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Research Article

Egg Weight, Shape Index and Hatching Weight and Interrelationships among These Traits in Native Turkish Geese with Different Coloured Feathers

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Abstract: Egg weight, shape index and hatching weight and interrelationship among these three traits have been studied in native Turkish geese with different coloured feathers (black, white, piebald and yellow). Means of the four feather colours for egg weights were 147, 150.49, 142.95, 150.88 g, for shape index 67.01, 66.19, 66.68, 67.12% and for hatching weight 94.99, 98.41, 92.95, 97.40 g, respectively. Egg weight and hatching weight showed significant differences according to feather colour ($P < 0.05$) but this difference has not been observed in shape index ($P > 0.05$). Egg weight was significantly correlated with hatching weight (72%) and also significant regression was found between egg weight and hatching weight ($r^2 = 0.51$).

Key Words: Geese, egg weight, hatching weight, feather colour

Değişik Tüy Rengine Sahip Yerli Irk Kazlarda Yumurta Ağırlığı, Şekil İndeksi ve Çıkım Ağırlığı ile Bu Özellikler Arası Korelasyonlar

Özet: Farklı tüy rengindeki yerli kazların (Siyah, Beyaz, Alaca ve Sarı), yumurta ağırlığı, şekil indeksi ve çıkım ağırlığı ile bu özelliklerin kendi aralarındaki ilişkileri incelendi. Değerlendirmeye alınan renklerin incelenen özellikler açısından ortalama değerleri sırasıyla yumurta ağırlığı için 147,00, 150,49, 142,95, 150,88 g, şekil indeksi için % 67,01, 66,19, 66,68, 67,12 ve çıkım ağırlığı için 94,99, 98,41, 92,95, 97,40 g olarak belirlendi. Yumurta ağırlığı ve çıkım ağırlığında tüy rengine göre önemli farklar bulunmasına rağmen ($P < 0,05$), şekil indeksinde bir fark ortaya çıkmadı ($P > 0,05$). Yumurta ağırlığı ve çıkım ağırlığı arasında istatiksel olarak önemli korelasyon (% 72) ve regresyon ($r^2 = 0,51$) belirlendi ($P < 0,05$).

Anahtar Sözcükler: Kaz, yumurta ağırlığı, çıkım ağırlığı, tüy rengi

Introduction

Researchers have reported that genotype, origin and variety of geese have significant effects on the traits of hatchability and egg properties (1-5). According to Tilki and İnal (6), origin and variety of geese have significant effects on egg properties, hatching and growth traits. The close relationship between the egg properties and hatching weight of chick has been well documented for domestic fowls (7). It was reported by several researchers (5,8-12) that egg size, egg weight and shape index have an important influence on overall hatchability, chick size and one-day-old chick weight in various poultry species. A great impact of egg weight on hatching weight of goslings was reported by Willin (13). Puchajda et al. (14) stated a significant relationship between egg weight and hatching weight of Bilgoraj goslings. But no information could be found about this relationship in native Turkish geese.

The purposes of the present study were to determine the egg weight, shape index and hatching weight and to search the relationships among these three traits in native Turkish geese with different coloured feathers.

Materials and Methods

The study was conducted at the Faculty Farm of Kafkas University, Kars, using native Turkish geese of the region in 4 main feather colours. Eggs were collected from those geese in aged around 3-4 years old in 2001-2002. Total 512 (308 eggs in 2001, 204 eggs in 2002)

fertile and hatched eggs were studied. Length and width of all the eggs were measured to calculate shape index. Prior to incubation, eggs were individually numbered and weighed to within 0.1 g. At hatching, chicks from certain numbered eggs were individually weighed to the nearest 0.1 g. Feather colours of laying goose hens were determined as black (B) white (W), piebald (P) and yellow (Y) according to the dominant colour of birds. Shape index (%) of the eggs was calculated as (width/length*100) as described by Nazlıgül et al. (15).

