Scientific Papers. Series D. Animal Science. Vol. LXVII, No. 1, 2024
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

EFFECT OF SELECTION IN LIVE WEIGHT ON REPRODUCTIVE TRAITS OF LOCAL GERZE CHICKENS

Ezgi İLKILINÇ, Elif CİLAVDAROĞLU, Umut Sami YAMAK

Ondokuz Mayis University, Agricultural Faculty, Department of Animal Science, Samsun, Turkey

Corresponding author email: usyamak@omu.edu.tr

Abstract

This study was executed to determine the effect of selection in live weight on reproduction of chickens. A total 300 Turkish local Gerze chickens were used in the study. All chickens were individually weighed at 8 weeks of age. Heaviest 75% (225 chickens) were chosen and separated from the flock. The mean live weight of chosen birds was 404.34 gram at 8 weeks and significantly higher than unselected birds (359.29 gram; P<0.05). At 18 weeks of age, the chickens were weighed again. The selected group had reached 1068.92 grams while unselected chickens 1059.69 grams and the difference between them was insignificant. Age at first egg was 182 days for selected hens while 177.5 days for unselected hens. The mean egg weights of eggs produced until 40 weeks of age were 47.11 g and 46.76 g, respectively for selected and unselected groups.

Key words: *egg weight, Gerze Chicken, live weight, selection.*

INTRODUCTION

Gerze chicken is one of two indigenous chicken breeds of Turkey. Mature body weight is 1400 g for females and 1600 g for males at one year old age. Total egg production at this age is between 85-100 per hen (Arslan et al., 2023). These lower production levels causes Gerze chickens not to be preferred for village flocks. As a result, Gerze chickens threatened with extinction. Therefore, a project started to increase live weight of Gerze chickens to make more preferable for back yard flocks. Measuring body weight is easy and there are high correlations with other traits. Therefore, selection for body weight is important for genetic improvement (Abd El-Ghany, 2005, Kosba et al., 2006; Ramadan et al., 2014). Body weight in poultry is known to be moderately to lightly heritable and hence the selection of heavier individuals in a population should result in genetic improvement of the trait (Oke et al., 2004).

While increasing body weight by selection, egg production has to be also stayed constant, because main factor influencing egg size and feed intake is body weight (Summer & Leeson, 1983).

Egg production depends of many characters and is the yield of overall performance of a bird concerning many variables such as body weight, egg weight, egg number, age at sexual maturity, egg quality, these variables are correlated with body weight and with each other in the positive or negative trends (Saleh et al., 2006; 2008; Younis et al., 2014).

On the other hand, selection for the live weight gain in laying hens showed that egg production decreased and egg weight and feed consumption increased as body weight increased because heavy birds consume more feed and lay larger eggs with large egg yolk than light hens (Lacin et al., 2008). Although egg size can be manipulated by nutrition, some other factors such as age and body weight of the hen can influence egg size (Iqbal et al., 2016).

The reproductive performance of Gerze chickens which were selected on body weight or not was investigated in the study. The effects of increased body weight on egg production, egg weight and fertility were examined.

MATERIALS AND METHODS

This study was conducted at the Experimental Farm of Ondokuz Mayis University Agricultural Faculty. Eggs collected from the Gerze chicken flock at the farm. After incubation, a total of 800 male-female mixed Gerze chickens were used in the study. 600 of chicks were wing-banded and grew on a litter

system. At 8 weeks of age, all chickens were individually weighed and the heaviest 75% of females (225 chickens) and heaviest 10% of males (30 chickens) were separated as the selected group. Selected birds were individually weighed at 18 weeks of age. For the control group; 200 male-female chickens were wing-banded and reared on a litter system without selection. Control group was also individually weighed at the ages of 8 and 18 weeks. At 18 weeks of age, selected birds were divided into 6 groups each containing 37 females and 4 males. Control group was divided into two groups each containing 40 females and 4 males. These chickens were randomly chosen. Feed and water were given *ad libitium*. The nutritional values of feed given during all periods of production are given in Table 1. Lighting provided 8 hours daily until 18 weeks, gradually increased by one hour weekly, reached 13 hours at 23 weeks, and stayed constant.

Production ended at 52 weeks of age. Egg production was daily recorded. Eggs were daily collected and weighed. Sexual maturity was determined when hens reached 50% egg production and chickens were weighed at that age.

SPSS software used for statistical analyses. the Results were compared with one-way analysis of variance and the Duncan multiple comparison test was used to determine the difference between the groups.

