POTATOES AS A FEED FOR CHICKENS

Thesis for the Degree of M. S.

Melvin J. Klooster

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Feeding + feeding stuffs
Poultry

Poultry Husbandry

POTATOES AS A FEED FOR CHICKENS

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Thesis

Respectfully submitted to the Department of Poultry Husbandry and to the Graduate School of Michigan State College of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of Master of Science.

by

Melvin J. Klooster

June 1936

THESIS

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Approved for the Department of Poultry Husbandry

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TABLE OF CONTENTS

POTATOES AS A FEED FOR CHICKENS

INTRODUCTION

According to a preliminary report from the United States Bureau of Agricultural Economics, March 1934, poultry and eggs constitute one of the major sources of agricultural income in this country. The estimated annual cash income from meat and eggs was approximately $784,000,000. The poultry industry in the United States represents a value of approximately $1,000,000,000. This is a fifty per cent increase over thirty years ago.

With this phenomenal advance in the poultry industry there has been increasing demand for a cheaper ration in which one could adjust the ingredients according to the abundance of home grown feeds.

In 1935, Michigan produced approximately 25,000,000 bushels of potatoes. According to E. J. Wheeler of the Farm Crops Department, Michigan State College, between seventy and eighty per cent would be classed as number one potatoes, leaving between twenty and thirty per cent of the crop for utilization in some other manner.

Preliminary feeding experiments were started to determine, if possible, the utilization of cull or unmarketable potatoes by poultry. Feeding trials were set up to determine the value of potatoes in a ration for egg production and for growth promoting properties in chicks.

REVIEW OF LITERATURE AND GENERAL DISCUSSION

Experimental data regarding potatoes as a feed for chickens are very limited. Potatoes have been fed to cattle (6) (11), pigs (1) (3), and sheep (7) in various forms with fair success.

In an article published in the Ohio Station Bi-monthly (4) potatoes are advocated for feeding hens during the winter months. According to this article, the potatoes should be boiled or steamed, mixed while hot with enough mash to make a moist, crumbly mixture, and fed at the rate of from six to ten pounds daily per one hundred hens. This was suggested as a means of maintaining body weight, keeping up egg production, and adding variety to a ration.

D. C. Kennard (12) suggested that farm poultry keepers who have, or can secure, unmarketable potatoes at a nominal price can use them to advantage as a substitute for a part of the grain in the poultry ration. He states that boiled potatoes make a valuable addition to the ration. However, no data were presented to support these statements.

A. R. Winter (10) states that one gallon of cooked potatoes can replace about one-half gallon of scratch grain per one hundred birds daily.

M. A. Maw (13) believes that boiled potatoes may be a valuable addition to the mash for poultry, not only being economical but adding finish to the dressed stock.

The white potato, as a source of vitamin B, has been studied by F. J. Lyman and D. Blystone (2) (this work with rats only). The potatoes were boiled, peeled, riced, and dried for 24 hours at a temperature not exceeding 70° C. They were then ground through a 20 mesh screen and incorporated in a diet in amounts of 5, 10, 20, 40, and 80 per cent, replacing equivalent amounts of starch. Satisfactory growth was not secured on amounts up to and including 40 per cent. On 80 per cent good growth was secured.

Although the potato is largely carbohydrate there is evidence that its protein is of considerable value. Hindhede and co-workers (14) in Denmark report that they subsisted for several months on a diet the protein of which was derived solely from potatoes. One man took a diet of four and one-half to nine pounds of potatoes daily for nearly 300 days with no ill effects.

McCollum and Simmonds (14), in their book on nutrition, give evidence that potato nitrogen is exceptionally valuable for repair. A number of experiments indicated that in the human diet the nitrogen of the potato is of extraordinary value in replacing that lost through daily catabolism in adults.

According to McCollum and Simmonds (14), the interior of the potato consists almost entirely of water, starch, protein and to some extent mineral salts. The cellular structures in the interior are gorged with starch. This portion is therefore analogous to the endosperm of the seed. Both are comparable to a mixture of purified protein, carbohy-

drates, and salts, which are not capable of supporting life. Potatoes in the raw state are an excellent anti-scorbutic food.

Cooking produces physio-chemical changes within the potato according to Marion D. Sweetman (8). The cooking does not cause the bursting of the cell wall but the separation of cells. The process is characterized by partial gelatinization of the starch, solution of some of the pectic substance, increased digestibility of the cellulose, coagulation of most of the protein, and more or less carmelization of the sugar.

In Cushny's Pharmacology and Therapeutics (15), solonine is a glucosidal alkaloid found in many species of Solanum such as s. tuberosum (potato). Solonine breaks up on being heated with acids into sugar and a base, Solanidine, which retains the poisonous action. Some interest is attached to solanine from its having been responsible for some instances of widespread poisoning from the use of potatoes. However, it is now known that the symptoms arose from putrefactive bacteria and their products, and that solanine is never present in the tuber of the potato in sufficient quantity to be noxious.

