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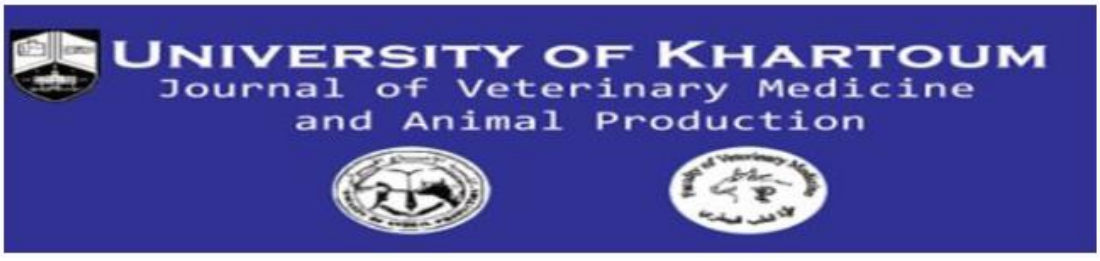

The Impact of the Seasonal Variation and Geographical Location (GL) on Fertility and Hatchability of the Native Libyan Chicken

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Abstract

This study aims to determine the effects of the seasonal variation and eggs sources on the fertility and the hatchability performance of the native chicken that is widely breed at the three agro-ecological regions located at Al Jabal Al Akhdar, Eastern Libya. A total of 1200 eggs were collected as 600 eggs in summer and 600 eggs at winter equally from the three selected regions (Darna (200), Al Beida (200) and Kharroba (200) for each season. The quantitative traits studied in the current trial were egg weight , fertility and hatchability percentage , mortality rate as well as the early, medium and late embryonic death. The findings of this study showed that at summer and winter seasons there are no significance differences in the fertility %, early, medium and late embryonic death % while both hatchability % and the overall embryonic death showed significant differences ($P<0.05$). It was clearly observed that the late embryonic death % was higher than the early embryonic death in both seasons. The results revealed that the hatchability was significant decreased at summer season (59.33±4.30) compared with 79.16±4.6 at winter season. Fertility and hatchability percentages showed significant differences ($P<0.05$) at the three geographical studied regions.

Keys: Libyan chicken breed, Fertility, Hatchability, Embryonic death

الملخص العربى

هدفت هذه الدراسه الى تحديد تاثير تغيير الفصول (الشتاء ، الصيف) وتاثير الاماكن الجغرافية التى تم جمع البيض منها على نسبتى الخصوبة والفقس فى الدجاج الوطنى المربى بمنطقة الجبل الاخضر- شرق ليبيا. تم جمع 1200 بيضه من ثلاثة مناطق مختاره (درنه

200 ، البيضاء 200، الخروبه 200) فى كل من فصلى الشتاء والصيف . الصفات المقياسيه التى تم دراستها هى وزن البيض ، نسبة الخصوبه ، نسبة الفقس ، نسبة الوفيات الاجماليه، نسبة وفيات الاجنه فى كل من المرحله الاوليه، المتوسطه والمتاخرة . اظهرت النتائج فى هذه الدراسه انه ليس هنالك اختلافات معنويه بين النتائج المتحصل عليها فى فصل الشتاء وفصل الصيف فى كل من نسبة الخصوبه، نسبة وفيات الاجنه فى المرحله الاوليه، نسبة وفيات الاجنه فى المرحله المتوسطه بينما وجدت اختلافات معنويه فى نتائج نسبة الفقس، النسبه العامه لوفيات الاجنه التى كانت اعلى من نسبة النفوق الجنينى فى المرحلة الاولية فى كل من فصل الشتاء والصيف . اظهرت الدراسة ايضا ان نسبة الفقس قد انخفضت بصوره ملحوظة فى فصل الصيف 59.33±4.30 مقارنة مع 79.16±4.6 فى فصل الشتاء . وجدت الدراسه ان العوامل المدروسه قد تاثرت معنويا ($P<0.05$) حسب المنطقه الجغرافيه التى تم جمع البيض منها. .

