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Effect of least cost ration on carcass yield of sasso and indigenous breeds in south gondar zone, Ethiopia

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The effects of substitution of different levels of commercial starter's diet with the homemade least-cost diet on carcass yield of Sasso and Indigenous breeds were studied in Hiruy-Abaregay Kebele of Farta Woreda. Homemade least-cost ration were formulated that, contained 0%, 25%, 50% 75% and 100% levels for T1, T2, T3, T4 and T5 and offered for 8 and 24 weeks for Sasso and indigenous breeds, respectively. At the end of the experiment, a total of 60 Sasso and indigenous matured chicken were randomly selected from each replication for carcass evaluation. Accordingly, edible carcass components of chicken on 0, 25, 50, and 75% in homemade least cost starter's rations was significantly (P<0.001) higher than 100% homemade least-cost ration. The slaughter weight, breast, drumstick, thigh muscle, and dressing percentage of Sasso and the indigenous breed was significantly (P<0.001) lower on the 100% homemade least-cost diet as compared to the others. The results of this study indicated that up to 50% of expensive commercial starter's ration could be economically replaced with the homemade least cost ration without adversely affecting the carcass yield.

Keywords: Commercial, Dressing, Edible, homemade, Starter

INTRODUCTION

Chicken production in developing countries support increase in Gross Domestic Product (GDP), food self-sufficiency, poverty reduction, livelihood improvement, and economic growth (Tafesse, 2005; Tadelle *et al*., 2013*;* Melkamu, 2013). The demand for food of animal origin is increasing in developing countries due to growth in human population, expansion of urbanization and improvement in family income (Abdullah *et al*., 2011). Poultry contribute about 33% of animal protein consumed at global level (FAO, 2010). The demands for animal proteins, particularly for poultry products are high in Ethiopia. Unfortunately productivity of the productivity of the Ethiopian, attributed to inadequate nutrition, among others (FAS 2017).

There is a need for the expansion of commercial poultry production and improvement of the small-scale poultry production system at the farmer's level with improved poultry breeds. However, commercial broiler feed is expensive and inaccessible for smallholder farmers (Etalem *et al*., 2009). Unfortunately, the carcass yield of indigenous breed and Sasso breeds under homemade least cost ration was not well address. Therefore it becomes very necessary to look for alternative feedstuffs, which are locally available, cheap, and nutritionally adequate to substitute the commercial diet to help resource-poor farmers cut down their production cost and thereby improve the efficiency of poultry production. The commercial poultry diet is high in cost and unavailable outside of Addis Ababa and its vicinity (Tadelle *et al*., 2013; Feleke *et al*., 2015; Yenesew *et al*., 2015). There is no efficient transportation system and the additional cost is incurred in the transportation of the feed to poultry producers located outside of Addis Ababa. Therefore, searching, formulating, and evaluating of least-cost ration from locally available ingredients are the best alternative mechanism to solve the above challenges. Therefore, the current study was designed to evaluate the effect of the least-cost ration on carcass yield for Sasso and indigenous breeds.

MATERIALS AND METHODS

Experimental treatments

At the end of the experiment, 2 chickens (one male and one female) were randomly selected from each replications of Sasso T44 and Indigenous chickens. A total of 60 chickens were slaughter for yield measurement and analysis of carcass.

Management of experimental animals

Before slaughter of the chicken, each chicken was fasted for 12 hours before slaughtering and individual weight was measured to consider as live weight of the chicken.

Carcass Measurement

After weighing the birds were slaughtered, blistered in hot water at a temperature of 53°C for 2 minutes, and de-feathered by handpicking. For each bird feather was weighed after being dried for 24 hours using sunlight during the day. Edible and none edible parts were separated and weighed using sensitive balance to determine the dressing percentage. Head and shanks were removed close to the scull and at the hock joints respectively and weighted. Each carcass was dissected into different cuts including breast (BR), drumstick (DR), thigh (TH), and back (BK). Finally, dressing percentage was determined by the following mathematical formula;

$$\text{Dressing percentage} = \frac{\text{Carcass weight}}{\text{Live weight of a bird}} * 100 \ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

