



North Carolina Cooperative Extension Service

NORTH CAROLINA STATE UNIVERSITY
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REPORT ON PULLET REARING PERIOD
31st NORTH CAROLINA LAYER PERFORMANCE
AND MANAGEMENT TEST¹

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The North Carolina Layer Performance and Management Test is conducted under the auspices of the Cooperative Extension Service at North Carolina State University and the North Carolina Department of Agriculture. The flock is maintained at the Piedmont Research Station, Salisbury, North Carolina. Mr. Raymond Coltrain is Piedmont Research Station Superintendent; Mr. Ed Radford is Resident Manager of the flock; Pam Jenkins, Statistical Research Technician; and Dr. K. E. Anderson is Project Leader. The purpose of this program is to assist poultrymen in North Carolina, across the country, and internationally in the evaluation of commercial layer stocks and management systems.

The data presented herein represents the analysis of the rearing period for the 31st North Carolina Layer Performance and Management Test. Performance summary tables are available examining open and closed housing types individually as well as the combined results.

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¹The use of trade names in this publication does not imply endorsement by the North Carolina Cooperative Extension Service of the products named nor criticism of similar ones not mentioned.

31st NORTH CAROLINA LAYER PERFORMANCE AND
MANAGEMENT TEST
Volume 31 No. 2

Report on Pullet Rearing Period

Dates of Importance:

The eggs were set on November 13, 1993 at the Piedmont Research Station (NCDA) Poultry Unit. The flock was hatched on December 8, 1993 and moved to laying facilities during April 4 to 7, 1994 at 17 weeks of age. The age of the flock at transfer was lowered to approximately 17 weeks due to current trends in the industry and requests of the breeders to move the flock prior to excessive egg production in the rearing houses.

Experimental Design:

The test was a factorial arrangement of treatments and the main effects were strain and pullet housing. The analysis was divided by pullet and type of house, then data from both houses were pooled and analyzed.

Strain--Samples of fertile eggs were provided/acquired from the breeders according to the rules which govern the conductance of this test. All eggs were set and hatched concurrently. A total of nine white egg and four brown egg strains were in the test for a total of thirteen strains. At hatch the chicks were sexed to remove the males. Each strain was sexed according to breeder recommendations i.e. feather, color, or vent sexing. A minimum of 1000 white and brown egg pullets/strain were started at the initiation of the test. If the number of pullets hatched were below the prescribed numbers, the chicks were divided as equally as possible between the two grow houses.

Pullet Housing--The chicks were divided between two separate brood-grow houses with white egg and brown egg replicates being intermingled throughout. The white egg strains occupied approximately 2/3 of each house and brown egg strains occupied the other third of each house. All strains were assigned to be represented as equally as possible in all cage rows and cage levels in each house where applicable.

House 6 - is an environmental controlled, closed brood-grow facility with 4 banks of triple-deck cages. Each row and bank of cages were assigned a row number, and each 3-cage section within each row and level/row was assigned a replicate number. All banks of cages were designated as blocks representing in house environments for statistical analysis. Thus, each block consisted of two rows containing 16 replicates on each level. The white and brown egg strains were assigned in the same manner to blocks 1 through 4 to insure that each strain was represented at least once in each block. All chicks were brooded in the center level of cages on paper within each of the replicate series (i.e. the 3 cage levels) within each row. Each center-61 cm x 51 cm (24"x20") cage-level replicate was filled with 90 white-egg and 90 brown-egg (30 per 24"x20" cage) pullets on the day of hatch. At 42 days of age, 1/3 of the birds in each brooding replicate were moved to the top cages, and 1/3 will be moved to the bottom cages for a final rearing allowance of 310 sq cm (48 sq in) for the white and brown egg layers.

House 8 - is an open-sided brood-grow facility with six rows of 122 cm wide by 102 cm (48"x40") deep single deck cages and each cage has been assigned a replicate number. The white-egg and brown-egg strains were randomly assigned to rows 1 through 6 in a restricted random manner with the restriction being each strain-replicate group was approximately equally represented in each row of cages. Forty white-egg and brown-egg

females were started and grown in each replicate for a final rearing allowance of 310 cm² (48 in²) for the white and brown egg layers.

Pullet Management and Nutrition:

Pullets were fed ad libitum by hand daily. Feed consumption and body weights were monitored bi-weekly beginning at 4 weeks of age. All mortality was recorded daily, but mortality attributed to the removal of males from a replicate have been excluded from the 31st NCLP&MT Grow Report. Starter (with Amprol at 454 g/ton), Grow and Developer diets are provided in diet formulation section. Each pullet placed was provided with 1 kg per bird. Thus, the white-egg and brown-egg replicates in brood-grow House 6 (90 females) should be given 92 kg of starter feed per replicate. The white-egg and brown-egg replicates in brood-grow House 8 (40 females) were given 41 kg of starter feed per replicate. Thereafter, all birds were placed onto the grower diet on which they remained until 12 weeks of age. From 12 weeks (March 13, 1994) to approximately 17 weeks (April 7, 1994) of age, all strains were provided with the developer diet.

