HatchTech
INCUBATION TECHNOLOGY

Abstract

Effect of Relative Humidity during Incubation at a Set Eggshell Temperature

Presented on the IFRG Meeting, June 2012, by Carla van der Pol MSc.

C. W. van der Pol*[1], I. A. M. van Roovert-Reijrink[1], C. M. Maatjens[1], H. van den Brand[2], R. Molenaar[1]

1 HatchTech B.V., P.O. Box 256, 3900 AG Veenendaal, The Netherlands
2 Adaptation Physiology Group, Wageningen University, P.O. Box 338, 6700 AH Wageningen, The Netherlands

Hatching success in broiler chicken eggs is influenced by the amount of water loss from the egg during incubation (Davis et al., 1988; Buhr, 1995). In previous studies, water loss was often manipulated by changing the relative humidity (RH) inside the incubator while the machine temperature was maintained at a fixed setpoint. However, it is possible that the eggshell temperatures in these studies varied between RH treatments because the heat transfer capacity of air is different at a high or low RH.

Eggshell temperatures were not monitored or controlled. Changes in embryonic mortality found in previous studies to RH or water loss during incubation may have been a reflection of changes in eggshell temperature, rather than a result of the RH or water loss itself. By incubating eggs at the optimal eggshell temperature of 37.8°C but with variable RH, effects on embryonic mortality, chick quality and development can be attributed to RH and water loss. Therefore, this study was performed to determine embryonic mortality, chick quality and postnatal development of chickens from eggs incubated at a high or low RH while maintaining the eggshell temperature at 37.8°C throughout incubation.

Eggs were incubated at a low (30-35%) or high (55-60%) RH from day 2 of incubation (E2) till day of hatch (E21). Eggshell temperature was maintained at 37.8°C throughout incubation. At E0 and E18, eggs were weighed to determine egg weight loss.

The number of hatched chickens was monitored every 6 hours from 468 till 510 hours of incubation. Unhatched eggs were opened at E21 to determine the stage of embryonic mortality. Embryo or chicken weight and several parameters of chick quality and development (chick length, navel quality, organ weight and dry matter of the yolk free body mass and residual yolk) were determined at E18, E21 and 4 days posthatch.

Results showed that egg weight loss from day 0 to day 18 of incubation increased (12.7% for low RH and 9.7% for high RH; P<0.001), third week embryonic mortality increased (+1.6%; P=0.02), and hatch of fertile decreased (-2.9%; P=0.004) for low RH eggs compared to high RH eggs. Hatch times, variation in hatch times, and chicken weight, quality and development were comparable between RH treatments (all P>0.17).

Results are in accordance with literature, which found that chickens from eggs with more than 20% weight loss at E20 will either die during incubation or hatch a chicken of the same quality and development as chickens from eggs with 14.4% weight loss (Davis et al., 1988). It appears that embryos are unable to respond to the level of water loss by altering their growth rate or development.

According to literature, the only strategy an embryo has to cope with increased water loss during incubation is by maintaining its water content through selective reabsorption of water from the allantois (Davis et al., 1988; Buhr, 1995). This is further evidenced by findings in the current study that egg weight loss was increased for low RH eggs compared to high RH eggs while chicken weight at E21 was comparable between treatments. This suggests that water was lost from the extraembryonic fluids rather than from the embryo and yolk. It can be concluded that incubating eggs at a high or low RH, while maintaining the eggshell temperature at 37.8°C throughout incubation, results in increased third week embryonic mortality for low RH eggs compared to high RH eggs and comparable chicken weight, quality and development at E18, E21 and 4 days post-hatch for both RH treatments.

References

Buhr, R. J. 1995. *Incubation relative humidity effects on allantoic fluid volume and hatchability.* Poult. Sci. 74:874-884

Davis, T. A., S. S. Shen, R. A. Ackerman. 1988. *Embryonic osmoregulation: consequences of high and low water loss during incubation of the chicken egg.* J. Exp. Zool. Suppl. 245:144-156

19_314_HAT142