Statistical analysis methods

All the data collected were subjected to statistical analysis of variance using the PROC GLM of Statistically Analysis software SAS 9.2 version (SAS, 2008). For the means, that have a significantly different, the Least Significant Difference (LSD) procedure was used. The model used for this experiment was represented as equation 2

$$Y_{ij} = \mu + B_i + R_j + BR_{ij} + \varepsilon_{ij} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots .2$$

Where;

Y_{ij} = the ith observation of ith breed (B), the jth ration types (R),

μ =is the general mean

B_i= the effect of level i of factor breed (B)

R_j= the effect of level j of factor ration types (R)

$(BR)_{ij}$= the effect of level ij of factor interaction between breed and ration types

ε_{ij}= is the random error associated with Y_{ij} observation. (Mean was separated by using LCD).

RESULTS AND DISCUSSION

Carcass yield of chicken.

The effect of the least-cost diet on the edible and none edible carcass components of Sasso and indigenous experimental chicks is presented in Tables 1 and 2. There was no significant deference (P>0.05) between the Sasso groups assigned to the treatment diets containing 0, 25, 50, and 75% homemade starter’s ration in breast muscle, thigh muscle, back, neck, and gizzard weight. However, the groups assigned to 100% homemade starter’s ration were significantly (P<0.001) lower than the others in mean weight of breast muscle, thigh muscle, back, neck, and gizzard weight. The results obtained indicated that there was no significant difference (P>0.05) between the experimental indigenous chicks fed on the treatment diets containing 0 and 25% of homemade starter’s ration in mean weight of breast muscle, thigh muscle, back, neck, and gizzard. On the contrary, the indigenous groups fed on the treatment containing 50, 75 and 100% homemade starter’s ration were significantly lower (P<0.001) than the others in mean breast muscle, thigh muscle, back, neck, and gizzard weight. The general tendency was that, the mean weight of the carcass components decreased with increased levels of inclusion of the homemade starters ration in the treatment diets. The mean slaughter, breast meat, drumstick, thigh muscle weight, and dressing percentage obtained from the current study was lower than that report on Ross broiler chicken (Berhan Tamir & Wude Tsega, 2009), Rhode Island Red chicken (Tegene Negesse & Asrat Tera, 2010) and Hubbard classic chicken (Mridula, D. et al., 2011; Kiross and Getachew, 2017).

Table 1 None Edible Offal's and Carcass Characteristics of the Experimental Chicks

None edible Carcass components	**Sasso breed**					**Indigenous breed**					**SEM**	**Sig.**
	T1	T2	T3	T4	T5	T1	T2	T3	T4	T5		
Blood	186.0^{b}	228.8^{b}	264.8^{b}	282.2^{a}	141.0^{c}	203.6^{b}	259.5^{b}	197.3^{b}	164.2^{b}	160.3^{c}	25.30	***
Feather	102.6^{a}	106.2^{a}	139.8^{a}	105.6^{a}	71.5^{a}	119.2^{a}	96.6^{a}	73.0^{a}	56.2^{b}	83.2^{a}	13.68	***
Head	30.8^{a}	27.6^{a}	33.2^{a}	27.6^{a}	21.2^{b}	27.6^{a}	33.6^{a}	19.6^{b}	19.5^{b}	16.3^{b}	2.65	**
Shank and legs	45.8^{a}	39.8^{a}	53.2^{a}	39.5^{a}	22.0^{b}	26.8^{b}	32.2^{b}	18.0^{bc}	14.8^{bc}	12.6^{c}	2.91	***
Esophagus	1.8^{b}	0.0^{c}	2.2^{ab}	0.8^{bc}	0.0^{c}	1.5^{b}	2.8^{a}	0.0^{c}	0.0^{c}	0.0^{c}	0.96	***
Preventriculus	4.8^{a}	4.5^{a}	6.2^{a}	4.3^{a}	3.0^{b}	3.3^{b}	2.6^{bc}	2.2^{bc}	1.8^{c}	1.8^{c}	1.03	***
Lung	5.2^{a}	4.5^{a}	5.2^{a}	3.8^{a}	2.2^{a}	4.8^{a}	4.2^{a}	3.0^{a}	1.0^{b}	1.8^{b}	0.91	**
Heart	6.3^{a}	4.3^{a}	6.6^{a}	5.3^{a}	2.8^{b}	3.5^{a}	6.3^{a}	3.5^{a}	2.3^{b}	3.2^{a}	1.02	**
Small intestine	58.2^{a}	53.3^{a}	61.3^{a}	45.8^{a}	34.5^{b}	31.3^{b}	31.6^{b}	25.2^{b}	24.5^{b}	32.6^{b}	6.83	**
Large intestine	12.5^{b}	19.2^{a}	19.2^{a}	14.0^{b}	22.2^{a}	12.2^{b}	14.3^{b}	10.8^{b}	7.0^{c}	10.5^{b}	2.69	**
Crop	15.0^{a}	10.2^{a}	10.8^{a}	6.8^{b}	5.8^{b}	11.8^{a}	6.6^{b}	5.3^{b}	4.0^{b}	4.3^{b}	2.05	**

