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FIRST CYCLE REPORT OF THE THIRTY SEVENTH 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 first production cycle and molt of the 37th North Carolina Layer Performance and Management Test. Performance summary tables are available for each strain, and molt treatment used as well as for the combined results.

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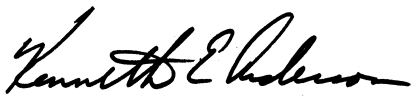

[1]The use of trade names in this publication does not imply endorsement by the North Carolina Cooperative Extension Service of the products named nor criticism of similar ones not mentioned.

37th NORTH CAROLINA LAYER PERFORMANCE AND MANAGEMENT TEST
Volume 37 No. 3

Report on First Laying Cycle and Molt

Entries and Strains:

A total of ten white egg and six brown egg strains were entered for a total of sixteen strains that were accepted in accordance with the rules and regulations of the test. The strain names and egg color designations are shown in Table 1.

Table 1. Strain name and egg color designation

Strain	Egg Color Designation
Hy-Line W-36	White
Hy-Line W-98	White
Hy-Line CV-22	White
Shaver White	White
Dekalb TX	White
Lohmann LSL-Lite	White
H&N Nick Chick	White
Bovans White	White
Hisex White	White
Bovans Robust	White
ISA Brown	Brown
Hy-Line Brown	Brown
Hy-Line S. Brown	Brown
Bovans Brown	Brown
Hisex Brown	Brown
Dekalb Amber Link	Brown

In the layer test, a minimum of approximately 760 white and brown egg pullets/strain were placed at the initiation of the layer portion of the test. However, if the number of hens were below the prescribed numbers, they were divided as equally as possible between the levels and replicates within the layer house and placement into the layer test was adjusted appropriately.

Dates of Importance:

The eggs were placed into trays and set on May 15, 2007 at the North Carolina Dept. of Agriculture and Consumer Services, Piedmont Research Station, Poultry Unit at Salisbury, NC. The flock was hatched on June 6, 2007 then moved to the laying facilities on September 26-28, 2007 during their 17th week of age.

First cycle production records commenced on October 3, 2007 (17 weeks of age), through the molt period which was induced on September 10, 2008. The molt records commenced on September 10, 2008 (66 weeks of age), and ended on October 8, 2008 (70 weeks of age). This report includes production data summarized from 17 to 66 weeks, and 66 to 70 weeks. A table showing the changes in body weights from 17 to 66 wk of age and the weight loss during the molt period is included in the molt period information.

Pullet Housing:

The chicks were randomly assigned to the growing cages with white egg and brown egg replicates being intermingled throughout the house. The white egg strains occupied approximately 59 % of the house and brown egg strains occupied the other 42 % of the house. All strains were assigned to be represented as equally as possible in each of room, row, and levels.

The chicks from the brown egg strains destined for the range study were randomly assigned to the growing pens throughout House 6. This work will not be reported further until the single cycle report.

House 8--is an environmental controlled closed brood-grow facility with 3 banks of quad-deck cages in each room. Each room was assigned a number, each side of each bank was assigned a row number, 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 consisted 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. The 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.

Layer Housing:

The hens were randomly assigned to the replicate cages with white egg and brown egg strains being inter-mingled throughout the houses. The white egg strains occupied 62% of the house and brown egg strains occupied the other 38%. All strains were assigned to be represented as equally as possible in all rows, and levels.

House 4 is a high rise, environmentally controlled facility with three banks of Quad-deck (4-tier) high cages. There are a total of 216 replicates in house 4 which can support 5,184 hens. The replicate blocks contain cages that are either 61 or 81 cm wide.

House 5 is a standard height totally enclosed force ventilated laying house with a scraper pit manure handling system. It has 2 banks of tri-deck cages and two banks with quad-deck (4 levels) of cages. There are a total of 252 replicates in house 5 which can support 6,048 hens.

In both houses, each side of a bank was designated as a row and each row was divided into 9 8-foot replicates/level. The replicates are equipped with feed hoppers to supply and monitor feed consumption for each individual replicate and the feed is distributed by an automatic feeding system. The cage density in both was dictated by the cage size in each replicate that contain cages that were either 61 or 81.2 cm wide and 40.6 cm deep, which allowed for a constant density of 64 in^2 (413 cm^2), at 6 or 8 hens/cage, respectively. The white-egg and brown-egg 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 cage sizes.

Test Design:

The arrangement for the laying test involved a completely randomized design and the main effects were set up in a factorial arrangement. The main effects within Houses 4 and 5 were strain, population, and molt treatment. Following are general descriptions of the main effects:

Strain

The samples of fertile eggs were provided directly by the breeders involved. All eggs were set and hatched concurrently. A total of ten white egg strains and six brown egg strains participated in the test. See the 37th Hatch Report (Vol. 37, No. 1) for details.

Density

In Houses 4 and 5, all individual cages within each block contained either the brown or the white egg layers. Thus the replicate consisted of 24 hens per replicate, the hens were contained in 61 x 40.6 cm cages for 4 cages with 6 hens/cage or 81.2 x 40.6 cm cages for 3 cages with 8 hens/cage. See Table 2 for density, feed and water space allocations.

Table 2. Population and Density Allocations in Houses 4 and 5

White and Brown Hens per Cage	Cage Size Width Depth	Floor Space per Bird	Feeder Space per Bird	Water Nipples per Cage
6	61 cm x 40.7 cm	413 cm^2 (64 in^2)	10.2 cm 4.0 in	2
8	81.2 cm x 40.7 cm	413 cm^2 (64 in^2)	10.2 cm 4.0 in	2

Table 3. Laying House and Molting Lighting Schedules

Age	Date	House 5 (Light Hours)	House 7 (Light Hours)
Housing Pullets	Sept. 26-Oct 3, 2007	10.0	10.0
17 Weeks[1]	Oct. 3, 2007	11.0	11.0
18 Weeks	Oct. 10, 2007	11.5	11.5
19 Weeks	Oct. 17, 2007	12.0	12.0
20 Weeks	Oct. 24, 2007	12.5	12.5
21 Weeks	Oct. 30, 2007	13.0	13.0
22 Weeks	Nov. 7, 2007	13.5	13.5
23 Weeks	Nov. 14, 2007	14.0	14.0
24 Weeks	Nov. 21, 2007	14.25	14.25
25 Weeks	Nov 28, 2007	14.5	14.5
26 Weeks	Dec. 5, 2007	14.75	14.75
27 Weeks	Dec. 12, 2007	15.0	15.0
28 Weeks	Dec. 19, 2007	15.25	15.25
29 Weeks	Dec. 26, 2007	15.5	15.5
30 Weeks	Jan. 2, 2008	15.75	15.75
31 Weeks	Jan. 9, 2008	16.0	16.0
Through 66 Weeks	Sept 11, 2008	16.0	16.0

Layer Management (Molting):

The molt experiment was conducted utilizing all hens involved in the layer test. Participating strains were randomly divided into three groups such that all strains, populations, and levels were approximately equally represented. In this test each group received one of the following treatments during the molt period commencing at 66 wks of age. The weeks in the molt tables were, therefore, adjusted accordingly, depending on the exact week in which the induced molt procedure was started.

Table 4. Molt Program Names and Treatment Codes

Program Name	Brief Description	Treatment Code
Full Fed Control	Not Molted	NM
Non-anorexic molt program with 20% wt loss	LP/LE Diet no fasting	NA20
Non-anorexic molt program with 25% wt loss	LP/LE Diet no fasting	NA25

Full Fed Control (NM): The replicates assigned to the full fed control group will be maintained according to the

standard management program as outlined previously. The laying house will be partitioned such that the lighting program will be consistent for maximum egg production.

Non-anorexic molt program (NA): The hens will be fed a diet, which is low protein, low energy, and has supplemental Ca for maintenance. When birds in the replicate being weighed reach target weight that replicate will be returned to full feed. The induced molt will be started at 66 wks of age. This Non-anorexic molt diet was low in energy and was designed to keep hens out of production and provide balanced nutrition for body maintenance only. The diet is bulky, such that a full trailer load will only weigh 2/3 of a normal full load. Please keep this fact in mind when ordering feed.

