APRW -76

Effects of Age of Broiler Breeders and Egg Storage Duration on Blastodermal Growth of Chicken Embryo

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Abstract
The study evaluated the effects of age of broiler breeder and storage duration on blastodermal growth. A total of 320 eggs were collected from *Marshall®* broiler breeders of two ages 43 weeks and 65 weeks and randomly alloted to four storage durations of 0 (control), 4, 7 and 10 days at 16^0C and 80% RH. Blastodermal diameter measurements were collected. Data were subjected to analysis of variance in a 2×4 factorial arrangement using SAS (2003). Eggs collected at 43 weeks had higher ($p<0.05$) central disc and area opaca diameters than those from 65 weeks old birds. The central disc (CD), area pellucida (AP) and area opaca (AO) diameters of the blastoderm were significantly ($p<0.05$) affected, increasing the length of storage. The results showed that diameter of the CD was highest ($p<0.05$) for eggs stored for 10 days from both 43 weeks and 65 weeks old breeders. Diameter of AP was largest for eggs stored for 10 days at 65 weeks and lowest for eggs not stored (0 days) at 65 weeks, while AO diameter also increased with storage lengths being largest for eggs stored for 7 and 10 days at 43 weeks and 10 days at 65 weeks. The study concluded that eggs stored longer for 10 days from 43 weeks old broiler breeders had greater blastodermal expansion indicatinggreater disposition for rapid embryonicgrowth and prolonged storage allowed a larger surface area for expansion.

Keywords: Age, broiler breeders, storage duration, blastoderm, diameter

Introduction

Broiler production has shown rapid development worldwide. The efficiency of reproduction of broiler breeders is reported to decrease with age, influencing subsequent embryogenesis and hatchability of broilers (Peebles *et al.,* 2001). Egg storage before setting is a common practice in the poultry industry. During pre-incubation, fertilized eggs are often stored at cool temperatures for extended periods and this occurs at the broiler breeder farms as well as at the hatchery.

Brake *et al.* (1997) had reported that the effect of pre-incubation egg storage on embryonic viability depends on storage time, environmental conditions, hen age, and strain which may subsequently influence post ovipositional development of embryos. Limited information exists less-well-understood factors, such as the age of the breeder and egg storage before incubation, which may affect the embryonic life of the chicks. This implies that their contribution to the household protein food security may not be fully realized without appropriate management and husbandry interventions.

Materials and Methods

The research was carried out at the Department of Animal Physiology Laboratory, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. A total of 320 eggs freshly laid eggs were obtained from two flock ages of 43 weeks and 65 weeks old and allotted for storage at 0 (control), 4, 7 and 10 days. The eggs were sourced from Obasanjo's Farm Nigeria Plc, Lanlate, Oyo state, Nigeria and stored under a cold room temperature of 16^0C and 80% relative humidity. The yolk was broken into a Petri dish and rotated for the blastodermal surfaceto be visible. The digital vernier caliper was used to measure the diameter of the dense center and the two concentric rings on the yolk surface.

Data collected were subjected to analysis of variance in a factorial arrangement (2 x 4) using SAS (2003). Treatment means were separated using Duncan multiple range test.

Results and Discussion

The effect of age of broiler breeders on the blastodermal diameter of fertile eggs is presented in Table 1. The results showed that the central disc and area opaca of the blastoderm was significantly ($p<0.05$) affected by age of broiler birds. Eggs collected from broiler breeders at 43 weeks had higher ($p<0.05$) central disc (3.17 ± 0.067 mm) and area opaca (10.11 ± 0.225 mm) diameters compared with those collected from 65 weeks old broiler breeder birds. This indicates a greater disposition by 43 weeks old birds for embryonic growth as a larger surface area is available for the absorption and utilization of available nutrients within the egg. Van den Brand *et al.* (2004) reported the corresponding decrease in albumen weight with the advance in the age of birds. This could have accounted for the larger blastodermal diameters of 43 weeks old birds compared to 65 weeks old broiler breeders.

The effect of egg storage duration on blastodermal diameter is shown in Figure 1. The diameter of the central disc increased with increasing storage durations from 2.55 ± 0.060 mm at day 0 storage till 4.07 ± 0.069 mm at day 10 storage. Area pellucida diameter increased with storage duration being higher in eggs stored for 10 days (6.45 ±0.175 mm), Area opaca diameter also increased with storage periods. Egg stored at 7 and 10 days had higher but similar ($p<0.05$) area opaca diameters compared with 0 and 4 days storage. These increase in blastodermal diameters observed with increased storage lengths suggests embryonic development as nutrient reserves are being utilized during prolonged storage (Fasenko, 1996).Van Schalkwyk*et al.* (1999) had reported a significant increase in blastoderm diameter after 7days of storage. These results are also consistent with the reports of Malechi *et al.* (2005) and Addo (2016). With respect to turkey, Bakst and Gupta (1997) reported that morphologically, this was characterized by an increase in the surface area of the area pellucida and an attenuation of the area opaca. Lapa˜o *et al.* (1999) also reported that albumen liquefaction probably facilitated the movement of nutrients from the albumen to the blastoderm and may reduce resistance to gaseous diffusion.

