

*Full length Research Paper*

# Production Performance of Fayoumi Chicken Breed Under Backyard Management Condition in Mid Rift Valley of Ethiopia

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This Study was conducted in the mid rift valley of Ethiopia from September 2009 to August 2010 to evaluate the production performance of Fayoumi chicken breed under backyard management conditions. A total of 350 female and 50 male two months age growing Fayoumi chicken were used for the study. The chickens were distributed to five farmer research groups (FRGs) in four districts of the mid rift valley of Ethiopia. The average age and weight at sexual maturity obtained in this study were  $183.5 \pm 5.60$  days and  $1215 \pm 11.12$ g, respectively. The annual average egg production obtained was  $150.47 \pm 3.15$  eggs/hen/year and the hen day egg production was  $41.23 \pm 15.97\%$ . The mean value measurements obtained on egg weight and shape index were  $44.68 \pm 3.63$ g and  $75.95 \pm 2.81$ , respectively while the yolk weight, albumen weight, shell weight, shell thickness and yolk color were  $14.54 \pm 1.36$ g,  $24.61 \pm 2.67$ g,  $5.63 \pm 0.76$ g,  $0.36 \pm 0.04$ mm and  $5.89 \pm 3.58$ , respectively. With regard to hatchability rate 78.22% of the Fayoumi eggs set were hatched. Higher mortality rate (54.85%) was recorded in this study. The mid rift valley area of Ethiopia is agro-ecologically suitable for Fayoumi chicken breed but, effective poultry health management technique should be designed to decrease the mortality to acceptable level.

**Keywords:** Mid rift valley, Fayoumi, Backyard management, Production performance

## INTRODUCTION

In most part of Ethiopia, village chicken represents a significant component of the rural household livelihood as a source of cash income for immediate household expenses and nutrition. Production of both egg and chicken meat has certainly assisted in reducing the gap in the supplies of animal protein for human consumption (Taddele and Ogle, 2001; Dhuguma, 2009; Leta and Bekana, 2010). In Ethiopia, indigenous poultry breeds produce eggs that are used for income generation and consumption, but their eggs production potential are invariably small as compared with those of exotic breeds. According to the MoA (1997) the annual egg production potential of Ethiopian hen ranges from 40-60 with a single egg weighing between 39 and 46g.

Because of low performance of indigenous chicken breed of Ethiopia, different exotic chicken breeds (White Leghorn, Brown Leghorn, New Hampshire, Light Sussex,

Barred Rock, Rhode Island Red, Fayoumi, etc have been introduced to Ethiopia (Alemu and Tadelle, 1998 ;Tadelle et al. 2003 ; Demeke, 2004 ; Wilson, 2010). Fayoumi chicken breed has been imported with the expectation of better productivity, adaptation and disease resistance. They are originated in Egypt, reported to be a hardy breed and particularly well suited to hot climates (Heinrichs, 2007). They are also very good foragers, and if left to their own devices on a free range basis they can fend for themselves in a nearly feral manner. Fayoumi hens are good layers of small white eggs. They are not given to broodiness as pullets, but can be when they reach two or three years of age. The breed is fast to mature, with hens laying by four and half months (Ekarius, 2007).

They imported to Ethiopia because of the above mentioned merits. Considering the above mentioned merits, they were distributed to smallholder farmers to study its production performance under backyard management conditions.

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## MATERIALS AND METHODS

### Description of the Study area

The study was carried out in four districts (Adama, Adami Tullu, Lume and Arsi-Negele) of the mid rift valley of Ethiopia from September 2009 to August 2010. Adama, Adami Tullu and Lume have semi-arid type of climate; an erratic, unreliable and low rain fall averaging between 500-900 mm per year. The minimum and maximum annual temperatures are 10° and 25 °C respectively. The climate of the Arsi- Negele is divided into sub-humid (32%), semi-arid (42%) and arid (26%) zones with an average annual rainfall ranging from 500 mm to 1150 mm. All area receives 12 hours of day light. The predominant production system of the mid rift valley area is mixed crop-livestock farming. The main crops include maize, haricot bean, wheat, sorghum and *Eragrostis* (Amenu *et al.* 2010; ATARC, 1998).

