PROCEDURES FOR IMPROVING EGG SHELL QUALITY AT HIGH TEMPERATURES

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Summary

Shell breaking strength of eggs from 30- and 38-week old commercial laying hens maintained from point of lay at 32°C was improved by altering the conventional lighting regimen of 16 h light:8 h dark (16L:8D) to an intermittent lighting regimen of 3L:1D. Additional improvements were achieved by supplementing the diet with sodium bicarbonate (NaHCO₃). Rate of lay to 38 weeks was not significantly affected by the treatments.

I. INTRODUCTION

Balnave and Muheereza (1996) reported the results of short-term studies which showed that supplementing a layer diet with 10 g NaHCO₃/kg significantly improved the shell breaking strength of eggs from hens caged at temperatures of 30°C and 35°C in continuous light. The hypothesis examined in these studies was that a continuous lighting regimen would allow the synchronisation of egg shell formation with supplementary bicarbonate intake by the hen. The inconsistent responses to bicarbonate observed in previous studies reported in the scientific literature probably reflects the fact that under a conventional daily 16 h photoperiod (16L:8D) the bicarbonate is not consumed during the dark period, the time during which egg shell formation normally occurs.

The application of continuous lighting for an extended period is not satisfactory from a poultry welfare point of view. However, alternative lighting regimens can be used which will allow hens to rest during dark periods while still synchronising the intake of supplementary bicarbonate with egg shell formation. One possibility is the use of repetitive 3L:1D cycles. This intermittent lighting regimen is currently being examined in a long-term study using hens maintained at 32°C. The initial results from this experiment are detailed in this report.

II. METHODS

One hundred and ninety two Tegel SuperBrown pullets were received from a rearing farm at 19 weeks of age and placed, two birds per cage, in two temperature controlled rooms maintained at a constant 32°C in a conventional 16L:8D lighting regimen. From the time of first egg (20 weeks of age) the birds in one room were continued on the conventional lighting programme while those in the other room were changed to repetitive 3L:1D cycles. Eight replicates of six hens were allocated to each of two dietary treatments in each room. These consisted of a conventional layer diet (11.96 MJ of ME and 200 g crude protein/kg) and this diet supplemented with 10 g NaHCO₃/kg.

Production measurements commenced when the overall rate of lay reached 10%. Egg numbers were recorded daily and egg shell breaking strength was measured at 30 and 38 weeks of age using all eggs laid over a three day period. Egg shell breaking strength was measured using a cantilever system (Balnave et al., 1992).

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Figure 1. Egg shell breaking strength (Newtons) for hens at different ages.

Figure 2. Egg production to 38 weeks.
III. RESULTS AND DISCUSSION

This novel approach to improving egg shell quality has been successful in that both intermittent lighting and dietary NaHCO$_3$ supplementation have given beneficial results in terms of egg shell breaking strength.

The results for rate of lay and egg shell breaking strength are shown in Figures 1 and 2. Neither the lighting regimen nor the dietary treatment had any significant effect on rate of lay to 38 weeks. However, egg shell breaking strength was significantly affected by the lighting regimen. The improvement observed with the 3L:1D regimen was significant (P<0.001) and evident at both 30 and 38 weeks of age. The NaHCO$_3$ supplement gave improvements additional to those obtained with the 3L:1D lighting regimen (P<0.01) but had no effect to 38 weeks in the 16L:8D light regimen.

These results, reporting measures in early lay at a time when egg shell quality should be optimum, indicate that the shell breaking strength of eggs from hens maintained at high temperatures can be improved by altering the daily lighting regimen to allow hens to consume nutrients throughout the daily 24 h period. The evidence also indicates that additional improvements can be achieved by supplementing the diet with NaHCO$_3$ under the intermittent lighting regimen. The experiment is being continued to determine whether the benefits accruing from these management strategies will be more pronounced later in the laying period when egg shell quality declines with increasing age of the hen.

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REFERENCES
