Second Annual

NORTH CAROLINA POULTRY NUTRITION CONFERENCE

SHERATON CENTER

Charlotte, N. C.

December 11, 1975

Sponsored by:
Carolina Feed Industry Association

In cooperation with:
North Carolina State University at Raleigh
and
Clemson University

MORNING SESSION

Chairman: Dr. Jack Jones, Clemson University

8:50 a.m. Welcome - Tom McNulty, President of Carolina Feed Industry Association
9:00 a.m. Plane of Nutrition and Feed Cost Per Pound of Meat - Dr. J. B. Ward, N. C. State University
9:30 a.m. Feed Mill Inspection - Dr. Jack Van Stavern, Feeds Administrator, N. C. Department of Agriculture
10:00 a.m. Fats and Fat Quality - Dr. C. W. Johnson, Director of Product Development, National Renderer's Association
10:30 a.m. Break

Chairman: Mr. Dave Harris, Harris-Crane Company

10:50 a.m. Plane of Nutrition and Turkey Performance - C. E. Brewer, N. C. State University
11:20 a.m. Ensiled Poultry Wastes for Cattle - Dr. D. L. Cross, Assistant Professor, Clemson University
11:50 a.m. Lunch

AFTERNOON SESSION

Chairman: Mr. Tom Hester, B & L Feeds

1:20 p.m. Phosphorus for Laying Hens - Dr. J. D. Garlich, N. C. State University
1:50 p.m. Ingredient Variability - Dr. D. W. Murphy, N. C. State University
2:20 p.m. The Measurement of Apparent and True Metabolizable Energy in Poultry Feedingstuffs - Dr. I. R. Sibbald, Animal Research Institute, Ottawa, Ontario
2:50 p.m. Break

Chairman: Mr. Buford Barrows, Siler City Mills

3:10 p.m. Mercury and Its Effect on Broilers - Dr. W. E. Donaldson, N. C. State University
3:40 p.m. Feed Mills and Environmental Factors - George Harlow, Chief of Water Enforcement Branch, EPA
4:10 p.m. Energy Values for Use in Feed Formulation - Dr. I. R. Sibbald, Animal Research Institute, Ottawa, Ontario
4:40 p.m. The Effect of Strain on Nutritional Requirements - Dr. E. P. Singsen Professor Emeritus, University of Connecticut
6:00 p.m. Carolina Feed Industry Association Business Meeting
6:15 p.m. Social Hour - Sponsored by Carolina Feed Association

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PLANE OF NUTRITION AND FEED COST PER POUND OF MEAT

J. B. Ward
Extension Poultry Science
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Raleigh, North Carolina

In an effort to determine the plane of nutrition that will give the lowest feed cost per pound of meat, a series of four feeding trials have been conducted. It was hoped that by getting weight and feed conversion data on four different planes of nutrition, current ingredient prices could be plugged in and thereby point up the plane of nutrition that will give the lowest feed cost per pound of meat.

The four planes of nutrition were based on four different energy levels, ranging from 3080 kilocalories of M.E./kilogram to 3520 in the starter and 3135 to 3575 in the grower as listed below:

	M.E. kilocalories/kg.	
Energy Level	Starter	Grower
1	3080	3135
2	3190	3245
3	3300	3355
4	3410	3465
5	3520	3575

Four week data for all trials are given below:

Trial #1 (Initiated 11-19-74)

Energy Level	Bird Weight In Grams	Feed to Weight Ratio
1	664 a	1.66 a
2	681 a	1.58 b
3	712 b	1.55 bc
4	718 b	1.52 c

L.S.D. (<.05) for weight = 21 grams
L.S.D. (<.05) for feed to weight ratio = .04

Trial #2 (Initiated 2-18-75)

Energy Level	Bird Weight In Grams	Feed to Weight Ratio
1	686 a	1.69 a
2	692 a	1.65 a
3	748 b	1.51 b
4	761 b	1.48 b

L.S.D. (<.05) for weight = 37 grams
L.S.D. (<.05) for feed to weight ratio = .07

Trial #3 (Initiated 5-20-75)

Energy Level	Bird Weight In Grams	Feed to Weight Ratio
1	613 a	1.62 a
2	626 a	1.59 a
3	652 b	1.50 b
4	661 b	1.46 b
5	671 b	1.45 b

L.S.D. (<.05) for weight = 21 grams
L.S.D. (<.05) for feed to weight ratio = .06

Trial #4 (Initiated 9-2-75)

