



A meta-Analysis of Effects of Green Light Stimulation During Incubation on Hatching Traits in Broiler Chickens

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Abstract

Green light stimulation during incubation has gained increasing attention as a potential strategy for improving hatching traits in broiler chickens. However, findings among studies remain inconsistent. Therefore, this meta-analysis evaluated the effects of green light exposure during incubation on hatchability of set eggs, hatchability of fertile eggs, chick length, and chick weight in broiler chickens. A comprehensive literature search was conducted in PubMed, Web of Science, and Scopus for studies published up to 26 January 2026, following Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines. A total of 3660 records were identified, of which 23 studies met the inclusion criteria for qualitative synthesis, while eligible outcomes were included in quantitative meta-analysis. Random-effects models were applied to estimate pooled standardized mean differences with 95% confidence intervals. The meta-analysis demonstrated that green light exposure during incubation significantly improved hatchability of set eggs (standardized mean difference = 1.83, 95% confidence interval: 0.53-3.12; $p = 0.0058$) and chick length (standardized mean difference = 0.64, 95% confidence interval: 0.02-1.26; $p = 0.042$). In contrast, no significant effects were observed for hatchability of fertile eggs (standardized mean difference = 0.78, 95% confidence interval: -0.33-1.88; $p = 0.167$) or chick weight (standardized mean difference = 0.58, 95% confidence interval: -0.50-1.67; $p = 0.293$). Considerable heterogeneity was detected for hatchability of set and fertile eggs, and chick weight, whereas chick length showed negligible heterogeneity. Sensitivity analyses confirmed the robustness and stability of the pooled estimates. Funnel plot assessment and Egger's regression test indicated no significant publication bias for chick weight outcomes ($p = 0.055$). Overall, the findings suggest that green light stimulation during incubation may positively influence hatchability set eggs and chick length in broiler chickens, although its effects on hatchability of fertile eggs and chick weight remain inconsistent. Further standardized studies are needed to determine the optimal light intensity, photoperiod, and incubation stage for green light application in commercial broiler production.

Keywords: Broiler chickens, chick quality, green light, hatchability, incubation, meta-analysis