Procedural steps:

Day -7 Sample of birds will be weighed to determine the pre-molt weight. Target weight loss (20 or 25 % body weight) will be calculated using the pre-molt weight.

Day 0 NA program instigated with the remaining layer feed being removed and replaced with the NA molt diet and daylight hours reduced. Controlled light housing, reduce the day length to 8 hr. Remove morbid birds before feed restriction.

Day +7 Sample of birds weighed 7 days after diet change to determine body weights.

Day +9 Sample of birds weighed 9 days after diet change to determine body weight. Weight loss per day calculated using 7 and 9 day body weights and target date for the % weight loss determined. When the target date for the % body weight loss is determined the hens will not be weighed until target date at which time they will be returned to the layer feed if body weight loss has been achieved.

Day +28 Birds will be fed layer diet and light stimulated.

Specific monitored criteria for all of the molt programs include the following.

The goal is for the birds to attain approximately 20 or 25% body weight loss.

Maintain house temperature at 80± 5° F, but the birds should not pant. Please react to environmental temperatures.

The 1st production period light schedule is the guide by which the lights will be adjusted following the molt. Actual house conditions and the flock's reaction to the NCSU Non-Fasting Molting Program may affect how the light stimulation will actually be given.

Table 5. Molting Lighting Schedules

Age	Date	House 5 (Light Hours)	House 7 (Light Hours)
Through 66 Weeks	Sept. 11, 2008	16.0	16.0
66 Weeks	Sept. 11, 2008	8 hr	8 hr
69 Weeks	Oct. 2, 2008	12.0	12.0
70 weeks	Oct. 9, 2008	13.0	13.0
71 Weeks	Oct. 16, 2008	14.0	14.0
72 Weeks	Oct. 23, 2008	15.0	15.0
73 Weeks through end of test (110 wk)	Oct. 30, 2008 to July 16, 2009	16.0	16.0

Hens should have ceased egg production by Day 6-10 of the molt program. However, the hens should be allowed to consume all of the feed provided between feedings. The molting ration is designed to keep hens out of production, and to provide for skeletal and muscle maintenance. Livability was excellent with this program. Diet E will bring hens back into peak production. Feed intake and egg size will determine which diet to progress toward.

Layer Nutrition:

Layer diets are identified as Diets D, E, F, G, H, I, M, N, and O which consist of a pre-lay diet and a series of layer diets formulated to assure a daily protein, mineral and amino acid intake as shown below. Feed was offered ad libitum in accordance with the guidelines that all birds should receive acceptable nutrient intake at all times depending on the bird's age and production rate as shown in the Laying House Feeding Program Table.

The diets provided during the molt, consisted of a low protein/energy diet and a Resting Diet described in the Molt Diets Table which follow. The molt diets were formulated to provide the layer with the nutrients needed to maintain a static body weight with no egg production.

Table 6. Minimum Daily Intake of Nutrients Per Bird at Various Stages of Production in the 37th NCLP&MT

Production Stage	Pre-Peak > 87%	87-80%	80-70%	<70%
White Egg Layers				
Protein[1](g/day)	19	18	17	16
Calcium (g/day)	4.0	4.1	4.2	4.3
Lysine (mg/day	820	780	730	690
TSAA (mg)day)	700	670	630	590
Brown Egg Layers				
Protein[1](g/day)	20	19	18	17
Calcium (g/day)	4.0	4.0	4.1	4.2
Lysine (mg/day	830	820	780	730
TSAA (mg)day)	710	700	670	630

[1] If the egg production is higher than predicted values protein intake should be increased by 1%
Note: House temperatures dictate the body maintenance demand of the hen if the house temperature is 75 to 80°F feed protein content should be increased accordingly to compensate for metabolic heat needed to maintain a homeostatic body temperature. If the house temperature is at or above 85°F no adjustment is needed.

Table 7. 37th NCLP&MT Laying House Feeding Program

Rate of Production	Consumption Per 100 Birds/Day (kg)	Diet Fed: White Egg Strains	Diet Fed: Brown Egg Strains
Weeks 17-26	< 9.52	D	D
Pre-Peak and > 87%	< 9.52	D	D
	9.57-10.39	F	E
	10.43-11.29	H	G
	11.34-12.20	I	H
	12.25-13.11	M	I
	>13.15	N	M
80-87%	< 9.52	F	E
	9.57-10.39	G	F
	10.43-11.29	I	H
	11.34-12.20	M	I
	12.25-13.11	N	M
	>13.15	O	N
70-80%	< 9.52	H	G
	9.57-10.39	I	H
	10.43-11.29	M	I
	11.34-12.20	N	M
	12.25-13.11	O	N
	>13.15	O	O
< 70%	< 9.52	H	G
	9.57-10.39	I	H
	10.43-11.29	N	M
	11.34-12.20	O	N
	12.25-13.11	O	O
	>13.15	O	O

Note: Low house temperatures and egg production higher than breeder guides for any given hen age will require an adjustment to the dietary phase feeding program to ensure the hens are in a positive nutrient status.

Table 8. 37th NCLP&MT Laying Periods Feed Formulations D through H

Ingredients	D	E	F	G	H
Corn	866.71	925.46	997.91	1068.19	1131.97
Soybean meal	663.18	621.10	552.33	499.80	457.65
Wheat Midds					
Fat (Tallow)	110.88	102.43	87.73	74.61	64.32
Gluten Meal 60%	95.83	88.37	100.00	99.23	90.80
D.L. Methionine	3.08	2.89	2.52	2.26	2.48
Lysine 78.8%					
Soybean Hulls					
Ground Limestone	132.42	133.70	135.07	134.02	132.50
Coarse Limestone	75.00	75.00	75.00	75.00	75.00
Bi-Carbonate	3.00	3.00	3.00	3.00	3.00
Phosphate Mono/D	36.77	34.73	32.84	30.36	28.79
Salt	6.00	5.99	5.95	5.93	5.92
Vit. premix	1.00	1.00	1.00	1.00	1.00
Min. premix	1.00	1.00	1.00	1.00	1.00
Mold Inhibitor	1.00	1.00	1.00	1.00	1.00
T-Premix	1.00	1.00	1.00	1.00	1.00
.06% Selenium Premix	1.00	1.00	1.00	1.00	1.00
Choline Cl 60%	2.14	2.33	2.65	2.59	2.57
Calculated Analysis					
Protein %	22.0	21.0	20.00	19.00	18.0
ME kcal/kg	2926.0	2926.0	2926.0	2926.0	2926.0
Calcium %	4.45	4.45	4.45	4.40	4.35
T. Phos. %	0.71	0.68	0.65	0.61	0.59
Lysine %	1.15	1.09	1.00	0.93	0.87
TSAA %	0.89	0.85	0.81	0.77	0.75

Table 9. 37th NCLP&MT Laying Periods Feed Formulations I through O

Ingredients	I	M	N	O
Corn	1199.47	1258.28	1309.81	1371.93
Soybean meal	406.08	363.91	340.24	333.87
Wheat Midds				
Fat (Tallow)	52.26	43.80	38.85	14.71
Gluten Meal 60%	89.84	82.64	61.54	25.79
D.L. Methionine	2.02	1.62	1.75	1.80
Lysine 78.8%				
Soybean Hulls				
Ground Limestone	158.82	160.10	161.33	167.71
Coarse Limestone	50.00	50.00	50.00	50.00
Bi-Carbonate	3.00	3.00	3.00	3.00
Phosphate Mono/D	26.79	24.75	22.60	20.30
Salt	5.90	5.89	5.89	5.89
Vit. premix	1.00	1.00	1.00	1.00
Min. premix	1.00	1.00	1.00	1.00
Mold Inhibitor	1.00	1.00	1.00	1.00
T-Premix	1.00	1.00	1.00	1.00
.06% Selenium Premix	1.00	1.00	1.00	1.00
Choline Cl 60%	0.83	1.02		
Calculated Analysis				
Protein %	17.00	16.00	15.00	14.00
ME kcal/kg	2926.0	2926.0	2926.0	2860.0
Calcium %	4.35	4.35	4.35	4.45
T. Phos. %	0.56	0.52	0.49	0.47
Lysine %	0.80	0.74	0.70	0.68
TSAA %	0.70	0.65	0.62	0.58

