

NOTABREVE

EFFECT OF EGG SIZE ON HATCHABILITY OF BROILER CHICKS

EFFECTO DEL TAMAÑO DEL HUEVO SOBRE LA INCUBABILIDAD DE BROILERS

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ADDITIONAL KEYWORDS

Egg weight losses. Birds. Carcass characteristics.

PALABRAS CLAVE ADICIONALES

Pérdidas de peso del huevo. Aves. Características de la canal.

SUMMARY

An experiment was conducted to determine the effect of egg size on hatchability, posthatch performance and carcass traits of broiler chicks. A total of 198 hatchable Anak broiler eggs comprising of small (40 g average weight), medium (50 g average weight) and large (60 g average weight) size categories were obtained from a commercial hatchery for the study. Results obtained on egg weight loss were comparable with one another. There were significant differences ($p < 0.05$) in the results recorded for hatchability. Best result of 96.67% hatchability was obtained for medium sized eggs. There was close correlation between egg size and chick hatching weight. Small chicks hatched from small eggs while large chicks hatched from large eggs. In the starter phase, daily feed intake increased with increase in the size of eggs from where the chicks hatched while in the finisher phase there was inverse relationship between feed intake and size of eggs from where the chicks hatched. Best results of dressing percentage (52.63%) and meat/bone ratio (2.60) were obtained for large chicks hatched from large eggs. Medium sized eggs are ideal for setting in order to obtain good hatchability and best result of body weight gain.

RESUMEN

Se realizó una experiencia para determinar el efecto del tamaño del huevo sobre la incubabilidad y rendimiento y características de la canal posteriores en pollos broiler. Se emplearon 198 huevos

incubables de broilers Anak procedentes de una empresa comercial, en ellos había tamaños pequeños (40 g), medios (50 g) y grandes (60 g). La pérdida de peso en los huevos fue similar. Hubo diferencias significativas ($p < 0,05$) en la incubabilidad cuyo mejor resultado (96,67%) fue obtenido en huevos de tamaño medio. Hubo una estrecha correlación positiva entre el tamaño del huevo y el tamaño del pollito nacido. En la fase inicial la ingestión diaria aumentó y en el acabado, disminuyó, con el tamaño de los huevos de procedencia. El mejor rendimiento a la canal (52,63%) y relación carne/hueso (2,60) se obtuvo con los pollos grandes, procedentes de huevos grandes. Los huevos medianos fueron los mejores para obtener buena incubabilidad y ganancia de peso vivo.

INTRODUCTION

In the production cycle of the commercial layer, the hen will begin to lay small eggs and in a matter of few weeks will go to medium size and then to the desired large size egg. Although egg size can be manipulated using fat levels, protein and enzymes, some other factors such as age and body weight of the hen, yolk weight and nutrient intake can influencing egg size. Asuquo and Okon (1993) studied the effects of age in lay and egg size on fertility and hatchability of eggs. The authors observed

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that egg size within the intermediate range of 45-56 g would hatch better than small eggs.

Senapati *et al.* (1996) reported positive correlation between egg weight and hatchability. A close correlation between egg weight and hatching weight in domestic birds has also been documented (Abiola, 1999). The effect of the egg weight on body weight at market age has been found to be independent of the age of the breeders from which the eggs originated (Tufft and Jensen, 1991). Given the high correlation between egg weight and final body weight, the economic importance of egg weight is apparent (Wilson, 1991).

Egg size has been widely studied in the context of life-history theory because it can be highly variable. Some studies have shown that egg size can affect both parental and offspring fitness. Williams (1994) studied the relationship between egg size and offspring quality in birds and came up with equivocal results. The author reported that egg size typically affects hatchling mass more strongly than it affects hatching size in birds because the main effect of egg size lies in the mass of the residual yolk sac that the chick retains at hatching. The objective of the present study is to determine the effect of egg size on hatchability, post hatch performance and carcass characteristics of broilers hatched from small, medium and large size Nigerian eggs.