Pullet Vaccination and Beak Trimming Schedule

Pullet vaccination and beak trimming schedules are outlined below:

<u>Age</u>	<u>Date</u>	<u>Event</u>
Hatch	December 8, 1993	HVT Marek's Vac. by injection in neck
Day 6 thru Day 8	December 14, 1993 December 16, 1993	Precision Beak Trim
Day 10	December 18, 1993	Newcastle (B1) and Bronchitis (Mass.) via aerosol spray (Triple Vac)
Day 35	January 12, 1994	Newcastle (LaSota) and Bronchitis (Mass.) via aerosol spray (ComboVac)
Day 63	February 9, 1994	Newcastle (LaSota) and Bronchitis (Mass.) via aerosol spray (ComboVac)
Day 70	February 16, 1994	Fowl Pox and Avian Encephalomyelitis vaccination via the wing web
Day 105	March 24, 1994	Newcastle (Lasota) and Bronchitis (Mass.) via aerosol spray (ComboVac)

Lighting Schedule

The lighting schedule for the pullet facilities is outlined below:

<u>Age</u>		<u>Photoperiod (hrs/day)¹</u>	
		Controlled Environment	Open-Sided
Days 1-3	December 8-10, 1993	23	23
Day 4 through 17 Weeks	December 11 through April 11, 1993	15	15
Move to lay house	April 4-8, 1994	15	15
18 weeks	April 11, 1994	15.5	15.5
19 weeks	April 18, 1994	16.0	16.0

¹On Day 4, time clocks were set to turn lights on 1/2 hour before sunrise and turn on lights 1/2 hour after sunset local daylight time for June 21.

Diet Formulations

BROOD-GROW PERIOD DIETS

Diet¹ Identification

Ingredient	Starter	Grower	Developer
	----- % -----		
Corn	58.15	61.98	65.65
Soybean meal	28.13	23.09	17.30
Wheat Midds	4.50	5.93	7.80
Oats	4.96	5.00	4.96
Limestone	1.17	1.60	1.72
Methionine	.25	.12	--
Dical	1.67	1.73	1.79
Salt	.25	.25	.25
Vit. premix	.10	.10	.10
Min. premix	.05	.05	.05
Mold Inhibitor	.10	.10	.10
Tracer	.05	.05	.05
Lysine	.61	--	.22
Protein %	20.0	18.0	16.0
ME kcal/kg	2970.0	2970.0	2970.0
Calcium %	0.90	1.10	1.10
T. Phos. %	.70	.69	.69
Lysine %	1.10	.95	.95
TSAA %	.66	.65	.65

¹Diets in crumblized form.

Starter - Amprol was added at the rate of 454 g/ton of feed; each female fed 1.02 kg of starter.

Grower - fed through 12 weeks of age.

Developer - fed through 17 weeks of age or until moved to layer house.

DESCRIPTION OF DATA TABLE STATISTICS

Rearing period performance of white egg and brown egg strains are shown in Tables 1-9 and 10-18, respectively. Following are the descriptions of the observations taken throughout the rearing period. Data presented in this report will be in metric.

Breeder (Strain):

Short identification of the breeder and strain of the stock. See more complete information in the table following the data.

Protein per Bird to 119 Days:

Calculated cumulative protein intake per bird to 119 days.

Metabolizable Energy per Bird to 119 Days:

Calculated cumulative metabolizable energy intake per bird to 119 days.

Feed Cost per Bird to 119 Days:

Calculated feed cost per bird to 119 days. Using average regional feed prices; Starter \$182.24/T; Grower \$165.43/T; Developer \$155.45/T.

Livability 1-119 Days:

The percentage of the birds housed which survived during days 1-119. Males which were removed are excluded from the analysis of livability.

Body Weights (4, 6, 8....17 Weeks):

Bi-weekly average body weights of all birds within representative cages. Sample size for these were approximately 60 birds/strain/brood-grow house. Cages selected were, as much as possible, a representative sample from all cage levels, rows, and strains.

Feed Consumption (1-4, 5-6....17, 1-17):

Feed consumption per bird within the time periods indicated. The last column in the table is the cumulative feed intake per bird throughout the growing period. Estimated feed consumed is calculated using pullet days which compensates for males removed from the flock at any time.

Statistical Analyses and Separation of Means:

Analyses of variance were performed on all data using the GLM procedure SAS Institute (1989)². Separate analyses were conducted for white and brown egg strains. Significant differences ($P < .01$) within white and brown egg strains are noted by different letters among columns of means. Significant white-egg strains and pullet house effects are noted in Tables 1-3 for the closed pullet facility (House 6); significant interactions between white egg strain and pullet house are noted in Tables 4-6 for the open pullet facility, and Tables 7-9 for the combined pullet rearing facilities. Significant brown-egg strains and pullet house effects are noted in Tables 10-12 for the closed pullet facility (House 6); significant interactions between brown egg strain and pullet house are noted in Tables 13-15 for the open pullet facility, and Tables 16-18 for the combined pullet rearing facilities.

