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Full Length Research Paper

Production performance of Fayoumi chickens under intensive management condition of Adami Tulu research center

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The study was done to characterize the production performance of exotic/Fayoumi chicken/under intensive management condition in semi-arid Ethiopia. Feed consumption, age at 40% egg laying, egg production, mortality rate, hatchability, external and internal their egg quality parameters used as evaluation parameters. Mean feed consumption of starter, grower and layer Fayoumi chicken under intensive management condition in Adami Tulu research center is 48.9±5.5, 71.4±5.4 and 113.5±8.1, respectively. Fayoumi chickens attain sexual maturity at 150 days and produced 159.9± 10.7 eggs in a year. Hatchability and mortality rate is 63.5 and 7.2%, respectively. Egg weight (g), egg length (mm), egg width (mm), shell thickness (mm) and shell weight in percent of egg weight of Fayoumi chicken`s egg was 44.3±4.51, 50.77±2.6, 39.3±1.41, 0.35±0.04 and 13.3, respectively. Yolk color, yolk weight in percent of egg weight, albumin weight in percent of egg weight and egg shape index of Fayoumi chicken is 1.59±0.76, 32.3%, 54.5% and 77.7±3.9, respectively. The result of the present study showed that Fayoumi chicken well adapted to semi-arid Ethiopia and their production performance is better than the indigenous village chicken means it is a good choice for egg producer who can regularly supply supplementary feed. Fayoumi chicken were active can easily escape predators and preferred perch after onset egg lay. Poultry breeder can also use the breed for the production of commercial breed by crossing with others in semi-arid Ethiopia.

Key words: Intensive, semi-arid, mortality rate, hatchability, indigenous.

INTRODUCTION

In Ethiopia, chicken production plays a great role as a prime supplier of eggs and meat in rural and urban area and as a source of income, especially to women. Chicken production also used for poverty alleviation and efficient transforming feed protein and energy in to consumable human diets. In Ethiopia, chicken production categorized into traditional, small and large – scale oriented sectors based on the type of inputs used, number and type of chicken kept (Alemu, 1995) and the rural sector constitutes about 99% of the total chicken population managed under traditional village poultry production system (Halima, 2007). According to ILRI (2004) and MoA (1997) annual egg production potential of Ethiopian indigenous village chicken is 36 eggs with a single egg weighing between 39 and 46 g. These birds are exposed to natural selection from the environment for hardness, running and flight skills and good mothering but they are poor layers. With this potential of indigenous

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chicken, the demand of egg and chicken meat of Ethiopian populations cannot be satisfied. Yet with large poultry population, Ethiopian poultry industry remain highly undeveloped, unorganized and the country export almost no poultry meat (ILRI, 2004). Attempts have been made to introduce different exotic poultry breeds to small holder farming systems of Ethiopia because of low performance of indigenous chicken as mentioned above.

Fayoumi chickens are one of the egg producers among the introduced chicken breed to Ethiopia. They have a single medium comb, red earlobes and slate blue legs. The male has silver neck and saddle hackles with silver and black barring all over the body. Females also have silver neck feathering and a very darkly barred tail. It is adaptable and resistance to hot and very dry area of tropical and sub-tropical conditions and originated Egypt (Hossary and Galal, 1994). It is characterized by its large capacity to tolerate harsh environmental conditions of Egypt and its nutritional requirements are limited compared to those of the world breeds (Ghamry et al., 2011). Even if the breed introduced to Ethiopia previously, is new to semi-arid Ethiopia so characterizing and evaluating their production performance in a new environment is useful to prepare necessary extension packages that contribute for the success of their extension. Therefore, the study was undertaken to characterize and to evaluate their production performance under intensive management system in Adami Tulu Research center.