### Animal Management

Two months age Fayoumi chicken breed were used in this study. A total of 350 growing females and 50 growing males Fayoumi were distributed to five farmer research groups (FRG) in four districts mentioned above, each FRG have got chicks ranging from 18-30. Before the distribution of the chicken, training was given for the participating farmers about poultry husbandry management and data collection. The chickens were vaccinated against the most common chicken diseases of the area, namely Newcastle and Infectious Bursal (Gumboro) diseases and chemoprophylaxis with broad-spectrum antibiotic (oxy-tetracycline 20% powder) was given for three days right after distribution and when disease suspected to minimize the risk of disease outbreak.

During rearing in a confinement system at Adami Tullu agricultural research center poultry farm, the chicks were fed with a balanced diet, containing 20% CP and 2850 kcal ME/kg. After transfer to the key rearers the chickens were kept for one week in confinement and fed similar feed. Subsequently, they were allowed to scavenge around the homestead and in the neighborhood for a period of three hours in the morning and three hours in the evening, and between the two scavenging periods they were provided with supplementary feed mainly maize, wheat, wheat bran and sorghum. There was a continuous supply of drinking water in the shelter as well as during the scavenging periods of the day.

### Data Collection

Data on mortality and egg production were collected daily by the participating farmers using a format prepared for

this purpose and data on egg quality parameters was collected during the peak egg production. Age at sexual maturity was considered to be the day when two eggs were collected from five hens. The egg production on a farm basis was calculated as number of eggs in relation to existing hens in a daily bases for each location and annual egg production was then computed from the sum of average daily egg production hence the number of hens in each district varies due to the difference in mortality. Egg quality parameters were determined from 200 (50 from each district) fresh clean eggs laid by the distributed chicken. Eggs were weighed using an electronic digital balance. The yolk weight was taken after gently separated the yolk from the albumen and the differences between [egg weight- (shell weight + yolk weight)] were considered as albumen weight. Egg length, egg width and eggshell thickness were measured using electronic digital caliper and Yolk color was determined by adjusting the score of yolk color on color fan from Roche (Vuilleumier, 1969). The egg index was calculated by dividing the egg width with the egg length times by hundred. Hatchability was calculated on the basis of total eggs set and no distinction was made between losses due to infertility and embryonic mortality.

### Data Analysis

Descriptive statistics such as mean, range and percentage were used to summarize and present the results. Standard deviation was also used to compute the variation of the mean from the results obtained.

## RESULTS AND DISCUSSION

### Age and Weight at Sexual Maturity

The average age and weight at sexual maturity of Fayoumi chicken obtained in this study were  $183.5 \pm 5.60$  days and  $1215 \pm 11.12$ g, respectively. Longer age at sexual maturity ( $190 \pm 3.20$  days) was observed in Arsi-Negele district this might be due to the humid agro-ecology of the area. Sazzad (1992) and Khan *et al.* (2006) observed that the age and weight at sexual maturity of Fayoumi chickens were 155.50 days and 1240g and 163.63days and  $1253 \pm 16.42$ g, respectively. This study showed early sexual maturity than the result reported by Barua *et al.* (1998) Zaman *et al.* (2004) ;Abraham and Yayneshet (2010), who reported the age at sexual maturity of Fayoumi chickens to be 225, 201.2 and  $231 \pm 5.53$  days, respectively. Zaman *et al.* (2004), further showed that the average body weight at sexual maturity for Fayoumi chicken was 1197g. The early sexual maturity obtained in this study may be due to the longer duration of light and the hot climate because this character is influenced by environmental factors such as temperature, nutrition, lighting intensity etc.

**Table 1:** Mean  $\pm$ SD for Fayoumi egg quality characteristics

<b>Egg quality trait</b>	<b>Mean <math>\pm</math> SD</b>
<b>External egg quality traits</b>	
Egg weight (g)	44.68 $\pm$ 3.63
Egg length (mm)	51.8 $\pm$ 1.71
Egg width (mm)	39.31 $\pm$ 1.17
Shape index	75.95 $\pm$ 2.81
<b>Internal egg quality traits</b>	
Yolk weight (g)	14.54 $\pm$ 1.36
Albumen weight (g)	24.61 $\pm$ 2.67
Shell weight(g)	5.63 $\pm$ 0.76
Shell thickness(mm)	0.36 $\pm$ 0.04
Yolk color on DSM color fan from Roche	5.89 $\pm$ 3.58