Metric Conversions

1 lb = 453.6 g

1 lb = .4536 kg

1 oz = 28.35 g

1 g = .03527 oz

1 kg = 2.204 lb

1 g = 1000 mg

1 kg = 1000 g

²SAS Institute, 1989. SAS® User's Guide: Statistics, Version 6 Edition, SAS Institute, Inc., Cary, North Carolina.

Table 1. Feed Consumption of White Egg Entries in Closed Housing, 31st NCLP & MT

Breeder	(Week of Age)								
	1-4	5-6	7-8	9-10	11-12	13-14	15-16	17 ¹	1-17
----- (kg per bird) -----									
Hyline (W-36)	.62 ^{AB}	.62	.67 ^{AB}	.87 ^{BC}	.90	.99	.97 ^{BC}	.27 ^B	5.92 ^{BC}
Hyline (W-77)	.62 ^{AB}	.63	.72 ^A	.95 ^A	.98	1.01	1.02 ^{ABC}	.34 ^A	6.26 ^{AB}
H & N (Nick Chick)	.63 ^{AB}	.61	.68 ^{AB}	.89 ^{ABC}	.92	1.01	.99 ^{ABC}	.34 ^A	6.08 ^{ABC}
Bovans (White)	.59 ^B	.59	.66 ^{ABC}	.85 ^{CD}	.88	1.02	.91 ^C	.32 ^A	5.82 ^{BC}
ISA (Experimental)	.67 ^A	.58	.60 ^C	.80 ^D	.84	.98	.92 ^C	.31 ^{AB}	5.71 ^C
ISA (Babcock B300)	.64 ^{AB}	.58	.63 ^{BC}	.88 ^{ABC}	.89	.98	.98 ^{ABC}	.36 ^A	5.95 ^{BC}
Shaver (White)	.61 ^B	.62	.69 ^{AB}	.89 ^{ABC}	.98	.98	.97 ^{BC}	.33 ^A	6.07 ^{ABC}
Shaver (2000)	.67 ^A	.70	.71 ^A	.93 ^{AB}	1.05	1.05	1.08 ^A	.36 ^A	6.55 ^A
Dekalb (Delta)	.64 ^{AB}	.66	.68 ^{AB}	.90 ^{AB}	.95	1.03	.97 ^{BC}	.31 ^{AB}	6.14 ^{ABC}
Average	.63	.62	.67	.89	.93	1.01	.98	.33	6.06

A,B,C,D - Different letters denote significant differences within column (P<.01).
¹Partial week of feed intake prior to being moved into the laying facilities.

Table 2. Feed Cost and Livability of White Egg Entries in Closed Housing, 31st NCLP & MT

Breeder	Protein	Met. Energy	Lysine	TSAA	Feed Cost	Livability (1 - 119 d)
	----- (per bird to 119 days) -----					
	(g)	(kcal)	(g)	(g)	(\$)	(%)
Hyline (W-36)	1039 ^{BC}	17581 ^{BC}	57.8 ^{BC}	38.6 ^{BC}	1.13 ^{BC}	98.2
Hyline (W-77)	1094 ^{AB}	18587 ^{AB}	61.0 ^{AB}	40.8 ^{AB}	1.19 ^{AB}	98.7
H & N (Nick Chick)	1065 ^{ABC}	18064 ^{ABC}	59.3 ^{ABC}	39.6 ^{ABC}	1.16 ^{ABC}	96.7
Bovans (White)	1021 ^{BC}	17285 ^{BC}	56.8 ^{BC}	37.9 ^{BC}	1.11 ^{BC}	96.7
ISA (Experimental)	1003 ^C	16960 ^C	55.8 ^C	37.2 ^C	1.09 ^C	97.3
ISA (Babcock B300)	1042 ^{BC}	17664 ^{BC}	58.0 ^{BC}	38.8 ^{BC}	1.14 ^{BC}	97.6
Shaver (White)	1064 ^{ABC}	18042 ^{ABC}	59.3 ^{ABC}	39.6 ^{ABC}	1.16 ^{ABC}	97.8
Shaver (2000)	1148 ^A	19465 ^A	63.9 ^A	42.72 ^A	1.25 ^A	97.5
Dekalb (Delta)	1078 ^{ABC}	18249 ^{ABC}	59.9 ^{ABC}	40.0 ^{ABC}	1.17 ^{AB}	98.2
Average	1062	17989	59.1	39.5	1.16	97.6

A, B, C - Different letters denote significant differences within columns (P<.01).