Table 1. Nutritional values of feed given at different ages

	Ages (weeks)	Crude Protein (%)	ME (Kcal/kg)	Calcium (%)	P (%)
Egg type chick feed	0-8	19	2800	0.8-1.2	0.35
Egg type chicken development feed	9-20	16	2800	1.0-1.5	0.33
Layer feed	21-52	15	2750	3.5-4.5	0.32

RESULTS AND DISCUSSIONS

The weight of chickens at 8 and 18 weeks of age; the ages at first egg and sexual maturity ages and total egg production at 52 weeks of age are given in Table 2. The chickens were selected according to weights at 8 weeks of age. The heaviest 75% of the chickens were chosen for selected group and the mean live weight of them at 8 weeks of age was 404.34 g while the mean live weight for control was 359.29 g ($P<0.05$). The birds were reared until 18 weeks of age and weighed again. It's seen that the difference between the body weights disappeared and the mean weights were determined as 1068.92 grams and 1059.69 for selected and control groups, respectively. It's thought that this is related to variations of the flock. In both groups, pullets reached their mature weight which their genetic potential allows. The effects of selection in live weight could be seen in the next generations.

The onset of laying was earlier in the control group than in selected hens ($P>0.05$). The first egg was taken at 177.5 days in the control group whereas; the selected group hens laid the first egg at 182 days. Similarly, age at 50% egg production which was commented as sexual maturity age was earlier in the control group than selected hens. Control group hens reached sexual maturity at 222 days while selected group hens reached 227.67 days. In both traits, there were five-day delays for the selected group, but the differences were not significant. The mean body weights at sexual maturity were 1387.1 g and 1469.5 g for selected and control groups, respectively ($P<0.05$). Although the control group had significantly higher sexual maturity body weight, both selected and control group hens' body weights were around 1400 g; this weight is evaluated as a limit sexual mature weight for indigenous chicken genotypes (Tang et al., 2009). This means that both selected and control groups reached their adult body weight at sexual maturity ages. It has been reported that there exists a threshold body weight for each strain of bird (Dunnington, & Siegel, 1984). Yuan et al. (1994) reported that underweight pullets have a delayed onset of egg production and overweight ones have started egg production earlier. This notice is contrary to our findings. But it is mostly about the uniformity of birds in the same flocks. In our study, selected birds and the control group were separately reared. So, there was no competition between the birds of the same

flocks which had different weight groups. Similar to our results, Bish et al. (1985) reported that body weight was not an influencing factor on age at 50% production.

Total egg production until 52 weeks of age was 52.49 and 44.0 for selected and control group hens. These values are lower than previous reports (Arslan et al., 2023). We thought that this could be related to management of the flocks. Deviation from the body weight threshold of hens can decrease the efficiency of egg production. Therefore sexual maturity weight one of the most important factors affecting egg productivity. Body weight at onset of egg production and throughout the production year influences the efficiency of egg production (Bish et al., 1985).

Table 2. Some productive traits of selected and control group chickens

	Weight at 8 weeks (g)	Weight at 18 weeks (g)	Age at first egg (days)	Age at 50% egg production (days)	Sexual maturity weight (g)	Total egg Production at 52 weeks of age	Mean egg weight (g)
Selected	404.34	1068.92	182.00	227.67	1387.1	52.49	47.11
Control	359.29	1059.69	177.50	222.00	1469.5	44.00	46.76
P	<0.05	0.684	0.159	0.230	0.001	0.299	0.418

The relationship between egg production, egg weight and mature body weight follows the same pattern as observed in the body weight at sexual maturity (Ayorinde et al., 1988; Oke et al., 2004). The sexual maturity weight of the hen is one the most significant factors affecting egg weight, at the beginning of the laying period (Robinson & Sheridan, 1982; Summers & Leeson, 1983). The mean weight of eggs produced by the control group hens until 40 weeks of age was 46.76 g, while the mean weight for selected hens at 40 weeks was 47.11 g. Although the sexual maturity weight of the control group was higher than the selected hens, the mean egg weight of the control group was lighter than selection groups' eggs. This result is contrary to the findings given above about the relationship between sexual maturity weight and egg weight. It's thought that this could be related to ages at first and sexual maturity ages of the groups. The age at the first egg was five days earlier than selection group. Similarly control group hens reached to sexual maturity age five days than selection hens. It's well known that hens begin to lay small eggs at the onset of production and eggs get bigger in the following weeks (Abiola et al., 2008). Therefore, the control group had more eggs that were laid earlier, and these eggs caused the mean weight to be lower than the selection group. Disregarding, the egg weights of both groups are in the ranges which reported that egg size within the intermediate range of 45-56 g would hatch better than small eggs (Asuquo and Okon, 1993). A positive correlation was reported between egg weight and hatchability (Senapati et al., 1996). Therefore, higher egg weight in the selection group was one of the aims of project.

CONCLUSIONS

As a conclusion, selecting local birds for live weight at immature ages did not significantly affect mature body weight at 18 weeks of age. But selected chickens. But, selected birds reached sexual maturity afterwards control group hens. Otherwise, cumulative egg production at 52 weeks of age was higher in selection group. Also, mean weight of eggs produced until 40 weeks of age was higher in selection group. This is an important point for the selection programs aiming body weight increase in the offsprings.

ACKNOWLEDGEMENTS

This study is supported by Ondokuz Mayis University Scientific Projects Office (Project number: PYO.ZRT.1904.23.002).