MATERIALS AND METHODS

MANAGEMENT OF HATCHABLE EGGS

A total of 198 hatchable Anak broiler eggs of different sizes were supplied by S and D Farms Ltd. in Abeokuta, Ogun State, Nigeria, for the study. The eggs were numbered and weighed individually using sensitive weighing scale (Mettler - Toledo @ PB3002 electronic balance) and later grouped into 3 size categories as follows: small (41.09-50.97 g), medium (50.98-57.39 g) and large (57.40-69.64 g). There were 3 treatments with 3 replicates per treatment.

Each treatment had 66 eggs with 22 eggs per replicate. The eggs were fumigated with formalin on potassium permanganate in the ratio of 1:2 for 15 minutes and then set into electric Western incubator with the broad ends pointing upward. The optimum incubation temperature was 99.7 °F with humidity of 83.5% while the hatching temperature was 98.5 °F with humidity of 85%. Fertility test was conducted on the 18th day of incubation. Parameters monitored include incubation weight losses, % hatchability and % mortality.

MANAGEMENT OF EXPERIMENTAL BIRDS

A total of 166 chicks (54 small, 59 medium and 53 large) hatched at the end of the incubation period. The chicks were allocated into 3 treatments with 3 replicates based on the weight categories. The chicks were fed *ad libitum* with broiler starter from 0-4 weeks and broiler finisher from 5-8 weeks. Fresh clean water was supplied daily. All necessary vaccinations and medications were provided as at when due. Parameters studied during the starter and finisher phases include growth rate, feed intake, feed: gain ratio and efficiency of protein utilization.

At the end of eight weeks, two birds were randomly selected from each replicate for carcass analyses. The birds were starved for 24 hours before slaughtering.

STATISTICAL ANALYSIS

The completely randomized design (CRD) was used. All data obtained were subjected to one-way analysis of variance using the method of Snedecor and Cochran (1980). Duncan multiple range test was used to separate significant differences among means as described by Gomez and Gomez (1986). The statistical model used is:

$$Y_{ij} = \mu + T_i + \Sigma_j$$

Where:

Y_{ij} = the overall observation (hatchability, post-

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hatch performance, carcass quality etc)
 μ = Population means
 T_i = Effect of different egg weights (small, medium, large)
 Σ_{ij} = Residual error with zero mean and variance σ^2 .

RESULTS

Although values obtained on egg weight loss for the 3 size categories are comparable with one another, lowest egg weight loss of 11.24% was obtained for large eggs while highest egg weight loss of 11.57% was recorded for medium eggs. Results obtained on hatchability of eggs did not follow any particular trend. However, values obtained ranged between 82.88-96.67%. Best result of 96.67% hatchability was obtained for medium eggs while large eggs had the lowest value of 82.88% hatchability.

Results of post hatch performance of the chicks in the starter phase showed a positive correlation between egg size and chick hatching weight. Small chicks hatched from small eggs while large chicks hatched from large eggs. The chicks maintained their size categories up to the end of the starter phase. Values obtained for daily weight gain for the 3 categories of chicks are comparable with one another. However, daily feed intake increased with increase in the weight of chicks, values obtained ranged from 30.75-50.08 g/bird. Expectedly the large chicks had the highest average daily feed intake of 50.08 g/bird but recorded the poorest value of 2.54 feed gain ratio.

At the end of the finisher phase the large birds maintained the advantage of their initially higher egg weight thereby resulting in the highest average liveweight of 1510.00 g/bird. Results recorded for medium and large chicks on weight gain are similar to one another while small chicks had the lowest average daily weight gain of 29.34 g/bird. There was inverse relationship between feed intake and chick weight in the finisher phase. Daily feed intake decreased with increase in the weight of chicks. The large chicks had

the lowest average daily feed intake of 113.07 g/bird.

Results obtained on carcass characteristics of birds of different size categories indicated that large birds had the highest dressing percentage (52.63%) and best meat/bone ratio (2.60). The lowest abdominal fat of 1.06% was obtained on small birds while the highest value of 2.52% was recorded for the medium sized birds.