MATERIALS AND METHODS

Description of the study area

The experiment was conducted at Adami Tulu Agricultural Research Center, located in the mid rift valley of Ethiopia at an altitude of 1650 m above sea level (m.a.s.l. and latitude of 7°9`N and 38°7`E. The mean maximum and minimum temperature of the experimental year were 28.5 and 12.9°C, respectively and its average relative humidity was 57.25% (Adami Tulu meteorological data).

Housing and management

Before placing the experimental birds into pens, the whole unit was cleaned and disinfected and littered with properly dried tef *(Eragrostis tef*) straw. A total of 430 female and 70 male Fayoumi chickens were used in the study. Chicken were vaccinated against the most common chicken diseases of the area namely Newcastle and Bursa (Gumboro), and fowl pox. In a poultry starter house five brooding hay boxes with a size of 4 m^2 were placed for rearing of chickens until four weeks. One hundred chickens were reared in each hay box until four weeks and heated with 250 watt bulbs in brooding hay boxes. After four weeks it transferred to grower house that partitioned with mesh wire in to four. One hundred nineteen (17 male and 102 Female) chickens were assigned in each four pens during growing period. The size of each pen is sixteen meter square (16 m^2). Similar pens (four pens each with 16 m^2) size and similar male to female ratio chickens were used during laying period. Grower`s and layer`s house heated with electric only during night.

Automatic drinking and feeding systems were used during the whole study period. The commercial diet composed of maize, soybean, wheat bran soybean toasted, Noug cake, salt, limestone and premix used during the study. During the starter period 50 gram commercial starter ration containing 20% CP and 2800 kcal ME/kg, was provided each chicken each day. Three plastic tube feeders and three bell shaped (round) plastic waters were used to provide feed and water ever day in brooding hay boxes. During growing period 75 gram per head per day (g/h/d) growing ration containing 16% CP, 2700 kcal ME/kg and during laying period 120 gram per head per day (g/h/d) layers ration containing 18% CP and 2750 kcal ME/kg were provided. Six plastic tube feeders and six bell shaped (round) waters were used to provide feed and water ever day in each partitioned grower and layer house during growing and laying period. Alfalfa, leucaena leucocephala and cabbage were cut from poultry farm and freely provided at two days interval.

Contaminated tef straw removed and replaced with new every week during starter period. During growing and laying period, every two months tef straw removed and the house cleaned, disinfected with dizinon and the straw replaced with new.

A chemoprophylaxis with broad–spectrum antibiotics (oxy-tetracycline 20% powder) was given when disease suspected to minimize the risk of disease outbreak. The chickens also disinfected every two months during replacing the straw with the diazinon to protect external parasite.

Data collection

Feed offered to the chicken were measured every morning and refusal were recorded next day morning and the differences between offered and refusal were calculated as intake. Mortality, egg production were recorded daily. Body weight of chickens was taken at two months and age at 40% laying rate using suspended spring balance. Data on egg quality parameters was taken during the peak egg production time (36 to 37 weeks). Eggs were weighed using an electronic digital balance. Egg length, egg width and egg shell thickness were measured using electronic digital caliper and yolk color was determined by adjusting the score of yolk color on color fan from Roche. Egg shape index was calculated by multiply the ratio of egg width to egg length by hundred. Albumin weight calculated as a difference between egg weight and sum of shell weight and yolk weight. Incubation was carried out with in artificial incubator heated with electricity. Eggs are packed in tray pointed end downwards. From the first to eighteen days temperature kept at 37.5 to 38.5°C and humidity at 40 to 45%. Eggs are removed from the incubator to the hatching compartment or hatchery at eighteen and humidity rose up to 65 to 70% until twenty-first. Hatchability was calculated by dividing total number of chickens hatched by total number of egg set then by multiplying by hundred.

The economic benefit was estimated by considering partial budget analysis assumptions according to the formula developed by CIMMYT (1988); Ehui and Rey (1992) and Ibrahim and Olaloku (2000). The price of feed, medicine and chemicals were recorded. Feed intake per bird and price of feed per kilogram were used to calculate the cost of feed consumed by chicken. Total gross return obtained from sales of chicken and eggs.

