers were taken. The weight, length and circumference of collected eggs at the institute were measured and recorded daily. The weighed eggs were stored in a cold room for seven days before transfering to the incubator machine to avoid development of the embryo. Stored eggs were against different deformities, and then fumigated using 0.5ml 40% formalin and 0.2g potassium permanganate. Chicks hatched were weighed and tagged followed by periodic measurements after every four (4) weeks. Chicks were monitored from day one up to 24 weeks in body weight, gain, age at first egg and egg number. The difference in body weight values between two consecutive measurements was divided by the number of days in the interval to obtain daily body weight gain.

Data analysis

Data on mature body weight, egg weight, egg length, circumference, day old chicks weight, 4, 8, 12, 16, 20, 24 weeks, age at first egg and egg number were analysed using GLM procedure of SAS (2006) software package and where significance were observed, Duncan's multiple range option of the same software was used to separate the means.

RESULTS AND DISCUSSION

Mean body weight of four indigenous chicken are presented in Table 1. Horasi ecotype had significantly (P<0.05) higher body weight than Kuchi, Naked neck and Frizzled. Kuchi ecotype had significantly (P<0.05) higher body weight than Naked neck and Frizzled. The results are in agreement with Guni *et al.* (2013) who reported higher body weight for Horasi ecotype in Southern Highlands of Tanzania. The result from this study could also be attributed to differences in genetic make up.

Table 1: Least square means of mature body weight of four indigenous chicken collected from farmers

Ecotype	N	Lsmeans ± se
Horasi (gm)	253	2075 ± 0.04[a]
Kuchi (gm)	162	2070 ± 0.03[a]
Naked neck(gm)	81	1792 ± 0.05[b]
Frizzled (gm)	52	1622 ± 0.06[c]

Least square means with no superscript letters in common within a column are significantly different (p <0.05) and se means standard error

The effect of sex on body weight on four ecotypes are presented in Table 2. The body weight for males birds were significantly (P<0.05) greater than those of the female birds. When each sex was compared separately between ecotypes, Horasi was significantly (P<0.05) superior for body weight in male birds. Kuchi ecotypes was higher in body weight for female birds than Naked neck and Frizzled ecotypes. The difference could be attributed to difference in their genetic make up.

Table 2: Least square means of mature body weight on sex

Ecotype	n	Sex	Ls ± se
Horasi	14	M	2753±0.11[a]
	148	F	1675 ±0.03[b]
Kuchi	50	M	2379 ± 0.07[a]
	203	F	1716±0.03[b]
Naked neck	14	M	2147 ± 0.08[a]
	67	F	1422±0.04[b]
Frizzled	42	M	1779±0.08[a]
	10	F	1247± 0.04[b]

Least square means with no superscript letters in common within a column are significantly different (p <0.05) and s.e means standard error

Egg characterists, day old chicks weight and chick percentage of egg weight

The egg weight, egg width, egg length and weight of chicks ecotypes of four indigenous chicken are presented in Table 3. Kuchi had the highest egg weight (45.9gm) followed by Horasi (44.7gm), naked neck (38.3gm) and frizzled (38.1gm). Egg width and length was highest for Horasi ecotype compared to other ecotypes, the trend was the same for eggs collected from indigenous chicken brought from farmers and those hatched at the institute (F1). The egg weight in this study is in agreement with Lwelamila et *al.* (2008) who reported 45g of Kuchi egg weight.

Table 3: Least square mean (±SE) for on-station egg weight, width and length, day old chick and chick % of egg weight of ecotype of chicken

Ecotype	EW(gm)	ED (cm)	EL (cm)	DOC	Chick % of egg wt
Horasi	44.73±0.352[a]	12.67 ± 0.058[a]	8.20 ± 0.392[a]	34.26[a]	78.9
Kuchi	45.94± 0.376[a]	12.58 ± 0.062[a]	7.43±0.419[a]	36.26[a]	76.5
Naked neck	38.28 ± 0.405 [b]	11.86 ± 0.067 [b]	6.77±0.452[a]	31.99[b]	83.0
Frizzled	38.08 ± 0.608[b]	11.81 ± 0.101[b]	6.74±0.678[a]	29.02[b]	76.2

Least square means with different superscript letters in column within a column are significantly different (p <0.05), EW = egg weight, ED = egg width, EL= egg length, DOC = day old chick and SE =Standard error

The egg weight of Kuchi are slightly higher than egg weight (44.7g, 44.3g and 42.7g) reported by Guni *et al.* (2013) in three districts of Southern Highlands. The average mean weight of Kuchi egg was 45.94g and produced chicks with an average weight of 36.26g which was 78.9% of egg weight. The results in Table 3 show that chick weight in all for ecotypes were found between 76 to 83% of egg weight. Egg weight has implication on the weight of chick at day one and consecutively week one weight as shown in Table 3 and survival of chick. This implies that heavier eggs hatch to heavier chicks.