The following analysis of potatoes is found in Connecticut Station Bulletin (5).

Water	76 per cent
Crude Protein	2.1 per cent
Fats	.1 per cent
Fibre	.9 per cent
Carbohydrates	19.7 per cent

Experimental work was started to determine the possibility of feeding large quantities of potatoes either in the cooked or raw state to poultry. The laying hens were given both raw and cooked potatoes to determine the effect of consumption of large quantities of this food on the health of the birds, and to determine the sum total the birds would consume when given free access. The chicks were fed dried potatoes primarily because of the ease in feeding, and because potatoes deteriorate rapidly in the late spring making it difficult to preserve them for feeding during brooding season.

Object of Experiment

This experiment was started to determine the feasibility of using unmarketable potatoes as part of the feed of the laying hens and growing chicks.

The laying hens and growing chicks were given potatoes in various ways in order that the toxic effect, if any, of consuming large amounts of potatoes might be studied. Two lots of laying hens were given free access to either raw or cooked potatoes. It was thought that some interesting results might occur when laying hens were forced to eat them as compared to those having free access to them.

Experimental Procedure

Laying Hens

Five pens, of fourteen birds each, of White Leghorn yearlings, and two year old hens were used for the egg production experiment.

The experiment lasted from November 15, 1935 to April 17, 1936, or for a period of twenty-two weeks.

All pens of laying hens were handled in approximately the same manner. Poultry bone and oyster shell were kept before each pen at all times. Cod liver oil was fed once a week and at the rate of .25 pound per fourteen birds, or in that proportion. The mash mixtures as given in Table I were before them constantly. Where potatoes were included in the diet, they were kept from freezing by heating contrivances. These heating units, electric bulbs in protective containers, underneath the feeders, were especially constructed to suit the needs of individual pens. The feed was weighed back at the end of each month.

The ration for the five pens of laying hens were arranged so the carbohydrate levels would be approximately the same. All rations were analyzed by O. B. Winter of Michigan State College Chemistry Experiment Station. The analyses of the rations are found in Table II.

From the beginning of the experiment to November 27, the birds received no artificial lights. However, from November 27 to December 14, the electric lights were turned on at 6:30 in the morning. From December 14 to the end of the experiment the day was lengthened by turning on the lights at 5:30 A. M.

Individual daily egg production records were kept during the experiment.

The laying hens were housed in a straw loft type of poultry house, the size of each pen being eight by twelve feet.

All hens were weighed biweekly.

All dead birds were sent to W. W. Thompson of the Bacteriology Department of Michigan State College for autopsy.

EXPERIMENTAL DISCUSSION

Laying Hens

The chemical analyses of the rations for the laying hens in Table II show that the proportion of moisture in the mixture for Pens 3 and 4 was between 56.3 and 58 per cent. It is interesting to note that the protein percentage for Pens 3 and 4 was between 6.64 to 6.69 per cent. The similarity of the rations for Pens 3 and 4 is worthy of mention. When comparing the analysis of the mash in Pen 5 with that of the mash used in the mixture (4a) for Pens 3 and 4 we notice that the mash in Pen 5 is lower in the per cent of proteins, ash, crude fiber, calcium, and phosphorus.

In Table VI, the feed consumption for the laying hens in Pen 1 indicates that ground raw potatoes were not very palatable. In Pen 2 we find that large quantities of cooked potatoes were consumed. The average daily individual consumption of cooked potatoes in Pen 2 was approximately .22 of a pound. In Pens 3 and 4 the daily individual consumption of the mash mixture was .55 and .53 of a pound respectively. The average daily individual mash consumption in Pen 5 was .26 of a pound.

When figuring feed consumption per dozen eggs Table VII shows, in general, cooked potatoes are more palatable than raw potatoes. When the rations for Pens 4 and 5 were figured on the dry basis, the pounds of feed consumed per dozen eggs were quite similar. The feed consumption

per dozen eggs was much higher than in Pen 4. The writer accounts for this difference in that the egg production was much lower and that raw potatoes were not as palatable to laying hens as cooked ones.

At the beginning of the egg production experiment the birds were in a molt. The body weights, on an average, were lower than they would have been if they had been in laying condition. We find that cooked potatoes, Table VIII, kept the birds in a satisfactory condition. The laying hens in Pen 3 maintained their body weight during the twenty-two week period. This result as shown for Pen 3 is looked upon by the writer as being significant.

Table IX shows that the egg production in Pen 5 (check pen) was adequate. The production for all pens was low due to the fact that at the beginning of the experiment many of the birds were in a molt. Good egg production was secured from the pens (2 and 4) which received mashed cooked potatoes. It is interesting to note that in Pen 3 the March egg production was 45 per cent.

The health of the laying hens during the twenty-two weeks was exceptionally good as shown in Table X. Only five of the seventy birds died. From external appearance all birds that finished the experiment were in a good condition. The mortality of the laying hens is a factor which is not considered of importance in this experiment because of the small number and the low mortality.