Table 10. 37th NCLP&MT Laying Periods Feed Formulations Molt and Resting Diets

Ingredient	Molt Diet s	
	Low ME	Resting
Corn	702.50	1427.70
Corn Gluten Meal		
Soybean Hulls	1164.77	226.00
Soybean Meal 48%		117.00
Wheat Midds	18.26	186.50
Coarse Limestone	17.78	16.50
Phosphate Mono/D	69.84	4.00
Bentonite		
Salt	9.16	5.00
Methionine	2.69	1.30
Choline Chloride		
Vit. premix	1.00	1.00
Min. premix	1.00	1.00
T - Premix	1.00	1.00
Fat	9.99	10.00
MYC-OUT 65	1.00	2.00
.06% Sel Premix	1.00	1.00
Total	2000	2000
Calculated Analysis		
Protein %	9.92	11.75
Me kcal/kg	1650	2859
Calcium %	1.33	3.80
T. Phos %	0.88	0.44
Lysine %	0.42	0.55
TSAA %	0.35	0.49

Data Collection Schedule and Procedures:

Age at 50% Production (Maturity)--The first day at which the birds in the individual replicates achieved 50% production.

Egg Production--All eggs that had the potential of being marketed were credited toward the test unit's (replicate) egg production, regardless of the shell condition at the time of collection. All eggs were collected and recorded daily. Egg production was summarized at twenty-eight day intervals, and was calculated and reported on a Hen-Housed and Hen-Day basis.

Egg Weight--At twenty-eight day intervals, all eggs produced in the previous 24-hour period were weighed and sorted by size (See egg size distribution). Percentages of eggs within each size category, average egg weight (g), and egg mass (g) were calculated and reported.

Egg Quality--At twenty-eight day intervals, all eggs produced within the previous 24 hours were examined by candling light and graded according to current USDA standards for egg quality. Eggs were graded in the pilot processing facility and handled as they would be in a commercial off-line facility.

Egg Size Distribution--At twenty-eight day intervals, all eggs produced within the previous 24 hours were weighed and sorted according to current USDA standards for egg size.

Egg Income--Egg income was calculated using current year regional average prices for farm value of eggs based on egg production and quality evaluation.

Feed Consumption and Conversion--All feed offered for consumption was recorded for each replicate. At twenty-eight day intervals, feed not consumed was weighed back and feed consumption was calculated. Daily feed intake (kg/100 hens/day) was calculated and reported for each strain.

Feed Costs--Feed costs were based on the actual current feed prices for each feed delivery which were calculated and summarized for the complete production cycle.

Body weights—Birds were weighed and weights recorded at housing (17 wk), end of 1st cycle (66 wks), and at the start of the 2nd cycle (70 wk). Body weight gain for the 1st cycle was calculated and reported for each strain. In the Molt period lowest body weight, percent weight loss, 70 wk body weights were taken or calculated and reported for each strain.

Mortality--All mortalities were recorded daily, and obvious accidents were not included in reported mortalities.

Statistical Analyses and Separation of Means:

All data were subjected to ANOVA utilizing the GLM procedure of SAS, with main effects of strain and density. Separate analyses were conducted for white and brown egg strains. Significant differences ($P < 0.01$) within white and brown egg strains are noted by differing letters among columns of means. The layer houses were not significant, therefore, data for houses 4 and 5 were pooled in this analysis. First and second order interactions were tested for significance. LS Means which is part of the GLM Procedure were separated via the PDIFF option.

DESCRIPTION OF DATA TABLE STATISTICS

First cycle performance of white and brown egg strains are shown on Tables 14 to 19. The molt period performance and weight loss data of the white and brown egg strains are shown on Tables 20 to 27.

Breeder (Strain):

Short identification codes of the breeder and strain of the stock were developed. See more complete information following data tables in Table 28.

Hen Housed Eggs per Bird:

The total number of eggs produced divided by the number of birds housed at 119 days.

Hen Day Egg Production:

The average daily number of eggs produced per 100 hens per day.

Egg Mass:

The average daily production of egg mass reported as in grams per hen day.

Mortality:

The percentage of birds which died between 119 through 462 days of age and 462 through 490 which occurred during the molt period are reported separately

Feed Consumption:

The kilograms of feed consumed daily per 100 hens per day.

Feed Conversion:

The grams of egg produced per gram of feed consumed.

Egg Weight:

The average egg weight (grams) for each period sampled. Weight of all eggs collected from previous 24 hours divided by the number of eggs collected.

Egg Income:

The calculated income per hen housed at 119 days, from egg production using current year regional average egg prices 10/3/2007 to 10/8/2008.

Table 11. Current Year Regional Average Egg Prices

Grade	Size	$/Dozen 1st Cycle
A	Extra Large	1.45
A	Large	1.41
A	Medium	1.21
A	Small	0.96
A	Pee Wee	0.48
B	All	0.75
Checks	All	0.75

Grade Information:

The average grade of all eggs sampled according to USDA grading standards over all sampling periods. Grades are established by personnel trained in USDA grading standards.

Egg Size Distribution:

Following are the size classifications used for establishing the USDA egg size grading. There has been blending of egg size

in this test with the weight cutoff between medium and large being 23.5. This maximizes the number of USDA large eggs just as would occur in a commercial plant. The proportion of the eggs falling into the following size categories are reported in the tables.

Table 12. USDA Egg Weights Used To Establish The Egg Size Distribution Weighted for Large Eggs.

Size Category	Ounces/Dozen
Pee Wee	< 18
Small	18 – 21
Medium	21 - 23.5
Large	23.5 – 27
Extra Large	> 27

Feed Cost:

The calculated feed cost per hen housed at 119 days, using the pounds/diet consumed and the average price of each diet per ton.

Table 13. The Average Contract Feed Price For Feed Purchases During The First Cycle.

Diets	Price Per Ton
D	300.30
E	339.27
F	366.90
G	374.27
H	360.61
I	382.53
Molt Diet LP/LE	328.60
Resting	299.20

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

TABLE 14. EFFECT OF WHITE EGG STRAIN AND POPULATION ON PERFORMANCE OF HENS IN THE 37th NCLP&MT (119-462 DAYS)

Breeder (Strain)	Population[1]	Feed Consumption (kg/100/hen/d)	Feed Conversion (g egg/g feed)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality (%)	Age at 50% Production (Days)
Hy-Line	6	9.5	0.52	276.5	82.5	49.4	2.3	140
W-36	8	9.5	0.52	272.5	82.7	49.9	2.9	140
	Average	9.5^{C}	0.52^{A}	274.5^{B}	82.6^{D}	49.6^{D}	2.6^{C}	140^{AB}
Hy-Line	6	10.1	0.51	276.7	82.7	51.6	3.7	137
W-98	8	10.3	0.50	274.2	82.3	51.4	3.8	136
	Average	10.2^{B}	0.51^{AB}	275.4^{B}	82.5^{D}	51.5^{C}	3.7^{C}	136^{C}
Hy-Line	6	10.3	0.50	271.8	83.4	52.1	7.3	137
CV-22	8	10.1	0.51	276.2	83.8	52.3	8.5	136
	Average	10.2^{B}	0.51^{AB}	274.0^{B}	83.6^{CD}	52.2^{ABC}	7.9^{AB}	136^{C}
Shaver	6	9.7	0.51	277.2	84.5	49.8	6.6	141
White	8	9.6	0.52	271.6	85.2	50.4	9.1	140
	Average	9.6^{C}	0.52^{A}	274.4^{B}	84.8^{BC}	50.1^{D}	7.8^{AB}	141^{A}
DeKalb	6	10.3	0.50	282.4	85.6	52.0	3.4	140
TX	8	10.0	0.50	276.9	84.5	50.8	6.6	139
	Average	10.2^{B}	0.50^{B}	279.6^{AB}	85.1^{B}	51.4^{C}	5.0^{BC}	140^{AB}
Lohmann	6	10.6	0.50	283.0	87.3	52.9	7.9	140
LSL-Lite	8	10.8	0.49	287.9	87.8	53.3	7.4	140
	Average	10.7^{A}	0.49^{B}	285.5^{A}	87.5^{A}	53.1^{A}	7.6^{AB}	140^{AB}
H&N	6	10.1	0.51	286.1	87.4	51.4	7.0	139
Nick Chick	8	10.3	0.51	282.8	88.4	52.4	9.3	140
	Average	10.2^{B}	0.51^{AB}	284.5^{A}	87.9^{A}	51.9^{BC}	8.1^{AB}	139^{B}
Bovans	6	10.4	0.51	284.6	87.6	53.1	8.9	139
White	8	10.3	0.51	285.2	88.1	53.0	9.5	140
	Average	10.3^{AB}	0.51^{AB}	284.9^{A}	87.9^{A}	53.1^{A}	9.2^{A}	139^{B}
Hisex	6	10.4	0.50	286.1	87.2	52.9	6.1	140
White	8	10.4	0.50	283.2	86.4	52.6	8.5	139
	Average	10.4^{AB}	0.50^{B}	284.6^{A}	86.8^{A}	52.8^{AB}	7.3^{AB}	140^{AB}
Bovans	6	10.0	0.51	276.7	83.7	51.8	4.9	140
Robust	8	10.1	0.51	277.5	84.4	52.2	4.6	140
	Average	10.1^{B}	0.51^{AB}	277.1^{B}	84.0^{BC}	52.0^{ABC}	4.7^{BC}	140^{AB}
All	6	10.1	0.51	280.1	85.2	51.7	5.8	139
Strains	8	10.1	0.51	278.8	85.4	51.8	7.0	139