Introduction

Poultry production is the main source of household nutrition and income in the developing countries. Local chickens are kept in many parts of the world irrespective of the climate, traditions, life standard, or religious taboos relating to consumption of eggs and chicken meat (Tadelle, 2003). The scope for utilizing local chicken as a source of poultry meat is high because consumers prefer its meat (Kperegbeyi *et al.*, 2009). Most of the poultry in Libya is endogenous breeds called Watni chicks which are known by their adaptation to the unique environmental condition. Its productive potentials has not been fully harnessed because it has remained unselected and unimproved (Okoleh *et al.*, 2012). El-Safty (2012) reported that the Libyan native fowls still neglected and there are no serious attempts to neither collect nor characterize those birds based on quantitative or qualitative traits over the Libyan areas. Momoh *et al.* (2007) reported that the development of the local chicken as potential layer have shown appreciable improvement in egg production traits under improved management. A more permanent approach towards a sustainable productivity is a genetic improvement which can be achieved through selection and crossbreeding (Szwackowski *et al.*, 2003). Okoleh *et al.* (2012) focused on the selection of the desirable genetic traits of the local breed which will subsequently be crossed either with themselves or with other populations.

Egg weight, fertility and hatchability are the most important economic traits in poultry production (El Safty, 2012). Fertility and hatchability performance of eggs depend on the number of factors like genetic, physiological, social and environmental (Olawumi *et al.*, 2008, Sapp and Wing, 2004). Seasonal fluctuations could cause wide variability in hatchability. Higher hatchability of chicken eggs was reported in spring than in summer (Farooq *et al.*, 2003**).** The objective of this study is evaluation of the effects of the seasonal variation and eggs sources locations on the fertility and the hatchability performance of the native chicken that is breed at the three agro-ecological regions located at Al Jabal Al Akhdar, Eastern Libya.

Materials and methods

This study was conducted at the Animal Production Department, Faculty of

Agriculture, Omer Al Mukhtar University, Libya. A total of 1200 eggs were collected as 600 eggs at summer and 600 eggs at winter equally from the three ecological selected regions (Darna (200), Al Beida (200) and Kharroba (200) for each season. The quantitative traits studied in the current study were egg weight fertility and hatchability percentage, overall mortality rate as well as the early, medium and late embryonic death. The eggs were numbered and weighed individually using sensitive weighing scale. The eggs were set into electronic incubator with broad end pointing upward. The incubation temperature was 37.7^{o} C with 65% humidity. Eggs were turned hourly from first day till the day 17th at which they were candled and fertile eggs were calculated as fertility percent. Dead embryos were recorded and classified as early embryonic death (death during first week), medium embryonic death (death at second week). The remaining fertile eggs were transferred to the Hatcher in special trays that divided into squares, every square for one egg. The hatching temperature was 37^{o} C with 80% humidity. Hatched chicks were removed from the Hatcher, the hatchability percent and late embryonic death (failed to hatch) were calculated. Data were statistically analyzed using SPPS and tabulated

Results and discussion

The influence of seasonality on fertility and hatchability traits (hatchability, embryonic mortality (early, medium, late and total mortality)) are given in Table 1.The results showed that at summer and winter season there are no significance differences in the fertility percent, early embryonic death percent, medium embryonic death percent and the late embryonic death percent, while both hatchability percent and the total mortality rates were showed presence of significant ($P<0.05$) differences. The results of the effect of seasonal variations on the fertility was 93.50 ±1.15 and 89.33±2.96 at winter and summer respectively, these results are not in accordance with the findings of Premavalli *et al.* (2015) and Jesuyon *et al.* (2013) who have reported highest egg fertility in chickens during the cold season. The present results might be attributed to the atmospheric environment of the Al Jabal Al Akhdar that lies at 600 meters above the sea which provided lower temperature even at summer season. Farooq *et al.* (2000) reported poor hatchability in summer hatches. In the same manner Chowdhury *et al.* (2004) also reported highest hatchability of duck eggs in winter and lowest in summer. The observed variations in fertility and hatchability performance of eggs confirm the previous findings of (Olawumi *et al*., 2008 and Sapp and Wing, 2004) who reported that there are many genetic and non-genetic or environmental factors which include breed or strain, nutrition, obesity, health and physiological factors that affect fertility and mortality of breeder cocks.

