Effect of Hen Weight on Egg Production and Some Egg Quality Characteristics in Pheasants (*Phasianus colchicus*)*

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ABSTRACT : A study was conducted to determine the effect of live weight of pheasants on egg production and egg quality characteristics. A total of 48 ring-necked pheasants were divided into control, heavy, middle and light BW groups. Live weights of the control were 1,187 g, 1,352.92 g for heavy group, 1,247.92 g for middle group and 1,003.33 g for light group. Egg production of groups were found as 47.32, 42.82, 45.79 and 46.51% respectively, in 10 weeks of period. There were no statistical differences on egg production among the groups. The effect of live weight on egg weight, shape index, specific gravity, shell weight, shell thickness, Haugh Unit, yolk weight and albumen weight were found statistically significant ($p<0.05$). The effect of live weight on albumen index, membrane weight and membrane thickness were found not important ($p>0.05$). On the other hand, other important factors to be effective on the egg quality of pheasants should be investigated. As a result of this study, live weight of pheasant hens is not an important factor to obtain high egg production in pheasants. But, body conformation of breeding materials should be in good conditions. ***(Asian-Aust. J. Anim. Sci. 2004. Vol 17, No. 5 : 684-687)***

Key Words : Pheasant, Live weight, Egg production, Egg quality

INTRODUCTION

The name of pheasant is used by the World Pheasant Association (WPA) as a common name of 49 species of pheasant (McGowan and Garson, 1995). Because of the goodness of these birds, pheasant breeding have been done as a hobby. It has been reported that the Ring necked pheasant has the most adaptable characteristics for intensive breeding and also, it is the most suitable species for breeding meat production purpose among all of the pheasant species (Marsico and Vonghia, 1992). The Ring-necked pheasant has been widely bred as a hunting material and for meat production throughout the world.

In literature, it has been reported that 40 to 170 eggs have been obtained from the pheasant in a laying season (Woodard and Snyder, 1978; Woodard et al., 1983; Blake et al., 1987; Slaugh et al., 1988; Çetin et al., 1997; Tepeli et al., 2002). While there were more studies on some egg quality characteristics of domestic fowl (Yannakopoulos and Tserweni-Gousi, 1986; Poyraz, 1989), a few studies were found related to the quality characteristics of pheasant eggs (Tserweni-Gousi and Yannakopoulos, 1990; Song et al., 2000). The important role of the pheasants as a game bird and the problems associated with hatchability, which may be due to the egg shell quality, indicates the need for more detailed research in this area**.** It was recommended by Nowland (1998) that a pheasant used as a breeding material should not be under 900 g in weight.

Egg weight, shape index, specific gravity, albumen weight, yolk weight, shell weight and shell thickness of pheasant eggs were reported as 30.49 g, 80.24, 1.07, 16.1 g, 9.78 g, 3.03 g and 0.27 mm respectively by Tserweni-Gousi and Yannakopoulos (1990). Song et al. (2000) reported as 25.79 g egg weight without stating the species of pheasant used in their study. The egg weight of the pheasant was reported as 33.99 g by Yannakapoulos (1992) and also was reported that egg weight of the pheasant has been increased together with age. Shape index and shell thickness of pheasant eggs were reported as 78 and 0.242 by Song et al. (2000)

In this study, the objective is to determine the effect of live weight of pheasants on egg production and egg quality characteristics.

MATERIALS AND METHODS

Animals and husbandry

The materials of this research were composed of the pheasant breeding flock in the Veterinary Faculty Research and Application Farm of Selçuk University. This flock of consisted of Hungarian ring-necked and Turkish native breeds (*Phasianus colchicus*). In this research, 48 female pheasants raised in same environmental conditions at the age of 37 weeks were used. Chicks were reared in environmentally controlled housing units from hatch to 8 weeks of age then reared in outside range pens (4 m×4 m ×2.5 m high) until moved into the breeding units at 37 weeks of age. The chicks were fed a starter diet containing 28% crude protein from hatch to 8 weeks of age, and then fed 16% crude protein from 8 to 37 weeks of age.

Research materials were divided into 4 groups, each group composed of 12 females at 37 weeks of ages. The

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Table 1. Live weights of the groups (mean±SE)

Groups	n	Live weight
Control	12	1,187±7.19[b]
Heavy	12	1,352.92±21.61[a]
Middle	12	1,247.92±32.49[b]
Light	12	1,008.33±27.46[c]

[a, b, c] The differences of live weights holding different letters in the same column are important ($p<0.05$).

groups were designated according to their live weights and formed as shown in Table 1.

The pheasants were placed randomly in breeding cages having 4 departments with 3 divisions. Each department consisted of 4 female pheasants in each division. The group of each cage was marked and daily 12 h of lighting was applied to the pheasants. Lighting was increased 1 h weekly and was kept steady until reaching 16 h a day. During the laying period a ration *ad libitum* composed of 18% crude protein was given to the birds. Water was provided from the automatic water cups.

