Effect of Brooding Density on Broiler Performance

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ABSTRACT A study was conducted to determine whether broiler performance is adversely affected when chicks are brooded under limited-area brooding densities or on a wire floor and then transferred and grown on a litter floor. Results showed that brooding broilers for the first 14 or 21 days at densities of 186 and 287 cm^2, either on wire or litter, and then allowed a growing density of 697 cm^2 on litter did not adversely affect the body weight at 14, 21, or 49 days, feed efficiency at 49 days, breast blisters at 49 days, or deformed legs at 49 days when compared to broilers brooded and reared on litter at a density of 697 cm^2. At 186 cm^2, the density is comparable with that of one-fourth house brooding; at 287 cm^2, the density is comparable with that of one-third house brooding.

(*Key words:* poultry, production, brooding density)

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INTRODUCTION

The major part of the fossil fuel energy for broilers is required during the first 2 or 3 weeks of the broiler's life. Limited-area brooding, which consists of brooding at a high floor density, is a method of conserving fossil fuel energy (Reece, 1977). Problems encountered in limited-area brooding include wet litter and caking of litter (Reece, 1978). Ventilation rates required to maintain a pliable litter by removal of the latent bird heat that causes wet litter also require extra heat from fossil fuel to heat the ventilation air. One way to eliminate the energy required to dry the litter during brooding is to brood the chicks on a wire floor for the first 2 or 3 weeks. The objective of this study is to determine whether broiler performance is adversely affected when chicks are brooded under limited-area brooding densities or on a wire floor and then transferred and grown on a litter floor.

EXPERIMENTAL PROCEDURE

In three trials, equal numbers of mixed-sex broilers were used. Bird densities used for limited-area brooding were based on work conducted by Reece (1978). The treatments consisted of: 1) commercial broilers reared on litter for 2 weeks at a density of 186 cm^2 per chick (300 chicks in a 1.5 × 3.6 m pen); 2) commercial broilers reared on wire for 2 weeks at a density of 186 cm^2 per chick (300 chicks in a 1.5 × 3.6 m pen); 3) commercial broilers reared on litter for 3 weeks at a density of 287 cm^2 per chick (194 chicks in a 1.5 × 3.6 m pen); 4) commercial broilers reared on wire for 3 weeks at a density of 287 cm^2 per chick (194 chicks in a 1.5 × 3.6 m pen); and 5) a control group of commercial broilers reared at a density of 697 cm^2 on litter from 1 day of age to market at 49 days of age (80 chicks in a 1.5 × 3.6 m pen). At 2 weeks of age 40 males and 40 females each from treatments 1 and 2 were placed in each of two 1.5 × 3.6 m pens on litter floor and raised to 49 days of age. At 3 weeks of age 40 males and 40 females each from treatments 3 and 4 were placed in each of two 1.5 × 3.6 m pens on litter floor and raised to 49 days of age. The litter was pine shavings.

Data were collected on body weight and feed consumption at 14, 21, and 49 days of age. Leg deformity and breast blister data were recorded at 49 days of age. Leg deformities were visually scored by examining each bird. Breast blisters were determined by examining the breast of each live bird. Fluid beneath the skin constituted a blister. The wire floor was a 3.2 cm^2 mesh and covered the entire 1.5 × 3.6 m pen.

Where 300 broilers were started in a 1.5 × 3.6 m pen, three 22 cm diameter water jugs and three 39.3 × 54.6 cm feeder lids were used for the first 5 days. Where 194 broilers were started, two 22 cm diameter water jugs and two 39.3 × 54.6 cm feeder lids were used for the first 5 days. Where 80 broilers were started, one 22 cm diameter water jug and one 39.3 × 54.6

cm feeder lid were used for the first 5 days. One 2.44 m long automatic waterer was used in each 1.5 × 3.6 m pen during the entire 49-day experiment. The waterer was located along the pen partition so that only one side was available to the broilers. After the first 5 days, the birds in each pen were allowed two 38.1 cm diameter tube feeders. House temperature of 29.4, 26.7, and 23.9 C was maintained for the first, second, and third weeks of age, respectively. After the third week, the house temperature was 21.2 C. Continuous light intensity at average bird height was 75 lx for the first 9 days. The light intensity at average bird height was 7.5 lx after 9 days.

For the first 2 trials, at 14 days of age, 25 tibia of each sex were taken for bone ash determinations from the litter- and wire-brooded groups that were brooded for 14 days at a density of 186 cm^2. Each group of fresh tibia was boiled for 3 to 5 min in distilled water, cleaned with the aid of a knife and cheesecloth, ether extracted, and dried for 24 hr. The fat-free, moisture-free tibia bones were ashed at 600 C for 8 hr.