Statistical analysis

Descriptive statistic such as mean and percentage were used to summarize the data. Standard deviation was used to compute the variation of the mean.

Table 1. Feed consumption and Production performance Fayoumi chickens under Adami Tulu Research center.

Production parameters	Mean ± S. deviation
Daily feed intake of starter (g/bird)	48.9±5.50
Daily feed intake of grower (g/bird)	71.4±5.40
Daily feed intake of layer (g/bird)	113.5 ± 8.10
Annual egg production	159.9± 10.70
Age at 40% laying rate (months)	5.0±0.02
Weight of pullet at two month(g)	277.135±5.56
Weight of cock at two months (g)	313.34±7.62
Weight of hen at five month (kg)	1.2±0.03
Weight of cock at five months (kg)	1.5±0.05
Hatchability (%)	63.50
Mortality rate%	7.20

g = gram, kg = kilo gram.

Table 2. External egg qualities of Fayoumi chicken managed under Adami Tulu Research center.

External egg quality parameters	Mean ± S. deviation
Egg weight (g)	44.30 ± 4.51
Egg length (mm)	50.77±2.60
Egg width (mm)	39.30±1.41
Egg shell thickness (mm)	0.35± 0.04
Egg shape index	77.7±3.90
Internal egg quality parameters	
Egg yolk color	1.59±0.76
Albumin weight (%)	54.5
Egg yolk weight (%	32.3
Egg shell weight (%)	13.3

g = gram.

RESULTS

Feed consumption and production performance Fayoumi chickens

Mean values of feed consumption, age at first egg laying, egg production, hatchability and mortality of Fayoumi birds are shown in Table 1.

Egg quality characteristics

The mean values of egg weight, egg length, egg width, egg shell thickness, egg shell weight, yolk color, yolk weight and albumin weight are shown in Table 2.

Economic efficiency of Fayoumi chicken rearing

The economic return in terms of partial budget analysis from Fayoumi chicken rearing under intensive management condition presented in Table 3.

DISCUSSION

Average daily feed intake of Fayoumi chicken under Adami Tulu Research center is similar with report of Khan et al. (2006), Akhtar et al. (2007), Rizwanual et al. (2011) due to similar management (intensive management) system and similar environments (semi-arid) where the experiments conducted. Age at sexual maturity of Fayoumi chicken under Adami Tulu Research center is similar with the (158.25±7.24) days report of Simeamelak et al. (2011) at Meskan Woreda of Gurage Zone, Ethiopia but attain sexual maturity earlier than the study done in northern Ethiopia by Abraham and Yayneshe (2010) in watersheds area, and than the study done at Chittagong Government veterinary College Pahartali by Khatun (2006) due to different managements and climate

Table 3. Average production cost and returns of chicken rearing at Adami Tulu research center.

Item	Cost
Total feed consumed during starter period (kg/bird)	2.28
Total feed consumed during growing period (kg/bird)	6.40
Total feed consumed during laying period (kg/bird)	42.4
Total feed cost (ETB/kg)	352.55
Cost of vaccination, medicine and disinfectant (ETB/bird)	12.00
Total variable cost (TVC), ETB	364.55
Sale of eggs and bird (GR), ETB	398.00
Net return (GR-TVC), ETB	33.45

Kg = kilogram, ETB = Ethiopian birr, TVC = Total variable cost, GR = Gross return.

condition. Age at first egg laying is late compared to the report of Abd-El-Latif et al. (1987).