The first egg was obtained within 40 weeks of age in all the groups. The eggs obtained from the pheasants were collected and recorded daily during the research period of 10 weeks from 41 to 51 weeks of age. In order to determine the egg quality characteristics of the pheasants, 5 eggs from each group up to a total of 50 eggs were used each week. The specific gravities of the eggs were designated the same day and they were collected by using the formula according to Archimet method below (Hempe et al., 1988).

Specific gravity=Weight in the air (g)/(weight in the air (g)-weight in the water (g))

Short and long diameters of the eggs were measured by digital caliper in sensitivity of 0.001 mm to determine of the shape index. After that, the eggs were broken one by one on a flat layer with a waiting period of 5 minutes. The heights of yolk and albumen, the long and short diameters of albumen, and diameter of yolk, were measured using the caliper. The yolks separated from albumen were weighed and the weights were recorded. The shells of the broken eggs were washed gently under flowing tap water to be released from albumen residues and then they were dried in the air. They were weighed to determine their latter weights and the shell thicknesses at equator, blunt and pointed edges of the egg shells with membrane and without membrane were measured using the caliper. From the values obtained the data related to investigated characteristics with the aid of the below formulas (Yannakopoulos and Tserweni-Gousi, 1986; Poyraz, 1989) was attained.

Shape index=Short edge/Long edge×100

Yolk index=Yolk height/Yolk diameter×100

Albumen index=Albumen height/(long diameter of albumen+short diameter of albumen /2)×100

Shell thickness=(pointed end+equator+blunt end)/3

Shell membrane thickness=(pointed end+equator+blunt end)/3

Haugh unit=100×log (Albumen height+7, 57-1.7×egg weight×0.37) (Nesheim et al., 1979).

Statistical methods

Analysis of variance has been used in determining the differences between egg production and egg quality characteristics and the importance of the differences among the pheasant groups has been determined by Duncan's Multiple Range Test (Petrie and Watson, 1997). Statistical analysis has been done in the package program of SPSS10.0. The effects of age on egg characteristics of pheasant groups were not investigated in this study.

RESULTS

Table 2 shows the egg production rate, egg weights, shape indexes and specific gravities of the eggs obtained from the groups in the research.

As noted in Table 2, it was found that the effect of the weight of the hen egg weight, shape index and specific gravity were important ($p<0.05$). Heavy eggs were obtained from the heavy group and light eggs were obtained from the light group. Shape index of eggs calculated for the middle group was lower than the other groups. Specific gravity of eggs obtained from the heavy and control groups were found to be different from each other ($p<0.05$).

While the yolk index of control and heavy groups were different from the middle group ($p<0.05$), the yolk index of the light group was similar to the others. There was not any difference among the groups with respect to albumen index. It was determined that the differences of shell weight of eggs obtained from the heavy group were found to be

Table 2. Egg production rate and some external egg quality characteristics of the groups (mean±SE)

Groups	Egg production rate (%)	Egg weight (g) n=40	Shape index n=40	Specific gravity n=40
Control	47.32±2.42	31±0.29[ab]	80.94±0.47[a]	0.94±0.002[a]
Heavy	42.82±2.7	31.89±0.34[a]	80.98±0.34[a]	0.93±0.001[b]
Middle	45.79±2.59	30.98±0.34[ab]	79.62±0.44[b]	0.94±0.002[ab]
Light	46.51±2.61	30.24±0.27[b]	81.23±0.49[a]	0.94±0.001[ab]

[a, b, c] The differences of means holding different lettsers in the same column are important ($p<0.05$).

Table 3. Some egg quality characteristics of the groups (mean±SE)

Characteristics	Control n=50	Heavy n=50	Middle n=50	Light n=50
Yolk index	44.29±0.75[a]	44.16±0.63[a]	41.76±076[b]	42.55±0.48[ab]
Albumen index	1.45±0.04	1.56±0.04	1.47±0.04	1.42±0.04
Shell weight (g)	3.18±0.06[b]	3.35±0.04[a]	3.23±0.05[ab]	3.14±0.05[b]
Shell membrane weight (g)	0.69±0.04	0.62±0.02	0.6±0.03	0.66±0.03
Shell thickness (mm)	0.26±0.008[a]	0.25±0.006[a]	0.24±0.006[ab]	0.22±0.005[b]
Shell membrane thickness	0.04±0.003	0.04±0.002	0.04±0.002	0.03±0.002
Yolk weight (g)	9.98±0.13[bc]	10.33±0.1[ab]	10.56±0.15[a]	9.93±0.16[c]
Albumen weight (g)	18.05±0.27[a]	18.03±0.28[a]	16.99±0.23[b]	17.22±0.24[b]
Haugh unit	95.64±0.48[b]	97.66±0.41[a]	96.34±0.44[b]	95.71±0.44[b]

[a, b, c] The differences of means holding different letters in the same row are important ($p<0.05$).

different from control and light groups. The light group was similar to the others with respect to shell weight. There was not any difference of the groups with respect to membrane weight. Shell thickness of the groups was determined the thickest in the heavy and control groups and the thinnest in the light groups. There was not any difference among the groups with respect to both membrane weight and membrane thickness.

