North Carolina
Cooperative Extension Service
NORTH CAROLINA STATE UNIVERSITY
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FINAL REPORT OF THE TWENTY-NINTH NORTH CAROLINA LAYER PERFORMANCE AND MANAGEMENT TEST

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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; and Dr. K. E. Anderson is Project Leader. The purpose of this program is to assist poultrymen in evaluation of commercial layer stocks and management systems.

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DESCRIPTION OF DATA TABLE STATISTICS

First cycle performance of white egg and brown egg strains are shown on Tables 1-15. The second cycle performance of white and brown egg strains are shown on Tables 16-30; and Tables 31-45 show the overall flock performance for both cycles.

Breeder (Strain):

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

Layer House:

"Open" denotes performance in the curtain-sided flush facility. "Closed" denotes performance in the controlled environment high rise facility.

Population and Space Allocations:

White Hens per Cage	Cage Size Width Depth	Floor Space per Bird	Feeder Space per Bird	Water Nipples per Cage
3	12" x 14"	56 in^2	4 in	2
4	16" x 14"	56 in^2	4 in	2
6	24" x 14"	56 in^2	4 in	3
8	32" x 14"	56 in^2	4 in	3

Brown Hens per Cage	Cage Size Width Depth	Floor Space per Bird	Feeder Space per Bird	Water Nipples per Cage
2	12" x 14"	84	6 in	2
3	16" x 14"	75	5.3 in	2
4	24" x 14"	84	6 in	3
6	32" x 14"	75	5.3 in	3

Eggs per Bird Housed:

The total number of eggs produced divided by the number of birds housed at 126 days.

Egg Production:

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

Egg Mass:

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

Mortality:

The percentage of birds which died between 126 and 434 days of age.

Feed Consumption:

The pounds of feed consumed daily per 100 hens.

Egg Weight:

The average egg weight of biweekly samples in grams per egg.

Egg Income:

The calculated income per hen housed at 126 days, from egg production using three-year regional average egg prices as follows:

Grade	Size	Cents/Dozen
A	Extra Large	79.8
A	Large	79.8
A	Medium	71.15
A	Small	57.02
A	Pee Wee	28.51
B	All	28.51
Cracks	All	42.29

Feed Cost:

The calculated feed cost per hen housed at 126 days, using average price per ton.

Diets	Price
D	168.86
E	164.35
F	159.05
G	161.58
H	148.42
I	144.57
M	142.76
N	137.13
O	137.82
P	128.77
Q	139.76

Grade Information:

The average grade of eggs according to USDA grading standards.

Egg Size Distribution:

The proportion of the eggs falling into the following size categories:

Size Category	Ounces/Dozen
Pee Wee	< 18
Small	18 - 21
Medium	21 - 24
Large	24 - 27
Extra Large	> 27

Egg Production Curves:

Figures 1-14 show the production curves for each strain averaged on a biweekly basis over rep and house type. In addition, changes in feed consumption during the production period are illustrated.

TABLE 1. EFFECTS OF LAYING HOUSE ON PERFORMANCE OF WHITE EGG ENTRIES, 29TH NCLP&MT (140-434 DAYS)

Breeder (Strain)	Laying House	Feed Cons (lbs/100 hens/d)	Egg Weight (g/egg)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality > 140d (%)
DeKalb	Closed	25.2	59.7	224.6	77.3	46.9	12.0
(XL-Link)	Open	25.3	59.7	221.5	76.9	46.6	11.0
	Average	25.2[A]	59.7[A]	223.0[B]	77.1[BC]	46.8[AB]	11.5[A]
H & N	Closed	24.9	59.5	231.7	77.5	46.9	7.2
(Nick Chick)	Open	24.8	59.3	230.8	78.0	47.0	8.1
	Average	24.8[A]	59.4[AB]	231.2[A]	77.8[AB]	46.9[AB]	7.7[ABC]
Hisex	Closed	25.3	59.4	226.3	77.6	46.8	10.2
(White)	Open	25.0	59.4	223.2	76.7	46.3	9.4
	Average	25.2[A]	59.4[AB]	224.7[AB]	77.1[BC]	46.5[AB]	9.8[AB]
ISA/Babcock	Closed	24.8	59.2	230.3	77.4	46.5	6.6
(B300)	Open	24.8	59.3	232.0	77.7	46.7	7.3
	Average	24.8[A]	59.2[AB]	231.1[A]	77.5[ABC]	46.6[AB]	6.9[BC]
HyLine	Closed	22.7	57.2	230.6	76.2	44.3	4.3
(W-36)	Open	22.8	57.5	230.8	76.6	44.6	4.1
	Average	22.7[B]	57.4[D]	230.7[A]	76.4[C]	44.4[C]	4.2[C]
Shaver	Closed	25.2	58.5	227.4	77.5	46.1	8.4
(288A)	Open	25.3	58.5	231.4	77.7	46.1	6.4
	Average	25.2[A]	58.5[C]	229.4[AB]	77.6[ABC]	46.1[B]	7.4[ABC]
Tatum	Closed	25.2	58.8	232.9	79.1	47.3	8.6
(T-100)	Open	25.0	59.3	230.6	78.7	47.2	8.6
	Average	25.1[A]	59.0[BC]	231.7[A]	78.9[A]	47.2[A]	8.6[AB]
All Strains	Closed	24.8	58.9	229.1	77.5	46.4	8.2
	Open	24.7	59.0	228.6	77.5	46.4	7.8
	Average	24.7	58.9	228.9	77.5	46.4	8.0

A,B,C,D - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

TABLE 2. EFFECTS OF LAYING HOUSE ON EGG SIZE DISTRIBUTION OF WHITE EGG ENTRIES, 29TH NCLP&MT (140-434 DAYS)

Breeder (Strain)	Laying House	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
DeKalb	Closed	2.8	7.6	17.5	37.9	34.1
(XL-Link)	Open	3.0	6.9	17.6	39.4	33.1
	Average	2.9	7.3[B]	17.6[BCD]	38.7	33.6[A]
H & N	Closed	3.5	6.9	16.4	40.9	32.4
(Nick Chick)	Open	3.3	7.2	17.3	41.4	30.8
	Average	3.4	7.0[B]	16.9[CD]	41.1	31.6[AB]
Hisex	Closed	3.0	7.8	16.2	40.7	32.3
(White)	Open	3.9	6.6	16.1	41.4	31.9
	Average	3.4	7.2[B]	16.2[D]	41.1	32.1[AB]
ISA/Babcock	Closed	3.7	7.9	16.3	39.9	32.3
(B300)	Open	4.1	7.2	15.9	40.5	32.4
	Average	3.9	7.5[B]	16.1[D]	40.2	32.3[AB]
HyLine	Closed	4.8	10.4	23.3	40.4	21.0
(W-36)	Open	3.8	10.7	22.1	42.4	20.9
	Average	4.3	10.6[A]	22.7[A]	41.4	21.0[D]
Shaver	Closed	3.7	7.9	19.9	41.4	27.1
(288A)	Open	3.8	7.9	19.3	42.5	26.5
	Average	3.7	7.9[B]	19.6[B]	42.0	26.8[C]
Tatum	Closed	3.8	7.2	18.0	41.8	28.9
(T-100)	Open	2.5	7.6	18.8	40.4	30.7
	Average	3.2	7.4[B]	18.4[BC]	41.1	29.8[BC]
All Strains	Closed	3.6	8.0	18.2	40.4	29.7
	Open	3.5	7.7	18.2	41.1	29.5
	Average	3.5	7.8	18.2	40.8	29.6

A,B,C,D - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

TABLE 3. EFFECTS OF LAYING HOUSE ON EGG QUALITY AND INCOME OF WHITE EGG ENTRIES, 29TH NCLP&MT (140-434 DAYS)

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
DeKalb	Closed	96.3	1.7	1.8	0.2	14.13	5.18
(XL-Link)	Open	96.4	2.3	1.1	0.2	13.90	5.18
	Average	96.4[C]	2.0[AB]	1.4	0.2	14.02	5.18[A]
H & N	Closed	96.3	2.2	1.1	0.3	14.48	5.27
(Nick Chick)	Open	96.7	2.4	0.7	0.1	14.45	5.19
	Average	96.5[BC]	2.3[A]	0.9	0.2	14.46	5.23[A]
Hisex	Closed	96.8	1.7	1.2	0.2	14.20	5.24
(White)	Open	96.3	2.1	1.3	0.3	13.94	5.17
	Average	96.6[BC]	1.9[ABC]	1.3	0.3	14.07	5.21[A]
ISA/Babcock	Closed	97.4	1.4	0.9	0.3	14.44	5.22
(B300)	Open	97.2	1.5	1.0	0.3	14.51	5.24
	Average	97.3[AB]	1.5[BC]	1.0	0.3	14.48	5.23[A]
HyLine	Closed	97.4	1.6	0.8	0.2	14.16	4.87
(W-36)	Open	97.6	1.4	0.9	0.2	14.26	4.86
	Average	97.5[A]	1.5[BC]	0.8	0.2	14.21	4.86[B]
Shaver	Closed	97.8	1.0	1.1	0.1	14.25	5.23
(288A)	Open	96.9	1.6	1.3	0.2	14.44	5.34
	Average	97.3[AB]	1.3[C]	1.2	0.2	14.35	5.28[A]
Tatum	Closed	97.3	1.6	0.9	0.2	14.57	5.26
(T-100)	Open	95.9	2.5	1.3	0.3	14.32	5.19
	Average	96.6[BC]	2.0[AB]	1.1	0.3	14.45	5.23[A]
All Strains	Closed	97.0	1.6	1.1	0.2	14.32	5.18
	Open	96.7	2.0	1.1	0.2	14.26	5.17
	Average	96.9	1.8	1.1	0.2	14.29	5.17

A,B,C - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

TABLE 4. EFFECTS OF POPULATION SIZE ON PERFORMANCE OF WHITE EGG ENTRIES, 29TH NCLP&MT (140-434 DAYS)*

Breeder (Strain)	Population (Birds /Cage)	Feed Cons (lbs/100 hens/d)	Egg Weight (g/egg)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality > 140d (%)
DeKalb	3	24.9	60.0	224.3	77.5	47.4	11.8
(XL-Link)	4	25.8	59.7	220.7	77.9	47.2	13.0
	6	24.8	59.7	221.2	75.9	46.1	10.8
	8	25.4	59.3	225.9	76.9	46.4	10.4
H & N	3	24.8	59.1	233.1	78.4	47.0	9.4
(Nick Chick)	4	24.7	59.7	230.0	77.8	47.1	7.8
	6	24.6	59.2	231.8	77.4	46.7	5.7
	8	25.3	59.5	230.1	77.5	46.9	7.8
Hisex	3	24.9	59.4	228.8	77.4	46.7	7.3
(White)	4	25.0	59.0	229.8	77.7	46.4	8.9
	6	25.5	59.5	219.8	77.2	46.6	13.0
	8	25.3	59.8	220.5	76.3	46.4	10.1
ISA/Babcock	3	24.1	58.8	232.3	77.2	46.0	6.9
(B300)	4	24.4	59.6	231.1	76.7	46.3	4.7
	6	25.1	59.4	232.3	78.2	47.1	8.3
	8	25.4	59.2	228.9	78.1	46.9	7.8
HyLine	3	22.7	57.6	229.8	75.5	44.2	3.1
(W-36)	4	22.6	57.2	224.5	76.1	44.1	6.9
	6	22.7	57.2	233.1	76.6	44.5	4.2
	8	23.0	57.5	235.3	77.2	45.0	2.6
Shaver	3	24.8	58.6	227.5	77.0	45.8	8.0
(288A)	4	25.5	58.9	227.8	78.1	46.7	9.0
	6	25.3	58.0	229.6	78.5	46.2	8.7
	8	25.4	58.4	232.6	76.8	45.7	3.9
Tatum	3	25.0	59.1	234.1	78.7	47.1	6.2
(T-100)	4	25.0	59.2	231.3	79.1	47.4	10.4
	6	25.4	59.2	233.2	79.8	48.0	7.3
	8	25.1	58.5	228.4	78.2	46.5	10.4
All Strains	3	24.5	58.9	230.0	77.4	46.3	7.5
	4	24.7	59.0	227.8	77.6	46.5	8.7
	6	24.8	58.9	228.7	77.6	46.5	8.3
	8	25.0	58.9	228.8	77.3	46.2	7.6

*There are no significant differences among these means.

TABLE 5. EFFECTS OF POPULATION SIZE ON EGG SIZE DISTRIBUTION OF WHITE EGG ENTRIES, 29TH NCLP&MT (140-434 DAYS)*

Breeder (Strain)	Population (Birds /Cage)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
DeKalb	3	2.2	7.9	16.7	37.1	36.1
(XL-Link)	4	2.1	8.0	17.7	39.8	32.5
	6	3.5	6.1	18.0	36.9	35.5
	8	4.0	7.0	17.8	41.0	30.2
H & N	3	2.5	8.0	18.7	42.1	28.7
(Nick Chick)	4	3.8	5.6	16.8	40.2	33.7
	6	3.3	8.0	15.4	43.1	30.3
	8	4.0	6.6	16.6	39.1	33.8
Hisex	3	4.0	7.0	15.3	41.0	32.7
(White)	4	3.4	7.8	17.0	43.3	28.6
	6	3.1	6.8	17.2	41.2	31.7
	8	3.3	7.2	15.2	38.8	35.5
ISA/Babcock	3	3.9	7.5	17.8	42.4	28.5
(B300)	4	3.4	7.3	15.2	40.3	33.8
	6	3.8	7.9	15.0	39.2	34.1
	8	4.5	7.5	16.3	38.8	32.9
HyLine	3	4.6	9.8	21.8	42.3	21.6
(W-36)	4	4.1	11.1	24.3	40.0	20.5
	6	4.9	10.3	22.6	41.8	20.4
	8	3.8	11.1	22.1	41.5	21.5
Shaver	3	3.4	8.7	18.7	41.9	27.3
(288A)	4	2.9	8.3	18.6	40.2	30.0
	6	4.8	7.2	20.9	42.8	24.2
	8	3.8	7.4	20.3	43.0	25.6
Tatum	3	3.5	6.7	18.1	42.0	29.8
(T-100)	4	2.5	7.9	19.3	39.2	31.1
	6	3.2	7.6	17.2	41.8	30.3
	8	3.5	7.4	19.1	41.4	28.1
All Strains	3	3.4	7.9	18.2	41.3	29.2
	4	3.1	8.0	18.4	40.4	30.0
	6	3.8	7.7	18.0	41.0	29.5
	8	3.8	7.7	18.2	40.5	29.6

*There are no significant differences among these means.

TABLE 6. EFFECTS OF POPULATION SIZE ON EGG QUALITY AND INCOME OF WHITE EGG ENTRIES, 29TH NCLP&MT (140-434 DAYS)*

Breeder (Strain)	Population (Birds /Cage)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
DeKalb (XL-Link)	3	96.1	1.9	1.7	0.2	14.14	5.11
	4	96.3	2.1	1.4	0.1	13.87	5.21
	6	97.1	1.4	1.2	0.2	13.93	5.13
	8	95.9	2.6	1.3	0.2	14.13	5.27
H & N (Nick Chick)	3	96.7	2.2	1.0	0.1	14.59	5.22
	4	95.8	2.9	1.0	0.4	14.33	5.18
	6	96.5	2.1	1.1	0.2	14.50	5.22
	8	97.0	2.2	0.6	0.2	14.43	5.31
Hisex (White)	3	97.2	1.6	1.0	0.2	14.37	5.22
	4	96.1	1.9	1.6	0.4	14.27	5.25
	6	96.6	1.9	1.4	0.1	13.81	5.16
	8	96.5	2.2	1.1	0.3	13.83	5.19
ISA/Babcock (B300)	3	97.2	1.6	0.9	0.3	14.53	5.14
	4	97.6	1.5	0.7	0.2	14.53	5.21
	6	97.2	1.2	1.2	0.3	14.55	5.30
	8	97.2	1.5	1.0	0.3	14.29	5.28
HyLine (W-36)	3	97.5	1.4	1.0	0.1	14.23	4.88
	4	98.0	1.4	0.5	0.1	13.81	4.73
	6	97.3	1.6	0.9	0.2	14.32	4.88
	8	97.2	1.5	1.0	0.3	14.47	4.97
Shaver (288A)	3	97.9	1.0	0.9	0.2	14.26	5.19
	4	97.5	1.1	1.2	0.2	14.28	5.26
	6	96.9	1.8	1.1	0.2	14.30	5.24
	8	96.9	1.4	1.6	0.1	14.54	5.43
Tatum (T-100)	3	96.1	2.5	1.2	0.1	14.59	5.27
	4	96.6	2.0	1.1	0.3	14.41	5.19
	6	96.8	1.7	1.0	0.4	14.59	5.26
	8	97.0	1.8	1.0	0.2	14.20	5.19
All Strains	3	97.0	1.7	1.1	0.2	14.39	5.15
	4	96.8	1.8	1.1	0.3	14.22	5.15
	6	96.9	1.7	1.1	0.2	14.28	5.17
	8	96.8	1.9	1.1	0.2	14.27	5.23

*There are no significant differences among these means.

