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REPORT ON PULLET REARING PERIOD 37th NORTH CAROLINA LAYER PERFORMANCE AND MANAGEMENT TEST[1]

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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 and Consumer Services. The flock is maintained at the Piedmont Research Station, Salisbury, North Carolina. Mr. Joe Hampton is the Piedmont Research Station Superintendent; Mr. Aaron Sellers is Resident Manager of the flock; Pam Jenkins is the Statistical Research Assistant; and Dr. K. E. Anderson is Project Leader. The purpose of this program is to assist poultry industry personnel 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 37th North Carolina Layer Performance and Management Test.

Copies of current and past reports are maintained for public access at http://www.ces.ncsu.edu/depts/poulsci/tech_manuals/layer_reports/37_grow_report.pdf .

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[1]The 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.

37th NORTH CAROLINA LAYER PERFORMANCE AND MANAGEMENT TEST
Volume 37 No. 2

Report on Pullet Rearing Period

Dates of Importance:

The eggs were placed into trays and set on May 15, 2007 and hatched on June 6, 2007. The chicks were all sexed according to their genetics (feather, or color), vaccinated for Marek's disease, and wing banded for identification before transfer to the brood/grow house. The pullets were moved to the laying facilities on September 26-28, 2007 during their 17th week of age.

Experimental Design:

The rearing portion of the test was a factorial arrangement of treatments and the main effect was strain. The analysis was divided by pullet strain. The pullet rearing facility consisted of a Quad-deck cage system in a light tight house. The test utilized 3 rooms within the house with all of the birds being reared in identical environments. In addition, two strains were selected to be reared in accordance with range standards as practiced by specialty egg producers.

Strain--Samples of fertile eggs were provided from the breeders according to the rules, which govern the conductance of the test. All eggs were set and hatched concurrently (Hatch/Serology Report Vol. 37, No. 1). A total of ten white egg and six brown egg strains were entered in the test for a total of sixteen strains. At hatch the chicks were sexed to remove the males. All strains were sexed according to breeder recommendations, (*i.e.* feather, color, or vent sexing). The percentages of sex slips and cull birds are shown in Table 1.

Table 1. Percentages of sexing errors and culls by strain.

Strain	Sexing Errors	Culls
	(%)	(%)
Hy-Line W-36	0.81	0.10
Hy-Line W-98	0.00	0.00
Hy-Line CV-22	6.67	0.68
Shaver White	0.14	0.28
Dekalb TX	0.26	0.13
Lohmann LSL-Lite	0.64	0.64
H&N Nick Chick	0.77	1.28
Bovans White	0.11	0.21
Hisex White	0.56	0.28
Bovans Robust	0.21	0.96
ISA Brown	14.15	0.00
Hy-Line Brown	0.55	0.14
Hy-Line S. Brown	4.81	0.19
Bovans Brown	0.13	0.13
Hisex Brown	0.27	0.00
Dekalb Amber Link	4.52	0.00

For the layer test, a minimum of approximately 760 white and brown egg pullets/strain were wanted for placement at the initiation of the layer portion of the test. If the number of pullets hatched were below the prescribed numbers, the chicks were divided as equally as possible between the levels and replicates within the grow house and placement into the layer test would be adjusted appropriately.

Pullet Housing – The chicks were randomly assigned to the growing cages or pens with white egg and brown egg replicates being intermingled throughout the houses. The white egg strains occupied approximately 5/8 of the house and brown egg strains occupied the other 3/8 of the house. All strains were assigned to be represented as equally as possible in all brooding rooms, cage rows, and cage levels throughout House 8. The chicks from the brown egg strains that were randomly assigned to the growing pens throughout the pens in House 6.

House 8 – is an environmental controlled closed brood-grow facility with 3 banks of quad-deck cages in each room. Each room has been assigned a number and each side of each bank has been assigned a row number, and each cage section within each row and level/row has been assigned a replicate number, for statistical analysis pairs of rows have been designated as blocks. Thus, each block consists of two rows containing 24 replicates on all levels. This allows for a total of 3,744 pullets per room resulting in a total pullet count for this test in House 8 using 3 rearing rooms of 11,232. The white and brown-egg strains were randomly assigned to the replicates in the house. Entrant strains were assigned to the replicates in a restricted randomized manner with the restrictions being that all strains were approximately equally represented in all rows, levels, and rooms. All chicks were brooded in the same cage during the entire 17 wk rearing period. Paper was placed on the cage floor for the first 7 days within each of the replicate series within each row. Each cage within the replicate was filled with 13 white-egg or brown-egg (13 per 24" x 26" cage) pullets on the day of hatch for a rearing allowance of 48 in^2, 4.7 cm (1.8 in) of feeder space/bird and 1:6.5 nipple drinkers to bird ratio. The same numbers of pullets were grown in each replicate for both white and brown-egg strains. The room dividers were removed for this test so that all birds were essentially reared in a contiguous house.