Energy Level	Bird Weight In Grams	Feed to Weight Ratio
1	726 a	1.52 a
2	742 a	1.51 ab
3	763 b	1.48 bc
4	778 b	1.43 c

L.S.D. (<.05) for weight = 20 grams
L.S.D. (<.05) for feed to weight ratio = .06

Eight week data for all trials are given below:

Trial #1 (Initiated 11-19-74)

Energy Level	Bird Weight In Grams	Feed to Weight Ratio
1	1928 a	1.95 a
2	1994 b	1.85 b
3	2028 bc	1.84 b
4	2040 c	1.81 b

L.S.D. (<.05) for weight = 49 grams
L.S.D. (<.05) for feed to weight ratio = .05

Trial #2 (Initiated 2-18-75)

Energy Level	Bird Weight in Grams	Feed to Weight Ratio
1	2033 a	2.15 a
2	2038 a	2.08 b
3	2082 ab	1.97 c
4	2101 b	1.97 c

L.S.D. (<.05) for weight = 59 grams
L.S.D. (<.05) for feed to weight ratio = .05

Trial #3 (Initiated 5-20-75)

Energy Level	Bird Weight in Grams	Feed to Weight Ratio
1	1834 a	2.03
2	1859 a	1.95
3	1864 ab	1.95
4	1899 ab	2.02*
5	1950 b	1.94

L.S.D. (<.05) for weight = 76 grams
L.S.D. (<.05) for weight to gain ratio = .13

*Unexplained mortality in one rep and the feed to weight ratio for that one rep was 2.20.

Trial #4 (Initiated 9-2-75)

Energy Level	Bird Weight in Grams	Feed to Weight Ratio
1	1847 a	2.07 a
2	1862 a	2.05 a
3	1934 b	1.99 b
4	2006 c	1.85 c*

L.S.D. (<.05) for weight = 60 grams
L.S.D. (<.05) for feed to weight ratio = .06

*Fat was added to this diet after the diet was pelleted.

Along with trial one, a trial (1A) was conducted by formulating to tryptophan and glycine minimums and adding lysine and methionine plus cystine back instead of formulating to lysine and methionine plus cystine minimums. In addition lower levels of amino acids were also compared to the control diet. The experimental treatments are given on the next page.

1. Control (formulating to lysine and methionine plus cystine minimums)
2. Formulating to tryptophan and glycine minimums
3. Amino acids levels 95% of diet number 2
4. Amino acids levels 90% of diet number 2
5. Amino acids levels 80% of diet number 2

Four week data are given below:

Treatment	Bird Weight In Grams	Feed to Weight Ratio
1	712 a	1.55 a
2	705 a	1.58 a
3	684 b	1.58 a
4	666 b	1.63 b
5	622 c	1.70 c

L.S.D. (<.05) for weight = 21 grams
L.S.D. (<.05) for feed to gain ratio = .04

Eight week data are given below:

Treatment	Bird Weight In Grams	Feed to Weight Ratio
1	2028 a	1.84 a
2	2015 a	1.86 a
3	1980 a	1.84 a
4	1914 b	1.88 a
5	1788 c	1.95 b

L.S.D. (<.05) for weight = 49 grams
L.S.D. (<.05) for feed to weight ratio = .05

In conjunction with trial two, treatments one and two of trial 1A were repeat

Four week data are given below:

Treatment	Bird Weight In Grams	Feed to Weight Ratio
1	748	1.51
2	733	1.58

L.S.D. (<.05) for weight = 37 grams
L.S.D. (<.05) for feed to weight ratio = .073

Eight week data are given below:

Treatment	Bird Weight In Grams	Feed to Weight Ratio
1	2082 a	1.97 a
2	2101 a	2.05 b

L.S.D. (<.05) for weight = 59 grams
L.S.D. (<.05) for feed to weight ratio = .05

In conjunction with trial number 4, another trial (4A) was conducted. In trial 4A additional methionine and lysine was added to energy levels 2, 3 and 4 of trial 4 in the following amounts.