A starter diet calculated to contain 22% protein and a metabolizable energy value of 3200 kcal/kg of diet was fed the first 4 weeks. A diet calculated to contain 20% protein and a metabolizable energy value of 3250 kcal/kg of diet was fed for the next 3 weeks.

An analysis of variance with a chi square analysis for the percentage data was used to analyze the data statistically.

RESULTS AND DISCUSSION

Brooding broilers for the first 14 to 21 days at densities of 186 and 287 cm^2, then allowing a growing density of 697 cm^2 did not significantly affect the body weight at 14, 21, or 49 days of age, feed efficiency at 49 days, breast blisters at 49 days, or deformed legs at 49 days when compared to broilers brooded and reared at a density of 697 cm^2 (Table 1). At 186 cm^2, the density is comparable with that of one-fourth house brooding; at 287 cm^2, the density is comparable with that of one-third house brooding.

The wire floor brooding concept was used

TABLE 1. *Effect of brooding density on broiler performance for broilers brooded on wire and litter floor*

Performance trait	Broiler performance at brooding density[d] of – 186 cm^2 Litter floor	186 cm^2 Wire floor	287 cm^2 Litter floor	287 cm^2 Wire floor	697 cm^2 Litter floor
Avg. body wt., g – 14 days:					
Male	275[a]	268[a]	290[a]	287[a]	286[a]
Female	258[a]	253[a]	269[a]	267[a]	266[a]
Avg.	267	261	280	277	276
Avg. body wt., g – 21 days:					
Male	504[a]	503[a]	514[a]	517[a]	518[a]
Female	454[a]	459[a]	472[a]	471[a]	470[a]
Avg.	479	481	493	494	494
Avg. body wt., g – 49 days:					
Male	1919[a]	1931[a]	1944[a]	1944[a]	1964[a]
Female	1592[a]	1570[a]	1620[a]	1595[a]	1574[a]
Avg.	1756	1751	1782	1770	1769
Feed efficiency – 49 days:	1.99[a]	1.99[a]	1.97[a]	2.00[a]	1.99[a]
Breast blisters – 49 days:					
No.	30/465[ab]	25/469[a]	47/466[c]	45/468[bc]	31/464[abc]
%	6.5	5.3	10.1	9.6	6.7
Deformed legs – 49 days:					
No.	10/465[a]	4/469[a]	11/466[a]	6/468[a]	2/464[a]
%	2.2	.9	2.4	1.3	.4

[a,b,c]Within each row, differing letters denote significant difference at the $P \leq .05$ level.

[d]After the chicks were brooded for either 14 days at a density of 186 cm^2 or 21 days at a density of 287 cm^2, they were then transferred to litter floor pens and reared to 49 days at a density of 697 cm^2.

primarily to keep the birds away from the litter under high bird density brooding. Without proper ventilation, the litter under high density brooding can become wet. With proper ventilation, excess energy is used to keep the litter pliable. Also, with the wire floor brooding concept, the manure can be removed and ammonia in the brooding area can thus be reduced (Reece *et al.*, 1980). Brooding the broilers on wire at a density of 186 or 287 cm^2 did not adversely affect body weight, feed efficiency, breast blisters, or deformed legs when compared to broilers brooded and reared on litter at a density of 697 cm^2 (Table 1). In general, these data agree with those of Thaxton *et al.* (1980), who noted that general product quality did not differ between battery brooding and litter-floor brooding. Thaxton *et al.* (1980) did note a depression in final body weight and a lower feed conversion ratio for the battery-brooded birds than for the floor-brooded birds; we did not note these results in our study.

In previous work conducted at this laboratory, Reece *et al.* (1971) noted a greater incidence of leg deformities in broilers reared in cages for the entire brooding and growing period than in those brooded and grown in litter floor pens. In the present study, the leg deformity problem was not noted to be severe if the broilers were brooded on wire floor for either 14 or 21 days and then transferred to the litter-floor pen (Table 1). The tibia ash data collected at 14 days from the wire and the litter-reared groups at a brooding density of 186 cm^2 did not differ significantly. The ash values were 42.08% for the wire-brooded group and 43.08% for the litter-brooded group.

Because the major part of the fossil fuel is used during the brooding period, investigators visualized that wire brooding may be an extension of the hatchery phase of broiler production. A firm can have brooding farms where high-cost energy intensive equipment is used continually. After the high energy required during brooding, the broilers are then taken to the grower farm. The wire would have the advantage of probable automation for ease of handling the chicks.

Although mortality was numerically higher for the high-brooding density groups than for those brooded and reared on litter at a density of 697 cm^2, mortality was not significantly different between treatments. Mortality was 3.3% for the brooding density groups of 697-cm^2 litter, 3.9% for the 186-cm^2 litter and the 186-cm^2 wire, 4.3% for the 287-cm^2 litter, and 3.7% for the 287-cm^2 wire.

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