House 6 – is an environmentally controlled floor brood-grow facility. It consists of a single room divided into 4 rows of 18 pens. The pen dimensional size was 32" x 72 " with 34" of linear feeder space, 6 nipple drinkers, and linear roosting space of 32". Each pen (replicate) was filled with 15 brown-egg pullets in a pen on the day of hatch for a rearing allowance of approximately 1.1 ft^2, 5.7 cm (2.3 in) of feeder space, 1:2.5 nipple drinkers to bird ratio, and bird roost space of 2.1 cm (0.8 in). The same numbers of pullets were grown in each replicate for both brown-egg strains.

Range Housing – The pullets for the range facilities were reared on litter at a density of 929 cm^2/pullet. They had access to feed, nipple waterers, and roosts (See House 6) in order to make them familiar with that behavior and facilitate nest box usage. All other rearing procedures and vaccinations were the same as their cage reared flock mates. The pullets were housed at 12 weeks of age in the range facility. They were provided a range hut that provided a minimum of 929 cm^2/pullet, 13 cm of roosting space/pullet, and 1 nest/8 hens. The range hut had a timer and light powered via battery and solar cell, supplemental propane heater for winter conditions to maintain a interior temperature above 7.2° C (45 F) which is the lower level of the chickens Thermal Neutral Zone (TNZ) where body temperature will be maintained via a feed intake increase. The hens had access to the outdoors throughout the day and appeared to return to the range hut during the dark for roosting and protection. Husbandry,

lighting and supplemental feed were allocated on the same basis as flock mates in cages in order to minimize the variables between flock mates as much as possible. Range density was based upon a 500 hen/acre static equivalency 8.04 m^2/hen. The range pens were 21.3 m x 21.3 m (70' x 70') and were enclosed by a fence 1.8 m (6 ft) with the lower chain link section being 1.2 m (4 ft).

Pullet Management and Nutrition:

Pullets were fed *ad libitum* by hand daily. Feed consumption and body weights were monitored bi-weekly beginning at 2 weeks of age. All mortality was recorded daily, but mortality attributed to the removal of males (sex slips) shown in Table 1 and accidental deaths from a replicate have been excluded from the 37th NCLP&MT Grow Report.

Table 2. Diet Formulations for the Brood-Grow Periods

	Diet[1] Identification			
Ingredient	Starter	Grower	Developer	Pre-Lay
Corn	1011.2	1089.3	1196.1	958.3
Fat (Tallow)	---	---	1.3	82.0
Soybean meal	286.0	50.0	50.0	622.0
EXT/EXP Soy	300.0	333.3	276.0	---
Soybean Hulls	---	---	50.0	---
Wheat Midds	170.0	238.9	200.0	---
Gluten Meal 60%	148.0	200.0	100.0	100.0
D.L. Methionine	1.0	2.0	2.7	3.2
Lysine 78.8%	2.8	3.0	3.0	---
Oyster Shell	---	---	---	75.0
Limestone	32.0	35.1	70.0	113.0
Bi-Carbonate	2.5	2.5	2.5	3.0
Phosphate Mono/D	32.5	32.5	35.0	30.0
Salt	6.5	6.2	6.4	6.0
Vit. Premix	1.0	1.0	1.0	1.0
Min. premix	1.0	1.0	1.0	1.0
Mold Inhibitor	2.0	2.0	2.0	1.0
T-Premix	1.0	1.0	1.0	1.0
.06% Sel. Premix	1.0	1.0	1.0	1.0
Choline Cl 60%	1.5	1.2	1.0	2.5
Total	2000	2000	2000	2000
Protein %	20.0	16.6	14.8	21.5
ME kcal/kg	2802	2802	2802	2928
Calcium %	1.02	1.05	1.75	4.01
T. Phos. %	0.79	0.79	0.75	0.64
Lysine %	0.50	0.50	0.40	0.43
TSAA %	0.73	0.69	0.65	0.89

[1]Diets were acquired from Southern States Cooperative in mash form and Lance Minear, Nutritionist for Southern States, provided assistance in formulation.