TABLE 7. EFFECTS OF LAYING HOUSE ON PERFORMANCE OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-434 DAYS)

Breeder (Strain)	Laying House	Feed Cons (lbs/100 hens/d)	Egg Weight (g/egg)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality > 140d (%)
HyLine	Closed	27.6	61.6	238.2	79.3	49.3	4.9
(Brown)	Open	27.3	62.0	244.6	80.4	50.3	3.3
	Average	27.4[BC]	61.8[C]	241.4[A]	79.8[B]	49.8[B]	4.1[B]
Hisex	Closed	27.0	62.1	230.6	76.7	48.0	5.8
(Brown)	Open	27.7	63.1	230.5	77.8	49.5	7.4
	Average	27.4[BC]	62.6[BC]	230.5[BC]	77.2[C]	48.8[BCD]	6.6[AB]
ISA	Closed	26.7	63.5	231.8	76.2	49.1	3.8
(Brown)	Open	27.0	63.4	228.7	77.0	49.5	8.4
	Average	26.8[C]	63.5[A]	230.2[BC]	76.6[CD]	49.3[BC]	6.1[AB]
H & N	Closed	27.6	62.5	247.5	83.1	52.1	7.8
(Brown Nick)	Open	27.6	62.6	246.6	82.8	52.2	6.0
	Average	27.6[BC]	62.5[BC]	247.1[A]	82.9[A]	52.2[A]	6.9[AB]
DeKalb	Closed	28.9	62.6	224.4	75.0	48.1	8.1
(Sex-Sal-Link)	Open	29.4	62.7	221.6	74.9	47.9	10.9
	Average	29.2[A]	62.7[BC]	223.0[C]	75.0[DE]	48.0[CD]	9.5[A]
Tatum	Closed	27.7	62.8	223.6	74.1	47.4	4.6
(T-173)	Open	27.9	63.4	224.0	74.5	48.3	5.9
	Average	27.8[B]	63.1[AB]	223.8[C]	74.3[E]	47.8[D]	5.2[AB]
Arbor Acres	Closed	28.0	62.4	232.4	76.9	48.7	3.2
(Brown)	Open	27.5	62.0	232.8	76.2	48.2	2.9
	Average	27.7[B]	62.2[C]	232.6[B]	76.6[CD]	48.4[CD]	3.1[B]
All Strains	Closed	27.6	62.5	232.6	77.3	49.0	5.5
	Open	27.8	62.7	232.7	77.7	49.4	6.4
	Average	27.7	62.6	232.7	77.5	49.2	5.9

A,B,C,D,E - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

TABLE 8. EFFECTS OF LAYING HOUSE ON EGG SIZE DISTRIBUTION OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-434 DAYS)

Breeder (Strain)	Laying House	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
HyLine	Closed	0.9	4.8	15.2^{V}	35.3	43.8
(Brown)	Open	1.2	4.4	13.5^{VWX}	35.5	45.4
	Average	1.0^{BC}	4.6	14.3	35.4^{A}	44.6^{C}
Hisex	Closed	1.3	4.1	14.2^{VW}	33.7	46.7
(Brown)	Open	1.5	3.7	10.0^{YZ}	30.5	54.3
	Average	1.4^{ABC}	3.9	12.1	32.1^{AB}	50.5^{B}
ISA	Closed	0.8	4.0	11.0^{XYZ}	27.6	56.5
(Brown)	Open	1.4	3.4	10.6^{YZ}	28.9	55.7
	Average	1.1^{BC}	3.7	10.8	28.3^{C}	56.1^{A}
H & N	Closed	0.6	3.5	13.5^{VWX}	34.6	47.8
(Brown Nick)	Open	1.0	4.4	11.7^{WXYZ}	33.5	49.4
	Average	0.8^{C}	4.0	12.6	34.1^{A}	48.6^{BC}
DeKalb	Closed	1.6	5.2	12.1^{WXY}	29.2	52.0
(Sex-Sal-Link)	Open	2.3	4.8	10.9^{XYZ}	28.6	53.5
	Average	2.0^{AB}	5.0	11.5	28.9^{BC}	52.7^{AB}
Tatum	Closed	1.8	5.3	10.4^{YZ}	28.7	53.8
(T-173)	Open	2.6	4.1	9.3^{Z}	26.7	57.2
	Average	2.2^{A}	4.7	9.8	27.7^{C}	55.5^{AB}
Arbor Acres	Closed	1.5	5.0	12.2^{WXY}	32.4	48.9
(Brown)	Open	2.2	4.3	12.3^{WXY}	34.4	46.9
	Average	1.8^{ABC}	4.6	12.2	33.4^{A}	47.9^{BC}
All Strains	Closed	1.2	4.6	12.6	31.6	49.9
	Open	1.7	4.1	11.2	31.2	51.8
	Average	1.5	4.3	11.9	31.4	50.8

A,B,C - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

V,W,X,Y,Z - Differing letters denote significant differences ($P < .01$), comparisons made among laying house and strain combinations.

TABLE 9. EFFECTS OF LAYING HOUSE ON EGG QUALITY AND INCOME OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-434 DAYS)

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
HyLine	Closed	96.7	2.1	0.9	0.3	15.14	6.03
(Brown)	Open	97.4	1.8	0.7	0.2	15.65	6.07
	Average	97.1	1.9	0.8	0.2	15.40[A]	6.05[BC]
Hisex	Closed	96.9	1.6	1.1	0.4	14.66	5.91
(Brown)	Open	96.2	2.2	1.1	0.5	14.67	6.00
	Average	96.5	1.9	1.1	0.5	14.67[BC]	5.95[C]
ISA	Closed	97.3	1.7	0.5	0.5	14.88	5.92
(Brown)	Open	96.0	2.1	1.5	0.4	14.67	5.90
	Average	96.6	1.9	1.0	0.5	14.78[BC]	5.91[C]
H & N	Closed	96.4	2.2	1.0	0.5	15.69	6.01
(Brown Nick)	Open	96.9	1.9	0.5	0.7	15.67	6.01
	Average	96.6	2.0	0.8	0.6	15.68[A]	6.01[BC]
DeKalb	Closed	94.9	2.5	2.1	0.4	14.32	6.28
(Sex-Sal-Link)	Open	96.3	2.4	1.0	0.4	14.18	6.33
	Average	95.6	2.5	1.6	0.4	14.25[C]	6.31[A]
Tatum	Closed	96.4	2.3	1.1	0.3	14.26	6.08
(T-173)	Open	96.0	1.8	1.5	0.6	14.28	6.13
	Average	96.2	2.1	1.3	0.4	14.27[C]	6.11[BC]
Arbor Acres	Closed	96.8	1.5	1.5	0.2	14.88	6.21
(Brown)	Open	96.3	2.4	1.1	0.2	14.85	6.12
	Average	96.5	1.9	1.3	0.2	14.87[B]	6.17[AB]
All Strains	Closed	96.5	2.0	1.2	0.4	14.83	6.06
	Open	96.4	2.1	1.1	0.4	14.85	6.08
	Average	96.5	2.0	1.1	0.4	14.84	6.07

A,B,C - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

TABLE 10. EFFECTS OF POPULATION ON PERFORMANCE OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-434 DAYS)

Breeder (Strain)	Population (Birds /Cage)	Feed Cons (lbs/100 hens/d)	Egg Weight (g/egg)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality > 140d (%)
HyLine (Brown)	2	27.5	61.8	243.7	80.3	50.0	3.1
	3	26.5	61.7	238.0	78.7	49.0	4.2
	4	27.9	62.0	242.1	81.0	50.8	7.0
	6	27.9	61.7	241.9	79.3	49.5	2.1
Hisex (Brown)	2	27.0	62.4	227.1	77.1	48.5	7.8
	3	26.7	62.7	233.9	76.8	48.7	6.2
	4	28.3	62.2	241.9	79.0	49.7	2.3
	6	27.5	62.9	219.1	76.0	48.3	10.1
ISA (Brown)	2	26.8	63.0	232.9	77.7	49.8	7.0
	3	26.6	63.4	227.8	75.2	48.2	4.2
	4	27.2	64.1	237.9	77.9	50.5	3.8
	6	26.8	63.4	222.2	75.4	48.5	9.3
H & N (Brown Nick)	2	26.7	62.4	252.6	82.8	52.0	5.2
	3	27.8	61.9	247.2	83.8	52.2	7.3
	4	28.6	63.0	253.4	83.5	52.9	4.8
	6	27.4	62.8	235.0	81.6	51.6	10.4
DeKalb (Sex-Sal-Link)	2	28.8	62.0	231.3	76.7	48.6	3.9
	3	28.3	62.2	228.8	76.1	48.6	6.2
	4	30.1	63.0	222.7	75.5	48.6	9.6
	6	29.3	63.4	209.3	71.5	46.3	18.1
Tatum (T-173)	2	27.7	63.5	222.1	73.9	48.0	5.5
	3	26.8	63.1	223.9	74.2	47.4	4.4
	4	28.4	62.7	225.9	75.2	48.1	6.3
	6	28.3	63.1	223.4	74.1	47.9	4.9
Arbor Acres (Brown)	2	27.5	61.1	231.7	76.9	47.7	3.3
	3	27.6	62.9	233.0	76.5	48.8	1.7
	4	28.8	62.8	236.2	77.2	49.5	4.2
	6	27.1	62.0	229.7	75.8	47.7	3.1
All Strains	2	27.4^{B}	62.3	234.5^{A}	77.9^{A}		5.1
	3	27.2^{B}	62.6	233.2^{A}	77.3^{AB}	49.2^{AB}	4.9
	4	28.5^{A}	62.8	237.1^{A}	78.5^{A}	49.0^{B}	5.4
	6	27.8^{B}	62.8	225.8^{B}	76.3^{B}	50.0^{A}	8.3
						48.6^{B}	

A,B - Differing letters denote significant differences ($P < .01$).

TABLE 11. EFFECTS OF POPULATION ON EGG SIZE DISTRIBUTION OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-434 DAYS)*

Breeder (Strain)	Population (Birds /Cage)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
HyLine (Brown)	2	0.5	4.3	14.0	36.8	44.4
	3	1.3	4.1	14.2	36.6	43.8
	4	0.8	5.2	14.5	32.9	46.6
	6	1.5	4.8	14.5	35.4	43.9
Hisex (Brown)	2	0.7	4.0	12.8	34.0	48.5
	3	1.7	3.7	12.8	30.0	51.8
	4	2.4	4.1	11.2	32.4	49.9
	6	0.7	3.9	11.5	32.1	51.8
ISA (Brown)	2	1.9	3.7	11.4	29.2	53.8
	3	0.9	3.5	10.8	29.1	55.7
	4	0.9	3.1	10.5	26.3	59.3
	6	0.8	4.5	10.6	28.5	55.6
H & N (Brown Nick)	2	0.8	4.4	12.9	33.9	47.9
	3	1.0	3.8	13.3	35.3	46.6
	4	0.9	3.7	12.1	31.4	51.9
	6	0.6	3.9	12.1	35.6	47.9
DeKalb (Sex-Sal-Link)	2	2.4	5.4	11.8	31.3	49.2
	3	2.8	5.3	12.2	28.7	51.0
	4	2.6	2.3	11.9	28.4	54.8
	6	0.1	6.9	10.0	27.2	55.8
Tatum (T-173)	2	1.7	4.5	9.9	25.4	58.6
	3	2.3	4.3	10.0	30.9	52.5
	4	2.7	4.9	10.9	27.2	54.3
	6	2.2	5.1	8.7	27.3	56.7
Arbor Acres (Brown)	2	2.0	6.3	12.2	35.6	43.8
	3	1.2	3.5	12.9	31.7	50.6
	4	2.2	4.1	10.8	32.2	50.6
	6	1.8	4.5	12.9	34.2	46.6
All Strains	2	1.4	4.7	12.1	32.3	49.4
	3	1.6	4.0	12.3	31.7	50.3
	4	1.8	3.9	11.7	30.1	52.5
	6	1.1	4.8	11.5	31.5	51.2

*There are no significant differences among these means.

TABLE 12. EFFECTS OF POPULATION ON EGG QUALITY AND INCOME OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-434 DAYS)

Breeder (Strain)	Population (Birds /Cage)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
HyLine (Brown)	2	97.2	1.8	0.7	0.2	15.59	6.09
	3	96.1	2.9	0.9	0.1	15.12	5.83
	4	97.7	1.5	0.6	0.2	15.46	6.09
	6	97.2	1.5	0.8	0.5	15.44	6.20
Hisex (Brown)	2	97.2	1.7	0.9	0.2	14.52	5.80
	3	96.5	1.8	1.1	0.6	14.85	5.92
	4	96.7	1.7	1.2	0.5	15.38	6.32
	6	95.8	2.3	1.2	0.6	13.91	5.77
ISA (Brown)	2	97.4	1.5	0.6	0.5	14.93	5.87
	3	96.1	1.9	1.5	0.4	14.63	5.88
	4	96.2	2.5	0.8	0.5	15.24	6.14
	6	96.8	1.5	1.2	0.5	14.30	5.76
H & N (Brown Nick)	2	97.3	1.4	1.0	0.4	16.11	5.96
	3	96.6	2.2	0.5	0.7	15.65	5.99
	4	95.6	2.8	0.8	0.8	15.99	6.34
	6	97.0	1.7	0.8	0.5	14.98	5.75
DeKalb (Sex-Sal-Link)	2	96.7	1.9	1.1	0.3	14.87	6.35
	3	96.1	2.8	0.8	0.4	14.60	6.20
	4	95.6	2.5	1.3	0.6	14.18	6.46
	6	93.9	2.6	3.1	0.3	13.35	6.23
Tatum (T-173)	2	96.1	2.0	1.5	0.4	14.14	6.09
	3	95.4	2.8	1.3	0.4	14.25	5.89
	4	96.1	2.4	1.2	0.3	14.38	6.23
	6	97.2	1.1	1.2	0.6	14.31	6.22
Arbor Acres (Brown)	2	97.1	2.0	0.8	0.1	14.74	6.07
	3	96.5	2.0	1.2	0.2	14.89	6.14
	4	96.4	1.4	2.1	0.1	15.20	6.45
	6	96.1	2.3	1.2	0.4	14.63	6.01
All Strains	2	97.0	1.8	0.9	0.3	14.99^{A}	6.03^{B}
	3	96.2	2.3	1.0	0.4	14.86^{A}	5.98^{B}
	4	96.3	2.1	1.1	0.4	15.12^{A}	6.29^{A}
	6	96.3	1.9	1.3	0.5	14.42^{B}	5.99^{B}

A,B - Differing letters denote significant differences ($P < .01$).

TABLE 14. EFFECTS OF DENSITY ON EGG SIZE DISTRIBUTION OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-434 DAYS)*

Breeder (Strain)	Density[1] (sq in /bird)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
HyLine	74.6	1.4	4.4	14.4	36.0	43.8
(Brown)	84	0.7	4.8	14.3	34.8	45.5
Hisex	74.6	1.2	3.8	12.2	31.0	51.8
(Brown)	84	1.5	4.1	12.0	33.2	49.2
ISA	74.6	0.8	4.0	10.7	28.9	55.6
(Brown)	84	1.4	3.4	11.0	27.7	56.5
H & N	74.6	0.8	3.9	12.7	35.4	47.3
(Brown Nick)	84	0.9	4.1	12.6	32.7	49.8
DeKalb	74.6	1.5	6.1	11.1	27.9	53.4
(Sex-Sal-Link)	84	2.4	4.0	11.8	30.0	51.8
Tatum	74.6	2.2	4.8	9.3	29.0	54.7
(T-173)	84	2.2	4.7	10.4	26.3	56.4
Arbor Acres	74.6	1.5	4.0	12.8	32.9	48.8
(Brown)	84	2.1	5.1	11.4	33.7	47.7
All Strains	74.6	1.3	4.4	11.9	31.6	50.8
	84	1.6	4.3	11.9	31.2	51.0

[1]Cages with densities of 84 or 74.6 sq. in./bird had populations of 2 and 4 or 3 and 6 birds, respectively.
*There are no significant differences among these means.

TABLE 15. EFFECTS OF DENSITY ON EGG QUALITY AND INCOME OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-434 DAYS)

Breeder (Strain)	Density[1] (sq in /bird)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
HyLine	74.6	96.7	2.2	0.9	0.3	15.28	6.01
(Brown)	84	97.5	1.6	0.7	0.2	15.52	6.09
Hisex	74.6	96.2	2.1	1.2	0.6	14.38	5.85
(Brown)	84	96.9	1.7	1.0	0.3	14.95	6.06
ISA	74.6	96.4	1.8	1.3	0.5	14.45	5.82
(Brown)	84	96.8	2.0	0.7	0.5	15.09	6.00
H & N	74.6	96.8	1.9	0.6	0.6	15.31	5.87
(Brown Nick)	84	96.4	2.1	0.9	0.6	16.05	6.15
DeKalb	74.6	95.0	2.7	1.9	0.3	13.98	6.21
(Sex-Sal-Link)	84	96.2	2.2	1.1	0.5	14.55	6.40
Tatum	74.6	96.4	1.8	1.3	0.5	14.27	6.06
(T-173)	84	96.1	2.2	1.3	0.4	14.26	6.16
Arbor Acres	74.6	96.4	2.2	1.2	0.3	14.76	6.07
(Brown)	84	96.6	1.7	1.6	0.1	15.02	6.29
All Strains	74.6	96.3	2.1	1.2	0.4	14.63[B]	5.99[B]
	84	96.7	1.9	1.0	0.4	15.06[A]	6.16[A]

[1]Cages with densities of 84 or 74.6 sq. in./bird had populations of 2 and 4 or 3 and 6 birds, respectively.

A,B - Differing letters denote significant differences ($P < .01$).

TABLE 16. EFFECTS OF LAYING HOUSE ON PERFORMANCE OF WHITE EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)

Breeder (Strain)	Laying House	Feed Cons (lbs/100 hens/d)	Egg Weight (g/egg)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality > 140d (%)
DeKalb	Closed	27.0[VWX]	65.5	163.2	72.1	48.2	19.5
(XL-Link)	Open	26.1[XY]	65.2	164.3	72.1	47.2	19.0
	Average	26.5	65.4[ABC]	163.8[ABC]	72.1[A]	47.7[AB]	19.2[A]
H & N	Closed	27.6[V]	66.2	170.5	73.9	49.6	17.7
(Nick Chick)	Open	25.8[Y]	65.4	167.3	71.6	48.4	16.9
	Average	26.7	65.8[AB]	168.9[AB]	72.8[A]	49.0[A]	17.3[AB]
Hisex	Closed	27.5[VW]	66.0	158.3	70.6	47.3	19.2
(White)	Open	26.5[WXY]	65.8	155.8	68.3	45.8	19.0
	Average	27.0	65.9[A]	157.0[C]	69.4[B]	46.5[BC]	19.1[A]
ISA/Babcock	Closed	26.4[WXY]	65.8	170.8	69.0	45.7	10.2
(B300)	Open	26.0[XY]	66.0	162.7	69.0	46.8	15.6
	Average	26.2	65.9[A]	166.7[ABC]	69.0[B]	46.2[BC]	12.9[BC]
HyLine	Closed	24.6[Z]	64.9	168.9	68.8	44.9	11.6
(W-36)	Open	23.6[Z]	64.8	177.8	69.4	47.2	7.3
	Average	24.1	64.9[C]	173.3[A]	69.1[B]	46.0[C]	9.5[C]
Shaver	Closed	26.9[VWX]	65.4	159.9	65.4	43.8	11.2
(288A)	Open	25.8[Y]	64.8	160.2	66.3	44.0	11.2
	Average	26.4	65.1[BC]	160.0[BC]	65.9[C]	43.9[D]	11.2[C]
Tatum	Closed	27.3[VW]	65.5	170.5	73.6	48.5	17.4
(T-100)	Open	26.4[WXY]	65.5	166.7	72.8	48.5	19.8
	Average	26.9	65.5[ABC]	168.6[AB]	73.2[A]	48.5[A]	18.6[A]
All Strains	Closed	26.8	65.6	166.0	70.5	46.9	15.3
	Open	25.7	65.4	165.0	69.9	46.8	15.5
	Average	26.3	65.5	165.5	70.2	46.8	15.4

A,B,C - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

V,W,X,Y,Z - Differing letters denote significant differences ($P < .01$), comparisons made among laying house and strain combinations.