Energy Level	% of Added Methionine	% of Added Lysine
2	.05	.05
3	.10	.10
4	.15	.15

Four week data are given below:

Energy Level	Bird Weight In Grams		Feed to Gain Ratio	
	No Added M or L	Added M & L	No Added M or L	Added M & L
2	742 a	761 a	1.51 a	1.50 a
3	763 ab	770 ab	1.48 ab	1.46 ab
4	778 b	794 b	1.43 b	1.40 b

L.S.D. (<.05) for weight = 20 grams
L.S.D. (<.05) for feed to gain ratio = .059

Eight week data are given below:

Energy Level	Bird Weight In Grams		Feed to Gain Ratio	
	No Added M or L	Added M & L	No Added M or L	Added M & L
2	1861 a	1922 b	2.05 a	2.03 a
3	1934 b	1890 ab	1.99 b	2.03 ab
4	2006 c	2022 c	1.85 c	1.87 c*

L.S.D. (<.05) for weight = 60 grams
L.S.D. (<.05) for feed to weight ratio = .060

*Fat was added to this diet after pelleting.

Starting Diets for Trial #1

Energy Level	1 %	2 %	3 %	4 %
Bakery Products	5.70	10.00	10.00	10.00
Fat (Blended)	---	1.37	3.76	6.31
Corn	60.19	53.37	48.63	43.97
Corn Gluten (60%)	.36	1.04	2.50	2.98
Meat Meal (Blended)	8.00	8.00	8.00	8.00
Fish Meal (60%)	4.00	4.00	4.00	4.00
Soybean Meal (48%)	19.70	20.97	22.07	23.70
Dicalcium Phosphate	.45	.45	.45	.46
Limestone	.78	.12	.11	.10
Trace Mineral	.05	.05	.05	.05
Coccidiostat	.05	.05	.05	.05
3-Nitro (10%)	.05	.05	.05	.05
Vitamin Premix	.25	.25	.25	.25
Salt	.34	---	---	---
Methionine Hydroxy Analog	.088	.098	.090	.105
Calculated Analyses				
M.E. calories/kg.	3080	3190	3300	3410
N.E. calories/kg.	2237	2350	2453	2560
Protein, %	23.0	23.8	24.8	25.5
Lysine, %	1.24	1.29	1.32	1.36
Methionine, %	.50	.53	.55	.57
TSAA, %[1]	.86	.90	.93	.96
Available Phosphorus, %	.64	.65	.65	.65
Total phosphorus, %	.80	.80	.80	.80
Calcium, %	1.25	1.00	1.00	1.00
Sodium, %	.30	.21	.21	.21
Fat, %	4.63	6.28	8.50	10.89

[1] TSAA (total sulfur amino acids) is the same as methionine plus cystine.

Growing Diets for Trial #1

Energy Level	1 %	2 %	3 %	4 %
Bakery Products	6.22	10.00	10.00	10.00
Fat (Blended)	---	1.41	3.83	6.37
Corn	63.31	57.31	52.08	47.52
Corn Gluten (60%)	1.92	2.54	4.03	4.50
Fish Meal (60%)	2.00	2.00	2.00	2.00
Meat Meal (Blended)	8.00	8.00	8.00	8.00
Soybean Meal (48%)	16.61	17.82	19.15	20.70
Dicalcium Phosphate	.24	.23	.24	.24
Limestone	.93	.26	.25	.24
Trace Mineral	.05	.05	.05	.05
Coccidiostat	.05	.05	.05	.05
3-Nitro (10%)	.05	.05	.05	.05
Vitamin Premix	.25	.25	.25	.25
Salt	.34	---	---	---
Methionine Hydroxy Analog	.027	.028	.016	.032
Calculated Analyses				
M.E. calories/kg.	3135	3245	3355	3465
N.E. calories/kg.	2281	2389	2495	2603
Protein, %	21.5	22.3	23.3	24.0
Lysine, %	1.08	1.12	1.16	1.20
Methionine, %	.44	.46	.47	.50
TSAA, %	.78	.81	.84	.87
Available Phosphorus, %	.54	.55	.55	.55
Total Phosphorus, %	.70	.70	.70	.70
Calcium, %	1.15	.90	.90	.90
Sodium, %	.30	.20	.21	.21
Fat, %	3.93	6.26	8.52	10.90