Each pullet placed was provided with Starter feed containing Amprol during the initial brooding period, followed by Grower and Developer diets that are shown in the diet formulation section Table 2. Thus, the white-egg and brown-egg replicates in brood-grow House 8 (52 females) were given the starter feed to achieve the breeder recommended body weights at each weigh interval. Pullets were moved on to the next tier rearing diet at the point of achiev-

ing target body weight goals or after a prescribed time interval. Expected feed transition intervals were; starter 0 to 6 weeks; grower 6 to 12 weeks; developer 12 to 15 weeks; Pre-lay diet 15 to 16 weeks. The strains were grown to the breeder recommended body weights. In this flock, the birds grew in accordance with the guidelines meaning that the dietary regimen was administered as discussed previously. The Starter, Grower, and Developer, diets were administered in order to maintain a growth pattern and target weights as closely as possible to the breeder recommendations. The pre-lay diet was provided no earlier than the last week in the rearing facility through the interim prior to reaching the threshold day length of 14 hours.

Pullet Vaccination, Precision Pinioning and Beak Trimming:

Pinioning was the act of surgically removing the wing at the pinion joint to prevent flight. This is the joint of a bird's wing farthest from the body. The portion removed when pinioning a bird is the metacarpals, the point on the wing where the primary flight feathers originate. The procedure was accomplished using a hot blade and a bar apparatus mounted in a Lyons trimmer. One wing (i.e. left or right), was extended a cut was made through the joint at the Intracarpal Ligament between the Radius and Ulna and the first phalanx of the third and fourth digit. Simultaneously the hot blade cauterized all cuts which stopped any bleeding enabling the birds to recover much faster. The pain and distress associated with this procedure at 1 day of age is similar to that of beak trimming at 6-10 days.

Pullet vaccination and beak trimming schedules are outlined in Table 3. Pullets were not retrimmed at any point in the rearing period.

Table 3. Pullet Vaccination and Beak Trimming Schedule

Age	Date	Event
Hatch	June 6, 2007	MVT Marek's vaccination by injection in neck
Day 6-8	June 12-14, 2007	Precision Beak Trim[1] all replicates throughout the
Day 10	June 16, 2007	1st Newcastle (B1) and Bronchitis (Mass.) vaccination Via aerosol spray (Triple Vac)
Day 35	July 25, 2007	2nd Newcastle (LaSota) and Bronchitis (Mass.) vaccination via aerosol spray (ComboVac)
Day 63	August 8, 2007	3rd Newcastle (LaSota) and Bronchitis (Mass.) vaccination via aerosol spray (ComboVac)
Day 70	August 15, 2007	Fowl Pox and Avian Encephalomyelitis vaccination via the wig web
Day 105	September 19, 2007	4th Newcastle (Lasota) and Bronchitis (Mass.) vaccination via aerosol spray (ComboVac)
Week 70	October 10, 2008	5th Newcastle (LaSota) and Bronchitis (Mass.) vaccination via aerosol spray (ComboVac)

Beak trimming was begun at 6 days of age using a Lyons Precision beak trimmer, with a 7/64" guide hole. The trim was a block cut with an approximate blade temp of 1100° F (dull red). Beak trimming was completed in less than 3 days.

Lighting Schedule

The lighting schedule for the pullet controlled environment facility and range rearing are outlined in Table 4.

Table 4. Pullet House Light Schedule:

Age	Date	Light Intensity	Photoperiod (hr)	
			House 8	House 6/Range
Days 1-2	June 6-7, 2007	10 ftc. (100 lux)	24	24
Day 3	June 9, 2007	1 ftc. (10 lux)	23	23
Week 1	June 13, 2007	1 to 0.5 flc. (10 to 5 lux)	22	22
Week 2	June 20, 2007	1 to 0.5 flc. (10 to 5 lux)	20	20
Week 3	June 27, 2007	1 to 0.5 flc. (10 to 5 lux)	18	18
Week 4	July 3, 2007	1 to 0.5 flc. (10 to 5 lux)	16	16
Week 5	July 10, 2007	1 to 0.5 flc. (10 to 5 lux)	14	14
Week 6	July 17, 2007	1 to 0.5 flc. (10 to 5 lux)	12	12
Week 7 to Week 12	July 24, 2007	1 to 0.5 flc. (10 to 5 lux)		10
Week 12 to Week 16	August 29, 2007	Natural Light		Natural Day Length
Week 7 to Week 16	Sept 26, 2007	1 to 0.5 flc. (10 to 5 lux)	10	
Begin housing of Pullets	Sept. 26, 2007	Working Intensity	10	

