

Evaluation of External and Internal Quality Characteristics of Eggs from Three Commercial Laying Breeds under Varying Storage Temperatures in the Eastern Cape

Ikusika Olusegun

Department of Livestock and Pasture, University of Fort Hare, South Africa

SAMRC Microbial Water Quality Monitoring Centre, University of Fort Hare, South Africa

Festus Akinmoladun

Department of Livestock and Pasture, University of Fort Hare, South Africa

Mthunzi Mndela

Department of Livestock and Pasture, University of Fort Hare, South Africa

Ishmeal Jaja

Department of Livestock and Pasture, University of Fort Hare, South Africa

Department of Agriculture and Animal Health, University of South Africa, Roodepoort, Johannesburg, South Africa

Abstract:

Egg quality is a critical factor influencing consumer acceptance, nutritional value, and marketability. Because eggs are sensitive to both genetics and environment, this study evaluated the external and internal quality characteristics of three commercial laying breeds (Lohmann, Hy-Line, and ISA Brown) under varying storage temperatures in the Eastern Cape, South Africa. A total of 180 eggs (90 per study focus) were collected under uniform management conditions. External quality was assessed through eggshell weight, thickness, and breaking strength using standard laboratory methods and the GLM procedure in SAS. Internal quality including yolk and albumen pH, dimensions, egg weight, and Haugh units were analyzed across two temperature treatments (room temperature and 30°C) using the PROC MIXED procedure in SAS 9.4. Statistical significance was set at $P < 0.05$. The study revealed that storage temperature significantly impacted internal stability; elevated temperatures (30°C) led to increased pH, reduced albumen height, and a sharp decline in Haugh units. Breed-specific differences were prominent in both internal and external traits. Eggs from Isa breed deteriorated most rapidly under heat stress, while Lohmann eggs maintained superior internal freshness. While no significant differences were found in shell weight ($P > 0.05$), ISA Brown exhibited the highest mean breaking strength (44.25 N), suggesting superior resistance to mechanical damage. The Hy-Line breed produced the thickest shells (0.406 mm) but showed significant quadratic variability in strength and thickness ($P < 0.05$), whereas Lohmann and ISA Brown demonstrated greater structural stability. In conclusion, both breed and storage temperatures profoundly influence the overall quality of table eggs. While ISA Brown offers superior shell breaking strength, the Lohmann breed displays better internal resilience to high temperatures. These findings underscore the importance of selecting heat-tolerant breeds and maintaining cold chain integrity to preserve both the structural and nutritional quality of eggs in the Eastern Cape's climate.

Keywords:

Egg quality, Storage temperature, Commercial breeds, Heat stress, Haugh units.