[1]All strains were housed at a constant density of: 413 cm^2 equals 64 in^2.

A,B,C,D - Different letters denote significant differences (P<.01), comparisons made among strain average values.

TABLE 15. EFFECT OF WHITE EGG STRAIN AND POPULATION ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF HENS IN THE 37th NCLP&MT (119-462 DAYS)

Breeder	Population[1]	Egg Weight	Pee Wee	Small	Medium	Large	Extra Large
(Strain)		(g/egg)	(%)	(%)	(%)	(%)	(%)
Hy-Line	6	59.3	0.0	1.5	14.9	27.8	55.7
W-36	8	59.7	0.0	1.4	13.3	25.7	59.6
	Average	59.5^{C}	0.0	1.5^{ABCD}	14.1^{AB}	26.7^{BC}	57.6^{B}
Hy-Line	6	62.0	0.0	0.5	9.5	18.6	71.4
W-98	8	62.2	0.0	0.5	10.6	17.2	71.6
	Average	62.1^{AB}	0.0	0.5^{EF}	10.0^{DE}	17.9^{D}	71.5^{A}
Hy-Line	6	62.2	0.0	0.3	8.8	18.8	71.9
CV-22	8	62.2	0.0	0.3	9.0	19.1	71.4
	Average	62.2^{A}	0.0	0.3^{F}	8.9^{E}	19.0^{D}	71.7^{A}
Shaver	6	58.1	0.0	2.8	14.7	36.1	46.4
White	8	58.6	0.0	1.6	14.6	36.0	47.9
	Average	58.4^{D}	0.0	2.2^{A}	14.6^{AB}	36.0^{A}	47.1^{C}
DeKalb	6	60.1	0.0	1.3	13.1	25.1	60.5
TX	8	59.5	0.0	1.5	12.7	27.6	58.3
	Average	59.8^{C}	0.0	1.4^{BCD}	12.9^{ABC}	26.3^{BC}	59.4^{B}
Lohmann	6	59.9	0.0	1.4	11.5	28.3	58.8
LSL-Lite	8	60.0	0.0	1.4	11.9	25.4	61.3
	Average	60.0^{C}	0.0	1.4^{BCD}	11.7^{CD}	26.9^{BC}	60.1^{B}
H&N	6	58.2	0.1	1.6	16.0	35.3	47.0
Nick Chick	8	58.7	0.0	1.8	13.9	32.1	52.1
	Average	58.5^{D}	0.0	1.7^{ABC}	14.9^{A}	33.7^{A}	49.6^{C}
Bovans	6	60.1	0.0	0.9	11.7	28.4	59.0
White	8	59.5	0.0	1.3	13.1	28.9	56.7
	Average	59.8^{C}	0.0	1.1^{CDE}	12.4^{BCD}	28.6^{B}	57.8^{B}
Hisex	6	60.0	0.0	2.2	11.4	24.7	61.8
White	8	60.2	0.0	2.0	11.6	25.5	60.8
	Average	60.1^{C}	0.0	2.1^{AB}	11.5^{CD}	25.1^{C}	61.3^{B}
Bovans	6	61.3	0.0	1.1	11.2	20.6	67.2
Robust	8	61.3	0.0	0.7	10.5	21.7	67.1
	Average	61.3^{B}	0.0	0.9^{DEF}	10.8^{CDE}	21.1^{D}	67.2^{A}
All	6	60.1	0.0	1.4	12.3	26.4	60.0
Strains	8	60.2	0.0	1.3	12.1	25.9	60.7

[1]All strains were housed at a constant density of: 413 cm^2 equals 64 in^2.

A,B,C,D,E,F - Different letters denote significant differences (P<.01), comparisons made among strain average values.

TABLE 16. EFFECT OF WHITE EGG STRAIN AND POPULATION ON EGG QUALITY, INCOME AND FEED COSTS OF HENS IN THE 37th NCLP&MT (119-462 DAYS)

Breeder	Population[1]	Grade A	Grade B	Cracks	Loss	Egg Income	Feed Costs
(Strain)		(%)	(%)	(%)	(%)	($/hen)	($/hen)
Hy-Line	6	92.6	4.5	2.8	0.2	30.75	12.30
W-36	8	89.2	4.5	3.4	0.3	29.44	12.12
	Average	90.9	4.5^{C}	3.1	0.2	30.09	12.21^{C}
Hy-Line	6	86.9	6.6	3.6	0.1	29.76	12.98
W-98	8	84.3	6.6	3.0	0.2	28.50	13.21
	Average	85.6	6.6^{A}	3.3	0.1	29.13	13.10^{AB}
Hy-Line	6	91.5	5.4	3.1	0.1	30.51	12.97
CV-22	8	91.3	4.6	4.0	0.1	30.98	12.88
	Average	91.4	5.0^{BC}	3.5	0.1	30.74	12.92^{B}
Shaver	6	92.0	5.2	2.7	0.1	30.52	12.32
White	8	91.4	5.3	3.1	0.2	29.94	11.80
	Average	91.7	5.2^{BC}	2.9	0.1	30.23	12.06^{C}
DeKalb	6	91.2	5.7	2.8	0.3	31.25	13.13
TX	8	91.1	5.9	2.7	0.3	30.59	12.73
	Average	91.1	5.8^{AB}	2.8	0.3	30.92	12.93^{B}
Lohmann	6	93.3	4.7	1.9	0.1	31.79	13.25
LSL-Lite	8	92.4	4.9	2.5	0.2	32.18	13.71
	Average	92.9	4.8^{BC}	2.2	0.2	31.98	13.48^{A}
H&N	6	92.6	4.7	2.6	0.1	31.72	12.77
Nick Chick	8	89.1	5.4	2.5	0.2	30.31	12.71
	Average	90.9	5.0^{BC}	2.6	0.1	31.01	12.74^{B}
Bovans	6	87.6	6.1	3.0	0.2	30.41	13.08
White	8	89.9	5.0	2.5	0.1	30.97	12.86
	Average	88.7	5.6^{ABC}	2.7	0.2	30.69	12.97^{B}
Hisex	6	88.5	5.7	2.4	0.3	30.67	13.19
White	8	87.1	6.3	3.4	0.3	30.15	13.23
	Average	87.8	6.0^{AB}	2.9	0.3	30.41	13.21^{AB}
Bovans	6	87.8	5.7	3.3	0.2	29.77	12.89
Robust	8	88.2	5.6	3.3	0.2	30.01	12.85
	Average	88.0	5.6^{ABC}	3.3	0.2	29.89	12.87^{B}
All	6	90.4	5.4	2.8	0.2	30.71	12.89
Strains	8	89.4	5.4	3.0	0.2	30.30	12.81

[1]All strains were housed at a constant density of: 413 cm^2 equals 64 in^2.