DESCRIPTION OF DATA TABLE STATISTICS

Rearing period performance of white egg and brown egg strains are shown in Tables 5-7 and 8-10, 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 is shown in more complete detail in Table 14 following the data tables.

Protein per Bird to 112 Days:

Cumulative protein intake per bird through 112 days was based on calculated values.

Metabolizable Energy per Bird to 112 Days:

Cumulative metabolizable energy intake per bird trough 112 days was based upon calculated values.

Lysine intake per Bird to 112 Days:

Cumulative Lysine intake per bird through 112 days was based on calculated values.

Total Sulfur Amino Acids (TSAA) intake per Bird to 112 Days:

Cumulative TSAA intake per bird through 112 days was based on calculated values.

Feed Cost per Bird to 112 Days:

Calculated feed cost per bird to 112 days. Using average contract feed prices; Starter $231.00/T; Grower $210.40/T; Developer $201.10/T, and Pre-Lay Diet $272.20.

Livability 1-112 Days:

The percentage of the birds housed which survived during days 1-112. Males and accidental deaths, which were removed, are excluded from the analysis of livability.

Flock Uniformity at 112 Days:

The percentage of the pullets with body weights falling within ±10% of the mean body weight at 112 days of age. This is based on the individual body weight from a sample of pullets from each strain.

Body Weights (0, 2, 4, 6, 8....16 Weeks):

Initial body weights were taken at time of placement in the brood/grow house 8. Thereafter, bi-weekly average body weights of all birds within representative cages were collected. Sample sizes 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.

Body weights were taken on a bi-weekly basis in House 6 through 12 weeks of age at that time the range pullets were moved to the range hut and only a final body weight was taken at 16 weeks.

Feed Consumption (1-2, 3-4, 5-6....16, 1-16 Weeks):

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. Feed weights were taken on a bi-weekly basis in House 6 through 12 weeks of age at that time the range pullets were moved to the range hut and only a final feed weight was taken at 16 weeks. Along with the feed weight a measure of forage disappearance was made and an analysis of the forage nutrient value was measured.

The Fescue forage analysis indicated that the forage was 98.1 % Dry Matter and had a Crude Protein of 17.7 %.

Statistical Analyses and Separation of Means:

Analyses of variance were performed on all data using the GLM procedure of 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.

For the Range data there was no statistical analysis conducted on this portion of the test. The values reported are the means for each of the strains.

Metric Conversions

1 lb = 453.6 g	1 g = .03527 oz
1 lb = .4536 kg	1 kg = 2.204 lb
1 oz = 28.35 g	1 g = 1000 mg
	1 kg = 1000 g
1 in = 2.54 cm	1 m = 39.4 in = 3.28 ft
1 in^2 = 6.45 cm^2	

