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FACTSHEET #41
July 2020

IMPACT OF LIGHT DURING INCUBATION ON THE HATCH RATE OF LAYING HEN STRAINS

Introduction: It is recognized that controlling temperature, relative humidity, and carbon dioxide levels are all very important to successfully incubate chicken hatching eggs. Adjustments in any of these parameters can significantly influence either the rate of embryo development or time taken to hatch. The time between when chicks start hatching and when the group finishes is known as the hatch window. It is important for hatchery operators to know what factors influence this window of time in order to schedule when the chicks are removed from the incubator. Chicks hatching too late will not be harvested, and chicks hatching too early may become dehydrated. Early hatched chicks can remain without access to food and water for up to 48 h (Careghi et al., 2005; Bergoug et al., 2013) resulting in body weights up to 10% lower than late hatching chicks. Little is known about the impact of providing light during incubation on embryo development and chick hatch rates. This may be another tool that can be employed to manage successful hatchery operation. Commercial incubation involves large numbers of eggs, therefore, even small improvements in hatch performance can have a significant impact on chick production.

Objective: To investigate if the provision of light during incubation will coordinate the hatching activities of emerging chicks and reduce the variability in the time of hatching.

Trial: Three strains of laying hens' eggs were used for this trial: 540 Lohmann Brown Lite (LB) and 540 Lohmann-LSL Lite (LL), both common strains used by Atlantic Canadian poultry farms; and, 620 Barred Plymouth Rock (BR), 620 Barred Plymouth Rock (BR), a dual-purpose breed of importance historically and therefore a control.

Four Chick Master Model G09 incubators were equipped with LED light strips (4100-k - cool blue) placed on the inside wall of each incubator. The light intensity at the egg level was an average of 250 lux. Another four incubators were operated without lights installed. The eggs were turned 45 to 180 degrees every 50 minutes. Treatment 1 was the control with eggs incubated in the dark for the entire incubation period. Treatment 2 consisted of exposure to light for 12 h per day (12L:12D) for the entire incubation period. For Treatment 3, eggs were removed from dark incubators and placed in the 12L:12D treatment at Day 9 and for Treatment 4 the eggs were removed from dark incubation and placed in light equipped incubators at Day 17. For the first 20 days (480 h) of incubation, air temperature was set at 37.5˚C and RH at 55% which was recorded twice daily. Relative humidity was increased to 64% at 489 h; 72% at 493 h; 82% at 498 h; and set back to 55% at 512 h for the remainder of the hatch. Eggs were candled to determine the presence of a viable embryo on Day 17 (421 h). Distribution of the time of hatching (hatch window), was determined by recording the number of chicks that hatched every 3 h over a 2.5-day period starting on d 19 (464 h) of incubation.

Photo 1: Incubator

Results: The strain of bird had an impact on embryo mortality and the number of chicks hatching late but there was no effect of the use of incubation lighting on the hatchability of fertile eggs. Mortality was considered equal between the LB (7%) and LL (9.5%) strains but significantly higher for the BR strain at 23.2%. The maximum percentage of eggs hatched, as outlined in Table 1 is lowest for all lighting treatments for the BR birds and highest for the LB birds receiving light starting at day 17 and the LL birds receiving light starting at day 0 and day 9.

Table 1: Time to Reach 50% Hatch by Lighting Treatment and Bird Strain

Incubation light treatment combination	Time to 50% Hatch (hr)
BR[1] Dark	33.4[b]
BR Light from day 0	32.2[bc]
BR Light from day 9	31.6[c]
BR Light from day 17	36.2[a]
LB[2] Dark	27.4[d]
LB Light from day 0	24.0[f]
LB Light from day 9	25.7[e]
LB Light from day 17	27.6[d]
LL[3] Dark	36.4[a]
LL Light from day 0	33.0[bc]
LL Light from day 9	33.8[b]
LL Light from day 17	34.1[ab]

*Within each column, parameter estimates sharing the same letter are not significantly different.
BR[1] – Barred Rock; LB[2] – Lohmann Brown; LL[3] – Lohmann Lite

All three strains of chicks hatched at a different rate with the LB chicks hatching the fastest and the BR chicks hatching the slowest, and the LL strain hatching at an intermediate rate. The percentage of chicks that hatched late was different for all three strains, with BR having the highest number of chicks hatching late at 3.4%, LB the lowest number at 0%, and LL at 0.3%. The LB chicks provided light from the start, reached 50% hatched 3.4 h earlier than those hatched in the dark, as seen in Table 1. When light started on Day 9, the LB chicks reached 50% 1.7 h earlier. The LB chicks hatched faster from 50% to 75% when given light from the start of incubation compared to the other lighting treatments. Results were similar for the LL chicks. However, the hatch rate from 50% to 75% was not different between any of the lighting treatments for the LL chicks. The rate of hatch for the BR chicks was slower overall. The provision of light increased the rate of hatch to 50% when provided light at 9 days of incubation, resulting in an advance of 1.8 h compared with chicks hatched in the dark. Unlike the other two strains of chickens, providing light at Day 17 with the BR strain was disruptive and resulted in a delay of 2.8 h to reach 50% hatched compared to those chicks that were incubated in the dark.

Industry Impact: Results indicate there is a difference in light sensitivity of the chicken strains used in this study, but all strains hatched in a more synchronized manner when 12L:12D is used early in incubation. Results also indicate that light does not increase the number of chicks that hatch as a percentage of fertile eggs set; it does cause chicks to hatch earlier within the hatch window when introduced early in the incubation period. Current research supports the impact of providing 12L:12D during incubation to reduce stress susceptibility post-hatch.

References:

Bergoug H., Burel, C. Guinebretiere M, Tong Q, Roulston N, Romanini CEB, Exadaktylos V, McGonnell IM, Demmers TGM, Verhelst R, Bahr C, Berckmans D and Eterradossi N 2013. Effect of pre-incubation and incubation conditions on hatchability, hatch time and hatch window, and effect of post-hatch handling on chick quality at placement. World's Poultry Science Journal 69, 313-334.

Careghi C, Tona K, Onagbesan O, Buyse J, Decuypere E and Bruggeman V 2005. The effects of the spread of hatch and interaction with delayed feed access after hatch on broiler performance until seven days of age. Poultry Science 84, 1314-1320.

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Funding: Canada/Nova Scotia Growing Forward II Program, Egg Farmers of Nova Scotia