TABLE 17. EFFECTS OF LAYING HOUSE ON EGG SIZE DISTRIBUTION OF WHITE EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)

Breeder (Strain)	Laying House	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
DeKalb (XL-Link)	Closed	0.0	0.0	2.3	26.5	71.5
	Open	0.1	0.2	3.1	27.3	69.2
	Average	0.1	0.1	2.7	26.9[AB]	70.3[ABC]
H & N (Nick Chick)	Closed	0.2	0.0	1.4	21.4	77.4
	Open	0.0	0.1	3.6	25.5	70.5
	Average	0.1	0.0	2.5	23.4[B]	73.9[AB]
Hisex (White)	Closed	0.1	0.1	2.0	23.0	74.8
	Open	0.2	0.0	1.8	26.4	72.7
	Average	0.1	0.0	1.9	24.7[B]	73.7[AB]
ISA/Babcock (B300)	Closed	0.5	0.0	1.9	22.4	75.3
	Open	0.1	0.0	1.5	24.3	74.4
	Average	0.3	0.0	1.7	23.4[B]	74.9[A]
HyLine (W-36)	Closed	0.1	0.0	2.6	33.0	64.0
	Open	0.0	0.1	2.3	29.6	68.0
	Average	0.1	0.0	2.4	31.3[A]	66.0[C]
Shaver (288A)	Closed	0.1	0.0	2.0	26.2	71.1
	Open	0.1	0.2	2.7	31.1	65.3
	Average	0.1	0.1	2.4	28.6[AB]	68.2[BC]
Tatum (T-100)	Closed	0.1	0.4	3.3	25.3	71.3
	Open	0.1	0.1	2.3	25.7	71.9
	Average	0.1	0.2	2.8	25.5[B]	71.6[ABC]
All Strains	Closed	0.2	0.1	2.2	25.4	72.2
	Open	0.1	0.1	2.5	27.1	70.3
	Average	0.1	0.1	2.3	26.3	71.2

A,B,C - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

TABLE 18. EFFECTS OF LAYING HOUSE ON EGG QUALITY AND INCOME OF WHITE EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
DeKalb	Closed	95.0	3.0	1.6	0.4	10.52	3.34
(XL-Link)	Open	94.9	2.9	1.9	0.4	10.52	3.45
	Average	94.9^{B}	3.0^{A}	1.8^{AB}	0.4^{B}	10.52^{BC}	3.39
H & N	Closed	94.7	3.1	1.7	0.4	10.99	3.50
(Nick Chick)	Open	95.0	2.5	1.8	0.5	10.70	3.44
	Average	94.8^{B}	2.8^{AB}	1.8^{AB}	0.4^{B}	10.84^{AB}	3.47
Hisex	Closed	94.4	2.5	2.1	0.9	10.11	3.33
(White)	Open	94.7	2.2	2.4	0.7	10.09	3.47
	Average	94.5^{B}	2.3^{ABC}	2.3^{A}	0.8^{A}	10.10^{C}	3.40
ISA/Babcock	Closed	94.6	2.7	1.8	0.6	10.91	3.56
(B300)	Open	94.9	2.2	2.3	0.6	10.50	3.47
	Average	94.8^{B}	2.4^{ABC}	2.1^{A}	0.6^{AB}	10.71^{ABC}	3.51
HyLine	Closed	95.9	1.9	1.5	0.8	10.87	3.37
(W-36)	Open	96.2	1.8	1.3	0.8	11.50	3.52
	Average	96.1^{A}	1.8^{C}	1.4^{B}	0.8^{A}	11.18^{A}	3.44
Shaver	Closed	95.4	2.1	2.1	0.4	10.24	3.62
(288A)	Open	95.5	2.0	2.1	0.3	10.28	3.57
	Average	95.5^{AB}	2.0^{BC}	2.1^{A}	0.4^{B}	10.26^{BC}	3.60
Tatum	Closed	95.4	2.5	1.6	0.4	11.00	3.44
(T-100)	Open	94.2	3.3	2.0	0.5	10.66	3.42
	Average	94.8^{B}	2.9^{A}	1.8^{AB}	0.4^{B}	10.83^{AB}	3.43
All Strains	Closed	95.1	2.5	1.8	0.6	10.66	3.45
	Open	95.1	2.4	2.0	0.5	10.61	4.48
	Average	95.1	2.5	1.9	0.5	10.63	3.46

A,B,C - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

TABLE 19. EFFECTS OF POPULATION SIZE ON PERFORMANCE OF WHITE EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)

Breeder (Strain)	Population (Birds /Cage)	Feed Cons (lbs/100 hens/d)	Egg Weight (g/egg)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality > 140d (%)
DeKalb	3	26.9	65.7	166.3	72.4	49.3	17.6
(XL-Link)	4	26.3	64.9	161.9	71.5	46.5	20.3
	6	25.7	65.5	162.2	70.7	46.6	18.2
	8	27.2	65.2	164.6	73.7	48.5	20.8
H & N	3	26.6	65.3	166.1	74.0	49.6	20.3
(Nick Chick)	4	26.1	65.6	169.3	72.1	48.0	15.1
	6	26.7	65.7	172.3	71.1	47.9	14.6
	8	27.4	66.5	167.9	73.8	50.4	19.3
Hisex	3	26.2	66.1	164.9	69.3	45.8	15.1
(White)	4	26.6	65.6	157.8	69.9	47.5	20.8
	6	27.1	65.5	156.6	70.0	46.3	19.3
	8	28.0	66.3	148.9	68.5	46.5	21.2
ISA/Babcock	3	25.3	65.3	169.1	68.6	44.8	12.0
(B300)	4	25.8	66.3	165.6	67.7	45.5	12.5
	6	27.1	66.4	166.7	69.3	47.0	13.0
	8	26.7	65.7	165.5	70.3	47.6	14.1
HyLine	3	24.1	65.1	173.8	68.7	45.6	11.0
(W-36)	4	23.6	64.7	161.0	68.3	45.3	11.8
	6	24.2	64.7	177.2	69.9	46.8	9.9
	8	24.5	64.9	181.3	69.5	46.4	5.2
Shaver	3	25.5	65.0	155.0	63.7	43.4	11.9
(288A)	4	26.3	65.5	162.6	66.3	44.0	10.5
	6	27.1	64.7	163.9	67.6	45.4	12.7
	8	26.6	65.1	158.6	65.9	42.8	9.6
Tatum	3	26.1	65.4	163.3	71.1	47.1	18.2
(T-100)	4	27.2	65.8	163.2	72.3	47.6	21.9
	6	27.1	65.6	175.2	73.9	48.7	15.1
	8	27.0	65.2	172.6	75.6	50.6	19.3
All Strains	3	25.8^{C}	65.4	165.5	69.7	46.5	15.2
	4	26.0^{BC}	65.5	163.1	69.7	46.3	16.1
	6	26.4^{AB}	65.4	167.7	70.3	47.0	14.7
	8	26.8^{A}	65.6	165.6	71.0	47.6	15.6

A,B,C - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among population and strain combinations are not significant ($P < .01$).

TABLE 20. EFFECTS OF POPULATION SIZE ON EGG SIZE DISTRIBUTION OF WHITE EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)*

Breeder (Strain)	Population (Birds /Cage)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
DeKalb	3	0.1	0.0	2.0	24.8	73.1
(XL-Link)	4	0.1	0.5	3.8	28.7	66.3
	6	0.0	0.0	2.6	26.7	71.2
	8	0.0	0.0	2.3	27.5	70.8
H & N	3	0.1	0.0	2.1	26.8	70.3
(Nick Chick)	4	0.1	0.1	3.9	22.7	73.2
	6	0.1	0.0	2.3	24.9	73.4
	8	0.0	0.0	1.6	19.4	79.0
Hisex	3	0.1	0.1	1.9	24.6	74.7
(White)	4	0.2	0.0	3.2	24.6	72.6
	6	0.2	0.0	2.0	27.6	70.2
	8	0.0	0.1	0.6	21.9	77.3
ISA/Babcock	3	0.1	0.0	1.7	29.2	69.0
(B300)	4	0.8	0.0	1.4	20.8	76.3
	6	0.1	0.0	0.8	20.7	79.1
	8	0.1	0.0	2.9	22.7	75.0
HyLine	3	0.0	0.0	1.4	29.8	68.2
(W-36)	4	0.0	0.0	2.7	33.9	63.4
	6	0.1	0.1	2.8	32.0	65.0
	8	0.2	0.0	2.8	29.5	67.5
Shaver	3	0.1	0.1	3.1	27.9	68.2
(288A)	4	0.2	0.0	1.9	26.0	70.7
	6	0.1	0.0	2.3	32.0	65.6
	8	0.1	0.2	2.2	28.6	68.3
Tatum	3	0.1	0.1	3.1	25.3	71.5
(T-100)	4	0.1	0.1	2.7	22.7	75.1
	6	0.0	0.7	3.1	23.0	73.2
	8	0.2	0.0	2.2	30.9	66.9
All Strains	3	0.1	0.1	2.2	26.9	70.7
	4	0.2	0.1	2.8	25.6	71.1
	6	0.1	0.1	2.3	26.7	71.1
	8	0.1	0.0	2.1	25.8	72.1

*There are no significant differences among these means.

TABLE 21. EFFECTS OF POPULATION SIZE ON EGG QUALITY AND INCOME OF WHITE EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)*

Breeder (Strain)	Population (Birds /Cage)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
DeKalb	3	94.6	3.2	1.7	0.5	10.67	3.41
(XL-Link)	4	95.2	3.1	1.5	0.2	10.32	3.35
	6	94.8	2.8	2.0	0.4	10.45	3.36
	8	95.1	2.7	1.8	0.4	10.66	3.46
H & N	3	93.7	3.2	2.5	0.6	10.55	3.35
(Nick Chick)	4	95.7	2.1	1.1	0.4	10.87	3.44
	6	94.3	3.6	1.8	0.4	11.10	3.59
	8	95.7	2.3	1.6	0.4	10.85	3.48
Hisex	3	94.2	2.4	2.6	0.9	10.68	3.46
(White)	4	94.8	2.3	2.2	0.8	10.17	3.37
	6	94.8	2.3	2.1	0.8	10.03	3.35
	8	94.4	2.3	2.4	0.9	9.54	3.41
ISA/Babcock	3	94.6	2.3	2.5	0.6	10.87	3.46
(B300)	4	94.4	2.8	2.1	0.8	10.49	3.52
	6	93.9	2.7	2.1	0.7	10.69	3.60
	8	96.1	2.0	1.7	0.3	10.78	3.47
HyLine	3	95.9	1.8	1.6	0.8	11.16	3.40
(W-36)	4	95.6	2.0	1.5	0.9	10.37	3.32
	6	96.7	1.8	1.0	0.5	11.49	3.51
	8	96.2	1.8	1.4	0.7	11.71	3.55
Shaver	3	95.6	2.2	2.1	0.2	9.93	3.44
(288A)	4	95.1	1.8	2.7	0.5	10.35	3.60
	6	96.2	2.2	1.3	0.4	10.61	3.68
	8	95.1	2.1	2.4	0.4	10.15	3.66
Tatum	3	93.5	3.8	2.2	0.5	10.39	3.35
(T-100)	4	95.4	2.7	1.7	0.3	10.58	3.38
	6	94.5	3.0	1.9	0.6	11.19	3.59
	8	95.9	2.2	1.5	0.3	11.16	3.41
All Strains	3	94.6	2.7	2.2	0.6	10.61	3.41
	4	95.2	2.4	1.8	0.6	10.45	3.43
	6	95.0	2.6	1.7	0.5	10.80	3.53
	8	95.5	2.2	1.8	0.5	10.69	3.50

*There are no significant differences among these means.

TABLE 22. EFFECTS OF LAYING HOUSE ON PERFORMANCE OF BROWN EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)

Breeder (Strain)	Laying House	Feed Cons (lbs/100 hens/d)	Egg Weight (g/egg)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality > 140d (%)
HyLine	Closed	29.4[WXYZ]	68.5[TUVW]	165.9	67.9	47.7	10.3
(Brown)	Open	27.9[Z]	68.0[VW]	169.6	68.4	48.4	10.5
	Average	28.6	68.2	167.7	68.2[AB]	48.0[ABC]	10.4
Hisex	Closed	29.8[VWXY]	68.2[UVW]	155.7	64.8	45.3	14.0
(Brown)	Open	29.0[WXYZ]	69.5[TU]	143.1	65.9	47.7	21.1
	Average	29.4	68.9	149.4	65.3[BC]	46.5[BC]	17.6
ISA	Closed	30.8[TUVW]	70.0[T]	161.8	67.3	48.9	13.6
(Brown)	Open	28.2[YZ]	70.0[T]	156.4	67.3	49.2	17.6
	Average	29.5	70.0	159.1	67.3[AB]	49.1[AB]	15.6
H & N	Closed	31.6[TUV]	69.4[TUV]	168.7	69.8	50.3	11.4
(Brown Nick)	Open	29.0[WXYZ]	68.1[UVW]	151.3	69.3	49.5	23.2
	Average	30.3	68.7	160.0	69.6[A]	49.9[A]	17.3
DeKalb	Closed	31.9[TU]	69.2[TUVW]	157.4	66.5	48.3	14.3
(Sex-Sal-Link)	Open	30.2[UVWX]	68.6[TUVW]	147.9	68.1	48.9	21.8
	Average	31.0	68.9	152.6	67.3[AB]	48.6[AB]	18.1
Tatum	Closed	30.3[UVWX]	69.2[TUVW]	157.5	63.6	45.2	12.1
(T-173)	Open	28.7[XYZ]	69.8[T]	148.5	62.9	45.7	15.0
	Average	29.5	69.5	153.0	63.2[C]	45.4[C]	13.6
Arbor Acres	Closed	32.3[T]	69.3[TUV]	174.1	67.9	48.5	5.8
(Brown)	Open	28.8[XYZ]	67.8[W]	163.8	66.1	46.6	9.3
	Average	30.6	68.6	168.9	67.0[AB]	47.6[ABC]	7.6
All Strains	Closed	30.9	69.1	163.0	66.8	47.7	11.6
	Open	28.8	68.8	154.4	66.9	48.0	16.9
	Average	29.8	69.0	158.7	66.8	47.9	14.3

A,B,C - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

T,U,V,W,X,Y,Z - Differing letters denote significant differences ($P < .01$), comparisons made among laying house and strain combinations.

TABLE 23. EFFECTS OF LAYING HOUSE ON EGG SIZE DISTRIBUTION OF BROWN EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)

Breeder (Strain)	Laying House	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
HyLine (Brown)	Closed	0.2	0.1	1.0	14.5	84.2
	Open	0.2	0.1	1.8	16.8	81.2
	Average	0.2	0.1	1.4	15.7[A]	82.7[C]
Hisex (Brown)	Closed	0.3	0.1	1.1	15.0	83.5
	Open	0.0	0.0	0.6	12.4	87.0
	Average	0.2	0.4	0.8	13.7[ABC]	85.3[ABC]
ISA (Brown)	Closed	0.3	0.0	0.8	9.2	89.6
	Open	0.2	0.0	0.8	9.6	89.8
	Average	0.3	0.1	0.8	9.4[C]	89.7[A]
H & N (Brown Nick)	Closed	0.2	0.0	0.3	12.9	87.0
	Open	0.3	0.0	0.9	16.2	83.1
	Average	0.2	0.0	0.6	14.5[AB]	85.0[BC]
DeKalb (Sex-Sal-Link)	Closed	0.0	0.0	1.0	12.9	86.1
	Open	0.2	0.0	0.7	11.6	87.6
	Average	0.1	0.0	0.8	12.2[ABC]	86.9[ABC]
Tatum (T-173)	Closed	0.2	0.0	0.8	12.3	87.1
	Open	0.1	0.0	0.3	10.3	89.2
	Average	0.1	0.0	0.6	11.3[BC]	88.2[AB]
Arbor Acres (Brown)	Closed	0.3	0.0	0.7	11.3	87.8
	Open	0.0	0.0	0.8	17.5	82.0
	Average	0.2	0.0	0.7	14.4[AB]	84.9[BC]
All Strains	Closed	0.2	0.0	0.8	12.6	86.5
	Open	0.1	0.0	0.8	13.5	85.7
	Average	0.2	0.1	0.8	13.0	86.1

A,B,C - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

TABLE 24. EFFECTS OF LAYING HOUSE ON EGG QUALITY AND INCOME OF BROWN EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
HyLine	Closed	94.8	2.7	1.6[YZ]	1.0	10.63	4.58
(Brown)	Open	94.0	3.9	1.4[Z]	0.8	10.82	4.55
	Average	94.4	3.3	1.5	0.9	10.72	4.56
Hisex	Closed	94.7	3.4	1.0[Z]	1.1	9.94	4.55
(Brown)	Open	91.9	4.6	2.7[Y]	1.0	9.00	4.18
	Average	93.3	4.0	1.8	1.0	9.48	4.37
ISA	Closed	94.5	2.9	1.5[Z]	1.2	10.35	4.66
(Brown)	Open	93.7	3.5	1.5[Z]	1.3	9.97	4.29
	Average	94.1	3.2	1.5	1.2	10.15	4.47
H & N	Closed	93.3	3.8	1.8[YZ]	1.1	10.77	4.82
(Brown Nick)	Open	93.5	3.6	1.7[YZ]	1.3	9.63	4.15
	Average	93.4	3.7	1.8	1.2	10.20	4.48
DeKalb	Closed	95.8	1.9	1.5[Z]	0.9	10.16	4.71
(Sex-Sal-Link)	Open	94.8	2.4	1.7[YZ]	0.8	9.51	4.27
	Average	95.3	2.3	1.6	0.8	9.84	4.49
Tatum	Closed	94.9	2.6	1.5[Z]	1.1	10.14	4.73
(T-173)	Open	93.4	3.0	1.7[YZ]	2.0	9.39	4.47
	Average	94.2	2.8	1.6	1.5	9.76	4.60
Arbor Acres	Closed	94.8	3.4	1.2[Z]	0.6	11.17	5.21
(Brown)	Open	94.4	2.8	1.9[YZ]	1.0	10.52	4.67
	Average	94.6	3.1	1.6	0.8	10.85	4.94
All Strains	Closed	94.7	3.0	1.4	1.0	10.45	4.75
	Open	93.7	3.5	1.8	1.2	9.83	4.37
	Average	94.2	3.2	1.6	1.1	10.14	4.56

Y,Z - Differing letters denote significant differences ($P < .01$), comparisons made among laying house and strain combinations.