Table 3. Body Weight of White Egg Entries in Closed Housing, 31st NCLP & MT

Breeder	----- (Weeks of Age) -----							
	4	6	8	10	12	14	16	17 ¹
	----- (kg) -----							
Hyline (W-36)	.25 ^{BC}	.44	.60	.85 ^{AB}	1.06 ^{AB}	1.19 ^{ABC}	1.37 ^{ABC}	1.32 ^{AB}
Hyline (W-77)	.28 ^A	.47	.64	.91 ^A	1.22 ^A	1.21 ^{AB}	1.44 ^A	1.38 ^A
H & N (Nick Chick)	.24 ^C	.45	.58	.85 ^{AB}	1.11 ^A	1.21 ^{AB}	1.41 ^{AB}	1.33 ^{AB}
Bovans (White)	.24 ^C	.42	.55	.82 ^B	1.01 ^{BC}	1.13 ^{BC}	1.34 ^{BC}	1.31 ^{AB}
ISA (Experimental)	.23 ^C	.40	.47	.73 ^C	.92 ^D	1.03 ^D	1.20 ^D	1.14 ^C
ISA (Babcock B-300)	.23 ^C	.41	.55	.81 ^B	.97 ^{CD}	1.12 ^{CD}	1.31 ^C	1.26 ^B
Shaver (White)	.26 ^{AB}	.45	.59	.86 ^{AB}	1.09 ^A	1.19 ^{ABC}	1.38 ^{ABC}	1.29 ^{AB}
Shaver (2000)	.27 ^{AB}	.45	.61	.87 ^{AB}	1.08 ^{AB}	1.25 ^A	1.43 ^A	1.40 ^A
Dekalb (Delta)	.27 ^{AB}	.45	.58	.87 ^{AB}	1.11 ^A	1.20 ^{ABC}	1.39 ^{ABC}	1.30 ^{AB}
Average	.25	.44	.57	.84	1.05	1.17	1.36	1.30

A,B,C,D - Different letters denote significant differences within column (P<.01).

¹During the week prior to the 17 week body weights being collected, the in-house temperature for the closed house increased 5 to 10°F resulting in lower feed intake and subsequent decrease in body weights.

Table 4. Feed Consumption of White Egg Entries in Open Housing, 31st NCLP & MT

Breeder	(Week of Age)								
	1-4	5-6	7-8	9-10	11-12	13-14	15-16	17 ¹	1-17
	----- (kg per bird) -----								
Hyline (W-36)	.66 ^{DE}	.63	.75 ^{BC}	.86 ^{ABCD}	.99 ^{BCD}	.99 ^{BCD}	.95 ^{BC}	.39 ^{BC}	6.22 ^{BC}
Hyline (W-77)	.70 ^{BCDE}	.64	.80 ^{AB}	.92 ^{AB}	1.06 ^{AB}	1.03 ^{ABC}	1.02 ^{AB}	.43 ^B	6.59 ^B
H & N (Nick Chick)	.72 ^{BCDE}	.68	.77 ^{ABC}	.90 ^{ABC}	.99 ^{BCD}	1.04 ^{AB}	.99 ^{BC}	.34 ^D	6.50 ^{BC}
Bovans (White)	.62 ^B	.61	.74 ^C	.83 ^{CD}	1.01 ^{BC}	.99 ^{BCD}	.95 ^{BC}	.42 ^{BC}	6.18 ^C
ISA (Experimental)	.79 ^{AB}	.68	.75 ^{BC}	.82 ^D	.91 ^D	.94 ^D	.93 ^C	.38 ^{CD}	6.19 ^C
ISA (Babcock B300)	.68 ^{CDDE}	.63	.76 ^{BC}	.83 ^{CD}	.94 ^{CD}	.95 ^{CD}	.96 ^{BC}	.40 ^{BC}	6.16 ^C
Shaver (White)	.76 ^{ABCD}	.64	.77 ^{ABC}	.85 ^{BCD}	1.01 ^{BC}	1.00 ^{BCD}	.99 ^{BC}	.37 ^{BC}	6.40 ^{BC}
Shaver (2000)	.86 ^A	.70	.81 ^A	.94 ^A	1.09 ^A	1.10 ^A	1.08 ^A	.50 ^A	7.08 ^A
Dekalb (Delta)	.77 ^{ABC}	.67	.75 ^{BC}	.87 ^{ABCD}	1.01 ^{BC}	1.00 ^{BCD}	.94 ^{BC}	.38 ^{BC}	6.38 ^{BC}
Average	.73	.65	.77	.87	1.00	1.00	.98	.41	6.41

A,B,C,D - Different letters denote significant differences within column (P<.01).
¹Partial week of feed intake prior to being moved into the laying facilities.