Body weight and growth performance of four indigenous chicken's ecotype

Table 4 shows mean weekly weight measurements and average daily gain of four ecotypes from day one to 24 weeks. The average body weight of Kuchi ecotype at day old chick was higher than other ecotypes. At the age of 24 weeks the Kuchi chicken ecotype scored the highest mean body weight (1738.70), Horasi ecotype ranked the second (1572.8g), Naked neck ecotype ranked the third (1427.58g) and lastly Frizzled ecotype (1100.47g). Differences in mean weights for day old chick and other stages of growth among the ecotypes could be attributed to differences in genotypes.

Table 4: Least square mean on growth performance of four indigenous chicken's ecotype

Parameter	Ecotypes			
	Kuchi	Horasi	Naked neck	Frizzled
Day old chick weight in gm	36.26[a]	34.26[a]	31.99[b]	29.02[b]
Average weight of chicks at 4weeks	154.91 [a]	144.49 [a]	140.30 [a]	117.14 [b]
Weight gain in gm per day (0-4weeks)	3.96	3.67	3.61	2.94
Average weight of chicks at 8 weeks	402.29 [a]	349.26 [b]	326.72 [b]	239.51 [c]
Weight gain in gm per day (4-8 weeks)	8.25	6.83	6.21	4.08
Average weight of chicks at 12 weeks	568.34 [a]	551.44 [a]	507.52 [a]	376.44 [b]
Weight gain in gm per day (8-12weeks)	13.20	11.6	12.70	8.94
Average weight of chicks at 16weeks	964.35 [a]	899.51 [a]	888.52 [a]	644.62 [b]
Weight gain in gm per day (12- 16weeks)	15.46	13.63	9.60	7.26
Average weight of chicks at 20weeks	1428.03[a]	1308.46[ab]	1176.59[b]	862.41[c]
Weight gain in gm per day (16-20weeks)	10.36	8.81	8.37	7.93
Average weight of chicks at 24weeks	1738.70[a]	1572.80[b]	1427.58[b]	1100.47 [c]

Least square means with different superscript letters in row within a row are significantly different (p <0.05). The average growth for Kuchi, Horasi, Naked neck and Frizzled of 3.96g, 3.67g, 3.61g and 2.94g per day from day old chick to week 4 and 10.36g, 8.81g, 8.37g and 7.93gm at week 20 respectively. The weight gains for Horasi at week 4 in the study are higher (2.8g) than those reported by Guni *et al.* (2013) on the same ecotypes. This implies that body weight gain can be influenced to some extent by management. Average body weight

(1572.80g) at week 24 for Horasi (F1) obtained from this study was lower (1806gm) than reported by Guni *et al*. 2013 for Horasi of the same age in Southern Highlands of Tanzania probably due to differences in agro ecological zone and management practices.

Average weight of Kuchi at week 20 from this study was higher (1428.03g) than (1240.3g) reported by Lweramila *et al*. (2008) in Morogoro Tanzania under extensive system. The difference might be due to management systems. This shows that under good management particularly semi intensive system Kuchi gain more weight than in free range system. Average ages at first egg for Horasi and Naked neck (F1) were found to be 15 weeks and 16 weeks, respectively. The age at first egg for Horasi in this study are lower than (18.4 weeks) those reported by Grobbelaar *et al*. (2010), on the same ecotypes under intensive system. The difference might be due to different management system. Average egg numbers per clutch for Horasi and Naked neck (F1) were 16 and 18 eggs respectively.

CONCLUSION AND RECOMMENDATION

Based on the findings from the present study, among the four indigenous chicken Horasi ecotype was leading in terms of body weight for chicken collected from farmers though not significant. On station study showed that Kuchi ecotype was superior in growth, weight gain and egg weight where possible the ecotype can be used to improve body weight of other indigenous chicken for meat production. However the study showed age at first egg and egg number were better for Horasi and Naked neck and therefore they could be good candidates for egg production. Nonetheless further studies to be done on molecular level.

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