TABLE 25. EFFECTS OF POPULATION ON PERFORMANCE OF BROWN EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)

Breeder (Strain)	Population (Birds /Cage)	Feed Cons (lbs/100 hens/d)	Egg Weight (g/egg)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality > 140d (%)
HyLine	2	28.9	68.3	165.8	66.0	46.4	7.8
(Brown)	3	27.9	68.4	166.0	66.2	46.5	8.3
	4	28.9	68.5	167.2	70.8	49.7	14.8
	6	28.8	67.6	171.9	69.6	49.5	10.6
Hisex	2	28.4	68.2	146.5	65.1	46.5	18.0
(Brown)	3	29.5	68.3	149.3	65.6	46.1	18.1
	4	30.1	69.2	166.0	65.4	45.5	7.8
	6	29.7	69.8	135.7	65.1	47.9	26.4
ISA	2	28.5	70.1	164.4	68.6	50.5	13.3
(Brown)	3	28.6	69.6	157.7	65.7	46.2	13.9
	4	30.1	70.5	169.5	67.7	50.2	13.3
	6	30.9	69.7	144.9	67.2	49.4	22.0
H & N	2	29.3	68.0	168.4	68.8	49.2	16.7
(Brown Nick)	3	30.5	68.5	160.7	70.3	50.1	14.4
	4	31.0	70.0	167.8	70.4	52.0	13.1
	6	30.4	68.3	143.2	68.7	48.2	25.0
DeKalb	2	30.1	67.9	174.6	71.7	51.2	11.7
(Sex-Sal-	3	29.4	68.2	164.3	68.8	49.5	12.5
Link)	4	32.7	69.7	154.5	67.4	48.9	16.1
	6	31.9	69.6	117.0	61.3	44.9	31.9
Tatum	2	29.6	69.9	154.8	63.6	46.4	12.5
(T-173)	3	28.4	69.2	157.3	65.3	45.8	12.7
	4	29.5	69.3	143.3	60.0	43.7	18.0
	6	30.4	69.7	156.5	64.0	45.8	11.1
Arbor Acres	2	29.7	68.0	169.4	65.8	46.2	4.6
(Brown)	3	31.1	68.6	179.1	68.4	49.3	3.7
	4	31.5	68.9	160.3	66.4	47.9	12.5
	6	29.9	68.7	166.9	67.4	46.9	9.4
All Strains	2	29.2^{C}	68.6	163.4	67.1	48.1	12.1
	3	29.4^{BC}	68.7	162.1	67.2	47.6	11.9
	4	30.5^{A}	69.4	161.2	66.9	48.3	13.7
	6	30.3^{AB}	69.1	148.0	66.2	47.5	19.5

A,B,C - Differing letters denote significant differences ($P < .01$).

TABLE 26. EFFECTS OF POPULATION ON EGG SIZE DISTRIBUTION OF BROWN EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)*

Breeder (Strain)	Population (Birds /Cage)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
HyLine (Brown)	2	0.2	0.0	1.3	16.7	81.8
	3	0.1	0.0	0.5	13.4	86.0
	4	0.1	0.2	2.3	15.1	82.3
	6	0.3	0.1	1.5	17.4	80.7
Hisex (Brown)	2	0.2	0.0	0.6	14.8	84.4
	3	0.4	0.2	1.4	15.2	82.8
	4	0.0	0.0	0.9	10.9	88.2
	6	0.1	0.0	0.4	13.9	85.6
ISA (Brown)	2	0.2	0.1	0.4	10.3	89.8
	3	0.6	0.0	0.7	8.9	89.9
	4	0.3	0.0	1.2	7.7	90.8
	6	0.0	0.0	0.9	10.7	88.3
H & N (Brown Nick)	2	0.4	0.0	0.6	14.3	84.6
	3	0.1	0.0	0.4	15.4	84.9
	4	0.2	0.0	0.6	9.9	89.4
	6	0.2	0.0	0.9	18.3	81.2
DeKalb (Sex-Sal-Link)	2	0.3	0.0	0.8	16.4	82.6
	3	0.1	0.0	0.9	14.2	84.8
	4	0.0	0.0	1.0	8.3	90.7
	6	0.0	0.0	0.6	10.0	89.3
Tatum (T-173)	2	0.3	0.1	0.7	8.0	91.0
	3	0.1	0.0	0.6	12.5	86.8
	4	0.1	0.0	0.7	13.8	86.1
	6	0.1	0.0	0.2	10.9	88.8
Arbor Acres (Brown)	2	0.0	0.0	1.1	15.7	83.2
	3	0.4	0.0	1.1	14.5	84.0
	4	0.1	0.0	0.0	14.7	85.8
	6	0.1	0.0	0.8	12.6	86.5
All Strains	2	0.2	0.0	0.8	13.7	85.3
	3	0.2	0.0	0.8	13.4	85.6
	4	0.1	0.0	1.0	11.5	87.6
	6	0.1	0.0	0.8	13.4	85.8

*There are no significant differences among these means.

TABLE 27. EFFECTS OF POPULATION ON EGG QUALITY AND INCOME OF BROWN EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)*

Breeder (Strain)	Population (Birds /Cage)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
HyLine (Brown)	2	93.6	4.0	1.4	1.0	10.54	4.68
	3	94.6	3.1	1.5	0.8	10.65	4.56
	4	95.1	2.9	1.5	0.6	10.73	4.41
	6	94.4	3.0	1.6	1.1	10.97	4.59
Hisex (Brown)	2	94.3	3.1	1.8	1.0	9.37	4.19
	3	94.3	3.6	1.0	1.1	9.50	4.31
	4	91.0	4.9	3.0	1.2	10.40	4.95
	6	93.6	4.2	1.4	0.9	8.63	4.02
ISA (Brown)	2	93.9	3.3	1.6	1.2	10.55	4.40
	3	94.3	3.0	1.3	1.4	10.03	4.35
	4	93.8	3.8	1.6	0.8	10.78	4.83
	6	94.4	2.7	1.5	1.5	9.25	4.33
H & N (Brown Nick)	2	93.7	3.5	2.0	0.8	10.73	4.62
	3	93.0	4.2	1.7	1.2	10.25	4.50
	4	93.0	3.7	1.7	1.6	10.63	4.71
	6	93.9	3.3	1.5	1.3	9.18	4.10
DeKalb (Sex-Sal-Link)	2	96.7	1.6	1.1	0.6	11.34	4.73
	3	96.4	1.7	1.3	0.6	10.65	4.55
	4	94.5	2.8	1.7	1.0	9.89	4.79
	6	93.6	3.2	2.3	0.9	7.46	3.91
Tatum (T-173)	2	94.6	3.1	1.2	1.1	9.88	4.65
	3	94.7	2.6	1.4	1.3	10.05	4.47
	4	92.9	2.8	2.2	2.1	9.11	4.54
	6	94.6	2.6	1.4	1.4	10.01	4.75
Arbor Acres (Brown)	2	94.1	3.2	2.0	0.7	10.85	4.86
	3	96.1	1.8	1.5	0.6	11.58	5.19
	4	94.4	3.3	1.1	1.2	10.30	4.96
	6	93.9	4.0	1.6	0.6	10.66	4.75
All Strains	2	94.4	3.1	1.6	0.9	10.47	4.59
	3	94.8	2.9	1.4	1.0	10.39	4.56
	4	93.5	3.5	1.8	1.2	10.26	4.74
	6	94.1	3.3	1.6	1.1	9.45	4.35

*There are no significant differences among these means.

TABLE 28. EFFECTS OF DENSITY ON PERFORMANCE OF BROWN EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)

Breeder (Strain)	Density[1] (sq in /bird)	Feed Cons (lbs/100 hens/d)	Egg Weight (g/egg)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality > 140d (%)
HyLine	74.6	28.4	68.0	169.0[AB]	67.9	48.0	9.5
(Brown)	84	28.9	68.4	166.5[ABC]	68.4	48.1	11.3
Hisex	74.6	29.6	69.0	142.5[D]	65.4	47.0	22.2
(Brown)	84	29.2	68.7	156.3[ABCD]	65.3	46.0	12.9
ISA	74.6	29.7	69.7	150.9[BCD]	66.4	47.6	18.1
(Brown)	84	29.3	70.3	166.9[ABC]	68.2	50.3	13.3
H & N	74.6	30.5	68.4	152.0[BCD]	69.5	49.1	19.7
(Brown Nick)	84	30.2	69.1	168.2[AB]	69.7	50.7	14.6
DeKalb	74.6	30.7	68.9	140.7[D]	65.1	47.2	22.2
(Sex-Sal-Link)	84	31.3	68.8	165.2[ABC]	69.7	50.1	13.9
Tatum	74.6	29.4	69.5	156.8[ABCD]	64.6	45.8	12.0
(T-173)	84	29.6	69.6	149.0[CD]	61.8	45.0	15.2
Arbor Acres	74.6	30.5	68.7	173.2[A]	67.9	48.2	6.4
(Brown)	84	30.7	68.5	165.4[ABC]	66.1	47.2	8.4
All Strains	74.6	29.8	68.9	155.0	66.7	47.6	15.7
	84	29.9	69.1	162.5	67.0	48.2	12.8

[1]Cages with densities of 84 or 74.6 sq. in./bird had populations of 2 and 4 or 3 and 6 birds, respectively.

A,B,C,D - Differing letters denote significant differences ($P < .01$).

TABLE 29. EFFECTS OF DENSITY ON EGG SIZE DISTRIBUTION OF BROWN EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)*

Breeder (Strain)	Density[1] (sq in /bird)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
HyLine	74.6	0.2	0.0	1.0	15.4	83.4
(Brown)	84	0.1	0.1	1.8	15.9	82.1
Hisex	74.6	0.2	0.1	0.9	14.6	84.2
(Brown)	84	0.1	0.0	0.8	12.9	86.3
ISA	74.6	0.3	0.0	0.8	9.7	89.2
(Brown)	84	0.2	0.0	0.8	9.0	90.3
H & N	74.6	0.2	0.0	0.7	16.8	83.0
(Brown Nick)	84	0.3	0.0	0.6	12.1	87.0
DeKalb	74.6	0.1	0.0	0.8	12.1	87.1
(Sex-Sal-Link)	84	0.2	0.0	0.9	12.6	86.4
Tatum	74.6	0.1	0.0	0.4	11.7	87.8
(T-173)	84	0.2	0.0	0.7	10.9	88.5
Arbor Acres	74.6	0.2	0.0	0.9	13.5	85.3
(Brown)	84	0.1	0.0	0.5	14.9	84.9
All Strains	74.6	0.2	0.0	0.8	13.4	85.7
	84	0.2	0.0	0.9	12.6	86.5

[1]Cages with densities of 84 or 74.6 sq. in./bird had populations of 2 and 4 or 3 and 6 birds respectively.

*There are no significant differences among these means.

TABLE 30. EFFECTS OF DENSITY ON EGG QUALITY AND INCOME OF BROWN EGG ENTRIES, 29TH NCLP&MT (435-728 DAYS)

Breeder (Strain)	Density[1] (sq in /bird)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
HyLine	74.6	94.5	3.0	1.5	1.0	10.81[AB]	4.58
(Brown)	84	94.3	3.5	1.4	0.8	10.64[ABC]	4.55
Hisex	74.6	93.9	3.9	1.2	1.0	9.06[D]	4.16
(Brown)	84	92.6	4.0	2.4	1.1	9.89[BCD]	4.57
ISA	74.6	94.3	2.9	1.4	1.5	9.61[BCD]	4.31
(Brown)	84	93.9	3.5	1.6	1.0	10.66[ABC]	4.61
H & N	74.6	93.4	3.7	1.6	1.2	9.72[BCD]	4.30
(Brown Nick)	84	93.4	3.6	1.9	1.2	10.69[AB]	4.67
DeKalb	74.6	95.0	2.4	1.8	0.8	9.06[D]	4.23
(Sex-Sal-Link)	84	95.7	2.2	1.4	0.8	10.66[ABC]	4.75
Tatum	74.6	94.7	2.6	1.4	1.4	10.02[ABCD]	4.61
(T-173)	84	93.7	3.0	1.7	1.6	9.50[CD]	4.60
Arbor Acres	74.6	95.0	2.9	1.6	0.6	11.13[A]	4.98
(Brown)	84	94.2	3.3	1.6	1.0	10.60[ABC]	4.95
All Strains	74.6	94.4	3.1	1.5	1.1	9.92	4.45[B]
	84	94.0	3.3	1.7	1.1	10.38	4.67[A]

[1]Cages with densities of 84 or 74.6 sq. in./bird had populations of 2 and 4 or 3 and 6 birds respectively.

A,B,C,D - Differing letters denote significant differences ($P < .01$).

TABLE 31. EFFECTS OF LAYING HOUSE ON PERFORMANCE OF WHITE EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)

Breeder (Strain)	Laying House	Feed Cons (lbs/100 hens/d)	Egg Weight (g/egg)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality > 140d (%)
DeKalb	Closed	26.1[ABC]	62.6	387.8	74.7	47.6	31.5
(XL-Link)	Open	25.7[ABC]	62.4	385.8	74.5	46.9	30.0
	Average	25.9	62.5[A]	386.8[BC]	74.6[AB]	47.2[AB]	30.8[A]
H & N	Closed	26.3[AB]	62.8	402.2	75.7	48.2	25.0
(Nick Chick)	Open	25.3[C]	62.3	398.1	74.8	47.7	25.0
	Average	25.8	62.6[A]	400.1[AB]	75.3[A]	48.0[A]	25.0[ABC]
Hisex	Closed	26.4[A]	62.7	384.5	74.1	47.0	29.4
(White)	Open	25.8[ABC]	62.6	379.0	72.5	46.0	28.4
	Average	26.1	62.7[A]	381.8[C]	73.3[BC]	46.5[B]	28.9[AB]
ISA/Babcock	Closed	25.6[ABC]	62.5	401.1	73.2	46.1	16.8
(B300)	Open	25.4[BC]	62.7	394.7	73.4	46.7	22.9
	Average	25.5	62.6[A]	397.9[ABC]	73.3[BCD]	46.4[B]	19.8[BCD]
HyLine	Closed	23.7[D]	61.0	399.5	72.5	44.6	15.9
(W-36)	Open	23.2[D]	61.2	408.5	73.0	45.9	11.4
	Average	23.4	61.1[C]	404.0[A]	72.7[CD]	45.2[C]	13.7[D]
Shaver	Closed	26.0[ABC]	61.9	387.3	71.5	44.9	19.6
(288A)	Open	25.5[ABC]	61.7	391.6	72.0	45.1	17.6
	Average	25.8	61.8[B]	389.4[ABC]	71.7[D]	45.0[C]	18.6[CD]
Tatum	Closed	26.3[A]	62.1	403.4	76.4	47.9	26.0
(T-100)	Open	25.7[ABC]	62.4	397.2	75.8	47.8	28.4
	Average	26.0	62.3[AB]	400.3[AB]	76.1[A]	47.9[A]	27.2[ABC]
All Strains	Closed	25.8	62.2	395.1	74.0	46.6	23.5
	Open	25.2	62.2	393.6	73.7	46.6	23.4
	Average	25.5	62.2	394.3	73.9	46.6	23.4

A,B,C,D - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

TABLE 32. EFFECTS OF LAYING HOUSE ON EGG SIZE DISTRIBUTION OF WHITE EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)

Breeder (Strain)	Laying House	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
DeKalb	Closed	1.4	3.8	9.9	32.2	52.8
(XL-Link)	Open	1.6	3.6	10.4	33.4	51.1
	Average	1.5	3.7^{B}	10.1^{BC}	32.8^{B}	51.9^{AB}
H & N	Closed	1.8	3.4	8.9	31.1	54.9
(Nick Chick)	Open	1.7	3.6	10.5	33.4	50.6
	Average	1.7	3.5^{B}	9.7^{BC}	32.3^{B}	52.8^{A}
Hisex	Closed	1.5	3.9	9.1	31.9	53.5
(White)	Open	2.1	3.3	9.0	33.9	52.3
	Average	1.8	3.6^{B}	9.1^{C}	32.9^{AB}	52.9^{A}
ISA/Babcock	Closed	2.1	3.9	9.1	31.1	53.8
(B300)	Open	2.1	3.6	8.7	32.4	53.4
	Average	2.1	3.8^{B}	8.9^{C}	31.8^{B}	53.6^{A}
HyLine	Closed	2.5	5.2	12.9	36.7	42.5
(W-36)	Open	1.9	5.4	12.2	36.0	44.5
	Average	2.2	5.3^{A}	12.6^{A}	36.4^{A}	43.5^{C}
Shaver	Closed	1.9	4.0	11.0	33.8	49.1
(288A)	Open	1.9	4.1	11.0	36.8	45.9
	Average	1.9	4.0^{B}	11.0^{B}	35.3^{AB}	47.5^{BC}
Tatum	Closed	1.9	3.8	10.6	33.6	50.1
(T-100)	Open	1.3	3.8	10.6	33.0	51.3
	Average	1.6	3.8^{B}	10.6^{B}	33.3^{AB}	50.7^{AB}
All Strains	Closed	1.9	4.0	10.2	32.9	51.0
	Open	1.8	3.9	10.3	34.1	49.9
	Average	1.8	4.0	10.3	33.5	50.4

