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Effect of different feeding schedules on reproductive parameters and egg quality of broiler breeders

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ABSTRACT

This experiment was carried out to evaluate the effects of three feeding schedules on egg production and egg quality of broiler breeders. The feeding schedules were: a single feeding at 8:00 a.m.; twice daily feeding (50% at 8:00 a.m. and 50% at 3:00 p.m.) and single feeding at 3:00 p.m. The total, 546 females and 63 males Cobb 500 broiler breeders were used from 28 to 40 weeks of age. The experimental design was completely randomized, with 3 treatments of 7 replicates with 26 females and 3 males. The nutritional requirements and management were according to the recommendations of the guideline. The following parameters were assessed weekly: total egg production, hatchable eggs, egg specific gravity, weight of egg shell, yolk, and albumen, as well as eggshell thickness. To measure the egg shell contamination was evaluated the aerobic mesophilic bacteria and total coliforms at 28, 32 and 36 week of age. Twenty three incubations were performed to evaluate fertility and incubation parameters. Laying rate was determined by 6 daily collections over the experimental period. Broiler breeders fed once in the afternoon had lower egg production than others feeding schedules. Hens fed once the afternoon had higher specific gravity ($P = 0.0063$), shell weight ($P = 0.0009$) and eggshell thickness ($P = 0.0001$) than others. Similarly, hens fed once in the afternoon had more egg ($P = 0.0022$) and yolk weight ($P = 0.0314$) than hens fed in the morning. On the other hand, hens fed in the morning had the lowest embryonic mortality and increased hatchability of fertile egg. Broiler breeders fed at the late period of day had better parameters on eggs quality, no change on bacterial contamination than the others feeding schedules, however, it had the worst results in the embryonic mortality and hatchability of eggs.

1. Introduction

An eggshell at the time of the oviposition should be essentially free from microbial contamination. However, this condition is quickly changed once the exterior of the egg comes in contact with the nesting material, where the egg is deposited. One of the first exposures of bacteria to eggs occurs throughout the cloaca. As a result, eggs are potentially contaminated by several surface which, they come into contact. Several factors can affect the extent of trans-shell contamination that occurs

Abbreviations: TAMC, total aerobic mesophilic count; PCA, plate count agar; TC, total counts; TTC, indicator tetrazolina.

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(Board and Tranter, 1995) as dust, soil and feces are some sources of contaminating microorganisms. The shell thickness has a significant effect on the bacteria ability to pass across the shell (Solomon, 1991) this ability has been demonstrated as positive correlation of bacterial penetration and poor shell quality (Haines and Moran, 1940). Particularly, the cracked eggshells are invaded more often by different numbers of bacteria, therefore including pathogenic microorganisms (Ricke et al., 2001).

It is widely accepted that bacterial contamination is a factor associated with infections that contributes significantly on the reduction outbreaks in commercial hatcheries, thus, exist valid efforts trying to minimize them (Bruce and Drysdale, 1991).

Broiler breeders usually have a limited food daily in the morning (Backhouse and Gous, 2005) this practice does not supply nutrients that the hens need, particularly to the shell formation (Bootwalla et al., 1983), which it normally begins in the afternoon or evening. Farmer et al. (1983a) reported that broiler breeder hens do not maintain an equal release of calcium from the crop to the lower digestive tract. It is possible to improve the eggshell quality if the nutrients are supplied at the close time that occur the shell deposition through the changes of the feed intake time. In the same way, splitting the single feed allocation in more frequents feeding periods throughout the day (split feeding), the feed maybe utilized more efficiently to enhance the performance of breeders (Taylor-Pickard and Noollet, 2006). Bootwalla et al. (1983), Farmer et al. (1983b), Brake (1988) and Harms (1991) reported increases in egg specific gravity when the broiler breeders were fed in the end of day. The greatest effect of afternoon feeding on shell quality manifested as an increase in egg specific gravity, shell weight and shell thickness (Taylor-Pickard and Noollet, 2006).

Therefore, the objective of this study was to evaluate the change in feeding schedules of hens in relation to the bacterial contamination of eggs, as well as the influence of different treatments on egg production, shell quality and incubation parameters of eggs.

2. Materials and methods

The present study was carried out in the Poultry Science Laboratory-LAVIC at the Federal University of Santa Maria (UFSM). This study was based on compliance with the Welfare Standards and was approved by the Ethics Committee of UFSM. 546 broiler breeder hens and 63 roosters (22 week-old) were acquired from a commercial poultry company to be used in the trial. They were placed in an open-sided house with a wood shaving floor. The broiler breeders were reared following the Cobb 500 broiler breeder guidelines (from the moment at which the hens reached 5% of egg production, the diet was increased 6 g every 10% increase in production, these increases occurred until peak production and the maximum consumption reached was 164 g/day/hen). The selected hens were placed in 21 pens, each pen had 4.61 m^2 (3.24 × 1.42 m) and, each pen was equipped with an automatic drinker, one tube feeders to females, and a trough-type feeder to the roosters. Hens were fed corn-soybean-based mash diets (Table 1). Throughout the experiment were necessary 14 batch of diets and all were sampled. Samples were sent to the Bromatology Laboratory of the Federal University of Santa Maria for bromatology analysis (Weende Analyses). Only in one batch analyzed the values (low protein level) were not in accordance with the recommendations in Table 1, due to this new diet was made. The supply of the feed was strictly controlled, in accordance to the recommendations of the breeder company. Water was ad libitum, and a photoperiod of 13 h light/day was used during the first week (22 weeks), gradually it was increasing (15 min every 15 days) they received 16 h and 45 min of light/day at 40 weeks until at the end of experiment.

Table 1
Composition of the diet and nutritional levels used (g/kg).

Ingredients	Content
Corn	690.5
Soybean meal (460 g/kg protein)	212.2
Soybean oil	2.1
Dicalcium phosphate	16
Limestone powder (380 g/kg Ca)	69.8
Salt	4.0
Premix[a]	5.0
DL-Methionine (990 g/kg)	0.8
Calculated nutritional composition	
Crude protein	160.0
Metabolizable energy (MJ/kg)	11,97
Calcium	30.0
Available phosphorus	4.5

[a] Mineral and vitamin premix: levels per kg of diet: Vit. A 10,450 IU, Vit. E 38 mg, Vit. D_3 1662.5 IU, Vit. K_3 4.75 mg; nicotinic acid 42.5 mg, Vit. B_1 2.37 mg, Vit. B_{12} 19 μg, Vit. B_2 9.5 mg, 4.75 mg Vit. B_6, folic acid 1.18 mg, biotin 0.19 mg, choline 360 mg; 19 mg pantothenic acid, copper 12 mg; 60 mg iron, iodine 0.8 mg, manganese 70 mg, selenium 0.54 mg and zinc 70 mg.