*** P<0.01; *** P<0.001, SEM; standard error of mean; T1=0% least-cost ration, T2=25% least-cost ration, T3=50% least-cost ration, T4=75% least cost ration and T5=100% least cost ration; Similar letters are indicated that there is no significant difference*

Table 2 Edible carcass yield of Sasso and indigenous breeds under different level of least-cost diet

Edible Carcass components	Sasso breed					Indigenous breed					SEM	Sig.
	T1	T2	T3	T4	T5	T1	T2	T3	T4	T5		
Slaughter wt. (gm)	943.0^{a}	860.6^{a}	1029.5^{a}	808.5^{a}	592.0^{b}	844.3^{a}	751.5^{a}	536.5^{b}	428.2^{b}	402.0^{b}	41.38	***
Breast muscle wt.	141.0^{a}	121.8^{a}	150.5^{a}	114.5^{a}	68.0^{b}	132.8^{a}	106.6^{a}	82.5^{b}	57.8^{b}	46.8^{b}	7.06	***
Breast muscle %	14.9^{a}	14.1^{a}	14.6^{a}	14.1^{a}	11.4^{b}	15.6^{a}	14.1^{a}	15.3^{a}	13.3^{b}	11.4^{b}	0.81	**
Drumstick muscle wt.	80.3^{a}	75.2^{a}	74.0^{a}	73.6^{a}	89.6^{a}	48.2^{b}	74.2^{a}	35.2^{b}	43.8^{b}	28.3^{c}	5.59	***
Drumstick muscle %	8.4^{a}	8.6^{a}	8.6^{a}	9.2^{a}	7.2^{b}	8.8^{a}	9.7^{a}	8.9^{a}	8.2^{b}	6.9^{c}	0.56	***
Thigh muscle wt.	82.5^{a}	74.0^{a}	90.3^{a}	64.2^{a}	42.5^{b}	66.5^{a}	64.2^{a}	43.2^{b}	31.5^{b}	25.2^{b}	3.90	***
Thigh %	8.6^{a}	8.6^{a}	8.7^{a}	7.9^{a}	7.1^{b}	7.8^{a}	8.5^{a}	8.0^{a}	7.2^{b}	6.2^{c}	0.23	***
Back wt.	82.6^{a}	77.6^{a}	85.3^{a}	70.6^{a}	55.6^{b}	71.3^{a}	65.8^{a}	41.2^{b}	34.5^{b}	31.2^{b}	4.72	***
Back%	8.6^{a}	8.9^{a}	8.3^{a}	8.6^{a}	9.2^{a}	8.4^{a}	8.6^{a}	7.6^{b}	7.9^{b}	7.7^{b}	0.43	***
Neck wt.	35.3^{a}	29.6^{a}	40.3^{a}	33.0^{a}	21.0^{b}	30.8^{a}	30.5^{a}	21.6^{b}	14.5^{b}	13.3^{b}	2.46	**
Neck %	3.7^{a}	3.3^{a}	3.8^{a}	4.1^{a}	3.5^{b}	3.5^{a}	3.9^{a}	3.9^{a}	3.3^{b}	3.2^{b}	0.23	**
Gizzard wt.	42.8^{a}	37.6^{a}	45.8^{a}	33.3^{b}	32.3^{b}	26.0^{b}	29.2^{b}	21.3^{b}	16.2^{c}	19.6^{c}	2.40	***
Gizzard %	4.4^{a}	4.3^{a}	4.4^{a}	4.1^{a}	5.4^{a}	3.1^{b}	3.8^{b}	3.9^{b}	3.7^{b}	4.7^{a}	0.24	**
Dressing wt. (gm)	536.3^{a}	485.5^{a}	589.2^{a}	460.6^{a}	310.6^{b}	466.5^{a}	430.0^{a}	300.5^{b}	223.6^{b}	196.3^{c}	36.74	***
Dressing %	56.9^{a}	56.4^{a}	57.1^{a}	57.0^{a}	52.1^{b}	55.5^{a}	57.0^{a}	55.7^{a}	52.3^{b}	48.8^{b}	1.62	**