The interactive effect of age of broiler breeders and egg storage duration on blastodermal diameters is presented in Table 2. The diameter of the central disc was largest ($p<0.05$) but similar to eggs stored for 10 days from both 43 weeks and 65 weeks of age. The diameter of the area pellucida was highest for eggs stored for 10 days at 65 weeks (6.93mm) and lowest for eggs not stored (0 days) at 65 weeks (4.62 mm) of age. The area opaca diameter increased with storage lengths being highest for eggs stored for 7 and 10 days at 43 weeks and 10 days at 65 weeks. The group interactions for eggs stored for 0 and 4 days at both 43 weeks and 65 weeks were not significantly ($p>0.05$) different in their diameters. Brake *et al.* (1997) reported that with longer storage periods, the poorer albumen quality of older hens with increased storage would permit freer gas exchange and oxygen availability for the embryo thus allowing for expansion of the blastodermal areas. These findings partly disagree with Mather and Laughlin (1979) who reported that the rate of blastodermal development in fresh eggs increased with parental age, however, storage reduced the rate of development at all flock ages. This may be due to the considerable egg to-egg variation in the appearance of the blastoderm at oviposition within strains as well as within a clutch of eggs.

Table 1: Effect of age of broiler breeders on blastodermal diameter

Parameters	43 weeks	65 weeks	p-value
Central disc (mm)	3.17 ±0.067 [a]	3.00±0.076 [b]	0.0152
Area pellucida (mm)	5.75 ±0.095	5.66 ±0.126	0.5674
Area opaca (mm)	10.11 ±0.225[a]	9.44 ± 0.227[b]	0.0363

[ab]Means with different superscripts in the same row differ significantly (p<0.05)

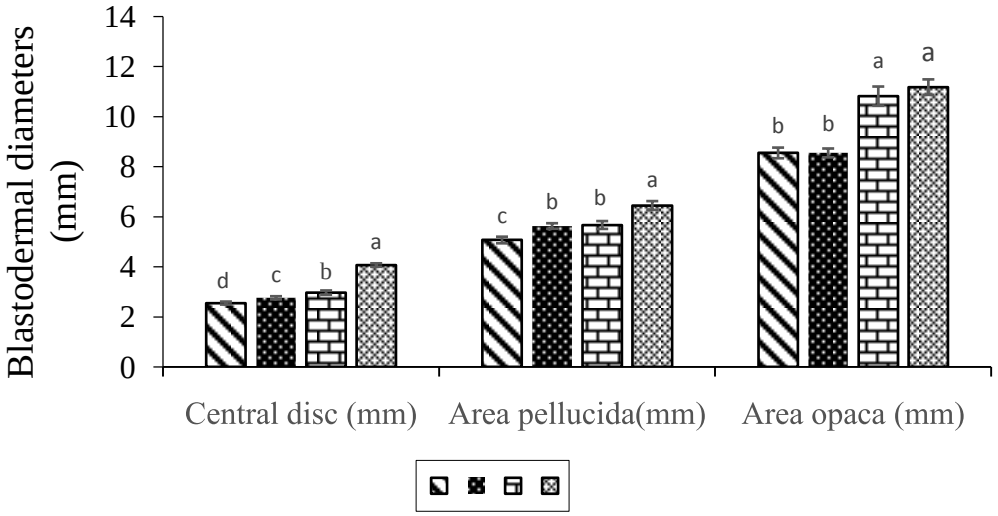

Figure 2: Effect of egg storage duration on blastodermal diameter

Table 2: Interactive effect of age of broiler breeders and egg storage duration on blastodermal diameter

	43 weeks				65 weeks					
	0 D	4D	7D	10 D	0 D	4D	7D	10 D	Pvalue	SEM
CD (mm)	2.70[bc]	2.85[bc]	2.97[b]	4.16[a]	2.39[d]	2.67[c]	2.98[b]	3.98[a]	0.0001	0.051
AP (mm)	5.52[b]	5.79[b]	5.73[b]	5.95[b]	4.62[c]	5.46[b]	5.62[b]	6.93[a]	0.0001	0.079
AO (mm)	8.99[bc]	8.50[c]	11.74[a]	11.22[a]	8.12[c]	8.60[c]	9.90[b]	11.13[a]	0.0001	0.161

[a,b,c]Means with different superscripts in the same row differ significantly (p<0.05)

Conclusion

It was concluded that eggsfrom43 weeks old broiler breeders had higher blastodermal diameters indicating greater disposition for rapid embryonic growth. Also, the decline in egg quality with older breeders and prolonged egg storage facilitated albumen degradation influencing blastodermal expansion. Thus, in the poultry industry, if extended pre-incubation egg storage is necessary, eggs from younger flocks should be stored rather than those from older. The adverse effects from older breeders when eggs were stored for 10 days suggests that shortening storage duration may be a method of retaining embryo quality from older breeders.

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