Starting Diets for Trial 2

Energy Level	1 %	2 %	3 %	4 %
Fat	---	2.04	4.68	7.19
Corn	61.52	58.16	53.36	48.80
Corn Gluten (60%)	1.85	2.29	2.33	2.82
Fish Meal (60%)	4.00	4.00	4.00	4.00
Poultry Offal Meal	8.00	8.00	8.00	8.00
Soybean Meal (48%)	21.84	23.36	25.44	26.96
Dicalcium Phosphate	1.00	1.00	1.00	1.00
Limestone	1.02	.37	.36	.35
Trace Mineral	.05	.05	.05	.05
Methionine Hydroxy Analog	.032	.058	.08	.096
3-Nitro (10%)	.05	.05	.05	.05
Coccidiostat	.05	.05	.05	.05
Vitamin Premix	.16	.16	.16	.16
Salt	.34	.34	.34	.34
Choline Chloride (50%)	.133	.133	.133	.133
Calculated Analyses				
M.E. calories/kg.	3080	3190	3300	3410
Protein, %	24.4	25.1	25.7	26.3
Lysine, %	1.23	1.27	1.32	1.36
Methionine, %	.50	.53	.55	.58
TSAA, %	.86	.90	.93	.96
Available Phosphorus, %	.59	.59	.60	.60
Total Phosphours, %	.80	.80	.80	.80
Calcium, %	1.25	1.00	1.00	1.00
Sodium, %	.20	.20	.20	.20
Fat, %	3.93	5.86	8.30	10.65
Assay Analyses				
Protein, %	23.13	24.31	24.57	24.8
Fat, %	4.62	6.26	8.32	10.58
Total Phosphours, %	.73	.73	.72	.73
Calcium, %	1.20	1.10	1.20	1.20
Sodium, %	.23	.20	.23	.20

Starting Diets for Trials 3 & 4

Energy Level	1 %	2 %	3 %	4 %
Fat	---	2.2	5.0	7.6
Corn	61.5	57.2	52.4	47.7
Corn Gluten (60%)	.6	2.6	2.6	3.1
Fish Meal (60%)	4.0	4.0	4.0	4.0
Poultry Offal Meal	8.0	8.0	8.0	8.0
Soybean Meal (48%)	23.7	23.8	25.8	27.4
Dicalcium Phosphate	1.1	1.1	1.1	1.1
Limestone	.3	.3	.3	.3
Trace Mineral	.05	.05	.05	.05
Methionine Hydroxy Analog	.069	.073	.096	.110
Coccidiostat	.05	.05	.05	.05
3-Nitro (10%)	.05	.05	.05	.05
Vitamin Premix	.05	.05	.05	.05
Salt	.33	.33	.33	.33
Choline Chloride (50%)	.132	.132	.132	.132
Calculated Analyses				
M.E. calories/kg.	3080	3190	3300	3410
Protein, %	24.1	24.9	25.5	26.2
Lysine, %	1.26	1.27	1.32	1.36
Methionine, %	.51	.54	.56	.58
TSAA, %	.86	.90	.93	.96
Available Phosphorus, %	.59	.59	.60	.60
Total Phosphorus, %	.80	.80	.80	.80
Calcium, %	1.00	1.00	1.00	1.00
Sodium, %	.20	.20	.20	.20
Fat, %	3.90	6.00	8.60	11.00
Assay Analyses for Trial 3				
Protein, %	23.54	24.06	23.90	25.08
Fat, %	4.22	5.86	8.44	10.80
Total Phosphorus, %	.67	.75	.73	.76
Calcium, %	1.00	1.09	.98	1.00
Sodium, %	.23	.24	.23	.22
Assay Analyses for Trial 4				
Protein, %	24.67	25.70	23.54	25.08
Fat, %	3.88	5.66	7.58	7.92
Total Phosphorus, %	.69	.69	.70	.68
Calcium, %	.80	.83	.89	.98
Salt, %	.20	.20	.24	.22

Growing Diets for Trials 2, 3 & 4

Energy Level	1 %	2 %	3 %	4 %
Fat	---	2.64	5.15	7.78
Corn	66.02	61.16	55.95	51.10
Corn Gluten (60%)	1.54	2.00	3.43	3.90
Fish Meal (60%)	2.00	2.00	2.00	2.00
Poultry Meal (58%)	8.00	8.00	8.00	8.00
Soybean Meal (48%)	20.02	21.61	22.99	24.58
Dicalcium Phosphate	.92	.94	.95	.96
Limestone	.46	.45	.43	.42
Trace Mineral	.05	.05	.05	.05
Methionine Hydroxy Analog	.36	.52	.42	.58
Coccidiostat	.05	.05	.05	.05
3-Nitro (10%)	.05	.05	.05	.05
Vitamin Mix	.05	.05	.05	.05
Salt	.35	.35	.35	.35
Choline Chloride (50%)	.132	.132	.132	.132

Calculated Analyses

M.E. calories/kg.	3135	3245	3355	3465
N.E. calories/kg.	2070	2185	2292	2407
Protein, %	22.10	22.70	23.80	24.40
Lysine, %	1.08	1.12	1.16	1.20
Methionine	.45	.47	.49	.51
TSAA	.78	.81	.84	.87
Available Phosphorus	.50	.50	.50	.50
Total Phosphorus	.70	.70	.70	.70
Calcium	.90	.90	.90	.90
Sodium	.20	.20	.20	.20
Fat	3.96	6.42	8.77	11.22

Assay Analyses for Trial #2[1]

Protein, %	21.60	22.45	23.44	24.12
Fat, %	4.50	6.50	8.60	10.90
Total Phosphorus, %	.61	.63	.62	.62
Calcium, %	1.01	.99	1.05	.99
Sodium, %	.21	.20	.21	.19

[1]These values are the average of three assays.

