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Relationship Between Egg Weight and Hatch Weight in Pigeons (*Columba livia*)

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Abstract: This study was undertaken to assess the relationship between egg weight and hatch weight in pigeons and also derive prediction equation based on the relationship. It was conduced in nine randomly selected households in Misau town of Bauchi State, Nigeria, between April and November 2009. The mean egg weight and squab hatch weight were 14.46±0.11 g and 12.55±0.08 g, respectively. No significant differences were detected in egg weight and squab hatch weight when compared on the basis of order of lay. The two traits were strongly correlated (r = 0.932). The study has shown that body weight of squabs at hatching is to a large extent determined by the weight of the egg (R^2 = 86.9%) and can be predicted using the latter with a high degree of precision.

Key words: Correlation, egg weight, hatch weight, pigeon, prediction, squab

INTRODUCTION

Pigeons are widely used as experimental models in biomedical research and have also been raised for meat production. Commercial squab (young pigeon) production has existed in North America since the early 1900s (Levi, 1974; Stanhope, 1978). Unlike other poultry species, pigeons form pair bonds to breed and hatchlings must be brooded and fed by their parents until the market age of 4 weeks (Levi, 1974). A pair of pigeons can raise about 15 squabs per year. Although meat from squabs is produced commercially, information regarding breeding techniques and advances is lacking (Mariam, 2007). No concentrated effort in selection to improve the efficiency of production has been made (Aggrey and Cheng, 1992). While the weight of day old squabs is of little practical importance so far as the squab producer is concerned, it is nevertheless desirable to produce squabs of average size for three major reasons as outlined by Bokhari (2002). Firstly, small squabs may be out of small strains of birds and may prove slow growing. Secondly, medium sized squabs are hatched from medium sized eggs, which hatch better than eggs that are much below or above the average weight. Thirdly if squabs are small, this may result in low hatchability and too great a mortality. Such conditions should therefore be avoided. Similarly, study of body weight traits in a breeding programme is also influenced by body weight of the newborn chick (Khurshid *et al*., 2003). Egg weight, shell weight, shell thickness, weight of egg yolk and albumen are the important egg traits influencing egg quality, weight of the newly hatched chick and hatching performance, if other management conditions and fertility are not the limiting factors (Khurshid *et al*., 2003). Farooq *et al*. (2001) also reported significant effect of egg weight on hatchability and weight of newly hatched chick in Japanese quails. Among the aforementioned traits, egg weight is the only parameter which could be determined before hatching, since the other traits are usually assessed after breaking the egg. Thus, keeping in view the importance of hatching weight, its prediction is a prerequisite of breed improvement programme. This study was therefore intended to assess the relationship between egg weight and hatch weight in pigeons and also derive prediction equation based on the relationship.

MATERIALS AND METHODS

The experiment was conducted in nine households in Misau town of Bauchi State, Nigeria, between April and November 2009. Misau Local Government lies on latitude 11.21° North and longitude 10.32° East of Bauchi State which is located between latitude 10°10´ and 10°33´ N and longitude 9°40´ and 10°13´E (Department of Lands, Misau Local Government, 2000). The entire local government covers an area of 1305.86 km^2. Rainy season starts between April and May and lasts up till October, while the dry season commences in November and ends in March. The mean daily maximum temperature is about 33.5°C (Bauchi State Agricultural Development Programme, 2000). The pigeons studied were of nondescript type, commonly referred to as street pigeons and popularly known as *Columba livia*. Mature pigeons of breeding age were housed in wooden

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cages or empty cartons attached externally to walls (open house type) or in man-made aviaries which comprised of compartment of about 35 cm by 35 cm, or in wooden cages or empty cartons attached internally to walls of specially built houses (enclosed house type), usually in monogamous pairs or couples. The birds were fed with grains, varying from millet, sorghum to crushed maize and kitchen scraps, once or twice daily. The birds also scavenged within the vicinity of their residence and sometimes farther. Water was provided *ad libitum*. The two eggs of pigeons are laid about 40 h apart. Each egg was given a unique number (1 for the first and 2 for the second in order of time of lay). In pigeons, the first eggs tend to be male and the second female and are hatched in the same order within an interval of about 24 h (Richard and Marian, 1995). Thus in pigeons, just after hatching, a pair of squabs consists of a day-old male and a recently hatched female. The incubation period lasted for about 17-19 days. Since the observations were made in various households, it was not possible to weigh the squabs immediately after hatch. Weights were therefore taken (using an electronic balance) within the first twelve hours post hatch, when the squabs had been fed the first crop milk.