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

Table 5. Bi-weekly Body Weights of White-Egg Entries, 37th NCLP&MT

	(Weeks of Age)								
Breeder	0	2	4	6	8	10	12	14	16
	(kg)								
Hy-Line W-36	0.041^{AB}	0.124^{A}	0.241^{AB}	0.413^{CD}	0.584^{C}	0.732^{C}	0.888^{BC}	1.024^{B}	1.119^{C}
Hy-Line W-98	0.039^{C}	0.124^{A}	0.251^{A}	0.457^{A}	0.638^{A}	0.800^{A}	0.934^{A}	1.089^{A}	1.209^{A}
Hy-Line CV-22	0.041^{AB}	0.117^{AB}	0.245^{AB}	0.445^{AB}	0.623^{A}	0.779^{A}	0.900^{AB}	1.061^{AB}	1.153^{BC}
Shaver White	0.039^{C}	0.112^{B}	0.242^{AB}	0.425^{BCD}	0.576^{C}	0.716^{C}	0.853^{C}	0.996^{B}	1.098^{C}
Dekalb TX	0.041^{AB}	0.112^{B}	0.239^{AB}	0.428^{B}	0.614^{AB}	0.771^{AB}	0.923^{AB}	1.063^{A}	1.193^{A}
Lohmann LSL-Lite	0.040^{BC}	0.111^{B}	0.243^{AB}	0.433^{AB}	0.629^{A}	0.789^{A}	0.933^{A}	1.088^{A}	1.207^{A}
H&N Nick Chick	0.039^{C}	0.116^{ABB}	0.249^{A}	0.439^{AB}	0.619^{A}	0.768^{A}	0.924^{AB}	1.064^{A}	1.150^{BC}
Bovans White	0.040^{B}	0.118^{AB}	0.245^{AB}	0.415^{CD}	0.589^{BC}	0.729^{C}	0.880^{BC}	1.012^{B}	1.110^{C}
Hisex White	0.042^{A}	0.110^{B}	0.233^{BC}	0.417^{CD}	0.589^{BC}	0.736^{BC}	0.914^{AB}	1.029^{B}	1.148^{BC}
Bovans Robust	0.037^{D}	0.107^{B}	0.225^{C}	0.401^{D}	0.578^{C}	0.743^{BC}	0.898^{AB}	1.059^{A}	1.187^{AB}
Average	0.040	0.115	0.241	0.427	0.604	0.756	0.905	1.048	1.157

^{ABCD} Denotes significant differences between strains (P<0.01)

Table 6. Bi-weekly Feed Consumption of White-Egg Entries, 37th NCLP&MT

	(Weeks of Age)								
Breeder	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	1-16
	(kg per bird)								
Hy-Line W-36	0.207^{AB}	0.355	0.549^{CD}	0.688^{C}	0.888^{B}	1.010	1.005	1.019	5.72^{BC}
Hy-Line W-98	0.211^{A}	0.360	0.581^{AB}	0.748^{A}	0.925^{AB}	1.036	1.030	1.049	5.94^{A}
Hy-Line CV-22	0.210^{A}	0.368	0.581^{AB}	0.736^{AB}	0.927^{A}	1.028	1.032	1.061	5.94^{A}
Shaver White	0.198^{BC}	0.355	0.558^{BCD}	0.686^{C}	0.894^{B}	1.032	0.968	1.005	5.70^{C}
Dekalb TX	0.208^{AB}	0.374	0.594^{A}	0.730^{AB}	0.935^{A}	1.051	1.020	1.058	5.97^{A}
Lohmann LSL-Lite	0.205^{AB}	0.363	0.572^{ABC}	0.717^{AB}	0.909^{AB}	1.031	1.008	1.028	5.83^{A}
H&N Nick Chick	0.205^{AB}	0.361	0.575^{AB}	0.726^{AB}	0.909^{AB}	1.057	1.025	1.018	5.88^{A}
Bovans White	0.202^{AB}	0.353	0.536^{D}	0.674^{C}	0.892^{B}	1.015	1.001	1.018	5.69^{C}
Hisex White	0.201^{ABC}	0.357	0.560^{BCD}	0.696^{BC}	0.945^{A}	1.069	1.040	1.052	5.92^{AB}
Bovans Robust	0.190^{C}	0.350	0.566^{BC}	0.704^{BC}	0.909 ^{AB}	1.048	1.010	1.024	5.81^{A}
Average	0.204	0.360	0.567	0.710	0.913	1.038	1.014	1.033	5.83

^{ABC} Denotes significant differences between strains (P<0.01)

Table 7. Total Nutrient Intake, Feed Cost, Livability, and Flock Uniformity of White-Egg Entries, 37th NCLP&MT

