Comparison of the Performance of Dwarf, Intermediate, and Normal Body Size Single-Comb White Leghorns Housed in Conventional Single-Cage Houses

Special Report 559
September 1979
Agricultural Experiment Station
Oregon State University, Corvallis

REVIEW OF LITERATURE

Developing a smaller body size White Leghorn for a commercial layer is valid if the layer will perform equally or better than the commercial normal size Single-Comb White Leghorn. Because of its smaller body size, this layer would eat less feed than normal body size commercial layers. This would lead to lower production costs since feed cost comprises approximately 75 percent of the total cost to produce a dozen eggs.

In 1973, Christmas *et al.* evaluated the performance of 12 strains of layers with two or three birds per cage for two 28-day periods. Considerable strain differences were observed, but no significant strain × housing interaction occurred. Feed efficiency and egg size were not different between groups.

McClung and Jones (1973) compared the performance of normal, intermediate, and mini-body size layers to 500 days of age for two consecutive years. Mini-body size layers took longer to reach 50 percent egg production, laid smaller eggs, and had lower hen day egg production than intermediate or normal body size layers. Feed cost per dozen eggs was about the same for the three strains.

Our study was undertaken to compare the performance of the Oregon Agricultural Experiment Station dwarf, a commercial intermediate, and a commercial normal body size strains of Single-Comb White Leghorn layers housed in conventional single-cage houses.

EXPERIMENTAL PROCEDURES

Dwarf*, intermediate**, and normal*** body size White Leghorn layers were housed individually in cages (8 inches × 14 inches or 20.3 centimeters × 35.6 centimeters) in a naturally ventilated cage house with adjustable wooden panels on both sides of the house. The rows of cages were arranged in a stair-step design. Each strain was replicated four times with 25 layers per replicate. Each replicate was randomly assigned throughout the house.

Feed was provided *ad libitum* throughout the ten 28-day experimental periods. The basal ration is listed in Table 1. Layers were fed identical rations, except the dwarf and intermediate body types were fed a ration with 0.1 percent more methionine. Water was provided in continuous V-trough-type waterers with eight 15-minute watering periods of approximately equal intervals from 5:15 a.m. to 6:45 p.m. daily. Artificial lights were provided from 5 a.m. to 7 p.m. when necessary to provide 14 hours of light. Approximately 5.4 lux (0.5 foot candle) light intensity was allowed at bird level.

Egg production and mortality were recorded daily, and all dead birds were sent to the OSU Veterinary Diagnostic Laboratory for necropsy. Feed consumption and percent egg production were determined for each 28-day period. Egg weight and grade, and specific gravity for egg shell quality, were determined at the end of periods 3 and 10. Specific gravity procedure was followed as outlined by Arscott and Bernier (1961). Eggs were graded by using an Egomatic egg grader. Before grading, the scales on the grader were calibrated with standard weights. Body weight was measured at the end of periods 4, 5, and 10.

All data derived from this experiment were submitted to an analysis of variance and Duncan's multiple range test (Steel and Torrie, 1960).

Table 1. Composition of diet fed to dwarf, intermediate, and normal size White Leghorn layers

Ingredients	Percent	
Corn, yellow	69.50	
Soybean meal (44% protein)	19.00	
Alfalfa meal (17% protein)	2.50	
Deflourinated phosphate	1.90	
Limestone flour	3.30	
Oyster shell (medium size)	3.30	
Salt, iodized	0.25	
Vitamin premix[1]	0.20	
Trace mineral premix[2]	0.05	
d, 1 methionine (98%)	....	(0.1)[3]
Calculated Analyses		
Protein (%)	15.50	
M.E. (kcal/kg)	2,835.80	
Calcium (%)	3.23	
Available phosphorus (%)	0.45	
Methionine (%)	0.24	
Meth. & Cyst. (%)	0.51	(0.61)[3]

1. Contributes per kilogram of ration, the following: Vitamin A, 3,300 IU; Vitamin D, 1,100 ICU; riboflavin, 3.3 mg; d-pantothenic acid, 5.5 mg; niacin, 22.0 mg; choline, 191 mg; Vitamin B_{12}, 5.5 mcg; Vitamin E, 1.1 IU, Vitamin K, 0.55 mg; folacin, 0.22 mg.
2. Contributes per kilogram of ration, the following: Ca 97.5 mg; Mn, 60 mg; Fe, 20 mg; Cu, 2 mg; I, 1.2 mg; Zn, 27.5 mg.
3. Increased by 0.1 percent for dwarf and intermediate layers.