### Egg Production Performance

In this study the annual average egg production of Fayoumi chicken managed under backyard management condition was  $150.47 \pm 3.15$  eggs/hen/year and the hen day egg production was  $41.23 \pm 15.97\%$ . The peak hen day egg production percent was achieved at 31-36 weeks of age and the peak hen day egg production was 60.22%. The egg production pattern was similar across the districts this might be due to similar management practices delivered. Abraham and Yayneshet (2010), found the egg production of Fayoumi chicken breed managed by smallholder farmers in northern Ethiopia to be  $144 \pm 6.97$ . Khan et al. (2006) found the annual average egg production of Fayoumi chicken to be 140.70 eggs per hen per year and the hen day egg production was 38.55% under intensive management condition. Rahman et al. (1997), reported the hen day egg production of Fayoumi chicken with 130g concentrate supplement to be 56% and Tareq (1992), reported annual egg production of 129.92/hen/year under rural condition. Sazzad (1992), observed the egg production of Fayoumi chicken under intensive management for 150 days and reported egg production of 76eggs/hen. Here it was found that the egg production of Fayoumi in this study was in agreement with those previously conducted studies, this indicates the suitability of Ethiopian mid rift valley for this breed.

### Egg Quality Characteristics

Mean values for internal and external egg quality traits of the eggs were as presented in Table 1. Measurement on egg weight, egg length, egg width and shape index ranged from 38.75 to 50.70g, 48.00 to 54.50mm, 37.40 to 42.00mm and 71.23 to 80.20, respectively while the yolk weight, albumen weight, shell weight, shell thickness and yolk color ranged between 13.00to 17.40g, 19.30 to

30.10g, 4.50 to 7.60g, 0.25 to 0.42mm and 3 to 14, respectively. The egg quality characteristics have shown similar trend across the districts, this might be due to the similar management practices.

The average egg weight obtained in this study was slightly in agreement with the finding reported by Yeasmin (2000), Islam et al. (2003) and Khan et al. (2006), for this breed who observed average egg weight of 46.25, 46.75 and 45.79g respectively. Abraham and Yayneshet (2010), in northern Ethiopia found the egg weight of Fayoumi chicken to be  $43.0 \pm 2.24$ g. Akhtar et al. (2007) reported egg weight of  $45.91 \pm 3.443$ g for Fayoumi,  $49.86 \pm 3.341$ g for Rhode Island Red (RIR) and  $51.84 \pm 3.318$ g for Lyallpur Silver Black (LSB). This indicates that the egg weight of eggs produced by LSB chicken breed and RIR were significantly higher than that of Fayoumi. But, the egg weight result obtained by this study is relatively higher than the result obtained by Zaman et al. (2004), who reported the average egg weight of Fayoumi chicken to be 41.4g. In general Fayoumi chicken breed lays relatively smaller egg when compared to other commercial chicken breeds.

The average mean shape index value observed was  $75.95 \pm 2.81$ . According to Rajkumar et al. (2009), the average shape index was 75.79 in naked neck chicken. Higher shape index was observed,  $80.76 \pm 1.32$  for IWK and lower shape index  $73.77 \pm 3.08$  for IWI and  $72.67 \pm 7.56$  for IWH strains of White Leghorn chicken breed than the present study (Chatterjee et al. 2006). The relatively higher shape indices observed in the present study may be because of the more uniform shape and size of the eggs. The egg length and egg width also showed the similar trend as that of shape index.

Shell weight of eggs produced by Fayoumis' chicken breed obtained in this study is slightly lower than the result obtained by Akhtar et al. (2007), who reported  $6.29 \pm 0.478$ g for Fayoumi and  $6.50 \pm 0.540$ g for RIR chicken breed. Khalid (2001), reported that shell weight of different breeds can vary significantly.

**Table .2.** Mortality at different ages of Fayoumi chicken breeds managed under Backyard Management Condition

S.No.	Mortality in different age category	District				Total
		ArsiNegele	Adami-Tullu	Lume	Adama	
1	Growers	43.67	33.3	22.2	28.89	32.02
2	Layers	33.15	-	0	12.5	22.83
<b>Grand total</b>						<b>54.85</b>

Key: - data not available

The shell thickness of the eggs of Fayoumi hens used in this study was in agreement with the result obtained by Akhtar et al. (2007), who reported  $0.37 \pm 0.023$ mm for Fayoumis' and  $0.35 \pm 0.028$ mm for RIR. Zaman et al. (2004), reported the average egg shell thickness of Fayoumi chicken to be 0.330mm. Egg shell thickness has genetic peculiarities, because the ability to produce eggs with varying shell thickness is 25% heritable character (Akhtar et al. 2007). This indicates that Fayoumi chicken breed has got good heritable character of shell thickness. Good shell thickness is economically important trait in commercial egg production as it may help to reduce the percentage of broken eggs.