A,B,C - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

TABLE 33. EFFECTS OF LAYING HOUSE ON EGG QUALITY AND INCOME OF WHITE EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
DeKalb	Closed	95.6	2.4	1.7	0.3	24.66	8.52
(XL-Link)	Open	95.6	2.6	1.5	0.3	24.43	8.63
	Average	95.6[C]	2.5[AB]	1.6[AB]	0.3[C]	24.54	8.57[AB]
H & N	Closed	95.5	2.7	1.4	0.4	25.47	8.77
(Nick Chick)	Open	95.8	2.5	1.2	0.3	25.15	8.62
	Average	95.7[BC]	2.6[A]	1.3[BC]	0.3[BC]	25.31	8.70[A]
Hisex	Closed	95.6	2.1	1.7	0.6	24.31	8.57
(White)	Open	95.5	2.1	1.9	0.5	24.03	8.64
	Average	95.6[C]	2.1[ABC]	1.8[A]	0.6[A]	24.17	8.60[AB]
ISA/Babcock	Closed	96.0	2.1	1.4	0.5	25.35	8.79
(B300)	Open	96.1	1.8	1.7	0.4	25.02	8.71
	Average	96.0[BC]	1.9[BC]	1.5[AB]	0.4[ABC]	25.18	8.75[A]
HyLine	Closed	96.7	1.7	1.1	0.5	25.03	8.24
(W-36)	Open	96.9	1.6	1.1	0.5	25.75	8.38
	Average	96.8[A]	1.7[C]	1.1[C]	0.5[AB]	25.39	8.31[B]
Shaver	Closed	96.6	1.5	1.6	0.3	24.49	8.85
(288A)	Open	96.2	1.8	1.7	0.3	24.72	8.91
	Average	96.4[AB]	1.7[C]	1.6[AB]	0.3[C]	24.61	8.88[A]
Tatum	Closed	96.4	2.0	1.3	0.3	25.57	8.71
(T-100)	Open	95.1	2.9	1.6	0.4	24.99	8.61
	Average	95.7[BC]	2.5[AB]	1.5[ABC]	0.3[BC]	25.28	8.66[A]
All Strains	Closed	96.1	2.1	1.5	0.4	24.98	8.64
	Open	95.9	2.2	1.5	0.4	24.87	8.64
	Average	96.0	2.1	1.5	0.4	24.93	8.64

A,B,C - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

TABLE 34. EFFECTS OF POPULATION SIZE ON PERFORMANCE OF WHITE EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)

Breeder (Strain)	Population (Birds /Cage)	Feed Cons (lbs/100 hens/d)	Egg Weight (g/egg)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality > 140d (%)
DeKalb	3	25.9	62.9	390.6	75.0	48.3	29.4
(XL-Link)	4	26.1	62.3	382.6	74.7	46.9	33.3
	6	25.3	62.6	383.4	73.3	46.4	29.1
	8	26.3	62.3	390.6	75.3	47.4	31.2
H & N	3	25.7	62.2	399.2	76.2	48.3	29.7
(Nick Chick)	4	25.4	62.7	399.3	75.0	47.6	22.9
	6	25.7	62.4	404.1	74.2	47.3	20.3
	8	26.3	63.0	398.0	75.6	48.7	27.1
Hisex	3	25.5	62.8	393.8	73.4	46.3	22.4
(White)	4	25.8	62.3	387.6	73.8	47.0	29.7
	6	26.3	62.5	376.4	73.6	46.5	32.3
	8	26.6	63.1	369.4	72.4	46.4	31.2
ISA/Babcock	3	24.7	62.0	401.4	72.9	45.4	18.9
(B300)	4	25.1	63.0	396.7	72.2	45.9	17.2
	6	26.1	62.9	399.0	73.8	47.1	21.4
	8	26.0	62.4	394.4	74.2	47.2	21.9
HyLine	3	23.4	61.4	403.6	72.1	44.9	14.1
(W-36)	4	23.1	60.9	385.6	72.2	44.7	18.6
	6	23.4	61.0	410.3	73.2	45.7	14.1
	8	23.8	61.2	416.5	73.4	45.7	7.8
Shaver	3	25.1	61.8	382.5	70.3	44.6	19.9
(288A)	4	25.9	62.2	390.4	72.2	45.4	19.5
	6	26.2	61.4	393.5	73.0	45.8	21.4
	8	26.0	61.8	391.2	71.3	44.2	13.5
Tatum	3	25.5	62.3	397.4	74.9	47.1	24.5
(T-100)	4	26.1	62.5	394.5	75.7	47.5	32.3
	6	26.3	62.4	408.3	76.8	48.4	22.4
	8	26.0	61.9	401.1	76.9	48.6	29.7
All Strains	3	25.1^{B}	62.2	395.5	73.5	46.4	22.7
	4	25.4^{B}	62.3	390.9	73.7	46.4	24.8
	6	25.6^{AB}	62.2	396.4	74.0	46.7	23.0
	8	25.9^{A}	62.2	394.5	74.2	46.9	23.2

A,B - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among population and strain combinations are not significant ($P < .01$).

TABLE 35. EFFECTS OF POPULATION SIZE ON EGG SIZE DISTRIBUTION OF WHITE EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)*

Breeder (Strain)	Population (Birds /Cage)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
DeKalb (XL-Link)	3	1.1	4.0	9.4	31.0	54.6
	4	1.1	4.2	10.8	34.2	49.4
	6	1.8	3.1	10.3	31.8	53.3
	8	2.0	3.5	10.1	34.2	50.5
H & N (Nick Chick)	3	1.3	4.0	10.4	34.5	49.5
	4	1.9	2.9	10.4	31.4	53.4
	6	1.7	4.0	8.9	34.0	51.8
	8	2.0	3.3	9.1	29.3	56.4
Hisex (White)	3	2.0	3.5	8.6	32.8	53.7
	4	1.8	3.9	10.1	34.0	50.6
	6	1.7	3.4	9.6	34.4	50.9
	8	1.7	3.6	7.9	30.4	56.4
ISA/Babcock (B300)	3	2.0	3.7	9.8	35.8	48.8
	4	2.1	3.7	8.3	30.6	55.1
	6	1.9	4.0	7.9	29.9	56.6
	8	2.3	3.7	9.6	30.7	53.9
HyLine (W-36)	3	2.3	4.9	11.6	36.0	44.9
	4	2.0	5.6	13.5	37.0	41.9
	6	2.5	5.2	12.7	36.9	42.7
	8	2.0	5.6	12.5	35.5	44.5
Shaver (288A)	3	1.7	4.4	10.9	34.9	47.7
	4	1.5	4.2	10.3	33.1	50.4
	6	2.4	3.6	11.6	37.4	44.9
	8	1.9	3.8	11.2	35.8	46.9
Tatum (T-100)	3	1.8	3.4	10.6	33.7	50.6
	4	1.3	4.0	11.0	31.0	53.1
	6	1.6	4.2	10.2	32.4	51.7
	8	1.8	3.7	10.7	36.2	47.4
All Strains	3	1.8	4.0	10.2	34.1	50.0
	4	1.7	4.0	10.6	33.0	50.6
	6	1.9	3.9	10.2	33.8	50.3
	8	2.0	3.9	10.1	33.2	50.9

*There are no significant differences among these means.

TABLE 36. EFFECTS OF POPULATION SIZE ON EGG QUALITY AND INCOME OF WHITE EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)*

Breeder (Strain)	Population (Birds /Cage)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
DeKalb (XL-Link)	3	95.4	2.6	1.7	0.4	24.80	8.52
	4	95.7	2.6	1.5	0.2	24.20	8.55
	6	95.9	2.1	1.6	0.3	24.38	8.48
	8	95.5	2.7	1.6	0.3	24.78	8.73
H & N (Nick Chick)	3	95.2	2.7	1.8	0.3	25.15	8.57
	4	95.7	2.5	1.0	0.4	25.21	8.62
	6	95.4	2.9	1.4	0.3	25.60	8.81
	8	96.4	2.2	1.1	0.3	25.28	8.79
Hisex (White)	3	95.7	2.0	1.8	0.5	25.05	8.69
	4	95.4	2.1	1.9	0.6	24.44	8.62
	6	95.7	2.1	1.7	0.5	23.84	8.51
	8	95.4	2.2	1.7	0.6	23.36	8.60
ISA/Babcock (B300)	3	95.9	2.0	1.7	0.4	25.40	8.60
	4	96.0	2.2	1.3	0.5	25.02	8.73
	6	95.6	2.0	1.7	0.5	25.24	8.90
	8	96.6	1.7	1.4	0.3	25.08	8.75
HyLine (W-36)	3	96.7	1.6	1.3	0.5	25.39	8.29
	4	96.8	1.7	1.0	0.5	24.18	8.04
	6	97.0	1.7	1.0	0.4	25.81	8.39
	8	96.7	1.6	1.2	0.5	26.18	8.51
Shaver (288A)	3	96.7	1.6	1.5	0.2	24.20	8.63
	4	96.3	1.4	1.9	0.3	24.63	8.87
	6	96.6	2.0	1.2	0.3	24.91	8.92
	8	96.0	1.7	2.0	0.3	24.69	9.10
Tatum (T-100)	3	94.8	3.2	1.7	0.3	24.97	8.62
	4	96.0	2.4	1.4	0.3	24.99	8.57
	6	95.7	2.4	1.5	0.5	25.78	8.85
	8	96.5	2.0	1.3	0.2	25.36	8.60
All Strains	3	95.8	2.2	1.6	0.4	25.00	8.56
	4	96.0	2.1	1.4	0.4	24.67	8.57
	6	96.0	2.2	1.4	0.4	25.08	8.70
	8	96.2	2.0	1.5	0.4	24.96	8.73

*There are no significant differences among these means.

TABLE 37. EFFECTS OF LAYING HOUSE ON PERFORMANCE OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)

Breeder (Strain)	Laying House	Feed Cons (lbs/100 hens/d)	Egg Weight (g/egg)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality > 140d (%)
HyLine	Closed	28.5^{WXYZ}	65.1	404.1	73.6	48.5	15.2
(Brown)	Open	27.6^{Z}	65.0	414.3	74.4	49.3	13.8
	Average	28.0	65.0^{C}	409.2	74.0^{AB}	48.9^{B}	14.5
Hisex	Closed	28.4^{XYZ}	65.2	386.3	70.7	46.7	19.8
(Brown)	Open	28.4^{XYZ}	66.3	373.5	71.8	48.6	28.5
	Average	28.4	65.7^{BC}	379.9	71.3^{C}	47.6^{BC}	24.2
ISA	Closed	28.7^{WXYZ}	66.8	393.6	71.7	49.0	17.4
(Brown)	Open	27.6^{YZ}	66.7	385.1	72.1	49.4	26.0
	Average	28.2	66.7^{A}	389.3	71.9^{BC}	49.2^{B}	21.7
H & N	Closed	29.6^{VWX}	65.9	416.3	76.4	51.2	19.2
(Brown Nick)	Open	28.3^{XYZ}	65.3	397.9	76.1	50.8	29.3
	Average	29.0	65.6^{BC}	407.1	76.3^{A}	51.0^{A}	24.2
DeKalb	Closed	30.4^{V}	65.9	381.8	70.7	48.2	22.4
(Sex-Sal-Link)	Open	29.8^{VW}	65.6	369.5	71.5	48.4	32.7
	Average	30.1	65.8^{BC}	375.6	71.1^{CD}	48.3^{BC}	27.5
Tatum	Closed	29.0^{VWXY}	66.0	381.1	68.9	46.3	16.8
(T-173)	Open	28.3^{XYZ}	66.6	372.5	68.7	47.0	20.9
	Average	28.6	66.3^{AB}	376.8	68.8^{D}	46.6^{C}	18.8
Arbor Acres	Closed	30.2^{V}	65.9	406.5	72.4	48.6	9.1
(Brown)	Open	28.1^{YZ}	64.9	396.6	71.2	47.4	12.2
	Average	29.2	65.4^{C}	401.5	71.8^{BC}	48.0^{BC}	10.6
All Strains	Closed	29.3	65.8	395.7	72.1	48.4	17.1
	Open	28.3	65.8	387.1	72.3	48.7	23.2
	Average	28.8	65.8	391.3	72.2	48.5	20.2

A,B,C - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

V,W,X,Y,Z - Differing letters denote significant differences ($P < .01$), comparisons made among laying house and strain combinations.

TABLE 38. EFFECTS OF LAYING HOUSE ON EGG SIZE DISTRIBUTION OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)

Breeder (Strain)	Laying House	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
HyLine	Closed	0.5	2.4	8.1	24.9	64.0
(Brown)	Open	0.7	2.2	7.6	26.2	63.3
	Average	0.6	2.3	7.9[A]	25.5[A]	63.7[D]
Hisex	Closed	0.8	2.1	7.6	24.4	65.1
(Brown)	Open	0.8	1.9	5.3	21.4	70.6
	Average	0.8	2.0	6.5[B]	22.9[AB]	67.9[BCD]
ISA	Closed	0.6	2.0	5.9	18.4	73.1
(Brown)	Open	0.8	1.7	5.7	19.2	72.7
	Average	0.7	1.8	5.8[BC]	18.8[C]	72.9[A]
H & N	Closed	0.4	1.8	6.9	23.8	67.4
(Brown Nick)	Open	0.6	2.2	6.3	24.8	66.2
	Average	0.5	2.0	6.6[B]	24.3[A]	66.8[CD]
DeKalb	Closed	0.8	2.6	6.5	21.0	69.0
(Sex-Sal-Link)	Open	1.3	2.4	5.8	20.1	70.5
	Average	1.0	2.5	6.2[BC]	20.5[BC]	69.8[ABC]
Tatum	Closed	1.0	2.6	5.6	20.5	70.5
(T-173)	Open	1.4	2.1	4.8	18.5	73.2
	Average	1.2	2.4	5.2[C]	19.5[C]	71.8[AB]
Arbor Acres	Closed	0.9	2.5	6.4	21.9	68.3
(Brown)	Open	1.1	2.1	6.5	26.0	64.5
	Average	1.0	2.3	6.5[B]	23.9[AB]	66.4[CD]
All Strains	Closed	0.7	2.3	6.7	22.1	68.2
	Open	1.0	2.1	6.0	22.3	68.7
	Average	0.8	2.2	6.4	22.2	68.5

A,B,C,D - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

TABLE 39. EFFECTS OF LAYING HOUSE ON EGG QUALITY AND INCOME OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
HyLine (Brown)	Closed	95.8	2.4	1.2^{YZ}	0.7	25.79	10.61^{XYZ}
	Open	95.7	2.8	1.0^{Z}	0.5	26.47	10.62^{XYZ}
	Average	95.7	2.6	1.1	0.6^{BC}	26.13	10.61
Hisex (Brown)	Closed	95.8	2.5	1.0^{Z}	0.7	24.61	10.46^{XYZ}
	Open	94.0	3.4	1.9^{Y}	0.8	23.68	10.18^{YZ}
	Average	94.9	2.9	1.5	0.7^{ABC}	24.14	10.32
ISA (Brown)	Closed	95.9	2.3	1.0^{Z}	0.8	25.21	10.58^{XYZ}
	Open	94.8	2.8	1.5^{YZ}	0.9	24.65	10.19^{YZ}
	Average	95.4	2.5	1.3	0.9^{ABC}	24.93	10.39
H & N (Brown Nick)	Closed	94.8	3.0	1.4^{YZ}	0.8	26.46	10.83^{WX}
	Open	95.2	2.7	1.1^{Z}	1.0	25.30	10.17^{Z}
	Average	95.0	2.8	1.3	0.9^{AB}	25.88	10.49
DeKalb (Sex-Sal-Link)	Closed	95.3	2.2	1.8^{Y}	0.6	24.48	10.99^{WX}
	Open	95.6	2.6	1.3^{YZ}	0.5	23.69	10.61^{XYZ}
	Average	95.4	2.4	1.6	0.6^{ABC}	24.09	10.80
Tatum (T-173)	Closed	95.7	2.4	1.3^{YZ}	0.7	24.40	10.82^{WXY}
	Open	94.7	2.4	1.6^{YZ}	1.3	23.67	10.60^{XYZ}
	Average	95.2	2.4	1.4	1.0^{A}	24.03	10.71
Arbor Acres (Brown)	Closed	95.8	2.5	1.4^{YZ}	0.4	26.05	11.43^{W}
	Open	95.3	2.6	1.5^{YZ}	0.6	25.37	10.79^{XY}
	Average	95.6	2.5	1.4	0.5^{C}	25.71	11.11
All Strains	Closed	95.6	2.5	1.3	0.7	25.29	10.82
	Open	95.0	2.8	1.4	0.8	24.69	10.45
	Average	95.3	2.6	1.4	0.7	24.99	10.63

A,B,C - Differing letters denote significant differences ($P < .01$), comparisons made among average values only, differences among laying house and strain combinations are not significant ($P < .01$).

W,X,Y,Z - Differing letters denote significant differences ($P < .01$), comparisons made among laying house and strain combinations.

TABLE 40. EFFECTS OF POPULATION ON PERFORMANCE OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)

Breeder (Strain)	Popu-ation (Birds /Cage)	Feed Cons (lbs/100 hens/d)	Egg Weight (g/egg)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality > 140d (%)
HyLine	2	28.2	65.1	409.5^{TUV}	73.1	48.2	10.9
(Brown)	3	27.2	65.1	404.0^{TUVW}	72.5	47.8	12.5
	4	28.4	65.2	409.3^{TUV}	75.9	50.2	21.9
	6	28.3	64.7	413.8^{TU}	74.5	49.5	12.7
Hisex	2	27.7	65.3	373.7^{WXY}	71.1	47.5	25.8
(Brown)	3	28.1	65.5	383.2^{UVWXY}	71.2	47.4	24.3
	4	29.2	65.7	407.9^{TUV}	72.2	47.6	10.2
	6	28.6	66.3	354.9^{YZ}	70.6	48.1	36.5
ISA	2	27.6	66.5	397.3^{TUVWX}	73.2	50.2	20.3
(Brown)	3	27.6	66.5	385.6^{UVWXY}	70.4	47.2	18.1
	4	28.6	67.3	407.3^{TUVW}	72.8	50.3	17.1
	6	28.9	66.6	367.1^{XY}	71.3	49.0	31.3
H & N	2	28.0	65.2	421.0^{T}	75.8	50.6	21.9
(Brown Nick)	3	29.2	65.2	407.9^{TUV}	77.1	51.1	21.7
	4	29.8	66.5	421.2^{T}	77.0	52.5	17.9
	6	28.9	65.5	378.3^{VWXY}	75.2	49.9	35.4
DeKalb	2	29.5	65.0	405.9^{TUVW}	74.2	49.9	15.6
(Sex-Sal-Link)	3	28.9	65.2	393.1^{TUVWX}	72.5	49.1	18.8
	4	31.4	66.4	377.2^{VWXY}	71.5	48.7	25.8
	6	30.6	66.5	326.4^{Z}	66.4	45.6	50.0
Tatum	2	28.7	66.7	376.8^{VWXY}	68.7	47.2	18.0
(T-173)	3	27.6	66.2	381.2^{UVWXY}	69.7	46.6	17.1
	4	29.0	66.0	369.1^{XY}	67.6	45.9	24.2
	6	29.3	66.4	380.0^{UVWXY}	69.0	46.9	16.0
Arbor Acres	2	28.6	64.6	401.1^{TUVWX}	71.3	46.9	7.9
(Brown)	3	29.4	65.7	412.1^{TU}	72.4	49.0	5.4
	4	30.2	65.8	396.5^{TUVWX}	71.8	48.7	16.7
	6	28.5	65.4	396.5^{TUVWX}	71.6	47.3	12.5
All Strains	2	28.3^{BC}	65.5	397.9	72.5	48.6	17.2
	3	28.3^{C}	65.6	395.3	72.3	48.3	16.8
	4	29.5^{A}	66.1	398.4	72.7	49.1	19.1
	6	29.0^{AB}	65.9	373.8	71.2	48.0	27.8

A,B,C - Differing letters denote significant differences ($P < .01$).