REFERENCES

Abd EL-Ghany, F.A. (2005). Selection for improving some economic traits in developed Inshas chickens strain. *Journal of productivity and development*, 10, 195-210.

Abiola, S.S., Meshioye, O.O., Oyerinde, B.O. & Bamgbose, M.A. (2008). Effect of egg size on hatchability of broiler chicks. *Archivos de Zootecnia*, 57 (217), 83-86.

Arslan, C., Cilavdaroglu, E. &Yamak, U.S. (2023). Age-related changes in egg weight and shape index in gerze chickens eggs. *Blacksea Journal of Engineering and Science*, 6(4), 317-320. https://doi.org/10.34248/bsengineering.1307350

Asuquo, B.O. & Okon. B. 1993. Effects of age in lay and egg size on fertility and hatchability of chicken eggs. *Nig. J. of Anim. Prod*., 20, 122- 124.

Ayorinde K.L., Toye A.A. & Aruleba O.A. (1988). Association between body weight and two feeding regimes during the growing phase on growth performance and early lay characteristics of pullets. *Nigeria Journal of Animal Production*, 22, 101-107.

Bish, C.L., Beane, W. L., Ruszler, P. L. & Cherry, J. A. (1985). Body Weight Influence on Egg Production. *Poultry Science*, 64, 2259-2262

Dunnington, E. A. & Siegel, P.B. (1984). Age and body weight at sexual maturity in female White Leghorn chickens. *Poultry Sci*., 63, 828-830.

Iqbal, J., Khan, S.H., Mukhtar, N., Ahmed, T & Pasha, R.H. (2016) Effects of egg size (weight) and age on hatching performance and chick quality of broiler breeder. *Journal of Applied Animal Research*, 44(1), 54-64, DOI: 10.1080/09712119.2014.987294

Kosba, M.A., Farghaly, M. H., Bahie El-Deen, M., Iraqi, M.M., El-Laban, A.F.M. & Abd El-Halim, H.A. (2006). Genetic trends and evaluation for some productive traits in Alexandria chickens. *Egypt. Poult. Sci.,* 26, 1497- 1513.

Lacin, E., Yildiz, A., Esenbuga, N. & Macit, M. 2008. Effects of differences in the initial body weight of groups on laying performance and egg quality parameters of Lohmann laying hens. *Czech J. Anim. Sci.*, 53(11), 466–471.

Oke, U.K., Herbert, U., & Nwachukwu, E.N. (2004). Association between body weight and some egg production traits in the guinea fowl (Numda meleagris galeata. Pallas). *Livestock Research for Rural Development*, 16,72. Retrieved March 12, 2024, from http://www.lrrd.org/lrrd16/9/oke16072.htm

Ramadan, G.S, Moghaieb R.E., El-Ghamry A.A., E.M. El-Komy, F.S. Nassrar, A.M. Abdou; Mona M. Ghaly & Stino, F.K.R. (2014). Effect of selection for high live body weight on slaughter performance of Broiler breeds. *Egypt. Poult. Sci*., 34, 289-304.

Robinson, D. & Sheridan, A.K. (1982). Effects of restricted feeding in growing and laying period on the performance of White Leghorn by Australorp cross-bred and White Leghorn strain cross chickens. *British Poultry Science*, 23, 199–214.

Saleh, K, Younis H.H., Abd El-Ghany F. & Enyat Hassan, A. (2006). Selection and correlated response for egg production traits in Inshas and Silver Montazah strains of chickens. *Egypt. Poult. Sci.,* 26, 749- 770.

Saleh, K., Younis H.H., Rizkalla H.E. & Ragaa E. Abd El-Krim (2008). Direct and correlated response of selection for improving body weight in El-Salam chickens. *Egypt. Poult. Sci.,* 28, 431-454.

Senapati, P.K, Dask Madal, K.G. & Chatterjee, A.K. (1996). Relationship between egg weight, shape index, fertility and hatchability of Japanese quail eggs. *Environ. Ecol. Stat.,* 14, 574- 577.

Summers J.D. & Leeson S. (1983). Factors influencing egg size. *Poultry Science*, 62, 1155–1159.

Tang, H., Gong, Y.Z., WU, C.X., Jiang, J., Wang, Y. & Li, K. (2009). Variation of meat quality traits among five genotypes of chicken. *Poult. Sci*. 88, 2212-2218.

Younis, H.H; Abd El-Ghany F.A. & Nasra Awadein B. (2014). Genetic improvement of egg production traits in Dokki-4 strain. 1- Correlated responses, heritability, genetic and phenotypic correlations for egg production and egg quality traits. *Egypt. Poult. Sci*., 34, 345-362.

Yuan, T., Lien, R.J. & Daniel, G.R. M.C. (1994). Effects of increased rearing period body weights and early photo stimulation on broiler breeder egg production. *Poult. Sci.,* 73, 792-800.