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HATCH AND SEROLOGY REPORT OF THE THIRTY NINTH NORTH CAROLINA LAYER PERFORMANCE AND MANAGEMENT TEST AND ALTERNATIVE MANAGEMENT TEST

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The North Carolina Layer Performance and Management Test is conducted under the auspices of the North Carolina Layer Performance and Management Program, 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-Poultry Unit, Salisbury, North Carolina. Mr. Joe Hampton is Piedmont Research Station Superintendent; Mr. Aaron Sellers is Poultry Unit Manager of the flock; Dr. Ramon Malheiros is coordinator of data compilation and statistical analysis; and Dr. K. E. Anderson is Project Leader. The purpose of this program is to assist poultry management teams in evaluation of commercial layer stocks and management systems.

Copies of current and past reports are maintained for public access at http://www.ces.ncsu.edu/depts/poulsci/tech_manuals/layer_reports/39_hatch_report.pdf .

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HATCH AND SEROLOGY REPORT OF THE THIRTY NINTH NORTH CAROLINA LAYER PERFORMANCE AND MANAGEMENT TEST

Dates of Importance and Entries:

Twenty entries were accepted or acquired in accordance with the rules and regulations of the test. The eggs were placed into trays and set on July 9, 2013 and were pulled from the hatchers on July 31, 2013. Twelve commercial white egg strains, and eight commercial brown egg strains are participating in the current test. Table 1, shows the source of the laying stock (Breeder) and the strain which was entered in the test and Table 5 provides the breeder, source of eggs, and entry status of each strain. The egg deliveries to the Research Station occurred from July 1 to 9 and all eggs arrived in good condition however, the age of the eggs were variable between strains. The eggs for each of the strains were shipped directly to the station via delivery truck, FedEx ground freight, or via US Mail. There were few broken eggs and the number of dirty eggs were minimal among all shipments for the represented strains. The eggs were set 90 eggs/tray and allowed to come to room temperature prior to placement in the incubators. At time of transfer, two egg trays were transferred to each hatching tray (180 eggs/tray), and were then placed into the hatchers. Only obvious leakers or contaminated eggs were removed at transfer to facilitate the hatch and were noted on the hatching tray labels.

Table 1. 39th North Carolina Layer Performance and Management Test Strain Code Assignments

Strain No.	Source of Stock	Source Code	Strain
1	ISA	ISA	Bovans White
2	ISA	ISA	Shaver White
3	ISA	ISA	Dekalb White
4	ISA	ISA	Babcock White
5	ISA	ISA	B 400 White
6	Hy-Line	HL	W-36
7	Hy-Line	HL	CV26
8	Hy-Line	HL	CV24
9	Hy-Line	HL	CV22
10	Lohmann	L	LSL Lite
11	Lohmann	L	H&N Nick Chick
12	Novogen	N	White
13	Tetra Americana	TA	TETRA Amber
14	Tetra Americana	TA	TETRA Brown
15	Novogen	N	Brown
16	Lohmann	L	LB Lite
17	Hy-Line	HL	Silver Brown
18	Hy-Line	HL	Brown
19	ISA	ISA	ISA Brown
20	ISA	ISA	Bovans Brown

Data Collection:

Serology: The serum samples were obtained by collecting a blood sample from 20 male chicks obtained from each strain at the time of hatch. The blood was allowed to agglutinate and the serum to separate for collection. The serum samples were then pooled by combining the individual samples from ten chicks per strain into 1 ml samples or aliquots. The pooled samples were collected and packaged and refrigerated until delivery and testing at the NC Department of Agriculture & Consumer Services, Rollins Diagnostic Laboratory for Mycoplasma gallisepticum (MG) and Infectious Bursal Disease (IBD). The serological tests were conducted for Infectious Bursal Disease using the Agar Gel Immuno Diffusion (AGID) method and ELISA. Mycoplasma gallisepticum serological test used the ELISA test. The serum pools were adequate for each of the 19 strains. Serology results for MG and IBD are shown in Table 2. The chicks were MG negative and the IBD antibody levels were positive, indicative of a reasonable breeder vaccination programs in the breeder flocks of all strains. IBD titers were present in all the strains and the titer levels for the individual samples appeared to have a greater variation between strains than seen in previous reports. The distribution of the sample titers across strains is shown in Figure 1.