The average yolk weight obtained in this study was slightly in agreement with the finding reported by Akhtar et al. (2007), who reported  $16.29 \pm 1.205$ g for Fayoumi,  $15.55 \pm 1.057$  for LSB and  $16.83 \pm 1.380$  for RIR. According to Cicek and Kartal kanat (2009), increase in yolk weight can be observed with increasing age. The average albumen weight obtained in this study was higher than the finding reported by Fayeye et al. (2005) and Parmar et al. (2006), who reported 20.33 for Fulani-ecotype chicken and 21.27g for indigenous Kadaknath breed, respectively; this might be due to the genetic variation among these breeds.

The yolk color obtained in this study was lower than the result obtained by Zaman et al. (2004), Cicek and Kartal kanat (2009), who reported 9.3 and 11.94 on DSM color fan from Roche; this might be due to the difference in scavengable feed resource of this study areas. Dark yellow, which is a preferred color by costumers, it is provided when they feed on herbage, insects and dung (Kirkpinar and Erkek, 1999). This indicates that the yolk color changes depends on how chicken are fed as a result village chicken eggs yolk color is darker than the commercial hence they feed on different herbage and insects. According to Premavalli and Viswanathan (2004), yolk color can vary as a result of nutrition, age, system of management and genetic makeup.

### Hatchability

In this study 78.22% of the Fayoumi eggs set under natural incubation were hatched. Higher hatchability rates

86.15% was achieved in Arsi-Negele district followed by Adama district 58.52%. This finding was in agreement with the result obtained by Tadelle et al. (2003) in Ethiopia and Moreki (2010) in Botswana. The relatively higher proportion of eggs hatched from Fayoumi eggs may be attributed to the positive correlation between lighter egg weight and its hatchability (Yassin et al. 2008). Hatchability of eggs is a function of both maternal and paternal components, and the former has an overriding effect on genetic variation in hatchability of a fertile egg, which is attributed to the quality (external and internal) of the laid egg. Eggs stored for a longer period of time and collected from older age flocks are known to have lower hatchability (Yassin et al. 2008).

### Mortality

Although, vaccination for most common poultry diseases of the area (Newcastle and Gumboro diseases) were delivered higher mortality rate (54.85%) was recorded in this study. This might be due to higher occurrence of other economically important diseases other than Newcastle and Gumboro, the ineffectiveness of the vaccine delivered, failure of cold chain and/or faulty administration of the vaccine. The highest level of mortality (76.82%) was recorded in Arsi-Negele district sites this might be due to its humid agro-ecology. According to Heinrichs (2007), Fayoumi chicken breed is suit to hot climates. The mortality rates recorded in this study also vary between age categories (table 2). The mortality records found in this study are highly in contrast with Demeke (2004), who reported 5 and 7% mortality for local and White Leghorn chicks under scavenging and intensive systems, respectively. However, the result obtained by this study was slightly in agreement with the result reported by Tadelle et al. (2003), who reported 49% mortality in village chickens in Ethiopia and Kugonza et al. (2008) who reported 74% mortality in local chicks in Uganda. Amin et al. (1992), reported higher mortality of 55% in RIR x Fayoumi compared with indigenous chicken in a scavenging system. According to previous research findings the major causes of poultry losses in village chicken production was mortality due to disease, predator and nutritional stress (Alemu and Tadelle,

1998; Chitate and Guta, 2001; Leta and Bekana, 2010; Moreki, 2010). In this study relatively lower mortality for growers and no mortality was observed in Lume district. This might be due to a better husbandry management practiced by farmers in this districts as well as its warmer agro-ecological condition.

In conclusion backyard chicken production has a deep-rooted impact on social, cultural and economic profile of the poor rural community. The Fayoumi chicken breed can express their production potential in rift valley area of Ethiopia in fever of the suitable agro-ecology but, effective poultry health management technique shall be designed to decrease the mortality to acceptable level.

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