Breeder	Protein	Met. Energy	Lysine	TSAA	Feed Cost	Livability (1-112 d)	Flock Uniformity
	----------(per bird to 112 days)----------						(% of pullets within ±10% of $\bar{x}$)
	(g)	(kcal)	(g)	(g)	($)	(%)	
Hy-Line W-36	951.1^{BC}	16,030^{BC}	26.6^{BC}	39.1^{BC}	1.33^{BC}	99.39^{A}	84.4
Hy-Line W-98	988.0^{A}	16,647^{A}	27.6^{A}	40.6^{A}	1.38^{A}	99.56^{A}	91.1
Hy-Line CV-22	988.2^{A}	16,652^{A}	27.6^{A}	40.6^{A}	1.38^{A}	99.34^{A}	88.9
Shaver White	947.5^{BC}	15,964^{BC}	26.5^{BC}	38.9^{BC}	1.33^{BC}	99.72^{A}	88.9
Dekalb TX	993.4^{A}	16,725^{A}	27.8^{A}	40.8^{A}	1.39^{A}	98.46^{BC}	83.3
Lohmann LSL-Lite	970.3^{ABC}	16,343^{ABC}	27.1^{ABC}	39.9^{ABC}	1.36^{ABC}	99.23^{A}	85.6
H&N Nick Chick	976.5^{ABC}	16,446^{ABC}	27.3^{ABC}	40.1^{ABC}	1.37^{ABC}	98.06^{BC}	85.6
Bovans White	945.5^{C}	15,946^{C}	26.4^{C}	38.9^{C}	1.32^{C}	98.93^{AB}	91.1
Hisex White	983.11^{AB}	16,589^{AB}	27.5^{AB}	40.5^{AB}	1.38^{AB}	97.38^{C}	90.0
Bovans Robust	964.5^{ABC}	16,264^{ABC}	27.0^{ABC}	38.7^{ABC}	1.35^{ABC}	98.07^{BC}	93.3
Average	969.1	16,331	27.1	39.9	1.36	98.82	88.2

^{ABC} Denotes significant differences between strains (P<0.01)

Table 8. Bi-weekly Body Weights of Brown-Egg Entries, 37th NCLP&MT

	(Weeks of Age)								
Breeder	0	2	4	6	8	10	12	14	16
	(kg)								
ISA Brown	0.038^{C}	0.116^{B}	0.253	0.470^{B}	0.698	0.902	1.078	1.253	1.399
Hy-Line Brown	0.038^{C}	0.115^{BC}	0.260	0.474^{B}	0.679	0.870	1.033	1.201	1.326
Hy-Line S. Brown	0.041^{A}	0.115^{BC}	0.257	0.472^{B}	0.695	0.872	1.040	1.234	1.380
Bovans Brown	0.040^{B}	0.125^{A}	0.265	0.493^{A}	0.711	0.916	1.086	1.266	1.419
Hisex Brown	0.037^{D}	0.110^{C}	0.256	0.479^{B}	0.702	0.893	1.072	1.233	1.387
Dekalb Amber Link	0.036^{E}	0.120^{AB}	0.264	0.480^{B}	0.681	0.897	1.058	1.258	1.413
Average	0.038	0.117	0.259	0.478	0.694	0.892	1.061	1.241	1.387

^{ABCD} Denotes significant differences between strains

Table 9. Bi-weekly Feed Consumption of Brown-Egg Entries, 37th NCLP&MT

	(Weeks of Age)								
Breeder	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	1-16
	(kg per bird)								
ISA Brown	0.191[BC]	0.354	0.606	0.756	0.957	1.063	1.053	1.070	6.05
Hy-Line Brown	0.197[AB]	0.356	0.597	0.747	0.939	1.039	1.025	1.022	5.92
Hy-Line S. Brown	0.191[BC]	0.344	0.602	0.761	0.947	1.049	1.065	1.051	6.01
Bovans Brown	0.202[A]	0.358	0.623	0.766	0.950	1.044	1.046	1.059	6.05
Hisex Brown	0.189[C]	0.362	0.601	0.766	0.941	1.040	1.018	1.056	5.97
Dekalb Amber Link	0.196[ABC]	0.355	0.596	0.752	0.958	1.036	1.070	1.059	6.02
Average	0.194	0.355	0.604	0.758	0.949	1.045	1.045	1.053	6.00

[ABC] Denotes significant differences between strains (P<0.01)

Table 10. Total Nutrient Intake, Feed Cost, Livability, and Flock Uniformity of Brown-Egg Entries, 37th NCLP&MT

Breeder	Protein	Met. Energy	Lysine	TSAA	Feed Cost	Livability (1-112 d)	Flock Uniformity
	----------(per bird to 112 days)----------						(% of pullets within ±10% of $\bar{x}$)
	(g)	(kcal)	(g)	(g)	($)	(%)	
ISA Brown	995.2	16,926	27.6	41.1	1.40	99.3	81.1
Hy-Line Brown	976.6	16,593	27.1	40.3	1.37	99.5	83.3
Hy-Line S. Brown	991.2	16,841	27.5	40.9	1.39	99.8	88.9
Bovans Brown	997.0	16,952	27.6	41.2	1.40	99.0	90.0
Hisex Brown	985.8	16,762	27.3	40.7	1.39	98.8	84.4
Dekalb Amber Link	990.9	16,860	27.5	40.9	1.39	99.1	85.6
Average	989.1	16,817	27.4	40.8	1.39	99.2	85.6