*Wt.; weight; ** P<0.01; *** P<0.001, SEM; standard error of mean; T1=0% least-cost ration, T2=25% least-cost ration, T3=50% least-cost ration, T4=75% least-cost ration and T5=100% least-cost ration; Similar letters are indicated that there is no significant difference*

Figure 1: Sasso breed live weight taking before slaughtering

Figure 2 indigenous breed live weight taking before slaughtering

Example for some part of Edible carcass weight

Figure 3 wing weight of Sasso breed

Figure 4 thigh muscle weight of Sasso breed

Figure 5drumstick, weight of Sasso breed

Figure 6 breast weight of Sasso breed

Figure 7 leg weight of indigenous breed

Figure 8 feather weight of indigenous breed

Figure 9 large intestine weight of Sasso breed

Figure 10: Small intestine weight of Sasso breed

This difference might be happened due to the different breed and ration. As compared to the reports of Russel Packard (2014) the results of the current study had a lower dressing percentage and live weight as compared to the different exotic broiler. This is due to in current study was used Sasso (dual-purpose chicken) and different feed types. The mean breast, drumstick, thigh, gizzard and , small intestine weight, and dressing percentage of Sasso experimental chicks used in the current study, were higher than those reported by (Laudadio, V.and V. Tufarelli, 2010; Magala H, et al., 2012), while the dressing percentage of the indigenous experimental chicks was lower. Carcass parameter of commercial broiler reported by Kefyalew Gebeyew et al., (2015), the dressing, breast, and drumstick percentage was lower as compared to the current study but higher in gizzard percentage. Drumstick's percentage of the current study was similar to that of Kassa Shawle, et al., (2016), however, had the lower weight of gizzard and higher in other carcass components for 42 days experiment on Cobb-500 day old chicks. The current study of slaughter, carcass, breast, thigh, and drumstick weight was low as compared to Cobb 500 strain experiment for 42 days (Priscila Oliveira, et al., 2016). Yet, the carcass weight of the current study had similar observations with the female carcass of Cobb 500 breed (Pavlovski, Z. et al., 2014). Fortunately, the percentage of gizzard and thigh muscle in the current study was a similar observation with the report of (Mona E, et al., 2016) but lower dressing and breast percentage of Sasso breed. In the current study, slaughter, breast, thigh, drumstick, back, and gizzard weight was agreed on the report of (Kedir Abdurahman, 2016) but higher in the dressing percentage. According to (Yousif, I. et al., 2014; Welelaw Edmew, et al., 2018) observation, the current study had lower carcass weight, dressing, breast, thigh, and drumstick percentage but higher gizzard weight of indigenous chicken, however, the age of the chicken was different.

CONCLUSION

The effect of the homemade ration on chicken carcass yield for Sasso and the indigenous breeds experiment result was indicated that substitution of expensive commercial ration by the homemade ration up to 50% was not adversely affected the carcass yield of Sasso and indigenous breeds. In the feature we suggest that, the evaluation of homemade ration micronutrient content and the maximum inclusion of the homemade ration on broiler and layer types of chicken including the indigenous chicken.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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