A,B,C - Different letters denote significant differences (P<.01), comparisons made among strain average values.

TABLE 17. EFFECT OF BROWN EGG STRAIN AND POPULATION ON PERFORMANCE OF HENS IN THE 37th NCLP&MT (119-462 DAYS)

Breeder (Strain)	Population[1]	Feed Consumption (kg/100/hen/d)	Feed Conversion (g egg/g feed)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality (%)	Age at 50% Production (Days)
ISA	6	10.2	0.51	280.6	85.4	52.7	5.6	141
Brown	8	10.1	0.51	278.6	84.6	52.1	7.5	141
	Average	10.1^{C}	0.51^{A}	279.6^{B}	85.0^{B}	52.4^{B}	6.5	141^{A}
Hy-Line	6	9.9	0.52	278.6	83.3	52.4	4.7	140
Brown	8	9.9	0.52	274.6	82.5	51.7	3.0	140
	Average	9.9^{C}	0.52^{A}	276.6^{B}	82.9^{C}	52.0^{B}	3.9	140^{BC}
Hy-Line	6	10.2	0.49	280.3	84.7	50.2	6.9	140
Silver Brown	8	10.1	0.50	279.6	84.6	50.3	5.4	140
	Average	10.2^{BC}	0.49^{B}	279.9^{AB}	84.6^{BC}	50.2^{C}	6.2	140^{BC}
Bovans	6	10.7	0.51	284.3	86.1	55.4	3.3	140
Brown	8	10.4	0.52	281.2	85.7	55.0	5.3	141
	Average	10.5^{AB}	0.52^{A}	282.8^{AB}	85.9^{AB}	55.2^{A}	4.3	141^{AB}
Hisex	6	10.5	0.52	286.8	86.8	54.7	5.5	139
Brown	8	10.6	0.51	286.8	87.1	54.8	6.4	140
	Average	10.6^{A}	0.51^{A}	286.8^{A}	86.9^{A}	54.7^{A}	6.0	139^{C}
DeKalb Amber	6	10.6	0.49	282.0	85.8	52.6	5.5	140
Link	8	10.6	0.48	279.9	85.1	51.8	6.5	140
	Average	10.6^{A}	0.49^{B}	281.0^{AB}	85.5^{AB}	52.2^{B}	6.0	140^{BC}
All	6	10.4	0.51	282.1	85.4	53.0	5.3	140
Strains	8	10.3	0.51	280.1	84.9	52.6	5.7	140

[1]All strains were housed at a constant density of: 413 cm^2 equals 64 in^2.

A,B,C,D - Different letters denote significant differences (P<.01), comparisons made among strain average values.

TABLE 18. EFFECT OF BROWN EGG STRAIN AND POPULATION ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF HENS IN THE 37th NCLP&MT (119-462 DAYS)

Breeder (Strain)	Population [1]	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
ISA Brown	6	61.0	0.0	1.2	10.2	22.7	65.8
	8	60.8	0.0	1.4	10.4	22.8	65.4
	Average	60.9^{C}	0.0	1.3^{A}	10.3^{B}	22.8^{B}	65.6^{B}
Hy-Line Brown	6	62.3	0.0	0.4	6.4	20.3	72.9
	8	62.0	0.0	0.5	7.4	19.9	72.2
	Average	62.1^{B}	0.0	0.4^{B}	6.9^{C}	20.1^{BC}	72.5^{A}
Hy-Line Silver Brown	6	58.7	0.0	1.0	13.2	33.4	52.4
	8	59.0	0.0	0.9	14.1	32.4	52.5
	Average	58.9^{D}	0.0	0.9^{AB}	13.6^{A}	32.9^{A}	52.4^{C}
Bovans Brown	6	63.6	0.0	0.7	7.3	14.4	77.4
	8	63.4	0.0	0.2	7.0	15.4	77.2
	Average	63.5^{A}	0.0	0.5^{B}	7.2^{C}	14.9^{D}	77.3^{A}
Hisex Brown	6	62.5	0.0	0.3	7.2	18.4	74.0
	8	62.3	0.0	0.7	8.5	18.2	72.5
	Average	62.4^{B}	0.0	0.5^{B}	7.9^{C}	18.3^{CD}	73.3^{A}
DeKalb Amber Link	6	60.7	0.0	1.8	10.0	22.1	66.0
	8	60.2	0.0	1.5	11.2	24.4	62.8
	Average	60.4^{C}	0.0	1.6^{A}	10.6^{B}	23.2^{B}	64.4^{B}
All Strains	6	61.5	0.0	0.9	9.1	21.9	68.1
	8	61.3	0.0	0.9	9.8	22.2	67.1

[1]All strains were housed at a constant density of: 413 cm^2 equals 64 in^2.

A,B,C,D - Different letters denote significant differences (P<.01), comparisons made among strain average values.

TABLE 19. EFFECT OF BROWN EGG STRAIN AND POPULATION ON EGG QUALITY, INCOME AND FEED COSTS OF HENS IN THE 37th NCLP&MT (119-462 DAYS)

Breeder	Population[1]	Grade A	Grade B	Cracks	Loss	Egg Income	Feed Costs
(Strain)		(%)	(%)	(%)	(%)	($/hen)	($/hen)
ISA	6	91.0	6.1	2.7	0.1	31.18	13.06
Brown	8	87.8	6.3	2.5	0.2	29.88	12.93
	Average	89.4	6.2^{A}	2.6^{BC}	0.2	30.53	12.99^{BC}
Hy-Line	6	91.7	4.5	3.7	0.1	31.49	12.86
Brown	8	92.1	4.8	3.1	0.0	31.01	12.80
	Average	91.9	4.7^{B}	3.4^{AB}	0.0	31.25	12.83^{C}
Hy-Line	6	89.9	4.7	1.9	0.0	30.21	13.14
Silver Brown	8	92.8	4.4	2.8	0.0	31.24	12.98
	Average	91.3	4.6^{B}	2.3^{C}	0.0	30.72	13.06^{ABC}
Bovans	6	89.8	6.3	3.8	0.1	31.64	13.74
Brown	8	90.5	5.9	3.4	0.1	31.52	13.23
	Average	90.2	6.1^{A}	3.6^{A}	0.1	31.58	13.49^{AB}
Hisex	6	84.3	6.6	3.2	0.1	29.95	13.55
Brown	8	87.8	6.2	3.3	0.1	31.08	13.61
	Average	86.0	6.4^{A}	3.3^{ABC}	0.1	30.52	13.58^{A}
DeKalb	6	86.0	6.1	3.0	0.1	29.69	13.59
Amber Link	8	88.4	5.7	3.2	0.2	30.16	13.58
	Average	87.2	5.9^{AB}	3.1^{ABC}	0.2	29.93	13.59^{A}
All	6	88.8	5.7	3.1	0.1	30.69	13.32
Strains	8	89.9	5.6	3.0	0.1	30.81	13.19

[1]All strains were housed at a constant density of: 413 cm^2 equals 64 in^2.

A,B,C - Different letters denote significant differences (P<.01), comparisons made among strain average values.