T,U,V,W,X,Y,Z - Differing letters denote significant differences ($P < .01$), comparisons made among population and strain combinations.

TABLE 41. EFFECTS OF POPULATION ON EGG SIZE DISTRIBUTION OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)*

Breeder (Strain)	Population (Birds /Cage)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
HyLine (Brown)	2	0.3	2.2	7.6	26.8	63.1
	3	0.7	2.0	7.4	25.0	64.9
	4	0.5	2.7	8.4	24.0	64.4
	6	0.9	2.4	8.0	26.4	62.3
Hisex (Brown)	2	0.4	2.0	6.7	24.4	66.4
	3	1.0	1.9	7.1	22.6	67.3
	4	1.2	2.1	6.1	21.6	69.1
	6	0.4	1.9	6.0	23.0	68.7
ISA (Brown)	2	1.0	1.9	5.9	19.8	71.8
	3	0.7	1.8	5.7	19.0	72.8
	4	0.6	1.5	5.9	17.0	75.0
	6	0.4	2.2	5.8	19.6	72.0
H & N (Brown Nick)	2	0.6	2.2	6.8	24.1	66.2
	3	0.5	1.9	6.8	25.3	65.8
	4	0.5	1.8	6.4	20.7	70.7
	6	0.4	1.9	6.5	27.0	64.6
DeKalb (Sex-Sal-Link)	2	1.3	2.7	6.3	23.8	65.9
	3	1.5	2.7	6.5	21.4	67.9
	4	1.3	1.1	6.5	18.3	72.8
	6	0.0	3.5	5.3	18.6	72.6
Tatum (T-173)	2	1.0	2.3	5.3	16.7	74.8
	3	1.2	2.1	5.3	21.7	69.7
	4	1.4	2.4	5.8	20.5	70.2
	6	1.1	2.6	4.5	19.1	72.7
Arbor Acres (Brown)	2	1.0	3.2	6.7	25.7	63.5
	3	0.8	1.7	7.0	23.1	67.3
	4	1.2	2.1	5.4	23.5	68.2
	6	0.9	2.3	6.9	23.4	66.6
All Strains	2	0.8	2.3	6.5	23.0	67.4
	3	0.9	2.0	6.6	22.6	67.9
	4	1.0	2.0	6.3	20.8	70.1
	6	0.6	2.4	6.1	22.4	68.5

*There are no significant differences among these means.

TABLE 42. EFFECTS OF POPULATION ON EGG QUALITY AND INCOME OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)

Breeder (Strain)	Population (Birds /Cage)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
HyLine (Brown)	2	95.4	2.9	1.1	0.6	26.13[STU]	10.77
	3	95.3	3.0	1.2	0.5	25.77[STUVW]	10.39
	4	96.4	2.2	1.0	0.4	26.19[STU]	10.50
	6	95.8	2.2	1.2	0.8	26.41[ST]	10.79
Hisex (Brown)	2	95.7	2.4	1.3	0.6	23.90[VWXY]	9.99
	3	95.4	2.7	1.0	0.9	24.35[TUVWXY]	10.23
	4	93.8	3.3	2.1	0.8	25.79[STUVW]	11.27
	6	94.7	3.3	1.3	0.7	22.54[YZ]	9.79
ISA (Brown)	2	95.7	2.4	1.1	0.9	25.49[STUVWX]	10.26
	3	95.2	2.5	1.4	0.9	24.66[STUVWXY]	10.23
	4	95.0	3.2	1.2	0.7	26.02[STUV]	10.96
	6	95.6	2.1	1.3	1.0	23.55[WXY]	10.09
H & N (Brown Nick)	2	95.5	2.4	1.5	0.6	26.84[S]	10.58
	3	94.8	3.2	1.1	1.0	25.90[STUV]	10.49
	4	94.3	3.3	1.3	1.2	26.62[S]	11.05
	6	95.4	2.5	1.1	0.9	24.16[UVWXY]	9.85
DeKalb (Sex-Sal-Link)	2	96.7	1.8	1.1	0.4	26.22[STU]	11.07
	3	96.3	2.2	1.0	0.5	25.25[STUVWX]	10.75
	4	95.1	2.6	1.5	0.8	24.07[UVWXY]	11.25
	6	93.8	2.9	2.7	0.6	20.82[Z]	10.13
Tatum (T-173)	2	95.3	2.6	1.3	0.8	24.02[UVWXY]	10.74
	3	95.0	2.7	1.4	0.9	24.30[TUVWXY]	10.36
	4	94.5	2.6	1.7	1.2	23.49[XY]	10.77
	6	95.9	1.8	1.3	1.0	24.32[TUVWXY]	10.97
Arbor Acres (Brown)	2	95.6	2.6	1.4	0.4	25.58[STUVWX]	10.93
	3	96.3	1.9	1.3	0.4	26.47[ST]	11.33
	4	95.4	2.4	1.6	0.7	25.50[STUVWX]	11.42
	6	95.0	3.2	1.4	0.5	25.29[STUVWX]	10.76
All Strains	2	95.7	2.4	1.3	0.6	25.45	10.62[B]
	3	95.5	2.6	1.2	0.7	25.24	10.54[B]
	4	94.9	2.8	1.5	0.8	25.38	11.03[A]
	6	95.2	2.6	1.5	0.8	23.87	10.34[B]

A,B - Differing letters denote significant differences ($P < .01$).

S,T,U,V,W,X,Y,Z - Differing letters denote significant differences ($P < .01$), comparisons made among population and strain combinations.

TABLE 43. EFFECTS OF DENSITY ON PERFORMANCE OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)

Breeder (Strain)	Density[1] (sq in /bird)	Feed Cons (lbs/100 hens/d)	Egg Weight (g/egg)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality > 140d (%)
HyLine	74.6	27.8	64.9	408.9	73.5	48.6	12.6
(Brown)	84	28.3	65.2	409.4	74.5	49.2	16.4
Hisex	74.6	28.3	65.9	369.0	70.9	47.7	30.4
(Brown)	84	28.4	65.5	390.8	71.7	47.6	18.0
ISA	74.6	28.2	66.5	375.7	70.8	48.0	25.0
(Brown)	84	28.1	66.9	402.3	73.0	50.3	18.7
H & N	74.6	29.0	65.4	393.1	76.1	50.5	28.5
(Brown Nick)	84	28.9	65.9	421.3	76.4	51.6	19.6
DeKalb	74.6	29.7	65.9	359.7	69.4	47.3	34.4
(Sex-Sal-Link)	84	30.4	65.6	392.5	72.9	49.3	20.5
Tatum	74.6	28.5	66.3	380.1	69.4	46.7	16.7
(T-173)	84	28.8	66.4	373.0	68.2	46.5	21.1
Arbor Acres	74.6	28.9	65.6	404.3	72.0	48.2	8.9
(Brown)	84	29.5	65.3	399.9	71.6	48.0	11.9
All Strains	74.6	28.6	65.8	384.4[B]	71.7	48.2	22.4
	84	28.9	65.8	398.5[A]	72.6	48.9	18.0

[1]Cages with densities of 84 or 74.6 sq. in./bird had populations of 2 and 4 or 3 and 6 birds, respectively.

A,B - Differing letters denote significant differences ($P < .01$).

TABLE 44. EFFECTS OF DENSITY ON EGG SIZE DISTRIBUTION OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)*

Breeder (Strain)	Density[1] (sq in /bird)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
HyLine	74.6	0.8	2.2	7.7	25.7	63.6
(Brown)	84	0.4	2.4	8.0	25.4	63.8
Hisex	74.6	0.7	1.9	6.5	22.8	68.0
(Brown)	84	0.8	2.0	6.4	23.0	67.8
ISA	74.6	0.6	2.0	5.7	19.3	72.4
(Brown)	84	0.8	1.7	5.9	18.4	73.4
H & N	74.6	0.5	1.9	6.7	26.1	65.2
(Brown Nick)	84	0.6	2.0	6.6	22.4	68.4
DeKalb	74.6	0.8	3.1	5.9	20.0	70.2
(Sex-Sal-Link)	84	1.3	2.0	6.4	21.3	69.1
Tatum	74.6	1.2	2.4	4.8	20.4	71.2
(T-173)	84	1.2	2.4	5.6	18.6	72.5
Arbor Acres	74.6	0.9	2.0	6.9	23.2	67.1
(Brown)	84	1.1	2.5	5.9	24.3	66.3
All Strains	74.6	0.8	2.2	6.3	22.5	68.2
	84	0.9	2.2	6.4	21.9	68.7

[1]Cages with densities of 84 or 74.6 sq. in./bird had populations of 2 and 4 or 3 and 6 birds, respectively.

*There are no significant differences among these means.

TABLE 45. EFFECTS OF DENSITY ON EGG QUALITY AND INCOME OF BROWN EGG ENTRIES, 29TH NCLP&MT (140-728 DAYS)

Breeder (Strain)	Density[1] (sq in /bird)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income ($/Hen)	Feed Cost ($/Hen)
HyLine	74.6	95.6	2.6	1.2	0.6	26.09	10.59
(Brown)	84	95.9	2.6	1.1	0.5	26.16	10.64
Hisex	74.6	95.0	3.0	1.2	0.8	23.44	10.01
(Brown)	84	94.8	2.8	1.7	0.7	24.84	10.63
ISA	74.6	95.4	2.3	1.3	1.0	24.06	10.13
(Brown)	84	95.3	2.8	1.2	0.8	25.75	10.61
H & N	74.6	95.1	2.8	1.1	0.9	25.03	10.17
(Brown Nick)	84	94.9	2.9	1.4	0.9	26.74	10.83
DeKalb	74.6	95.0	2.6	1.9	0.6	23.03	10.44
(Sex-Sal-Link)	84	96.0	2.2	1.3	0.6	25.21	11.15
Tatum	74.6	95.5	2.2	1.3	1.0	24.29	10.67
(T-173)	84	94.9	2.6	1.5	1.0	23.76	10.75
Arbor Acres	74.6	95.7	2.5	1.4	0.5	25.89	11.05
(Brown)	84	95.4	2.5	1.6	0.5	25.62	11.23
All Strains	74.6	95.3	2.6	1.3	0.8	24.55[B]	10.44[B]
	84	95.3	2.6	1.4	0.7	25.44[A]	10.83[A]

[1]Cages with densities of 84 or 74.6 sq. in./bird had populations of 2 and 4 or 3 and 6 birds, respectively.

A,B - Differing letters denote significant differences ($P < .01$).

Figure 1. DeKalb "XL−Link" Strain
Hen−Day Egg Production and Feed Consumption Per 100 Hens Per Day

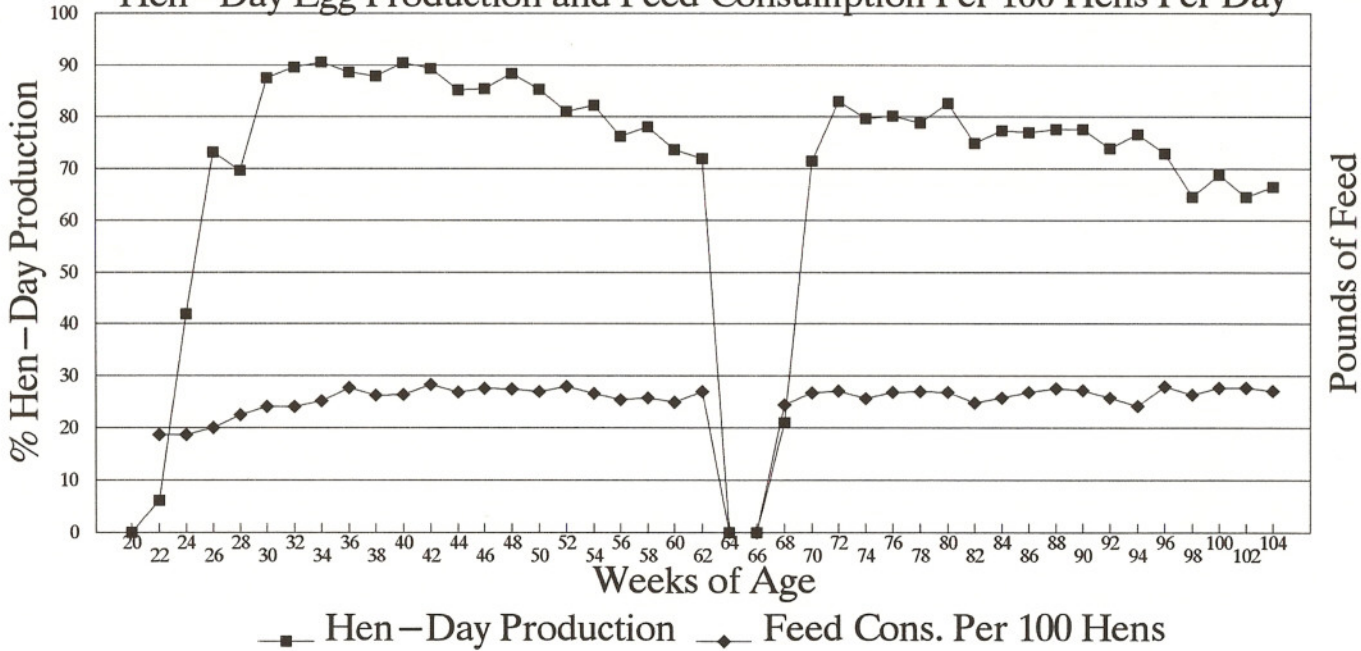


Figure 2. H & N "Nick Chick" Strain
Hen–Day Egg Production and Feed Consumption Per 100 Hens Per Day

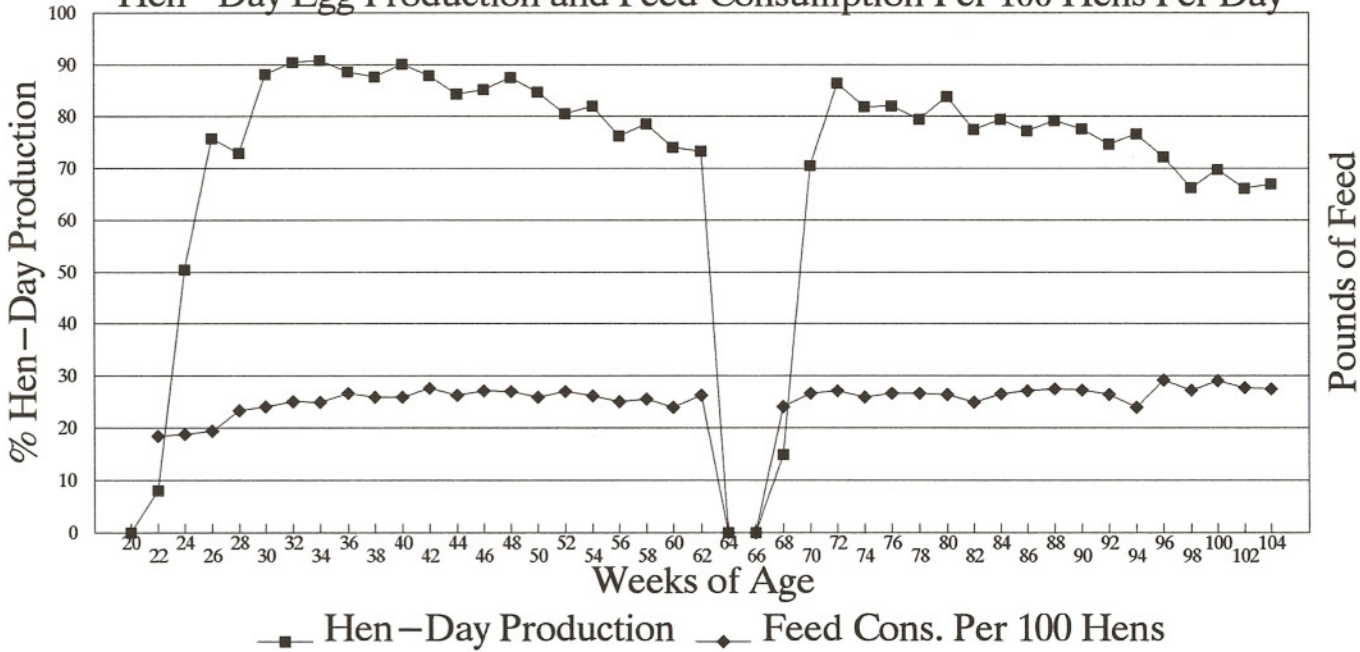


Figure 3. Hisex "White" Strain
Hen–Day Egg Production and Feed Consumption Per 100 Hens Per Day

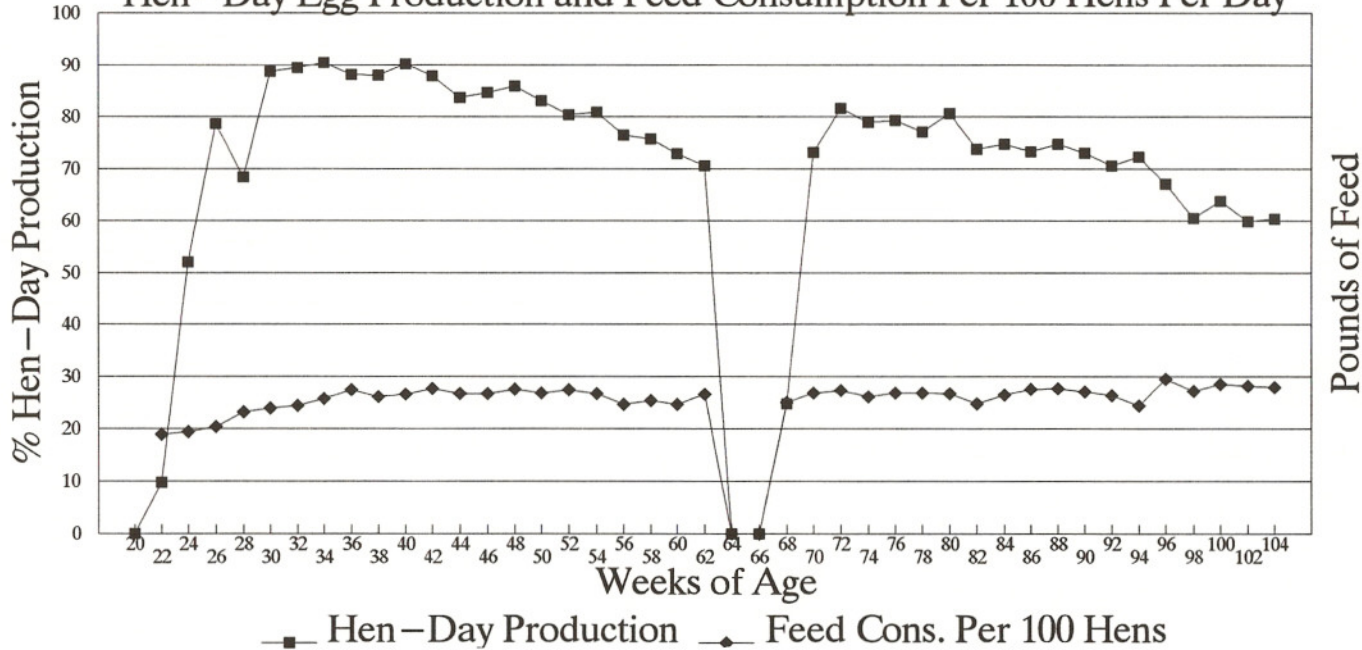


Figure 4. ISA/Babcock "B−300" Strain
Hen−Day Egg Production and Feed Consumption Per 100 Hens Per Day