Yolk weight determined in the middle group was heavier than the others and the light group had the lightest yolk weight ($p<0.05$). Control and heavy groups were similar to each other and they had heavier albumen weight than both middle and light groups ($p<0.05$). With respect to the important criterion of haugh unit to determine the egg quality; maximum value was (97.66) received from the heavy group and the minimum value (95.64) was received from the control group. The heavy group was different from the other groups with respect to Haugh Unit ($p<0.05$).

DISCUSSION

In a report in literature by Nowland (1988), contrary to this study, the effect of female weight on egg production was not effective. Obtained egg production from the pheasant has been similar to reported value by (Woodard and Snyder, 1978; Woodard et al., 1983; Blake et al., 1987; Slaugh et al., 1988; Çetin et al., 1997; Tepeli et al., 2002). Based upon this finding, it could be said that the genotype of pheasant is more effective on egg production than female weight, because, in this study, a different factor was not applied except live weight.

The effect of live weight of the female on egg weight has been seen clearly from Table 2. While heaviest eggs were obtained from the heavy group, the lightest eggs were obtained from the light group. It could be recommended that using heavy eggs to obtain heavy female for breeder to breed broiler type pheasant with respect to highly positive correlation between egg weight and hatching weight of chick is desirable (Shanawany, 1987; Tserweni-Gousi and Yannakopoulos, 1990). On the contrary, when breeding the pheasant as a hunting material a light weight female should be used obtain light and should have good flying capability. For this purpose, it could be thought that this selection would be useful.

The egg weight of the pheasant was reported by Woodard and Snyder (1978) 28.1-29.5 g, Woodard et al. (1983) 30.6 g, Blake et al. (1987) 31.9-34.4 g, Slaugh et al. (1988) 31-32.3 g, Tserweni-Gousi and Yannakopoulos (1990) 30.49 g and Çetin et al. (1997) 33.36 g, which were the same genotype used in this study. The egg weight obtained from this study is heavier than that reported by Woodard and Snyder (1978) and Song et al. (2000). Genotype could be a reason for egg weight differences. The egg weight of the pheasant was reported as 33.39 g by Yannakopoulos (1992) and it was also reported that the egg weight has increased with the aged hen. The pheasant used in this study comes from the same family used in the research conducted by Çetin et al. (1997). The differences between the egg weights could be attributed to the egging period because of the first 10 weeks egg used in this study. The effects of age on egg characteristics of bird were not investigated in this study.

The specific gravity designated in the groups range between 0.93-0.94 and it seems that there was almost no variation among the specific gravity of eggs. The reason for this lack of variation may be the same environmental condition when applied to the pheasant. The specific gravity of pheasant eggs was reported 1.07 by Tserweni-Gousi and Yannakopoulos (1990). This value is higher than the value determined in this study.

The shape index of pheasant eggs was determined as 79.62 in the middle group. The other groups' values were similiar to those reported as 80.24 by Tserweni-Gousi and Yannakopoulos (1990) but those groups' values were higher than those reported as 78 by Song et al. (2000). The egg weight of pheasant used in Song et al. (2000) research (25.79 g) was lower than the egg weight obtained in this research so the reason for the differences between the shape index values may arise from the egg weight. The lowest yolk index value of the pheasant egg is also in the middle groups ($p<0.05$). The albumen index of the groups' value is similar to the others.

The heavy group has the heaviest shell weight ($p<0.05$) like that which is of the egg weight. The shell weights of pheasant egg determined in groups of this research were higher than the value reported as 3.03 g by Tserweni-Gousi and Yannakopoulos (1990). The difference may arise from different management and feeding conditions.

While it was determined that there were differences among shell thickness of the groups ($p<0.05$), there was not any difference among membrane thickness of the groups. So, it could be said that the differences directly arise from the shell thickness. Shell thickness value of the light group is thinner than the control and heavy groups. Obtained shell thickness value from the groups (Table 3) were lower than the value reported as 0.27 mm by Tserweni-Gousi and Yannakopoulos (1990).

It is an important result that with respect to shell weight, the heavy group was heavier than the control group value while there was not any difference between the heavy and control groups. This result could arise from the specific gravity value of the control groups, which were higher than the heavy group. So, it could be thought that the shell thickness of the control group is denser than the heavy group. Membrane thickness of the groups is similar to the others.

The heavy group has a higher Haugh Unit value than the others ($p<0.05$), because, it has the heaviest egg weight and there might be a correlation between egg weight and Haugh Unit. While albumen weight of the control and heavy group were heavier than the middle and light groups ($p<0.05$), it was determined that the middle group had the heaviest yolk weight among the others ($p<0.05$) Determined yolk and albumen weights in this study are heavier than the value reported as 9.78 g and 16.1 g by Tserweni-Gousi and Yannakopoulos (1990). This difference might be attributed to the use of a different genotype and the application of different environmental conditions.

As a result of this study; the pheasant in the heavy group obtained less number eggs than the others groups although it is not important statistically. It could be said that the live weight of the pheasant hens is an important factor to obtain higher egg production in pheasants, but the body conformation of breeding material should be good. On the other hand, other important factors, for example effects of age, which effect the egg quality of pheasants should be investigated.

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