Table 2. Status of the IBD parental immunity and determination of MG presence in the participating strains in the 39th NCLP&MT

Source Code	Strain	MG[1]	IBD[2]	
			Result	S/P[3]
ISA	Bovans White	- Neg	+ Pos	1.843
ISA	Shaver White	- Neg	+ Pos	3.867
ISA	Dekalb White	- Neg	+ Pos	6.264
ISA	Babcock White	- Neg	+ Pos	5.929
ISA	B 400 White	- Neg	+ Pos	5.170
HL	W-36	- Neg	+ Pos	3.674
HL	CV26	- Neg	+ Pos	3.273
HL	CV24	- Neg	+ Pos	2.686
HL	CV22	- Neg	+ Pos	2.498
L	LSL Lite	- Neg	+ Pos	4.895
L	H&N Nick Chick	- Neg	+ Pos	5.880
N	White	- Neg	3Pos/2 Neg	0.303
TA	TETRA Amber	- Neg	+ Pos	3.895
TA	TETRA Brown	- Neg	+ Pos	3.359
N	Brown	- Neg	+ Pos	3.900
L	LB Lite	- Neg	+ Pos	3.336
HL	Silver Brown	- Neg	+ Pos	3.243
HL	Brown	- Neg	+ Pos	2.912
ISA	ISA Brown	- Neg	+ Pos	2.230
ISA	Bovans Brown	- Neg	+ Pos	1.705

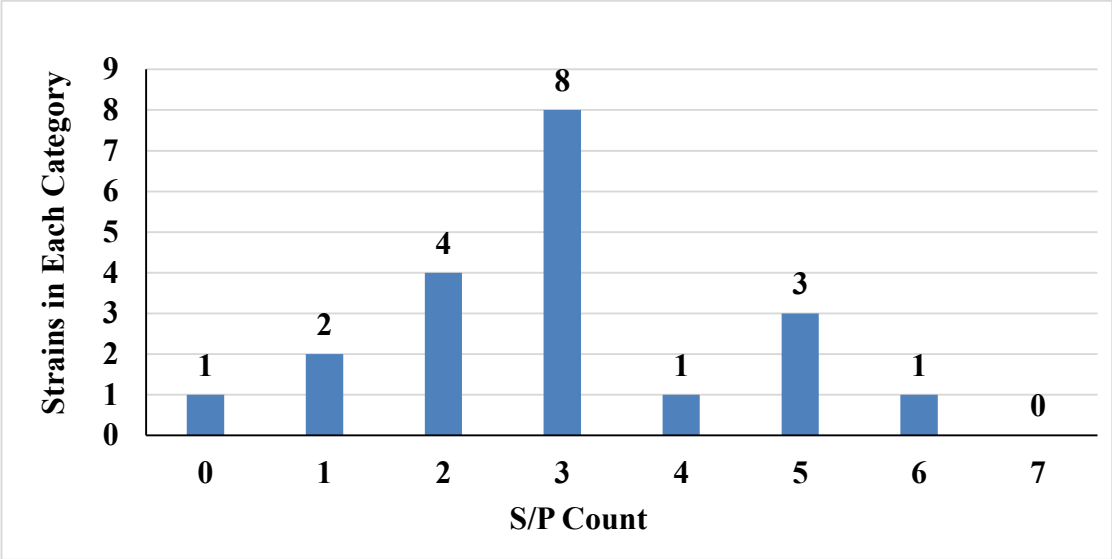
Samples n=5 pooled serum samples/strain representing 20 chicks

[1]MG status was determined using the ELISA method

[2]IBD status was determined using Agar Gel Immune Diffusion (AGID) by Synbiotics Corp

[3]S/P =Titer for IBD

Figure 1. Distribution of strain serum samples across titer groups (582-IBD-XR)



Pre-Incubation Handling and Storage – The eggs were received for flock 39 from 7/1/13 thru 7/8/13. The temperature in the cooler was maintained at 60° F ± 3°F and the relative humidity was maintained at 75-80%. The eggs were delivered by company representatives in either vans or other automobiles. One strain arrived at Charlotte Douglas Airport and another via US Mail priority over night. The eggs were set in trays on Monday 7/8/13 in the hatchery in the work room warmed to 85°F. On Tuesday morning the eggs were transferred to the incubators at 12:30 and closed the doors at 3:00 pm. The humidity control was not turned on until Wednesday morning as soon as the replacement sensor for incubator was installed.