In all, 180 egg weight records and 171 hatch weight records produced by 50 pairs of breeders, were taken. Data obtained were analyzed using simple descriptive statistics, correlation and regression analyses and a two-way analysis of variance using the Minitab Statistical Package (1994). The coefficient of determination was high (R^2 = 86.9%). The Coefficient of Variation (CV) was obtained by expressing the standard deviation as a percentage of the average weight, that is:

$$CV\% = (SD/Mean) \times 100$$

RESULTS AND DISCUSSION

A total of 180 eggs were laid by 50 pairs of pigeons, out of which 171 squabs were successfully hatched. The mean egg weight was 14.46±0.11 g (14.73±0.12 g and 14.50±0.14 g, respectively, as presented in (Table 1). This value is lower than those reported for the domestic pigeon (21.4 g) and Rock pigeon (18.9 g) by Sales and Janssens (2003) and Robinson (2005), respectively. The latter found that egg shell weighed as much as 7% of the total egg weight. The average hatch weight of squabs was 12.55±0.08 g (12.69±0.12 g and 12.44±0.11 g for first and second hatchlings, respectively) as shown in Table 1. Weight of hatchlings observed in this study falls within a range of between 12.6-14 g, reported by Richard and Marian (1995). Aggrey and Cheng (1992) on Silver King x White King crosses recorded an average hatching weight of 16.34 g. Bokhari (2002) reported 15.01 g as average weight of squabs at hatching and observed that values differed between strains and cautioned that individual variations may also be due to differences in the time elapsing between hatching and weighing. Because in pigeons, within 4-6 h after hatching, the first chick, usually the male, is fed with crop milk, giving it an advantage over its female sibling in terms of body weight, the young squabs are mostly perceptibly different in size, as they are also in developmental rate and basal metabolism (Kotov, 1978). In poultry, the weight of the newly hatched depends primarily on the weight of the egg from which it is hatched, a trait greatly determined by the genotype of the hen; hens that lay larger eggs may possess superior genetic profiles for size, growth or aggressiveness in competing for feed. Thus their chicks would receive a similar superior genetic endowment for these traits (Skogland and Seagar, 1952). Variations in body weight could also be caused by other factors such as differences in management practices, flock size, nutritional levels and method of weighing, as pointed out by Bokhari (2002).

No significant differences were detected in terms of egg weight and squab hatch weight when compared on the basis of order of lay. This fact corroborates the observation of Mariam (2007) in Sudan. This finding disagrees with the generally held view that the first egg is larger than the second (Richard and Marian, 1995) Egg weight and squab hatch weight were strongly correlated (r = 0.932). Table 2 shows the regression equation for predicting hatch weight of squab from the weight of egg laid. The high phenotypic correlation between egg weight and hatch weight was similarly observed in broiler chicks by Pinchasov (1991). The author reported that the correlation decreased markedly after hatch and was not significant by 5 days after hatching. He pointed out that as the age of the squab increases, the preovipositional maternal effect on BW may become insignificant compared to the effect of the

Table 1: Factors affecting hatching weight in pigeons

		Variable				
		Egg weight			Hatch weight	
Factors	No.	Mean±SE	CV (%)	No.	Mean±SE	CV (%)
Overall	180	14.46±0.11	10.58	171	12.55±0.08	8.40
Sequence of lay NS						
First	91	14.73±0.12	7.40	87	12.69±0.12	8.43
Second	89	14.50±0.14	9.10	84	12.44±0.11	8.20

CV = Coefficient of Variation; NS = Not Significant

Table 2: Prediction equation for hatching weight in pigeons

Regression Equation	Coefficient determination (%)
HW = 0.026 + 0.859 EW	86.9

HW = Hatching weight; EW = Egg weight

genotype. Aggrey and Cheng (1992) found estimates of genetic correlation between hatch weight and weight at 2-4 weeks to be low and suggested that squab hatch weight is a poor indicator of later body weight. Earlier, Abdellatif (1989) made similar observation and concluded that hatch weight must therefore be considered a separate trait.

Conclusion: The study has shown that body weight of squab at hatching is to a large extent determined by the weight of the egg and can be predicted using the latter with a high degree of precision.

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