TABLE 20. EFFECT OF WHITE EGG STRAIN AND POPULATION ON PERFORMANCE OF HENS IN THE 37th NCLP&MT (462-490 DAYS)

Breeder	Population[1]	Feed Consumption	Eggs Per Bird Housed	Egg Production	Mortality	Egg Income	Feed Costs	Days to 0% Production
(Strain)		(kg/100hens/d)		(HD%)	(%)	($/hen)	($/hen)	(Days)
Hy-Line	6	6.1	8.5	31.3	0.8	0.79	0.56	6
W-36	8	6.4	8.6	32.0	0.4	0.78	0.58	7
	Average	6.2^{B}	8.6	31.7	0.6	0.78	0.57	6^{B}
Hy-Line	6	6.8	8.7	32.4	0.6	0.73	0.63	7
W-98	8	7.1	8.7	32.3	0.6	0.79	0.65	7
	Average	6.9^{A}	8.7	32.4	0.6	0.76	0.64	7^{AB}
Hy-Line	6	6.7	8.5	33.7	1.7	0.84	0.58	7
CV-22	8	7.1	8.1	31.8	1.8	0.73	0.60	7
	Average	6.9^{AB}	8.3	32.7	1.8	0.78	0.59	7^{AB}
Shaver	6	7.1	9.0	34.2	1.9	0.83	0.62	8
White	8	7.6	8.1	33.0	2.0	0.70	0.62	7
	Average	7.3^{A}	8.5	33.6	2.0	0.77	0.62	7^{AB}
DeKalb	6	6.7	9.3	34.9	1.3	0.83	0.61	8
TX	8	7.1	8.6	33.6	3.0	0.74	0.61	8
	Average	6.9^{A}	9.0	34.3	2.1	0.78	0.61	8^{A}
Lohmann	6	7.2	9.2	35.7	1.1	0.83	0.63	7
LSL-Lite	8	7.5	9.2	36.9	2.8	0.81	0.64	7
	Average	7.3^{A}	9.2	36.3	2.0	0.82	0.63	7^{AB}
H&N	6	7.0	8.6	33.5	2.1	0.80	0.60	7
Nick Chick	8	6.8	8.8	36.3	1.4	0.78	0.57	6
	Average	6.9^{A}	8.7	34.9	1.7	0.79	0.59	7^{AB}
Bovans	6	7.4	8.3	34.1	4.9	0.68	0.61	6
White	8	7.1	8.3	34.6	3.0	0.75	0.59	6
	Average	7.2^{A}	8.3	34.3	3.9	0.72	0.60	6^{B}
Hisex	6	7.2	7.8	31.3	2.3	0.68	0.61	7
White	8	7.1	8.5	34.7	3.2	0.78	0.57	7
	Average	7.1^{A}	8.1	33.0	2.8	0.73	0.59	7^{AB}
Bovans	6	6.9	8.7	33.0	0.8	0.82	0.62	7
Robust	8	6.9	8.6	32.6	1.2	0.77	0.62	7
	Average	6.9^{A}	8.7	32.8	1.0	0.79	0.62	7^{AB}
All	6	6.9	8.7	33.4	1.7	0.78	0.61	7
Strains	8	7.1	8.6	33.8	1.9	0.76	0.61	7

[1]All strains were housed at a constant density of: 413 cm^2 equals 64 in^2.

A,B - Different letters denote significant differences (P<.01), comparisons made among strain average values.

TABLE 21. EFFECT OF WHITE EGG STRAIN AND SYNCHRONIZED MOLT ON PERFORMANCE OF HENS IN THE 37th NCLP&MT (462-490 DAYS)

Breeder	Molt Program[1]	Feed Consumption	Eggs Per Bird Housed	Egg Production	Mortality	Egg Income	Feed Costs	Days to 0% Production
(Strain)		(kg/100hens/d)		(HD%)	(%)	($/hen)	($/hen)	(Days)
Hy-Line	NM	9.1	20.5	75.5^{Y}	0.5^{YZ}	2.34	0.95	.
W-36	NA20	5.1	2.7	9.9^{Z}	0.4^{Z}	0.00	0.42	6
	NA25	4.5	2.6	9.6^{Z}	0.8^{YZ}	0.01	0.36	6
Hy-Line	NM	10.5	20.6	76.4^{XY}	0.0^{Z}	2.18	1.10	.
W-98	NA20	5.5	2.6	9.5^{Z}	0.6^{YZ}	0.05	0.44	7
	NA25	4.8	3.0	11.2^{Z}	1.1^{YZ}	0.04	0.38	8
Hy-Line	NM	10.4	19.5	76.6^{XY}	1.5^{YZ}	2.16	1.01	.
CV-22	NA20	5.5	2.6	9.9^{Z}	1.1^{YZ}	0.06	0.42	7
	NA25	4.7	2.9	11.7^{Z}	2.6^{XYZ}	0.12	0.34	7
Shaver	NM	10.9	19.7	77.3^{WXY}	1.2^{YZ}	2.13	1.04	.
White	NA20	5.8	2.9	11.8^{Z}	3.3^{XY}	0.08	0.41	8
	NA25	5.4	3.0	11.7^{Z}	1.3^{YZ}	0.09	0.41	7
DeKalb	NM	10.4	21.2	80.8^{VWX}	2.8^{XYZ}	2.30	1.05	.
TX	NA20	5.6	3.0	11.6^{Z}	2.0^{XYZ}	0.05	0.43	8
	NA25	4.7	2.7	10.4^{Z}	1.7^{XYZ}	0.01	0.36	8
Lohmann	NM	10.9	22.0	86.6^{U}	1.7^{XYZ}	2.37	1.07	.
LSL-Lite	NA20	5.6	2.8	11.3^{Z}	2.8^{XYZ}	0.07	0.39	7
	NA25	5.5	2.9	11.0^{Z}	1.3^{YZ}	0.03	0.44	7
H&N	NM	10.6	20.7	83.6^{UV}	3.0^{XYZ}	2.29	1.02	.
Nick Chick	NA20	5.4	2.7	10.4^{Z}	1.6^{YZ}	0.02	0.40	7
	NA25	4.8	2.8	10.7^{Z}	0.7^{YZ}	0.06	0.34	7
Bovans	NM	11.2	20.0	82.1^{UVW}	1.1^{YZ}	2.15	1.07	.
White	NA20	5.5	2.4	10.3^{Z}	6.6^{W}	0.00	0.38	6
	NA25	5.1	2.5	10.5^{Z}	4.1^{WX}	0.00	0.35	6
Hisex	NM	10.4	19.0	78.0^{WXY}	3.2^{XY}	2.09	0.94	.
White	NA20	5.7	2.7	10.4^{Z}	1.8^{XYZ}	0.04	0.43	7
	NA25	5.3	2.7	10.5^{Z}	3.3^{XY}	0.06	0.40	7
Bovans	NM	10.0	20.5	77.5^{WXY}	0.5^{YZ}	2.25	1.01	.
Robust	NA20	5.5	2.9	10.8^{Z}	0.4^{Z}	0.10	0.46	7
	NA25	5.2	2.6	10.2^{Z}	2.2^{XYZ}	0.03	0.41	7
All	NM	10.4^{A}	20.4^{A}	79.4	1.6	2.23^{A}	1.03^{A}	.
Strains	NA20	5.5^{B}	2.7^{B}	10.6	2.1	0.05^{B}	0.42^{B}	7
	NA25	5.0^{C}	2.8^{B}	10.7	1.9	0.04^{B}	0.38^{C}	7

[1]All strains were housed at a constant density of: 413 cm^2 equals 64 in^2.

A,B,C - Different letters denote significant differences (P<.01), comparisons made among strain average values.

U,V,W,X,Y,Z - Different letters denote significant differences (P<.01), comparisons made among molt program average values.