Incubator and Hatcher - We have used the same incubation and hatch program since the 37th NCLP&MT when new incubators and hatchers were acquired for the hatchery. The incubators are set up with an automatic dialing alarm to notify the managers of electrical, temperature or humidity problems. The temperature and humidity are recorded 3 times each day. The incubation temperatures ranged in all of the incubators from 99.9 to 99.3°F with a set point of 99.5°F and humidity ranged from 53-56 % with a set point of 55% which were the same as those used in our weekly hatches. The eggs were transferred from the incubators to the hatchers on day 18 and temperatures were reduced to 98.5°F. There was a direct transfer from incubation trays into the hatching trays.

Hatch-Hatch residues were examined to evaluate potential hatch problems which occurred. The evaluation included fertility and embryonic mortality at specific points during the incubation period. The evaluation was conducted on a random sample of approximately 1080 eggs out of all eggs set for each strain participating in the test. At transfer the eggs were placed in hatching trays each containing 180 eggs. At the hatch residues remaining in the hatching trays on the hatch day were examined from 6 trays. The hatch trays were randomly selected to represent each of the incubators and hatchers used for each of the strains. Table 3 shows the percent usable chicks, cull chicks, and residue of the total eggs set. Table 4 shows the distribution of the residue by each embryonic category and is based upon the percentages based upon the total residue.

There were problems associated with the hatch. The hatch of some strains were very poor. From the breakout the issue may have been related to egg fertility or egg age related to pre-incubation death. The breeders were consulted and a decision was made to acquire chicks from hatches which were hatched during the same week. Fortunately we were able to receive replacement chicks which were within the same week and in all but one strain chicks were replaced. In all cases the chicks were less than 3 days different in age from the 39th NCLP&MT. They have been integrated into the flock.

Table 3. Analysis of hatch by evaluating chicks pulled, female, male, and cull chicks as a percentage of the total eggs set for the 39th NCLP&MT

Source Code & Strain	Chicks Pulled	Female Chicks[1]	Male Chicks	Cull Chicks	Total Egg Residue
	----------%----------				
ISA Bovans White	963	45.41	42.12	0.56	11.91
ISA Shaver White	940	39.26	49.69	0.65	10.40
ISA Dekalb White	506	20.27	29.53	3.52	46.68
ISA Babcock White	743	35.50	37.43	1.77	25.30
ISA B 400 White	710	31.36	35.77	3.70	29.16
HLW-36	670	29.85	12.98	0.42	56.74
HL CV26	336	13.51	22.45	0.66	63.39
HL CV24	744	31.91	37.06	0.37	30.66
HL CV22	499	16.59	31.93	0.65	50.83
L LSL Lite	746	31.05	29.98	0.65	38.33
L H&N Nick Chick	735	37.05	37.05	1.92	23.99
N White	909	39.40	43.66	0.65	16.28
TA TETRA Amber	933	40.36	45.66	0.00	13.98
TA TETRA Brown	870	28.78	51.57	0.09	19.56
N Brown	884	40.89	40.72	0.56	17.83
L LB Lite	698	31.83	30.77	4.81	32.59
HL Silver Brown	750	31.00	36.48	2.47	30.05
HL Brown	647	29.26	31.77	1.11	37.86
ISA Brown	900	38.53	43.22	0.28	17.98
ISA Bovans Brown	927	45.23	39.55	0.09	15.12

[1]Calculated as a percentage of total eggs set.

Table 4. Analysis of breakout on eggs set to determine cause of embryo mortality as percent of residue sample (n=1080/Strain) of the 39th NCLP&MT