* Dwarf = Oregon Agricultural Experiment Station dwarfs
** Intermediate = H & N Petite
*** Normal size = Babcock B-300

RESULTS AND DISCUSSION

The performance data are presented in Table 2. Because the dwarfs were two and three weeks older than the normal and intermediate body types, respectively, the performance data were recalculated to the same age. Average hen day egg production, feed conversion, daily feed consumption, and cumulative mortality were corrected for age, and the data are reported for seven 28-day periods.

The intermediate body size layers laid significantly more ($P \leq 0.05$) eggs than either the dwarf or normal body size layers, with the latter two body types comparable. The dwarf layers required significantly less ($P \leq 0.05$) feed to produce a dozen eggs than either the intermediate or normal body size layers. The intermediate body size layers required significantly less ($P \leq 0.05$) feed to produce a dozen eggs than the normal body size layers. The ranking for efficiency of converting feed to eggs was: dwarf < intermediate body size < normal body size.

Daily feed consumption correlates closely with body size. The dwarf layers ate significantly less ($P \leq 0.05$) daily feed than either the intermediate or normal body size layers for maintenance and production. The layers of intermediate body size ate significantly less ($P \leq 0.05$) than the normal body size layer.

Normal body size and dwarf layers showed 3.3 and 2.3 times more mortality, respectively, at the end of seven periods than the intermediate body size layers.

Specific gravity, an indirect measurement of egg shell quality, was significantly better ($P \leq 0.05$) for eggs from the dwarf and intermediate body size than from the normal body size layers. Since the dwarf layer was two and three weeks older than the normal and intermediate body size layers, respectively, the better egg shell quality cannot be attributed to age. In fact, older birds actually produce poorer quality egg shells than younger layers. The age differential between the intermediate and normal body size layers was one week. This small age difference should not have had an influence on the significantly better ($P \leq 0.05$) shell quality obtained with eggs from the intermediate body size layer than from the normal body size layer.

Average egg weight and egg grade reflect the influence of body size. Smaller body size layers produce smaller eggs than the larger body size layers.

SUMMARY

The comparison of the performance of dwarf, intermediate, and normal body size White Leghorn layers indicated that the intermediate body size layer outproduced the dwarf and the normal body size layer. The latter two body types had comparable production in rela-

Table 2. Comparison of the performance of dwarf, intermediate, and normal size Single-Comb White Leghorns housed in conventional cage houses[1]

Body Size	Ave.* Body Wt. (kg)	Ave.[2] Egg Prod. (%)	F/D Eggs[2] (kg/doz)	Daily[2] Feed Consumed (gm/bird/day)	Cum.[2] Mortality (%)	Specific[3] Gravity	Ave.[3] Egg Wt. (gms)	Egg size (%)* Jumbo	Extra Large	Large	Medium
Dwarf	1.23	68.5^{a}	1.43^{a}	81.3^{a}	7.0	1.0825^{b}	52.8^{a}	0	2.6	38.9	52.7
Intermediate	1.41	79.3^{b}	1.61^{b}	106.7^{b}	3.0	1.0835^{b}	57.9^{b}	1.3	16.7	64.7	17.1
Normal	1.63	66.9^{a}	2.00^{c}	111.2^{c}	10.0	1.0796^{a}	59.4^{c}	3.0	29.3	62.4	5.4

1. Values for each column with different superscripts are significantly different at $P \leq 0.05$.
2. Average values for seven 28-day periods.
3. Average values from the third and tenth 28-day periods.

* Average values for period 10 only.

tion to feed conversion and daily feed consumption. The dwarf layer was significantly better ($P \leq 0.05$) for feed conversion and daily feed consumption than either the intermediate or normal body size layers. Two to three times more mortality was observed in the dwarf and normal body size layers, respectively, than in the intermediate body size layer. Dwarf and intermediate body size layers had significantly better ($P \leq 0.05$) egg shell quality than the normal body size layers. Egg weight and size reflect the body size. Smaller body size layers produced smaller eggs and less weight.

The dwarf and intermediate body size layers performed equally or better, respectively, than the commercial normal body size White Leghorn layer.

REFERENCES

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