Table 5. Feed Cost and Livability of White Egg Entries in Open Housing, 31st NCLP & MT

Breeder	Protein	Met. Energy	Lysine	TSAA	Feed Cost	Livability (1 - 119 d)
	----- (per bird to 119 days) -----					
	(g)	(kcal)	(g)	(g)	(\$)	(%)
Hyline (W-36)	1086 ^{BCD}	18460 ^{BCD}	60.8 ^{BC}	40.5 ^{BCD}	1.19 ^{BCD}	99.0 ^A
Hyline (W-77)	1149 ^B	19580 ^B	64.4 ^B	43.0 ^B	1.26 ^B	97.9 ^{AB}
H & N (Nick Chick)	1136 ^{BC}	19303 ^{BC}	63.6 ^{BC}	42.4 ^{BC}	1.24 ^{BC}	96.5 ^{ABC}
Bovans (White)	1077 ^{CD}	18346 ^{CD}	60.4 ^{BC}	40.3 ^{CD}	1.18 ^{CD}	94.2 ^{BC}
ISA (Experimental)	1088 ^{BCD}	18396 ^{BCD}	60.8 ^{BC}	40.4 ^{BCD}	1.19 ^{BCD}	92.1 ^C
ISA (Babcock B300)	1065 ^D	18050 ^D	59.6 ^C	39.6 ^D	1.16 ^D	98.1 ^{AB}
Shaver (White)	1119 ^{BC}	19000 ^{BCD}	62.7 ^{BC}	41.7 ^{BCD}	1.22 ^{BCD}	97.3 ^{AB}
Shaver (2000)	1238 ^A	21032 ^A	69.4 ^A	46.2 ^A	1.35 ^A	96.9 ^{ABC}
Dekalb (Delta)	1119 ^{BC}	18957 ^{BCD}	62.6 ^{BC}	41.6 ^{BCD}	1.22 ^{BCD}	98.5 ^A
Average	1120	19014	62.7	41.7	1.22	96.7

A,B,C,D - Different letters denote significant differences within columns (P<.01).

Table 6. Body Weight of White Egg Entries in Open Housing, 31st NCLP & MT

Breeder	----- (Weeks of Age) -----							
	4	6	8	10	12	14	16	17
	----- (kg) -----							
Hyline (W-36)	.28 ^{AB}	.46 ^B	.69 ^{AB}	.85 ^{AB}	1.09 ^{ABC}	1.19 ^{ABC}	1.29 ^{AB}	1.37 ^A
Hyline (W-77)	.29 ^A	.50 ^A	.72 ^A	.89 ^A	1.14 ^A	1.23 ^A	1.35 ^A	1.40 ^A
H & N (Nick Chick)	.27 ^{BCD}	.46 ^B	.70 ^A	.84 ^{ABC}	1.08 ^{ABC}	1.21 ^A	1.29 ^{AB}	1.36 ^{AB}
Bovans (White)	.26 ^{CD}	.43 ^C	.64 ^C	.78 ^{CD}	1.04 ^{CD}	1.15 ^{BC}	1.22 ^{BC}	1.27 ^C
ISA (Experimental)	.25 ^D	.42 ^C	.64 ^{BC}	.76 ^D	.98 ^D	1.04 ^D	1.14 ^D	1.15 ^D
ISA (Babcock B-300)	.26 ^{CD}	.43 ^C	.65 ^{BC}	.84 ^{ABC}	1.03 ^{CD}	1.14 ^C	1.21 ^{CD}	1.29 ^{BC}
Shaver (White)	.29 ^A	.48 ^{AB}	.71 ^A	.87 ^{AB}	1.11 ^{AB}	1.20 ^{AB}	1.29 ^{AB}	1.36 ^{AB}
Shaver (2000)	.28 ^{AB}	.48 ^{AB}	.70 ^A	.89 ^{AB}	1.10 ^{ABC}	1.21 ^A	1.32 ^A	1.40 ^A
Dekalb (Delta)	.28 ^{AB}	.47 ^B	.69 ^{AB}	.86 ^{AB}	1.07 ^{BC}	1.15 ^{BC}	1.23 ^{BC}	1.25 ^C
Average	.27	.46	.68	.84	1.07	1.17	1.26	1.32

A,B,C,D - Different letters denote significant differences within column (P<.01).

Table 7. Feed Consumption of White Egg Entries in All Housing, 31st NCLP & MT

Breeder	(Week of Age)								
	1-4	5-6	7-8	9-10	11-12	13-14	15-16	17 ¹	1-17
----- (kg per bird) -----									
Hyline (W-36)	.65 ^{CD}	.62 ^B	.72 ^{BC}	.86 ^{BCD}	.96 ^{BCD}	.99 ^{BC}	.96 ^{BC}	.36 ^B	6.13 ^C
Hyline (W-77)	.68 ^{BCD}	.64 ^B	.77 ^{AB}	.93 ^A	1.04 ^{AB}	1.02 ^{AB}	1.02 ^{AB}	.40 ^{AB}	6.49 ^B
H & N (Nick Chick)	.70 ^{BCD}	.66 ^{AB}	.75 ^{ABC}	.90 ^{AB}	.97 ^{BCD}	1.03 ^{AB}	.99 ^{BC}	.38 ^B	6.38 ^{BC}
Bovans (White)	.61 ^D	.61 ^B	.71 ^C	.83 ^{CD}	.98 ^{BC}	1.00 ^{BC}	.94 ^C	.39 ^B	6.07 ^C
ISA (Experimental)	.76 ^{AB}	.65 ^{AB}	.70 ^C	.81 ^D	.89 ^D	.95 ^C	.93 ^C	.36 ^B	6.05 ^C
ISA (Babcock B300)	.67 ^{BCD}	.62 ^B	.72 ^{BC}	.85 ^{BCD}	.93 ^{CD}	.96 ^C	.97 ^{BC}	.39 ^B	6.10 ^C
Shaver (White)	.71 ^{BC}	.64 ^B	.75 ^{ABC}	.87 ^{BCD}	1.00 ^{ABC}	1.00 ^{BC}	.99 ^{BC}	.36 ^B	6.30 ^{BC}
Shaver (2000)	.80 ^A	.70 ^A	.78 ^A	.93 ^A	1.08 ^A	1.09 ^A	1.08 ^A	.46 ^A	6.93 ^A
Dekalb (Delta)	.73 ^{ABC}	.67 ^{AB}	.73 ^{ABC}	.88 ^{ABC}	.99 ^{ABC}	1.01 ^{BC}	.95 ^C	.36 ^B	6.31 ^{BC}
Average	.70	.64	.74	.87	.98	1.00	.98	.38	6.31