Source Code & Strain	Infertile	Early Dead		Dead		Air Cell		Pipped		Contam[1]	Abnormal		Upside Down[3]	Crack
		Mem	Blood	Mid	Late	Pre-pip	Post-pip	Live	Dead		Shell[2]	Embryo		
		%												
ISA Bovans White	38.79	11.21	10.34	5.17	1.72	21.55	1.72	0.00	8.62	0.00	0.00	0.00	0.00	0.86
ISA Shaver White	47.86	1.43	9.29	6.43	1.43	12.14	7.14	5.71	5.71	0.71	0.00	0.71	1.43	0.00
ISA Dekalb White	61.32	2.79	4.53	3.83	1.92	4.70	5.57	13.41	0.17	0.70	0.00	0.00	0.00	1.05
ISA Babcock White	40.96	13.55	8.43	6.63	5.42	11.45	1.51	6.33	2.11	0.90	0.30	0.30	0.00	2.11
ISA B 400 White	37.30	1.62	7.30	5.41	4.32	15.41	7.57	18.38	0.54	0.81	0.00	0.00	1.08	0.27
HLW-36	59.65	6.89	7.68	2.56	2.17	4.53	4.92	9.65	0.59	0.79	0.00	0.00	0.20	0.39
HL CV26	80.66	0.55	6.17	0.55	2.33	4.25	1.23	4.12	0.00	0.00	0.00	0.00	0.14	0.00
HL CV24	53.27	8.63	4.76	5.06	2.38	10.42	4.46	8.33	0.89	1.19	0.00	0.00	0.00	0.60
HL CV22	67.30	6.06	9.69	2.08	8.65	0.52	0.69	3.11	0.17	1.73	0.00	0.00	0.00	0.00
L LSL Lite	57.66	3.30	4.50	3.90	9.61	9.31	4.20	2.70	2.10	2.40	0.00	0.00	0.00	0.30
L H&N Nick Chick	57.87	4.72	3.54	6.69	2.76	4.72	7.48	8.27	1.57	1.97	0.00	0.00	0.39	0.00
N White	37.50	13.10	9.52	7.74	3.57	13.69	4.17	3.57	6.55	0.00	0.00	0.00	0.00	0.60
TA TETRA Amber	31.29	12.93	7.48	3.40	6.12	9.52	5.44	5.44	13.61	1.36	0.00	0.68	1.36	1.36
TA TETRA Brown	46.67	14.76	9.52	4.76	4.29	8.57	4.29	2.38	2.38	0.48	0.00	0.00	0.00	1.90
N Brown	36.22	11.22	4.08	6.63	3.57	15.82	10.71	1.53	5.10	2.55	1.53	0.00	0.00	1.02
L LB Lite	34.29	23.82	4.19	5.76	5.24	5.50	5.24	13.09	1.31	0.00	0.00	0.00	1.57	0.00
HL Silver Brown	41.45	19.08	4.61	4.93	7.57	5.59	3.62	6.25	4.28	0.33	0.00	0.00	2.30	0.00
HL Brown	55.68	6.50	5.34	5.34	3.02	12.53	2.09	2.55	3.25	2.09	0.46	0.00	0.00	1.16
ISA Brown	50.00	5.00	11.11	6.11	2.22	12.78	3.33	1.11	7.22	0.56	0.00	0.00	0.56	0.00
ISA Bovans Brown	41.55	18.31	9.15	5.63	4.23	11.27	2.11	0.70	4.93	0.70	0.00	0.00	0.00	1.41

[1]Contaminated eggs.
[2]Abnormal shell structure.
[3]Eggs set with the small end up.

PULLET HOUSING AND MANAGEMENT:

Housing: The chicks were weighed then randomly assigned to the growing replicates with white egg and brown egg replicates being intermingled throughout the rooms within the house. The white egg strains occupied approximately 60 % of the house and brown egg strains occupied the other 40 % of House 8 and 50 and 50 % of House 4, respectively. Strain assignment codes indicate the cage/pen arrangement, replicate identification numbers, and the strain assignments for brood-grow House 4 and 8. Strain codes are maintained by the PI and Unit Manager for identification of birds and record keeping. Individual birds are identified by a permanent identification tag which identifies the replicate number; indicate room, row, level and replicate within room-row-level-replicate, for the four digits, respectively. The replicate number identifies the strain to the unit manager and PI.

House 8 - is an environmentally controlled windowless brood-grow facility with 3 banks of quad-deck cages in each room. Each room has been assigned a number and each bank has been assigned a row number, and each cage section within each row and level/row has been assigned a replicate number, for statistical analysis pairs of rows have been designated as blocks. Thus, each block consists of two rows containing 24 Replicates on all levels. This allows for a total of 3,744 pullets per room resulting in a total pullet count. For this study 3 rooms will be utilized in House 8 for a total of 9,600 pullets. The white and brown egg strains will be randomly assigned to the replicates within the house. Entrant strains will be assigned to the replicates in a restricted randomized manner with the restrictions being that all strains are approximately equally represented in all rooms, rows, and levels, as described earlier under the experimental design. All chicks will be brooded in the same cage during the entire 16 wk rearing period. Paper will be placed on the cage floor for the first 7 days within each of the replicate series within each row. Each cage within the replicate will be 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 sq. in. for the white and brown-egg layers.

House 4 – is contains 24 pens (12’ x 18’) for a total sq ft of 216. The pullets would be housed at approximately 144 in^2 per hen for a total hen population of 216 hens/pen. Until the pullets are 12 wk of age the house will serve dual purpose for brooding and rearing of both the range and cage free birds. The house is being set up to include whole house heat capabilities. There will be 227 to 306 chicks started in each pen with the rearing protocol being identical to the cage reared hens.