The General Linear Model described below was used to examine the importance of the factors influencing the investigated traits (egg weight, shape index and hatching weight) in the Minitab statistical package (16,17). Scheffe's comparison test was used to examine the differences between means, which were based on unequal numbers of observations. Relationships between the traits were evaluated with correlation and linear regression.

$$Y_{ijk} = \mu + a_i + b_j + E_{ijk}$$

where

Y_{ijk} is the observation of traits (egg weight, shape index and hatching weight)

μ is the overall mean,

a_i is the feather colour (i = black, white, piebald and yellow)

b_j is year (j = 1-2)

E_{ijk} is random error associated.

Results

Data including egg weight, shape index and hatching weight were summarised by descriptive statistics and are presented in Table 1.

Piebald (P) geese produced the lowest mean values for egg weight and hatching weight. Although yellow (Y) geese produced the highest mean values for egg weight and shape index, white geese had the highest mean value for hatching weight. But it is worth noting that mean values of B, W and Y were quite close to each other (Table 1).

According to results of General Linear Model analyses, year did not significantly affect any of the traits ($P > 0.05$). Therefore it was not presented in a table. Although feather colour had a significant influence on both unincubated egg weight and hatching weight ($P < 0.05$) it did not affect the shape index ($P > 0.05$). Egg weight of P was significantly lighter than W and Y.

Table 1. Descriptive statistics for egg weight, shape index and hatching weight in native Turkish geese with different coloured feathers.

	N	MEAN	SE	MIN	MAX	CV%
Egg weight						
Black (B)	151	147.85	1.38	121.07	184.02	10.50
White (W)	128	150.49	1.66	100.23	180.99	11.19
Piebald (P)	99	142.95	1.30	123.02	173.07	7.83
Yellow (Y)	134	150.88	1.68	120.32	184.55	11.63
General	512	148.43	0.79	100.23	184.55	10.75
Shape index (%)						
Black (B)	151	67.09	0.28	55.86	73.68	4.66
White (W)	128	66.19	0.34	54.58	73.02	5.15
Piebald (P)	99	66.68	0.30	61.45	73.20	3.87
Yellow (Y)	134	67.12	0.34	60.38	75.30	5.21
General	512	66.80	0.16	54.58	75.30	4.83
Hatching Weight						
Black (B)	151	94.99	1.02	70.15	120.41	12.08
White (W)	128	98.41	1.08	73.34	118.91	11.13
Piebald (P)	99	92.95	1.04	71.41	115.97	9.58
Yellow (Y)	134	97.40	1.21	70.16	119.68	12.95
General	512	96.12	0.56	70.15	120.41	11.84

N = Number of observations; SE = Standard Error; Min and Max = Minimum and maximum values; CV% = Coefficient of variation.

Similarly, in terms of hatching weight, geese in feather colour P produced a lighter hatching weight than those geese in W and Y. Although group B produced egg weight and hatching weight heavier than group P, and lighter than groups W and Y, there were no statistically significant differences between the mentioned groups (Table 2).

A significant positive correlation (72%) was found between egg weight and hatching weight ($P < 0.01$). But there was no relationship between shape index and other traits. The relationship between egg weight and hatching weight was also investigated by linear regression, and a significant regression was determined between these traits ($P < 0.05$). It is also presented as a graph in the Figure with regression equation and r^2 ($r^2 = 0.51$).

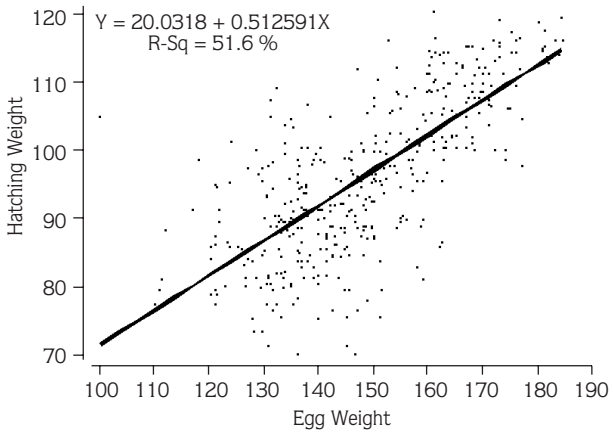

Figure. Relationship between egg weight and hatching weight in native Turkish geese.