A,B,C,D - Different letters denote significant differences within column (P<.01).
¹Partial week of feed intake prior to being moved into the laying facilities.

Table 8. Feed Cost and Livability of White Egg Entries in All Housing, 31st NCLP & MT

Breeder	Protein	Met. Energy	Lysine	TSAA	Feed Cost	Livability (1 - 119 d)
	----- (per bird to 119 days) -----					
	(g)	(kcal)	(g)	(g)	(\$)	(%)
Hyline (W-36)	1072 ^c	18202 ^c	59.9 ^c	39.9 ^c	1.17 ^c	98.7 ^A
Hyline (W-77)	1133 ^b	19288 ^b	63.4 ^b	42.3 ^b	1.24 ^b	98.1 ^A
H & N (Nick Chick)	1115 ^{bc}	18938 ^{bc}	62.3 ^{bc}	41.6 ^{bc}	1.22 ^{bc}	96.5 ^{ABC}
Bovans (White)	1060 ^c	18034 ^c	59.3 ^c	39.6 ^c	1.16 ^c	94.9 ^{BC}
ISA (Experimental)	1063 ^c	17973 ^c	59.3 ^c	39.5 ^c	1.16 ^c	93.6 ^C
ISA (Babcock B300)	1058 ^c	17936 ^c	59.1 ^c	39.4 ^c	1.15 ^c	98.0 ^{AB}
Shaver (White)	1103 ^{bc}	18718 ^{bc}	61.6 ^{bc}	41.1 ^{bc}	1.20 ^{bc}	97.4 ^{AB}
Shaver (2000)	1212 ^A	20571 ^A	67.8 ^A	45.2 ^A	1.32 ^A	97.1 ^{ABC}
Dekalb (Delta)	1107 ^{bc}	18749 ^{bc}	61.8 ^{bc}	41.2 ^{bc}	1.21 ^{bc}	98.4 ^A
Average	1103	18712	61.6	41.1	1.20	97.0

A,B,C - Different letters denote significant differences within columns (P<.01).

Table 9. Body Weight of White Egg Entries in All Housing, 31st NCLP & MT

Breeder	----- (Weeks of Age) -----							
	4	6	8	10	12	14	16	17
	----- (kg) -----							
Hyline (W-36)	.27 ^{BCD}	.45 ^B	.66 ^{AB}	.85 ^{BC}	1.08 ^{BC}	1.19 ^{AB}	1.31 ^{AB}	1.35 ^{AB}
Hyline (W-77)	.29 ^A	.49 ^A	.70 ^A	.90 ^A	1.14 ^A	1.23 ^A	1.38 ^A	1.40 ^A
H & N (Nick Chick)	.26 ^{CDE}	.46 ^B	.66 ^{AB}	.84 ^{BC}	1.09 ^{AB}	1.21 ^{AB}	1.32 ^{AB}	1.35 ^{AB}
Bovans (White)	.26 ^{CDE}	.43 ^C	.61 ^{BC}	.79 ^{DE}	1.03 ^{CD}	1.14 ^C	1.26 ^{BC}	1.28 ^{CD}
ISA (Experimental)	.25 ^B	.42 ^C	.59 ^C	.75 ^E	.96 ^E	1.03 ^D	1.16 ^D	1.15 ^B
ISA (Babcock B-300)	.25 ^B	.42 ^C	.62 ^{BC}	.83 ^{CD}	1.01 ^{DE}	1.13 ^C	1.24 ^C	1.28 ^{CD}
Shaver (White)	.28 ^{AB}	.47 ^{AB}	.67 ^{AB}	.87 ^{ABC}	1.10 ^{AB}	1.19 ^{AB}	1.32 ^{AB}	1.34 ^{BC}
Shaver (2000)	.28 ^{AB}	.47 ^{AB}	.67 ^{AB}	.89 ^{AB}	1.09 ^{AB}	1.22 ^A	1.36 ^A	1.40 ^A
Dekalb (Delta)	.28 ^{AB}	.47 ^{AB}	.66 ^{AB}	.86 ^{ABC}	1.08 ^{BC}	1.16 ^{BC}	1.28 ^{BC}	1.26 ^D
Average	.27	.43	.65	.84	1.06	1.17	1.29	1.31

A,B,C,D,E - Different letters denote significant differences within column (P<.01).