Egg production under Adami Tulu Research center (159.9±10.7) is higher than their egg production in watersheds area of North Ethiopia (144±6.97) as Abraham and Yayneshe (2010) reported and then at Chittagong Government veterinary College Pahartali (140.7) eggs as Khatun (2006) reported due to different feeding managements and different climate. Fayoumi chickens attain sexual maturity earlier compared to Indigenous village birds in Ethiopia that attain sexual maturity at seven months (FAO, 2004) and produce higher eggs compared to the 36 eggs production potential of indigenous birds (FAO, 2004). Egg produced from Fayoumi chickens under Adami Tulu research center had lower hatchability (63.5%) compared to hatchability (67.9±4.11) reported by Abraham and Yayneshet (2010) in northern Ethiopia for the same breed most probably due to lower humidity under Adami Tulu Research center that cause sticking chicken with shell and causes death of chicken.

Mortality rate of Fayoumi chicken under Adami Tulu Research center (7.2%) is similar with the mortality rate (5.45%) reported by Rizwanual et al. *(*2011) for the same breed because both are done under similar management (intensive management condition). The current result is the lowest compared to the mortality rate reported for semi-scavenging Fayoumi chicken by Zaman et al. (2004) and by Abraham and Yayneshe (2010) because of different managements (feeding, housing, sanitation) and environmental temperature. Fowl pox and diarrhea caused chicken death before onset of lay. Fayoumi chickens were active and prefer perch especially after onset of lay and death of chick after onset lay related to mechanical damage while flying from ground to perch and clashing with wall. Lice are the common external parasite that observed on Fayoumi chicken under intensive management. Weight of hen and Cock in current study was lower than the weight reported by Evans (2010) due to different age when weight taken, feed type and environment where the investigation done.

Descriptive statics indicated that egg weight of Fayoumi chicken under Adami Tulu Research center is lower than the egg weight (45±0.14) reported by khan (2006) and then egg weight (45.91±3.443) reported by Akhtar et al. (2007) but heavier than egg weight (43.0±2.24) reported by Abraham and Yayneshe (2010) and then the weight (41.4) g reported by Zaman (2004) at Bangladesh for the breed. Lower shell weight was recorded under Adami Tulu Research center compared to shell weight recorded for the same breed in Pakistan by Akhtar et al (2007) due to lower egg weight under Adami Tulu Research center but higher than the shell weight recorded in Bangladesh by Zaman et al (2004) because of heavier egg weight compared to egg weight in Bangladesh for the breed. Shell thickness was similar with the report of Akhtar et al (2007) and Zaman et al (2004). Since shell is a material that contains calcium carbonate in it, its thickness related directly with the calcium carbonate content of the layers diet. Yolk color of Fayoumi chicken's egg fall at pale yellow of yolk strip which indicated less degree of saturation compared to the report of Ghamry et al. (2011). Yolk color was determined by nutrition of the layer. Because of the intensive management birds did not have the opportunity to stroll around to eat more herbage and insects so that the color of yolk has changed to a pale yellow due to carotenoid (source of Vitamin A).

In this study, net return of 33.45 birr per unit bird was obtained from the sale of eggs and bird but poultry litters that used for animal feeding and for fertilizer was not included because intensive chicken management is not common and poultry litter selling also not common in the area. Under intensive management condition, the major cost that determined the profitability of exotic chicken rearing is feed cost compared to non-feed costs (Table 3). Similar to the current study of Aganga et al. (2005) reported that under intensive and semi-intensive livestock production, a large proportion of production costs are feed costs. In the current study, commercial diet that incurred the highest cost per unit kilogram was used. Since Adami Tullu is a potential area where different grains grown, abundant agro-industrial by-products and

fish meal found using these as chicken diet instead of commercial diet used to increase net return from rearing chicken.

Conclusion

Fayoumi chickens adapted and perform well under intensive management condition of semi-arid Ethiopia. Fayoumi are very flighty, do not like being handled at all and will become very vocal when picked up. It is a good choice for egg producer who can regularly supply supplementary feed. Also, it is a good option for poultry breeder for the production of commercial breed by crossing with others in semi-arid Ethiopia. Low humidity of the area causes sticking of the embryo to the shell and causes death of embryo which results for low hatchability of the eggs. Providing enough water, watering the ground where the incubator installed used to minimize the effect of low humidity.

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