[ABC] Denotes significant differences between strains

Table 11. Bi-weekly Body Weights of Brown-Egg Entries, 37th NCLP&MT on Range

	(Weeks of Age)							
Breeder	0	2	4	6	8	10	12	16
	(kg)							
Hy-Line Brown	0.038	0.114	0.260	0.459	0.667	0.950	1.020	1.230
Hisex Brown	0.037	0.113	0.264	0.473	0.700	1.053	1.040	1.320
Average	0.038	0.114	0.262	0.466	0.674	1.001	1.030	1.280

Table 12. Bi-weekly Feed Consumption of Brown-Egg Entries, 37th NCLP&MT on Range

	(Weeks of Age)							
Breeder	1-2	3-4	5-6	7-8	9-10	11-12	13-16	1-16
	(kg per bird)							
Hy-Line Brown	0.21	0.33	0.52	0.64	1.13	1.02	1.49	5.34
Hisex Brown	0.21	0.34	0.55	0.68	1.11	0.88	1.74	5.51
Average	0.21	0.33	0.54	0.66	1.12	0.95	1.62	5.43

Table 13. Total Nutrient Intake, Feed Cost, Livability, and Flock Uniformity of Brown-Egg Entries, 37th NCLP&MT on Range

Breeder	Forage Protein[1]	Protein	Met. Energy	Lysine	TSAA	Feed Cost	Livability (1-112 d)	Flock Uniformity
	----------(per bird to 112 days)----------							(% of pullets within ±10% of $\bar{x}$)
	(g)	(g)	(kcal)	(g)	(g)	($)	(%)	
Hy-Line Brown	63.6	904.1	14,881	25.0	36.6	1.25	99.6	92.0
Hisex Brown	74.2	934.7	15,464	25.9	38.0	1.30	100.0	96.0
Average	68.9	919.4	15,173	25.5	37.3	1.28	99.8	94.0

[1] This is calculated from the measure of forage disappearance and an analysis of the CP in the Fescue forage sample Sharrow (1984) JRM 37(1):94-95

Table 14. Entries in the 37th NCLP&MT by Breeder, Stock Suppliers, and Categories

Breeder	Stock	Category[1]	Source
Hy-Line International 2583 240th Street Dallas Center, IA 50063	W-36	I-A	Hy-Line International 4432 Highway 213, Box 309 Mansfield, GA 30255
	W-98	I-A	Hy-Line International 17458 G. Avenue Perry, IA 50220
	Hy-Line Brown	I-A	Same
	Hy-Line Silver Brown	I-A	Dallas Center Research Farm 2418 N Ave. Dallas Center, IA 50063
	CV-22	I-A	Same
Lohmann Tierzucht Gmbh Am Seedeich 9-11 . P.O.Box 460 D-27454 Cuxhaven, Germany	Lohmann LSL-Lite	I-A	Hy-Line North America 79 Industrial Rd E-town, PA 17022
H&N International 321 Burnett Ave South, Suite 300 Renton, Washington 98055	H&N "Nick Chick"	I-A	Feather Land Farms 32832 E. Peral Road Coberg, OR 97408
Centurion Poultry, Inc. P.O. Box 591 Lexington, Georgia 30648	Bovans White	I-A	CPI-South Central Hatchery 5087 County Road 35 Bremen, AL 35033
	Bovans Robust	II-A	(Same)
	Bovans Brown	I-A	(Same)
Centurion Poultry, Inc. P.O. Box 591 Lexington, Georgia 30648	Hisex White	I-A	(Same)
	Hisex Brown	I-A	(Same)
Centurion Poultry, Inc. P.O. Box 591 Lexington, Georgia 30648	Dekalb TX	I-A	(Same)
	Dekalb Amber Link	II-A	(Same)
Instiut de Selection Animale (A Hendrix Genetic Company) ISA North America 650 Riverbend Drive, Suite C Kitchener, Ontario N2K 3S2 Canada	Shaver White	II-A	McKinley Hatchery P O Box 1900 772 Queen Street St. Mary's, Ontario N4X 1C2 Canada
	ISA Brown	II-A	(Same)

[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