House 4 – is a slat-litter cage-free facility which is windowless and environmentally controlled high-rise house that is set up to include whole house heat capabilities. The house will serve dual purpose for brooding/rearing and production of the cage-free birds. House 4 is divided into 36 pens which are 8.0’ x 10’ for a total of 80 sq ft. The chicks would be housed at approximately 177 in^2 per hen for a total hen population of 65 chicks were started in each pen with the rearing protocol being as identical to the cage reared hens as possible. Roosts will be included in the rearing pen to allow the pullets to learn to utilize vertical space. This improves the use of nests as a hen enters production.

Range Huts - The huts will serve dual purpose for brooding/rearing and production of the cage free birds. The huts are set up to include whole house heat capabilities. The slats will be covered with landscape cloth and a layer of wood shavings. The chicks have been housed at approximately 177 in^2 per hen for a total hen population of 65 chicks were started in each pen with the rearing protocol being as identical to the cage reared hens as possible. The litter will be removed after brooding so the pullets can become accustomed to slats after the brooding period. Pullets will be provided 13 cm of roosting space/bird. The range hut has a timer and light, supplemental propane heater for brooding and cool

conditions to maintain an interior temperature within the Thermal Neutral Zone (TNZ) where body temperature will be maintained.

At 12 weeks of age the pullets will be allowed access to their respective range paddocks where the completion of the rearing will be done. The pullets will have free access to the outdoors throughout the day and night but, will be trained to return to the range hut during the dark for roosting and protection. Husbandry, lighting and supplemental feed were allocated on the same basis as flock mates in cage-free and cages in order to minimize the variables between flock mates as much as possible. Range density will be based upon research a 721 bird/acre static equivalency 5.56 m^2/hen (60 ft^2/hen). The range pens were 18.3 m x 18.3 m (60' x 60') and were enclosed by a fence 1.8 m (6 ft) with the lower chain link section being 1.2 m (4 ft) high. In order to facilitate range forage replenishment each of the paddocks will be divided in half with a diagonal fence providing 2.78 m^2/hen (30 ft^2/hen) and rotated every 4 wks. One week prior to rotation the paddocks were mowed to an approximate height of 15 cm (6 in.). Hen movement will be controlled by an access a gate that will allow access to one half of the paddock at any point in time. The veranda area will be a 3.04 m x 4.6 m (10'x15') shaded area which was bare dirt. Each range hut had 8 nipple drinkers inside each pen and 8 nipple drinkers outside. Tube feeders will be in each pen 1 inside and a covered feeder outside providing 6.4 cm of feeder space /pullet.

Table 5. Entries in the 39th 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 North America 4432 Highway 213, Box 309 Mansfield, GA 30255
	Hy-Line Brown	I-A	(Same)
	Hy-Line Silver Brown	I-A	(Same)
	CV22	II-A	(Same)
	CV24	II-A	(Same)
	CV26	II-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 Elizabethtown 79 Industrial Rd Elizabethtown, PA 17022
	Lohmann LB-Lite	I-A	(Same)
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
Instiut de Selection Animale (A Hendrix Genetic Company) ISA North America 650 Riverbend Drive, Suite C Kitchener, Ontario N2K 3S2 Canada	Bovans White	I-A	CPI-South Central Hatchery 5087 County Road 35 Bremen, AL 35033
	Dekalb White	I-A	(Same)
	Bovans Brown	I-A	(Same)
	Babcock White	II-A	Institute de Sélection Animale 650 Riverbend Dr. Suite C Kitchener, Ontario N2K 3S2 Canada
	B 400	II-A	(Same)
	Shaver White	I-A	Midwest Farms, LLC. 135 S. Epes St. Blackstone, VA 23824
	ISA Brown	I-A	(Same)
Tetra Americana, LLC 1105 Washington Road Lexington, GA 30648	TETRA Brown	I-A	CPI-MidAmerica Hatchery Lexington, GA 30648 (Same)
	TETRA Amber	I-A	
NOVOGEN S.A.S. Mauguérand – Le Foeil BP 265 22 800 QUINTIN - FRANCE	NOVOgen BROWN	I-A	Morris Hatchery 18370 SW 232 Street, Goulds, FL 33170-5399
	NOVOgen WHITE	I-A	Pennovo Hatchery 621 Stevens Road Ephrata, PA 17522

[1] I = Extensive distribution in southeast United States A = Entry requested
II = Little or no distribution in southeast United States