Table 10. Feed Consumption of Brown Egg Entries in Closed Housing, 31st NCLP & MT

Breeder	----- (Week of Age) -----								
	1-4	5-6	7-8	9-10	11-12	13-14	15-16	17 ¹	1-17
----- (kg per bird) -----									
Bovans (Brown)	.58	.69	.78	1.03	1.14	1.16	1.10	.39	6.87
ISA (Brown)	.60	.72	.78	1.04	1.10	1.09	1.05	.38	6.76
H & N (Brown Nick)	.62	.68	.80	1.04	1.13	1.15	1.12	.37	6.91
Hyline (Brown)	.59	.70	.78	1.03	1.12	1.11	1.04	.36	6.72
Average	.60	.69	.79	1.03	1.12	1.13	1.08	.37	6.82

¹Partial week of feed intake prior to being moved into the laying facilities.

Table 11. Feed Cost and Livability of Brown Egg Entries in Closed Housing, 31st NCLP & MT

Breeder	Protein	Met. Energy	Lysine	TSAA	Feed Cost	Livability (1 - 119 d)
	----- (per bird to 199 days) -----					
	(g)	(kcal)	(g)	(g)	(\$)	(%)
Bovans (Brown)	1195	20413	66.8	44.8	1.31	98.4 ^A
ISA (Brown)	1180	20083	65.8	44.1	1.29	96.9 ^{AB}
H & N (Brown Nick)	1206	20516	67.3	45.0	1.32	89.8 ^B
Hyline (Brown)	1174	19962	65.4	43.8	1.28	94.7 ^{AB}
Average	1190	20258	66.4	44.4	1.30	95.0

A,B - Different letters denote significant differences within columns (P < .01).

Table 12. Body Weight of Brown Egg Entries in Closed Housing, 31st NCLP & MT

Breeder	----- (Weeks of Age) -----							
	4	6	8	10	12	14	16	17 ¹
	----- (kg) -----							
Bovans (Brown)	.29	.50	.74	1.06	1.37	1.53	1.69	1.72
ISA (Brown)	.30	.49	.71	1.06	1.31	1.45	1.72	1.65
H & N (Brown Nick)	.30	.51	.74	1.06	1.37	1.51	1.75	1.71
Hyline (Brown)	.30	.49	.74	1.08	1.31	1.49	1.72	1.63
Average	.30	.50	.73	1.06	1.34	1.50	1.72	1.68

¹During the week prior to the 17 week body weights being collected, the in-house temperature for the closed house increased 5 to 10°F resulting in lower feed intake and subsequent decrease in body weights.

Table 13. Feed Consumption of Brown Egg Entries in Open Housing, 31st NCLP & MT

Breeder	----- (Week of Age) -----								
	1-4	5-6	7-8	9-10	11-12	13-14	15-16	17 ¹	1-17
	----- (kg per bird) -----								
Bovans (Brown)	.75	.72	.86	1.00	1.14	1.20	1.14	.45	7.26
ISA (Brown)	.68	.74	.85	1.01	1.20	1.18	1.03	.46	7.17
H & N (Brown Nick)	.66	.69	.87	1.00	1.17	1.18	1.08	.48	7.14
Hyline (Brown)	.66	.74	.87	.97	1.22	1.18	1.10	.47	7.21
Average	.69	.73	.86	1.00	1.18	1.18	1.09	.47	7.19

¹Partial week of feed intake prior to being moved into the laying facilities.

Table 14. Feed Cost and Livability of Brown Egg Entries in Open Housing, 31st NCLP & MT

Breeder	Protein (g)	Met. Energy (kcal)	----- (per bird to 119 days) -----		Feed Cost (\$)	Livability (1 - 119 d) (%)
			Lysine (g)	TSAA (g)		
Bovans (Brown)	1262	21549	70.8	47.3	1.38	99.2
ISA (Brown)	1247	21297	69.9	46.7	1.37	98.3
H & N (Brown Nick)	1241	21203	69.6	46.5	1.36	97.1
Hyline (Brown)	1254	21427	70.3	7.0	1.37	98.0
Average	1251	21367	70.1	46.9	1.37	98.2

Table 15. Body Weight of Brown Egg Entries in Open Housing, 31st NCLP & MT

Breeder	----- (Weeks of Age) -----							
	4	6	8	10	12	14	16	17
	----- (kg) -----							
Bovans (Brown)	.31	.55	.82	1.03	1.30	1.48	1.58	1.68
ISA (Brown)	.32	.56	.83	1.07	1.34	1.49	1.61	1.71
H & N (Brown Nick)	.30	.54	.82	1.07	1.34	1.45	1.59	1.71
Hyline (Brown)	.31	.56	.83	1.02	1.32	1.45	1.60	1.72
Average	.31	.55	.82	1.05	1.33	1.47	1.59	1.71