DISCUSSION

The similarity in the results obtained on egg weight loss may suggest that the 3 egg size categories used for the study probably had equal proportion of pore areas and pore diameter regardless of the size of egg. Deeming (1995) indicated that eggs which loss less than 10% or over 20% of their initial mass were less likely to hatch. The author attributed this to reflection of functional porosity of the shell and the initial mass of each egg. Results obtained on hatchability in the present study conform with earlier findings which recommended the setting of average sized eggs for the purpose of incubation. Gonzalez *et al.* (1999) in a related study suggested the setting of eggs of average weight in order to achieve good hatchability.

The positive correlation observed between egg size and chick hatching weight clearly identified the advantage of initial bigger egg size at the time of setting. This observation is in agreement with the findings of Abiola (1999) who reported close correlation between egg and chick hatching weights. In contrast, Sinclair *et al.* (1990) and Pinchasov (1991) indicated that there is a decline in the magnitude of correlation between egg weight and chick body weight with the advancement of age of the chick. The advantage of initially higher weight attributable to a larger egg diminishes rapidly after hatching while food intake is the main factor affecting final body weight (Wyatt *et al.*, 1985). The results of final liveweight

also confirmed the significance of initial bigger egg size for incubation. The importance of egg weight as a factor in the performance of broiler chicks to market age has been reported (Wyatt *et al.*, 1985).

Although large birds were superior to the small and medium birds in terms of dressing percentage and meat/bone ratio, results observed on other parameters on carcass traits did not show any particular trend. Tufft and Jensen (1991) studied the effect of egg weight on chick performance and lipid retention and reported that as egg weight increased feed efficiency and fat retention were not affected.

It can be concluded from the result of this study that medium sized eggs would be

suitable for setting in order to obtain good hatchability, best result of weight gain and lower mortality. This is in conformity with the results of previous studies on egg size in relation to broiler performance. However, where carcass traits are of special consideration, the large eggs would be preferred for setting.

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REFERENCES

- Abiola, S.S. 1999. Effects of turning frequency of hen's egg in electric table-type incubator on weight losses, hatchability and mortality. *Nig. Agr. J.*, 30: 77-82.
- Asuquo, B.O. and B. Okon. 1993. Effects of age in lay and egg size on fertility and hatchability of chicken eggs. *Nig. J. of Anim. Prod.*, 20: 122-124.
- Deeming, D.C. 1995. Factors affecting hatchability during commercial incubation of ostrich (*Struthio camelus*) eggs. *Brit. Poultry Sci.*, 36: 51-65.
- Gomez, K.A. and A.A. Gomez. 1986. Statistical Procedures for Agricultural Research. 2nd ed. John Wiley and sons Inc. USA.
- Gonzalez, A, D.G. Satterlee, F. Moharer and G.G. Cadd. 1999. Factors affecting ostrich (*Struthio camelus*) eggs hatchability. *Poultry Sci.*, 78: 1257-1262.
- Pinchasov, Y. 1991. Relationship between the weight of hatching eggs and subsequent early performance of broiler chicks. *Brit. Poultry Sci.*, 32: 109-115.
- Senapati, P.K, K.G. Dask Madal and A.K. Chatterjee. 1996. Relationship between egg weight, shape index, fertility and hatchability of Japanese quail eggs. *Environ. Ecol. Stat.*, 14: 574- 577.
- Sinclair, R.W, F.E. Robinson and R.T. Hardin. 1990. The effects of parent age and posthatch treatment on broiler performance. *Poultry Sci.*, 69: 526-534.
- Snedecor, G.W. and W.G. Cochran. 1980. Statistical methods, Iowa State University Press, Ames Iowa, 7th edition.
- Tufft, L.S. and L.S. Jensen. 1991. Effect of age of hen, egg weight and sex on chick performance and lipid retention. *Poultry Sci.*, 70: 2411-2418.
- Williams, T.D. 1994. Intraspecific variation in egg size and egg composition in birds: effects on offspring fitness. *Biol. Rev.*, 68: 35-39.
- Wilson, H.R. 1991. Interrelationship of egg size, chick size, post hatching growth and hatchability. *World's Poult. Sci. J.*, 47: 5-20.
- Wyatt, C.L, W.D. Weaver Jr. and W.L. Beane. 1985. Influence of egg size, egg shell quality and post hatch holding time on broiler performance. *Poultry Sci.*, 64: 2049-2055.