The overall mean per cent of embryonic mortality was 19.33±4.04 at winter season which was significantly lower than summer (36.00±2.78) as shown in table 1. it was clearly

observed that the late embryonic death percent was higher than the early embryonic death in both seasons and similarly at the eggs that collected from the three different regions and this might be strongly attributed to the improper hatching environment. With regard to early, medium and late embryonic death percentages they did not differ significantly (P>0.05), that is, there was no statistically significant difference in their mean values at winter and summer seasons.

The hatchability was significantly (P<0.05) decreased during summer season (59.33±4.30) compared with 79.16±4.6 at winter season. The higher hatchability during winter season could be attributed to favorable environment for egg storage and availability of more fresh eggs for hatching than in other seasons of the year. The decline in hatchability performance in summer may perhaps be attributed to pre-incubation development and weakening of the embryos before the eggs were received at the hatchery as well as the fact that the prolonged exposure of fertile eggs on the litter leads to soiling, shell damage and entry of pathogens, These are all the main determining factors for the lowered hatchability performance in summer. Jayaranjan (1992) also observed a significant effect of hot season on hatchability.

The mean of the egg weight for the eggs that collected from Darna, Karroba and Al Beda regions are presented in table 2, It is clear that the size is considered as medium size according to the international standard (44.5-46.7 grams) . The average egg weight of Libyan native chicken was 43.7g as reported by El-Safty (2012). Other authors mentioned eggs weight range between 37-55 grams (Msoffe *et al.* (2001and 2004), Khan *et al.* (2004) and Fathi *et al.* (2007).

The analysis of the fertility% and hatchability parameters of the eggs that collected from three different regions were shown in table (2) the fertility percent was highest on the eggs that collected from Darna (95.25±0.25) followed by the eggs that collected from Karroba (90.75±2.75) and the least mean was shown with eggs that collected from Al Beda region (88.25±3.20). In the same table the hatchability percent was significantly different in the three studied regions and it was the highest at eggs that collected from Darna. Significant differences were observed with the early and medium embryonic death percentages (P<0.05) while the other parameters (late embryonic death percent and the total mortality) showed no level of significance. Similarly, the total embryonic death had no significant difference in three regions of the study as shown in table 2.

In general, the fertility% values observed in the present study was higher than the value reported by El-Safty (2012) who reported fertility percent as 73% in the local chicken belongs to southern Libya , and therefore the obtained higher fertility rate this might be attributed to effect of lower temperature in the eastern area of the country compared with the southern. The hatchability

percent values of the present study were ranged between 59.33 and 79.16, where the highest percent of the hatchability was observed in the eggs collected from Darna region (77.50±4.60) followed by Karroba region (67.25±12.25), and the lowest percent was observed al Al Beida region (63.00±8.00). El-Safty (2012) reported hatchability of 69% in the Libyan local breed. Other authors reported hatchability of native chicken as 83.6% and 52.2% in Tanzania (Mwalusanya *et al*., 2001) and (Malago and Baitilwake, 2009) respectively, in Kenya 70% and 81% in two native breeds (Odula Olwande *et al.*, 2009). All previous authors were mentioned that the fertility and hatchability of local chicken eggs may be highly varied due to poor management and improper proportion of males or poor ability of males to produce viable sperms. Farooq *et al.* (2000) observed that hatchability of scavenging chicken maintained by untrained farmers is low (60%) and high (84.1%) for trained farmers.

Variations in embryonic mortality may be due to differences in environmental conditions, imbalanced nutrition, and stress conditions to the parent flock, improper in incubation process and poor egg quality.

This study concluded that the fertility and hatchability of the native breed are intermediate and recommended further studies for genetically mapping and selection for improvement of the native breed productivity. Control of management and nutrition might play an important role enhancing productivity of the native breed.

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