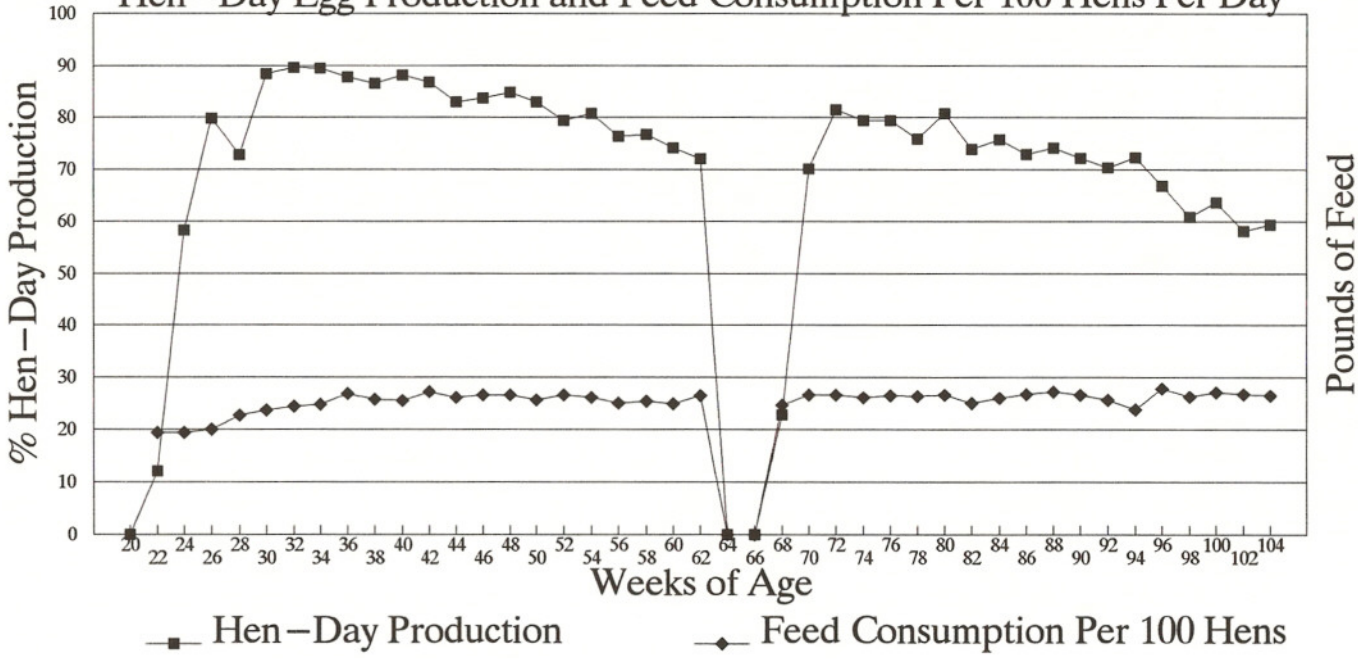


Figure 5. Hy−Line "W−36" Strain
Hen−Day Egg Production and Feed Consumption Per 100 Hens Per Day

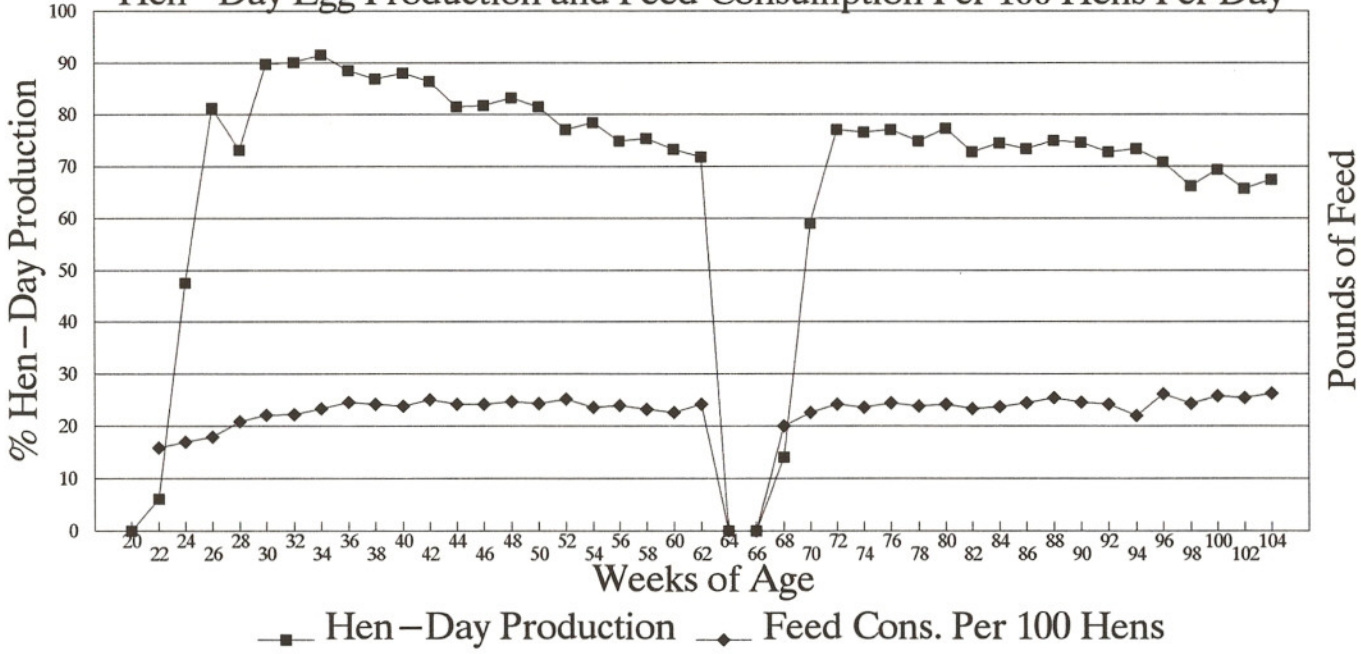


Figure 6. Shaver "SC288 A" Strain
Hen−Day Egg Production and Feed Consumption Per 100 Hens Per Day

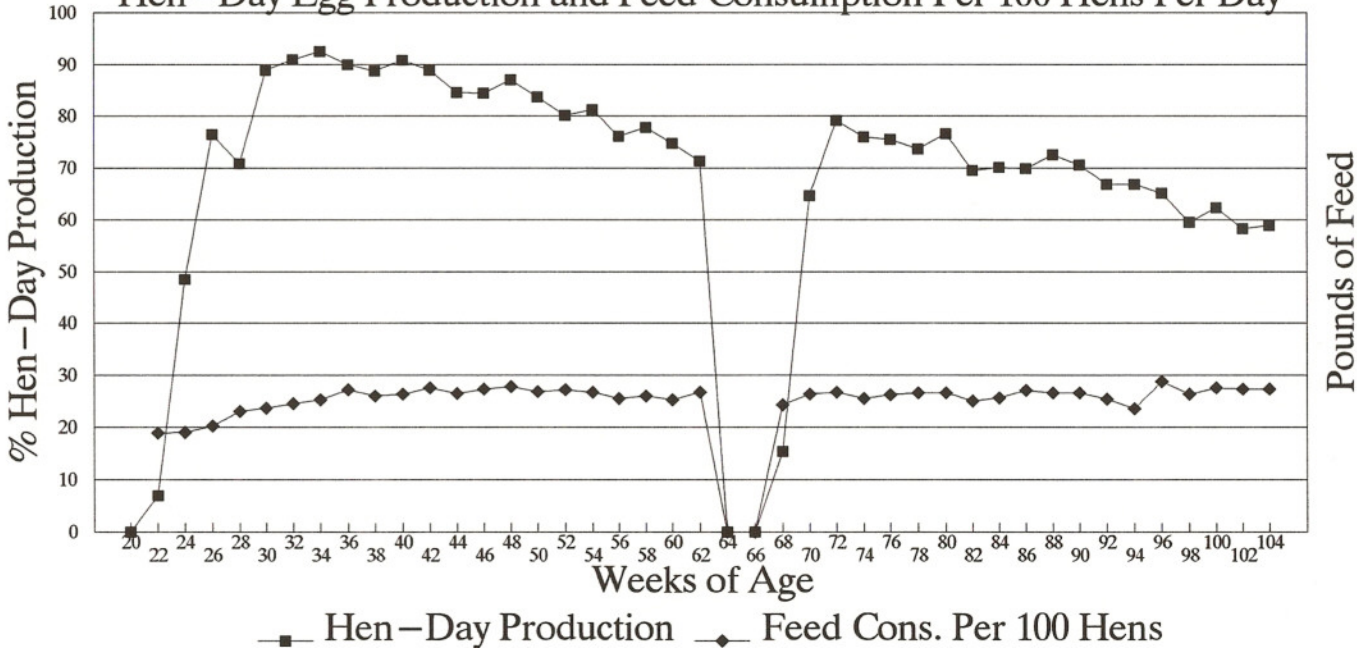


Figure 7. Tatum "T−100" Strain
Hen−Day Egg Production and Feed Consumption Per 100 Hens Per Day

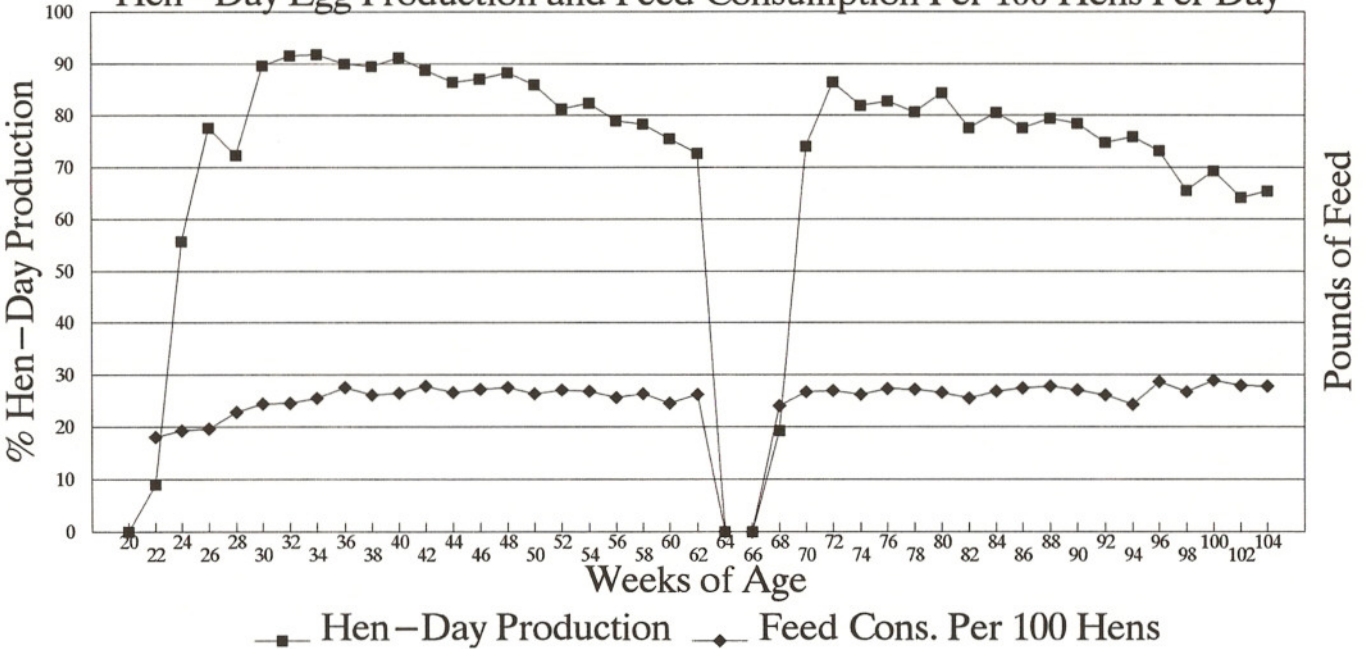


Figure 8. Hy−Line "Brown" Strain
Hen−Day Egg Production and Feed Consumption Per 100 Hens Per Day

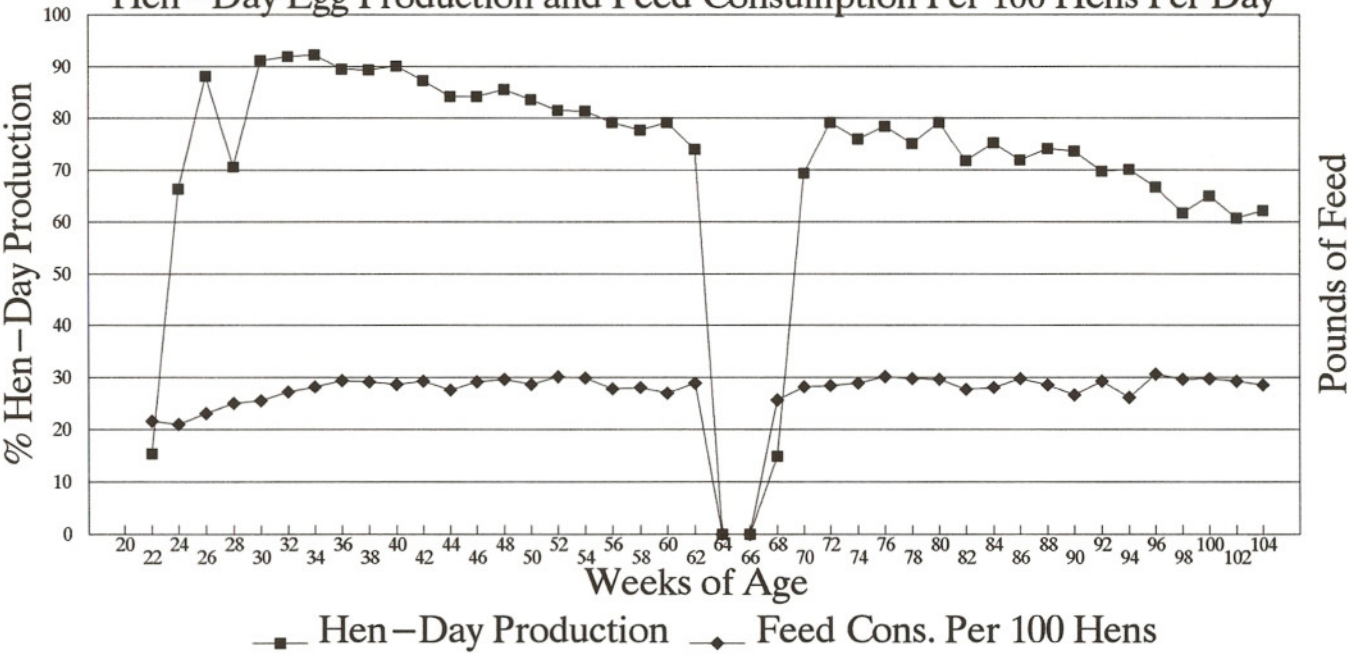


Figure 9. Hisex "Brown" Strain
Hen–Day Egg Production and Feed Consumption Per 100 Hens Per Day

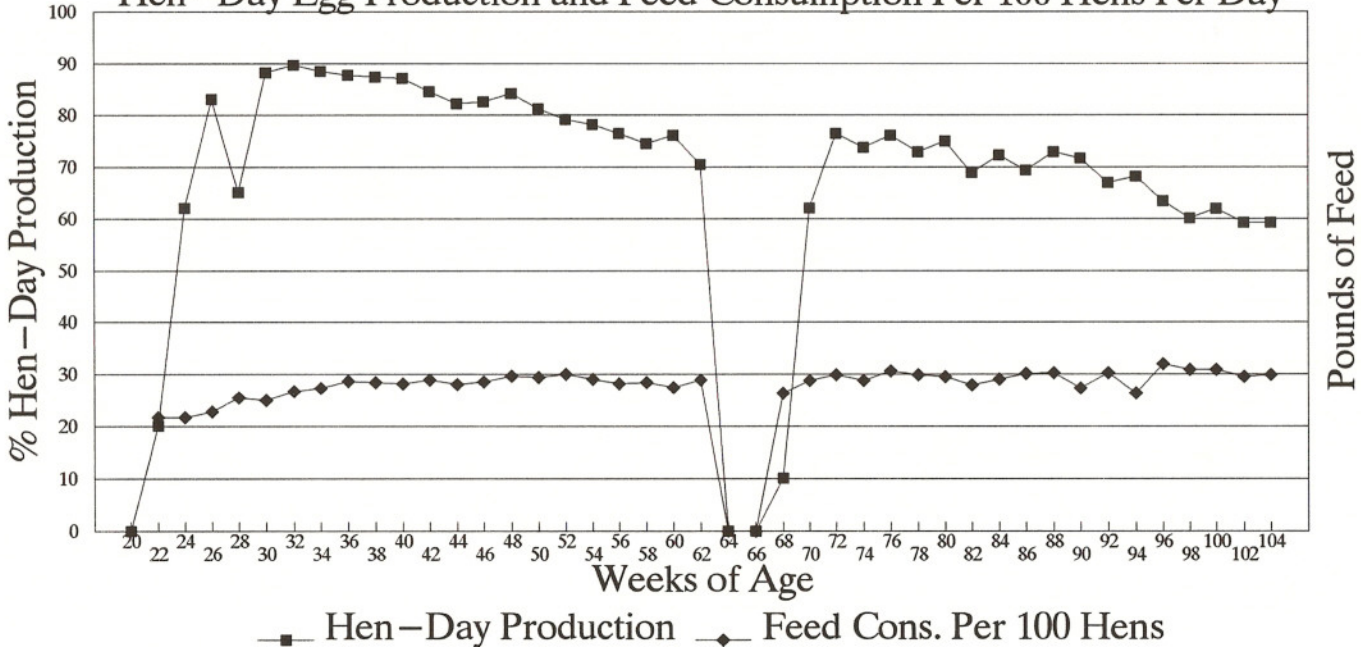


Figure 10. ISA/Babcock "Brown" Strain
Hen–Day Egg Production and Feed Consumption Per 100 Hens Per Day