TABLE 22. EFFECT OF WHITE EGG STRAIN AND POPULATION ON BODY WEIGHT OF HENS IN THE 37th NCLP&MT (462-490 DAYS)

Breeder (Strain)	Population[1]	17 Wk Body Wt (kg)	66 Wk Body Wt (kg)	1st Cycle Wt Gain (%)	Lowest Body Wt (kg)	Molt Wt Loss (%)	70 Wk Body Wt (kg)
Hy-Line	6	1.17	1.73	48.4	1.42	17.8	1.50
W-36	8	1.15	1.70	48.7	1.41	17.2	1.47
	Average	1.16^{CD}	1.71^{CD}	48.6^{ABC}	1.41^{CD}	17.5	1.49^{BCD}
Hy-Line	6	1.24	1.83	47.9	1.50	18.1	1.57
W-98	8	1.24	1.87	51.9	1.54	18.0	1.63
	Average	1.24^{A}	1.85^{A}	49.9^{ABC}	1.52^{A}	18.1	1.60^{A}
Hy-Line	6	1.24	1.84	49.8	1.52	17.8	1.59
CV-22	8	1.17	1.84	62.3	1.48	19.9	1.60
	Average	1.20^{ABC}	1.84^{A}	56.0^{A}	1.50^{AB}	18.9	1.60^{A}
Shaver	6	1.12	1.65	47.7	1.34	19.2	1.48
White	8	1.13	1.62	43.8	1.29	20.5	1.44
	Average	1.13^{D}	1.64^{E}	45.7^{BC}	1.31^{E}	19.8	1.46^{D}
DeKalb	6	1.22	1.78	46.9	1.44	19.1	1.53
TX	8	1.21	1.78	47.4	1.44	19.2	1.54
	Average	1.21^{AB}	1.78^{ABC}	47.2^{ABC}	1.44^{BC}	19.2	1.54^{BC}
Lohmann	6	1.23	1.81	47.7	1.45	19.6	1.55
LSL-Lite	8	1.24	1.79	44.8	1.43	20.5	1.55
	Average	1.23^{A}	1.80^{AB}	46.2^{BC}	1.44^{BC}	20.0	1.55^{AB}
H&N	6	1.19	1.69	42.2	1.36	19.4	1.45
Nick Chick	8	1.19	1.75	46.8	1.42	18.9	1.50
	Average	1.19^{ABC}	1.72^{CD}	44.5^{BC}	1.39^{CD}	19.2	1.48^{CD}
Bovans	6	1.13	1.69	50.5	1.38	18.4	1.54
White	8	1.13	1.69	49.2	1.36	19.3	1.49
	Average	1.13^{D}	1.69^{DE}	49.8^{ABC}	1.37^{DE}	18.9	1.52^{BCD}
Hisex	6	1.16	1.77	52.7	1.38	22.0	1.52
White	8	1.18	1.75	48.7	1.41	19.3	1.51
	Average	1.17^{BCD}	1.76^{BCD}	50.7^{AB}	1.39^{CD}	20.6	1.52^{BCD}
Bovans	6	1.19	1.71	43.9	1.43	16.4	1.52
Robust	8	1.20	1.66	39.3	1.39	16.3	1.50
	Average	1.19^{ABC}	1.69^{DE}	41.6^{C}	1.41^{CD}	16.4	1.51^{BCD}
All	6	1.19	1.75	47.8	1.42	18.8	1.52
Strains	8	1.18	1.75	48.3	1.42	18.9	1.52

[1]All strains were housed at a constant density of: 413 cm^2 equals 64 in^2.

A,B,C,D,E - Different letters denote significant differences (P<.01), comparisons made among strain average values.

TABLE 23. EFFECT OF WHITE EGG STRAIN AND SYNCHRONIZED MOLT ON BODY WEIGHT OF HENS IN THE 37th NCLP&MT (462-490 DAYS)

Breeder (Strain)	Molt Program	17 Wk Body Wt (kg)	66 Wk Body Wt (kg)	1st Cycle Wt Gain (%)	Lowest Body Wt (kg)	Molt Wt Loss (%)	70 Wk Body Wt (kg)
Hy-Line W-36	NM	1.15	1.72	49.6	1.64	4.5^{GH}	1.69
	NA20	1.16	1.70	45.7	1.29	23.6^{EF}	1.43
	NA25	1.15	1.72	50.5	1.30	24.4^{DEF}	1.34
Hy-Line W-98	NM	1.22	1.89	54.7	1.81	4.3^{GH}	1.84
	NA20	1.23	1.82	47.8	1.38	24.3^{DEF}	1.50
	NA25	1.25	1.85	47.2	1.37	25.6^{BCDEF}	1.47
Hy-Line CV-22	NM	1.12	1.90	76.1	1.79	5.7^{GH}	1.85
	NA20	1.23	1.80	46.0	1.35	24.9^{DEF}	1.49
	NA25	1.26	1.83	46.0	1.36	26.1^{BCDE}	1.46
Shaver White	NM	1.12	1.66	48.4	1.60	3.8^{GH}	1.64
	NA20	1.16	1.62	40.8	1.19	26.8^{BCDE}	1.38
	NA25	1.10	1.62	48.0	1.15	28.9^{ABC}	1.35
DeKalb TX	NM	1.20	1.79	49.5	1.70	5.2^{GH}	1.75
	NA20	1.21	1.77	47.1	1.31	25.6^{BCDEF}	1.44
	NA25	1.23	1.78	44.9	1.31	26.7^{BCDE}	1.42
Lohmann LSL-Lite	NM	1.23	1.82	49.3	1.76	3.6^{GH}	1.79
	NA20	1.23	1.79	45.6	1.33	25.9^{BCDEF}	1.43
	NA25	1.25	1.79	43.8	1.24	30.6^{A}	1.42
H&N Nick Chick	NM	1.18	1.72	45.7	1.68	2.1^{H}	1.72
	NA20	1.19	1.76	48.1	1.29	26.5^{BCDE}	1.40
	NA25	1.20	1.68	39.6	1.19	28.9^{ABC}	1.32
Bovans White	NM	1.14	1.72	50.5	1.69	1.7^{H}	1.72
	NA20	1.11	1.68	53.7	1.22	27.7^{ABCD}	1.45
	NA25	1.15	1.66	45.3	1.21	27.2^{ABCDE}	1.38
Hisex White	NM	1.15	1.74	52.6	1.62	7.2^{G}	1.67
	NA20	1.17	1.76	50.7	1.31	25.1^{CDEF}	1.49
	NA25	1.19	1.78	48.7	1.25	29.5^{AB}	1.39
Bovans Robust	NM	1.17	1.69	45.1	1.65	2.8^{H}	1.67
	NA20	1.21	1.68	39.8	1.31	22.0^{F}	1.42
	NA25	1.21	1.69	39.8	1.28	24.3^{DEF}	1.42
All Strains	NM	1.17	1.77	52.2^{A}	1.69^{A}	4.1	1.73^{A}
	NA20	1.19	1.74	46.5^{B}	1.30^{B}	25.2	1.44^{B}
	NA25	1.20	1.74	45.4^{B}	1.27^{B}	27.2	1.40^{C}

A,B,C - Different letters denote significant differences (P<.01), comparisons made among molt program average values.

TABLE 24. EFFECT OF BROWN EGG STRAIN AND POPULATION ON PERFORMANCE OF HENS IN THE 37th NCLP&MT (462-490 DAYS)

Breeder	Population[1]	Feed Consumption	Eggs Per Bird Housed	Egg Production	Mortality	Egg Income	Feed Costs	Days to 0% Production
(Strain)		(kg/100hens/d)		(HD%)	(%)	($/hen)	($/hen)	(Days)
ISA	6	7.4	9.3	36.2	2.9	0.89	0.63	8
Brown	8	7.0	9.4	36.4	1.9	0.87	0.61	9
	Average	7.2	9.4	36.3	2.4	0.88	0.62	8
Hy-Line	6	7.1	9.1	35.4	1.6	0.82	0.62	9
Brown	8	7.0	9.5	35.2	0.2	0.93	0.64	9
	Average	7.0	9.3	35.3	0.9	0.88	0.63	9
Hy-Line	6	7.5	10.0	38.9	3.1	0.93	0.63	10
Silver Brown	8	6.6	9.2	35.6	1.0	0.79	0.59	8
	Average	7.0	9.6	37.3	2.0	0.86	0.61	9
Bovans	6	7.6	9.9	37.0	2.3	0.92	0.68	8
Brown	8	7.6	9.2	35.1	2.7	0.84	0.66	8
	Average	7.6	9.5	36.1	2.5	0.88	0.67	8
Hisex	6	7.0	9.2	35.3	2.1	0.86	0.64	8
Brown	8	7.6	8.9	35.1	1.6	0.75	0.67	8
	Average	7.3	9.1	35.2	1.8	0.81	0.65	8
DeKalb	6	7.4	9.6	36.9	1.4	0.88	0.66	9
Amber Link	8	7.4	9.3	36.3	1.4	0.81	0.65	8
	Average	7.4	9.4	36.6	1.4	0.85	0.66	8
All	6	7.3	9.5	36.6	2.3	0.88	0.64	9
Strains	8	7.2	9.2	35.6	1.4	0.83	0.64	8

[1]All strains were housed at a constant density of: 413 cm^2 equals 64 in^2.
There are no significant differences among these means.