Energy Level	1 %	2 %	3 %	4 %
Assay Analyses for Trial #3				
Protein, %	22.36	23.54	24.57	24.42
Fat, %	4.20	6.40	8.48	10.34
Total Phosphorus, %	.68	.69	.70	.70
Calcium, %	.87	.94	1.00	.94
Sodium, %	.20	.24	.21	.20
Assay Analyses for Trial #4				
Protein, %	22.51	22.51	24.42	25.19
Fat, %	4.10	6.40	8.60	10.72

The types of equipment and its capacity to perform the job for which it is intended is important in the manufacturing of medicated feed. Highly significant in this regard are the scales used to weigh out bulk drugs. One would not expect much accuracy from a scale graduated in one pound increments that is used to weigh out drugs in terms of ounces. Serious errors may result from inaccurate scales or inaccurately used scales, and drug deficiencies or overages may occur. Mixing equipment must be designed and installed in a manner to facilitate inspection and cleaning of all parts that come in contact with medicated feed. Ledges or shelves where feed from previous batches may accumulate are a source of potential cross-contamination. All equipment must be maintained in a reasonably clean and orderly manner.

Qualified personnel are essential for the proper formulation, manufacture, and control of medicated feeds. Training and experience are necessary for the proper use of equipment and maintenance of accurate records.

The receipt, storage, inventory, and handling of drug components must be adequate to assure their integrity and identity. Non-drug components must be stored and handled in a manner to avoid unsafe contamination. Inventory records are necessary. Drug accountability should be maintained for each lot of drug by means of a comparison of the actual drug used with the theoretical drug usage. The inventory record should also show the batches of feed in which the drugs were used. These records must be kept for a period of one year.

The master formula record provides a procedure setting forth the theoretical yield for the manufacture of a production run of medicated feed. The master formula and a system of maintaining the integrity of the formula down to the operating or production formula is important. A perfect formula in the safe or at the home office does little good if the mixer man is deviating from the approved formula to fit his daily operating needs. A transposition error from the master formula to the operating or production formula could be a major error and result in violative feed. The production record should include: (1) product identification, (2) date of production, (3) amount of drug components used, and (4) amount of feed produced. In the case of customer-formula feeds the formula and production records may consist of copies of the invoices or purchase orders.

It is important that the manufacturer of medicated feed observe every precaution and take all steps necessary to avoid contamination of his product with drug residue. Each critical step in the processing of medicated feed must be performed in a manner to assure integrity of the final product. The manner in which drugs are handled, weighed out, and introduced into feed has great bearing on the accuracy of a firm's activities. All containers of drugs and feeds should be identified at all times. Failure to clean equipment between batches of feed, by whatever methods shown effective, is a serious violation of the GMPs; and the deliberate use of contaminated flushings in dissimilar feed could have serious consequences both to animals and to humans consuming animal products. Dust, spilled feed ingredients and flushing material should be properly identified and/or disposed of to prevent contamination. Much of what constitutes controls taken by a firm to preserve the integrity of their product is just good common sense.

Complete labeling must accompany all medicated feed. In the case of feed distributed in bulk, the labeling may consist of an invoice or placard bearing the adequate information for the safe and effective use of the medicated feed. Provisions should be made for the proper storage of labels so as to prevent mix-ups.

A periodic assay of medicated feeds for drug components is required. For feeds containing New Animal Drugs, the sampling and assay schedule is set forth in the approved Form FD-1800. For other medicated feeds three appropriately drawn samples for every 400 tons of production or not less than three samples per year shall be assayed.

A complete record must be maintained for each shipment of medicated feed. Such records permit the manufacturer to relate complaints to specific production runs and will facilitate recall, diversion, or destruction of medicated feed if it should become necessary.

A complaint file is mandatory. A record of each written or verbal complaint and the action taken must be maintained for a period of two years. These records may reveal the existence of problems not otherwise detected by normal quality control procedures.