Discussion

Although goose breeding is a common practise in some parts of Turkey, there is not sufficient knowledge available on this species. Aşkın and İlaslan (18) reported 4 different feather colours in geese reared in Kars region, black, white, piebald and yellow. They have also reported the variations among the mentioned feather colour groups in terms of production traits. Data obtained in this study indicated that the lightest egg weight was produced by geese in P colour group ($P < 0.05$). But this significant difference did not exist between the colour groups B, W and Y. In agreement with the corresponding study, many researchers reported the effect of variety and breed on egg weight (1,3,19).

Shape index did not tend to increase or decrease according to feather colour ($P > 0.05$). Although no publication could be found about shape index differences according to breed and variety in goose, Salahuddin and Howlider (20) and Halaj and Veterany (21) reported different means of the shape indices for chicken breeds and lines. Similarly, Ksiazkiewicz et al. (22) stated different shape index values for 3 different duck breeds.

Effect of breed, variety and line on hatching weight was stated (23-25) for several poultry species but not geese. The present study is in agreement with those researchers reporting the influence of feather colour on hatching weight of geese.

The clarified relationship between egg weight and hatching weight with correlation and regression analyses indicated that egg weight is positively related to changes in gosling hatching weight. Therefore chick weight increased with egg weight as illustrated in the Figure. Also regression equation showed that hatching weight increases by 0.51 g for every 1 g increase in egg weight. The positive correlation between egg weight and the weight of chick hatched from it was reported by Skewes et al. (26) for Bobwhite quail, Altan et al. (11) for Japanese quail, Raju et al. (24) for chicken, Ksiazkiewicz et al. (22) for ducks and Shanawany (27) for geese.

Table 2. Effect of feather colour on Egg weight, shape index and hatching weight in native Turkish geese.

Varieties	Means of traits with their standard error (SE)			
	N	Egg Weight	Shape Index	Hatching Weight
Black (B)	151	147.85±1.38^{ab}	67.01±0.28	94.99±1.02^{ab}
White (W)	128	150.49±1.66^{a}	66.19±0.34	98.41±1.08^{a}
Piebald (P)	99	142.95±1.30^{b}	66.68±0.30	92.95±1.04^{b}
Yellow (Y)	134	150.88±1.68^{a}	67.12±0.34	97.40±1.21^{a}

Means within each column followed by different superscripts are significantly different ($P< 0.05$), N = Number of hatched chicks from certain eggs.

According to Shanawany (9) a significant regression between egg weight and hatching weight was stated for all the domestic birds including goose (r = 0.98, with restricted number, n = 23), as found in this study. The regression coefficient between egg and hatching weight defined in this study (r^2 = 51%) was less than those found for goose "r^2 = 64%" (15) and for Japanese quail "r^2 = 70%" (28).

Obtained results from the study indicate that egg weight and feather colour play a significant role in determining hatching weight of goslings. It might be said that for the studied goose population, in order to obtain maximum chick weight, heavier eggs from yellow, white and black geese might be preferred. It was well documented by Yannakopoulos and Tserveni-Gousi (10) and Shanawany (27) that age of poultry hens has a great impact on egg weight and as a reflection on hatching weight. But, there was not a big range between the ages of goose hens used in this study. Therefore, the variation source on hatching weight may dominantly related with goose feather colour and egg weight. These defined differences may guide us to call the feather colour groups as a different genotype or variety. If additional certain differences will be defined for more traits between these groups in the further studies, feather colour groups might be called as colour varieties of native geese.

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