TABLE 25. EFFECT OF BROWN EGG STRAIN AND SYNCHRONIZED MOLT ON PERFORMANCE OF HENS IN THE 37th NCLP&MT (462-490 DAYS)

Breeder	Molt Program[1]	Feed Consumption	Eggs Per Bird Housed	Egg Production	Mortality	Egg Income	Feed Costs	Days to 0% Production
(Strain)		(kg/100hens/d)		(HD%)	(%)	($/hen)	($/hen)	(Days)
ISA	NM	10.2	21.6^{W}	83.2^{VW}	1.9	2.44	0.98	.
Brown	NA20	6.0	3.1^{Z}	12.3^{Z}	1.7	0.07	0.46	9
	NA25	5.3	3.3^{YZ}	13.3^{Z}	3.5	0.14	0.43	8
Hy-Line	NM	10.5	21.0^{WX}	80.1^{WX}	1.4	2.32	1.01	.
Brown	NA20	5.3	3.5^{YZ}	13.1^{Z}	0.9	0.20	0.44	9
	NA25	5.3	3.5^{YZ}	12.8^{Z}	0.5	0.12	0.44	8
Hy-Line	NM	9.9	20.4^{X}	78.8^{X}	2.6	2.25	0.95	.
Silver Brown	NA20	5.6	4.6^{Y}	18.0^{Y}	1.4	0.21	0.42	9
	NA25	5.6	3.8^{YZ}	15.1^{YZ}	2.1	0.12	0.46	9
Bovans	NM	10.7	21.9^{W}	82.4^{VWX}	0.9	2.44	1.07	.
Brown	NA20	5.9	3.7^{YZ}	13.9^{Z}	2.5	0.14	0.47	8
	NA25	6.1	3.0^{Z}	11.8^{Z}	4.1	0.07	0.47	8
Hisex	NM	11.1	20.9^{WX}	81.3^{VWX}	1.1	2.28	1.07	.
Brown	NA20	5.5	3.3^{YZ}	12.6^{Z}	2.1	0.05	0.45	9
	NA25	5.4	3.0^{Z}	11.8^{Z}	2.3	0.09	0.45	7
DeKalb	NM	11.2	21.7^{W}	84.7^{V}	2.4	2.32	1.09	.
Amber Link	NA20	5.3	3.3^{YZ}	12.6^{Z}	0.8	0.14	0.43	8
	NA25	5.7	3.2^{Z}	12.4^{Z}	1.1	0.08	0.45	8
All	NM	10.6^{A}	21.3	81.7	1.7	2.34^{A}	1.03^{A}	.
Strains	NA20	5.6^{B}	3.6	13.7	1.6	0.13^{B}	0.44^{B}	9
	NA25	5.6^{B}	3.3	12.9	2.3	0.10^{B}	0.45^{B}	8

[1]All strains were housed at a constant density of: 413 cm^2 equals 64 in^2.

A,B - Different letters denote significant differences (P<.01), comparisons made among strain average values.

V,W,X,Y,Z - Different letters denote significant differences (P<.01), comparisons made among molt program average values.

TABLE 26. EFFECT OF BROWN EGG STRAIN AND POPULATION ON BODY WEIGHT OF HENS IN THE 37th NCLP&MT (462-490 DAYS)

Breeder	Population[1]	17 Wk Body Wt	66 Wk Body Wt	1st Cycle Wt Gain	Lowest Body Wt	Molt Wt Loss	70 Wk Body Wt
(Strain)		(kg)	(kg)	(%)	(kg)	(%)	(kg)
ISA	6	1.45	2.02	40.3	1.68	16.6	1.75
Brown	8	1.48	1.96	33.7	1.67	14.8	1.78
	Average	1.46^{A}	1.99^{ABC}	37.0^{B}	1.68^{BC}	15.7	1.77^{C}
Hy-Line	6	1.34	1.96	47.1	1.71	13.2	1.77
Brown	8	1.36	1.96	45.0	1.67	15.0	1.74
	Average	1.35^{B}	1.96^{BC}	46.1^{A}	1.69^{ABC}	14.1	1.76^{C}
Hy-Line	6	1.45	2.07	43.4	1.75	15.2	1.88
Silver Brown	8	1.41	2.08	47.8	1.78	14.5	1.89
	Average	1.43^{A}	2.07^{A}	45.6^{A}	1.76^{A}	14.9	1.89^{A}
Bovans	6	1.46	2.04	40.3	1.72	15.3	1.79
Brown	8	1.46	1.99	37.2	1.65	17.2	1.78
	Average	1.46^{A}	2.01^{ABC}	38.7^{AB}	1.68^{BC}	16.3	1.79^{BC}
Hisex	6	1.46	1.96	34.5	1.63	17.0	1.71
Brown	8	1.43	1.95	36.3	1.65	15.3	1.76
	Average	1.44^{A}	1.95^{C}	35.4^{B}	1.64^{C}	16.1	1.74^{C}
DeKalb	6	1.45	2.02	40.5	1.71	15.1	1.83
Amber Link	8	1.47	2.03	38.4	1.73	14.8	1.82
	Average	1.46^{A}	2.03^{AB}	39.4^{AB}	1.72^{AB}	15.0	1.83^{AB}
All	6	1.43	2.01	41.0	1.70	15.4	1.79
Strains	8	1.43	2.00	39.7	1.69	15.3	1.80

[1]All strains were housed at a constant density of: 413 cm^2 equals 64 in^2.

A,B,C - Different letters denote significant differences (P<.01), comparisons made among strain average values.

TABLE 27. EFFECT OF BROWN EGG STRAIN AND SYNCHRONIZED MOLT ON BODY WEIGHT OF HENS IN THE 37th NCLP&MT (462-490 DAYS)

Breeder	Molt Program	17 Wk Body Wt	66 Wk Body Wt	1st Cycle Wt Gain	Lowest Body Wt	Molt Wt Loss	70 Wk Body Wt
(Strain)		(kg)	(kg)	(%)	(kg)	(%)	(kg)
ISA	NM	1.45	1.97	36.6	1.86	5.7	1.89
Brown	NA20	1.47	2.02	38.9	1.61	20.3	1.73
	NA25	1.46	1.98	35.6	1.56	21.1	1.67
Hy-Line	NM	1.36	1.99	46.4	1.92	3.4	1.95
Brown	NA20	1.36	1.95	44.3	1.55	20.5	1.68
	NA25	1.32	1.94	47.5	1.58	18.5	1.63
Hy-Line	NM	1.39	2.04	46.5	1.94	4.8	2.01
Silver Brown	NA20	1.44	2.13	47.8	1.68	21.0	1.84
	NA25	1.45	2.06	42.5	1.67	18.9	1.81
Bovans	NM	1.41	2.00	41.9	1.89	5.3	1.91
Brown	NA20	1.48	2.02	36.8	1.60	20.8	1.75
	NA25	1.48	2.03	37.5	1.57	22.8	1.70
Hisex	NM	1.45	2.00	38.2	1.89	5.0	1.92
Brown	NA20	1.44	1.91	32.9	1.50	21.7	1.70
	NA25	1.44	1.94	35.2	1.52	21.7	1.59
DeKalb	NM	1.43	1.99	39.4	1.94	2.2	1.98
Amber Link	NA20	1.48	2.04	37.8	1.61	21.1	1.76
	NA25	1.48	2.06	41.1	1.61	21.6	1.75
All	NM	1.41	2.00	41.5	1.91^{A}	4.4^{B}	1.94^{A}
Strains	NA20	1.44	2.01	39.7	1.59^{B}	20.9^{A}	1.74^{B}
	NA25	1.44	2.00	39.9	1.59^{B}	20.8^{A}	1.69^{C}

A,B - Different letters denote significant differences (P<.01), comparisons made among molt program average values.

Table 28. 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