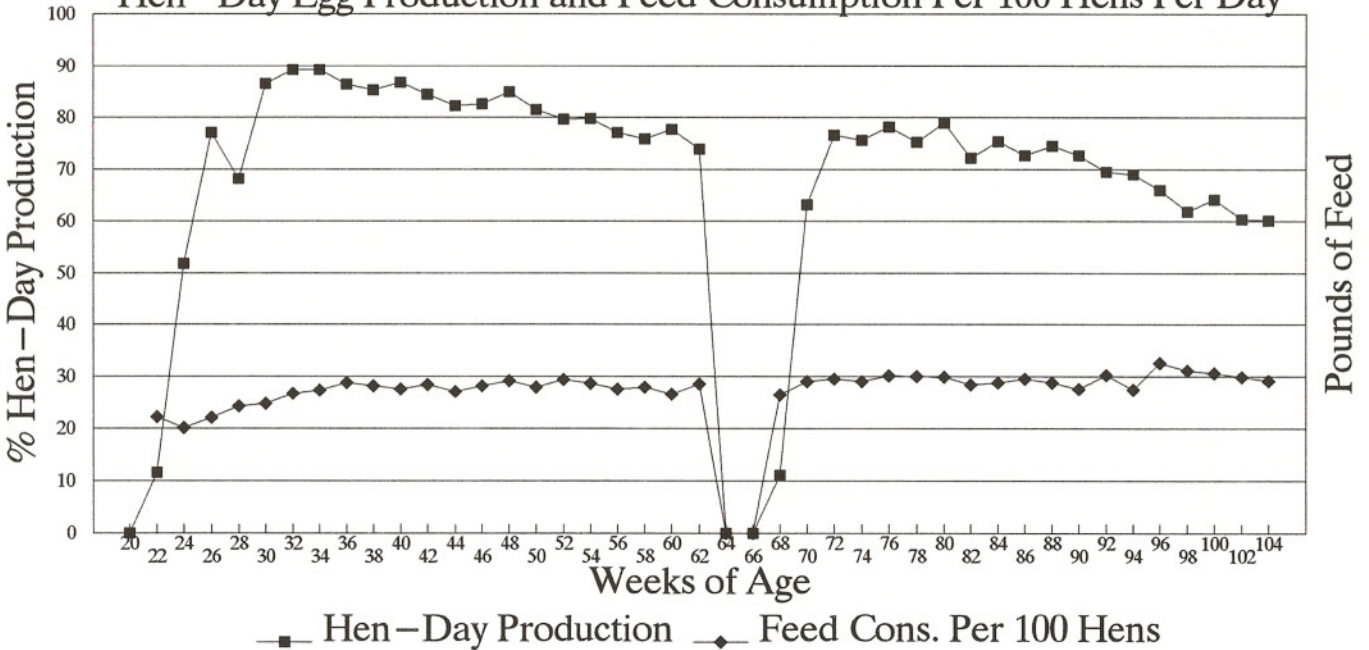


Figure 11. H & N "Brown Nick" Strain
Hen–Day Egg Production and Feed Consumption Per 100 Hens Per Day

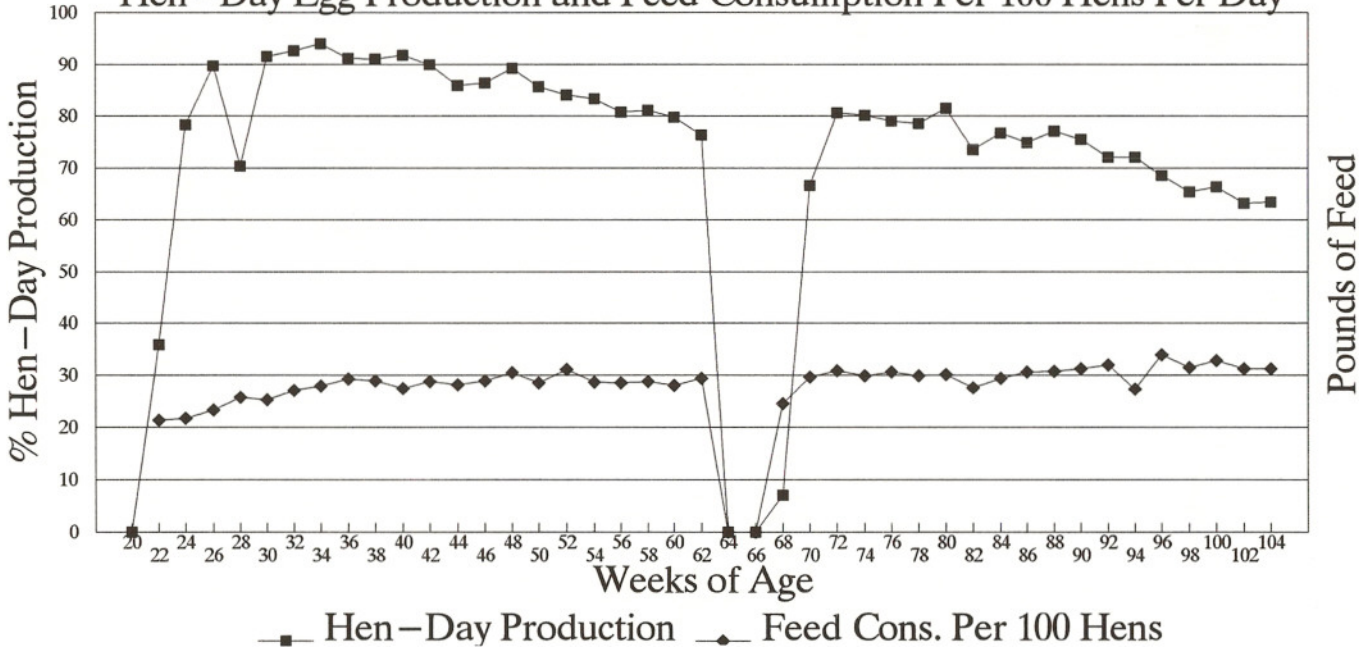


Figure 12. DeKalb "Sex−Sal−Link" Strain
Hen−Day Egg Production and Feed Consumption Per 100 Hens Per Day

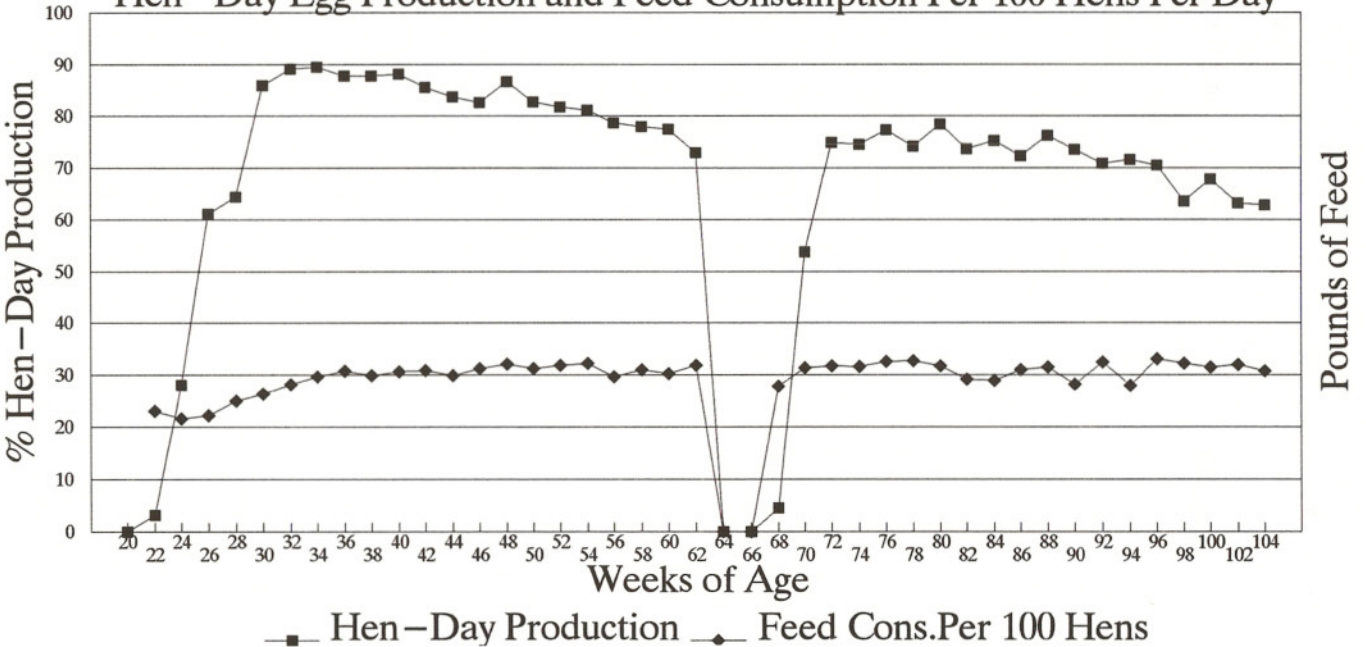


Figure 13. Tatum "T−173" Strain
Hen−Day Egg Production and Feed Consumption Per 100 Hens Per Day

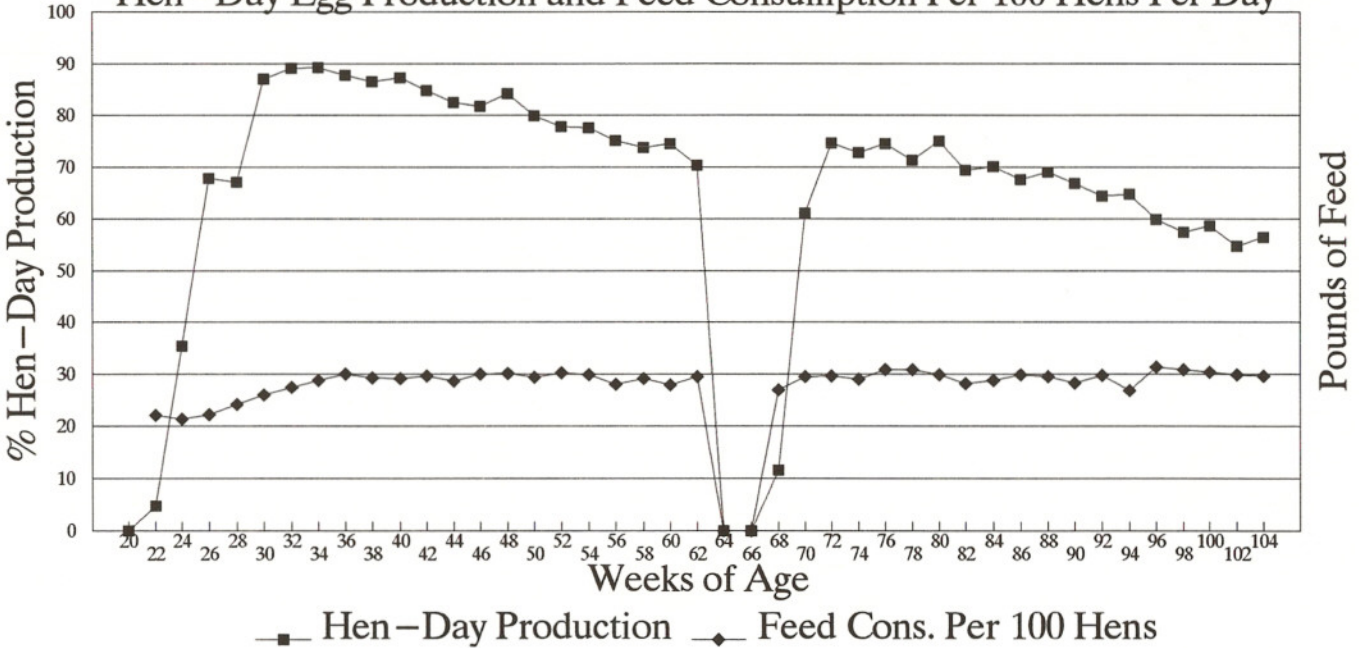
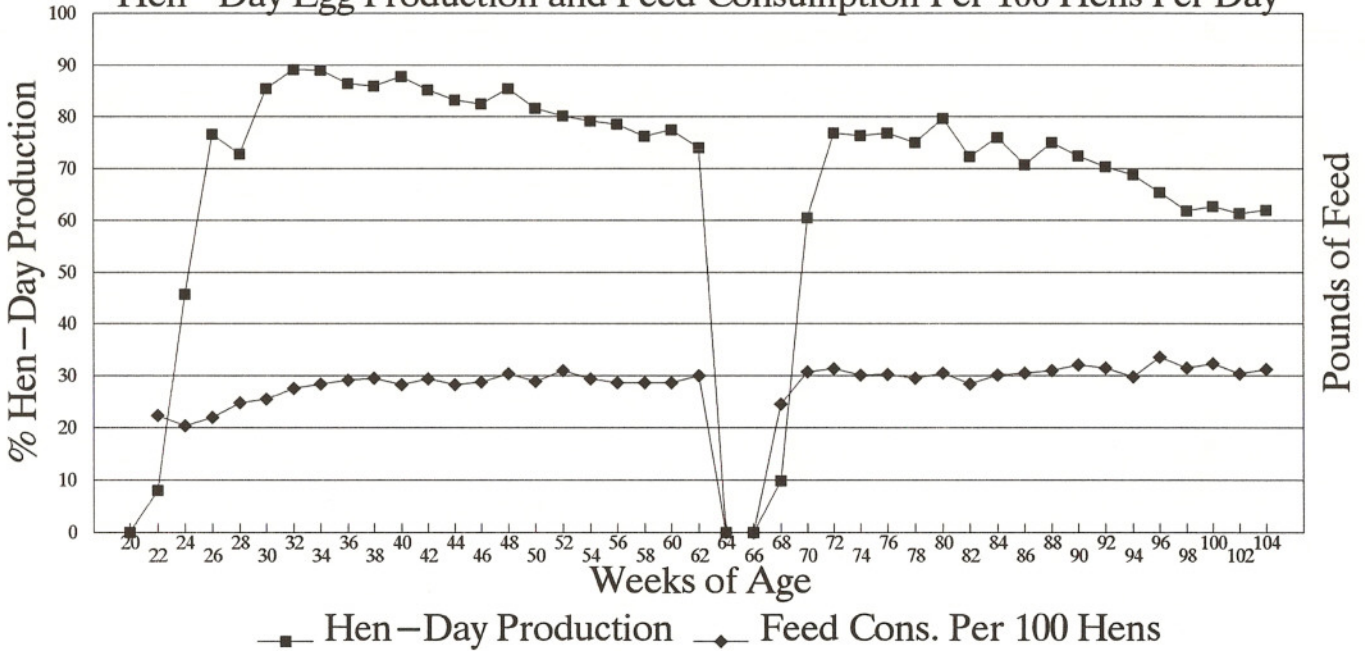


Figure 14. Arbor Acres "Brown" Strain
Hen–Day Egg Production and Feed Consumption Per 100 Hens Per Day



STOCK SUPPLIERS AND CATEGORIES

Breeder	Stock	Category	Source
DeKalb AgResearch, Inc. 3100 Sycamore Road DeKalb, IL 60115	XL Link	I-A	Brickland Breeder Farms Route 1, Box 308 Kenbridge, VA 23944
H & N International 3825 154th Avenue, NE Redmond, WA 98052	H & N "Nick Chick"	I-A	Wheelock Hatchery 2170 Wayne Road Chambersburg, PA 17201
Hisex Division Pilch, Inc. Box 438 Troutman, NC 28166	Hisex White	I-A	Euribred, Inc. P.O. Box 719 Troutman, NC 28166
ISA-Babcock, Inc. P.O. Box 280 Ithaca, NY 14851	B-300	I-A	American Selected Products 615 Copeland Mill Road Suite 1-B Westerville, OH 43081
Hy-Line International P.O. Box 310 Dallas Center, IA 50063	W-36	I-A	Hy-Line International 1005 4th Avenue, SE Spencer, IA 51301
Shaver Poultry Breeding Farms, Ltd. Box 400 Ontario, CANADA N1R 5V9	288A (Shaver White)	I-A	American Selected Products, Inc. 209 Grove Street Silver Lake, MN 55381
Tatum Farms Route 3 Dawsonville, GA 30534	T-100	II-A	Tatum Farms Route 3 Dawsonville, GA 30534
Hy-Line International P.O. Box 310 Dallas Center, IA 50063	Hy-Line Brown	II-A	Lakeview Farms Route 3, Box 818 Searcy, AR 72143
Hisex Division Pilch, Inc. Box 438 Troutman, NC 28166	Hisex Brown	I-A	Euribred, Inc. P.O. Box 719 Troutman, NC 28166
ISA-Babcock P.O. Box 280 Ithaca, NY 14851	Babcock Brown	II-A	Clock & DeCloux 1609 Trumansburg Road Ithaca, NY 14850
H & N International 3825 154th Avenue, NE Redmond, WA 98052	Brown Nick	II-A	Wheelock Hatchery 2170 Wayne Road Chambersburg, PA 17201
DeKalb AgResearch, Inc. 3100 Sycamore Road DeKalb, IL 60115	Sex-Sal-Link	I-A	Heartland Hatcheries, Inc. 509 South Wayne Street P.O. Box 911 Portland, IN 47371
Tatum Farms Route 3 Dawsonville, GA 30534	T-173	II-A	Tatum Farms Route 3 Dawsonville, GA 30534
Arbor Acres Marlborough Road Glastonbury, CT 06033- 6501	Brown	II-A	Clock and DeCloux 1609 Trumansburg Road Ithaca, NY 14850

*I = Extensive distribution in southeast United States.
II = Little or no distribution in southeast United States.
A = Entry requested.
C = Entry not requested.