Table 16. Feed Consumption of Brown Egg Entries in All Housing, 31st NCLP & MT

Breeder	----- (Week of Age) -----								
	1-4	5-6	7-8	9-10	11-12	13-14	15-16	17 ¹	1-17
----- (kg per bird) -----									
Bovans (Brown)	.70	.71	.83	1.01	1.14	1.19	1.13	.43	7.14
ISA (Brown)	.66	.74	.83	1.02	1.17	1.16	1.04	.44	7.05
H & N (Brown Nick)	.65	.69	.85	1.01	1.16	1.17	1.09	.45	7.07
Hyline (Brown)	.64	.73	.85	.99	1.19	1.16	1.08	.44	7.07
Average	.66	.72	.84	1.01	1.16	1.17	1.09	.44	7.09

¹Partial week of feed intake prior to being moved into the laying facilities.

Table 17. Feed Cost and Livability of Brown Egg Entries in All Housing, 31st NCLP & MT

Breeder	Protein	Met. Energy	Lysine	TSAA	Feed Cost	Livability (1 - 119 d)
	----- (per bird to 119 days) -----					
	(g)	(kcal)	(g)	(g)	(\$)	(%)
Bovans (Brown)	1242	21215	69.6	46.5	1.36	99.0 ^A
ISA (Brown)	1228	20940	68.7	45.9	1.34	97.9 ^{AB}
H & N (Brown Nick)	1231	21001	68.9	46.1	1.35	94.9 ^B
Hyline (Brown)	1231	21009	68.9	46.1	1.35	97.1 ^{AB}
Average	1233	21043	69.0	46.2	1.35	97.2

A,B, - Different letters denote significant differences within columns (P<.01).

Table 18. Body Weight of Brown Egg Entries in All Housing, 31st NCLP & MT

Breeder	----- (Weeks of Age) -----							
	4	6	8	10	12	14	16	17
	----- (kg) -----							
Bovans (Brown)	.31	.54	.79	1.04	1.32	1.49	1.61	1.69
ISA (Brown)	.31	.54	.79	1.07	1.33	1.48	1.65	1.70
H & N (Brown Nick)	.30	.53	.80	1.07	1.35	1.46	1.63	1.71
Hyline (Brown)	.31	.54	.81	1.04	1.32	1.46	1.63	1.70
Average	.31	.54	.80	1.05	1.33	1.48	1.63	1.70

Entries 31st NCLP&MT
Stock Suppliers and Categories

<u>Breeder</u>	<u>Stock</u>	<u>Category</u> ¹	<u>Source</u>
H & N International 3825 154th Ave., N.E. Redmond, WA 98052	"Nick Chick"	I-A	Wheelock Hatchery 2170 Wayne Road Chambersburg, PA 17201
Hy Line International P.O. Box 310 Dallas Center, IA 50063	W-36	I-A	Hy Line International 4432 Highway 213, Box 309 Mansfield, GA 30255
	W-77	I-A	(Same)
ISA/Babcock P.O. Box 280 Ithaca, NY 14850-0280	B300	I-A	American Selected Products Milton Hatchery 55 Lawton Lane Milton, PA 17847
	Experimental	III-A	ISA Babcock P.O. Box 280 Ithaca, NY 14851
Shaver Poultry Breeding Farms Ltd. P.O. Box 400 Cambridge, Ontario Canada N1R5V9	Shaver White	I-A	American Selected Products Inc. Milton Hatchery 55 Lawton Lane Milton, PA 17847
	Shaver 2000	II-A	(Same)
Dekalb Ag Research Inc. 3100 Sycamore Road Dekalb, IL 60115	Delta	I-C ³	(See footnote)
Centurion Poultry 1471 Lane Creek Road Bogart, GA 30622	Bovans White	I-A	Centurion Poultry Inc. 1471 Lane Creek Road Bogart, GA 30622
	Bovans Brown	I-A	(Same)
H & N International 3825 154th Ave., N.E. Redmond, WA 98052	"Brown Nick"	I-A	Wheelock Hatchery 2170 Wayne Road Chambersburg, PA 17201
Hy Line International P.O. Box 310 Dallas Center, IA 50063	Hy Line Brown	I-A	Hy Line International 1915 Sugar Grove Dallas Center, IA 50063
ISA/Babcock P.O. Box 280 Ithaca, NY 14850-0280	ISA Brown	I-A	American Selected Products Inc. Milton Hatchery 55 Lawton Lane Milton, PA 17847

- ¹ I = Extensive distribution in southeast United States
 II = Little or no distribution in southeast United States
 III = Unavailable for commercial distribution in United States
 A = Entry requested
 C = Entry not requested

³Entrance of these strains were requested by the North Carolina egg producers who secured the acquisition of the stock and appropriate fees. Procedures followed were in accordance with North Carolina Layer Performance and Management Test.