Experimental Procedure

Growing Chicks

In the growth promoting experiment five pens of 20 chicks each of Barred Rocks were used in both feeding trials.

The first part of the experiment was started January 28, 1936 and ended March 3, 1936, a period of five weeks. The second trial lasted six weeks or from March 20, 1936 to May 1, 1936.

All pens of growing chicks were fed an all mash diet. Table III shows the feed ingredients for individual pens. The feed was weighed back at the end of each week.

The rations for the growing chicks were arranged so that the protein percentage would be approximately the same. All rations were analyzed by O. B. Winter of Michigan State College Chemistry Experiment Station. The analysis of individual rations is found in Table IV and the analysis of the dried raw and dried cooked potatoes is found in Table V.

All chicks were brooded in hot water heated batteries in a room with a constant temperature.

All growing chicks were weighed weekly.

All dead chicks were sent to W. W. Thompson of the Bacteriology Department of Michigan State College for autopsy.

Drying of Potatoes for the Growing Chicks

In the rations for growing chicks, dried potatoes were used as one of the ingredients for Pens 2, 3, 4, and 5. The dried raw potatoes were prepared in the following manner -- first, ground fine; second,

after grinding they were spread in a thin layer and a current of warm air blown over them until they were dry; last, they were reground through a hammer mill. After drying and regrinding individual samples were sent to the Chemistry Experiment Station for analysis. The cooked potatoes were similarly prepared with the exceptions -- first, the potatoes were boiled; second, after boiling the water was poured off; last, they were then mashed and spread out in a thin layer for drying. The temperature of the air current for drying, varied from between 110° to 120° F.

EXPERIMENTAL DISCUSSION

Growing Chicks

The chemical analysis of the dried raw and dried cooked potatoes is shown in Table V. The percentage of crude protein in either the raw or cooked potatoes approximates that of ground yellow corn. In making up the rations for the growing chicks the dried potatoes were substituted for yellow corn pound for pound. The analysis of individual chick rations in Table IVa and IVb shows a marked similarity.

According to Table XIa and XIb, dried raw potatoes do not seem to be very palatable for growing chicks. In Pen 3, the feed consumption per chick day was much greater than the check pen (Pen 1). In Pens 2 and 4, the dried cooked potatoes seem to replace equal amounts of ground corn.

In the growing chick experiment the writer finds that in both trials, Pens 2, 4, and 5 had a better weight average at the end of the trial periods than did the check pen (Pen 1). Tables XIIa and XIIb show that the outstanding difference, worthy of mention is that of Pen 3.

In both feeding trials, 18 per cent of dried cooked potatoes were substituted satisfactorily for equal amounts of yellow ground corn.

Table XIII indicates that in the first trial the mortality in Pens 3 and 5 was very high. The autopsy reports show that most of the deaths were due to Colibacillosis. The writer interprets this mortality as being partially due to variable temperatures on the first few days of the experiment and to coarse ground ingredients in the mash. In the second trial, the mortality is not considered by the writer as being significant.

CONCLUSIONS

1. Cooked potatoes may be substituted for part of cereal grains in the ration of the laying hen.
2. Raw potatoes are not as palatable to the laying hen as cooked potatoes.
3. Fair egg production was secured when cooked potatoes were substituted for part of the cereal grains in a ration of yearling and two year old hens.
4. The laying hen has the ability to maintain her body weight when either the raw or cooked potatoes are substituted for a part of cereal grains in her diet. Her daily total consumption, however, is greatly increased due to the moisture content of potatoes.
5. Good egg production was not secured where large quantities of raw potatoes were used in the hen's diet.
6. Excessive amounts of either the raw or cooked potatoes have a laxative effect on the digestive system of the laying hen. This is probably due to the high moisture content of the potato.
7. When the growing chicks are fed a mash similar to those of Pen 1 (check pen) dried ground cooked potatoes can be substituted for either the full or one-half the amount of the yellow corn.
8. When dried cooked potatoes are substituted for one-half of the amount of yellow ground corn in the growing chick's diet better average gains are made than when fed a mash similar to Pen 1 (check pen).

9. Dried raw or dried cooked potatoes did not have a laxative effect on the digestive system of the growing chicks when fed according to Table III.
10. Cooked potatoes made a better substitute for a part of the cereal grains in the diet of either the growing chick or laying hen than raw potatoes.

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A P P E N D I X

Table I. Feed Ingredients in Ration for Laying Hens

Ingredients in pounds	Pen 1 (a)	Pen 2 (b)	Pen 3 (c)	Pen 4 (d)	Pen 5
yellow corn meal	43	43	21.5	21.5	43
ground wheat	5	5	2.5	2.5	5
ground oats	17	17	8.5	8.5	17
wheat flour middlings	10	10	5.0	5.0	10
wheat bran	10	10	10.0	10.0	10
meat scraps	4	4	4.0	4.0	4
dried skim milk	3	3	3.0	3.0	3
white fish meal	1	1	1.0	1.0	1
alfalfa leaf meal	5	5	5.0	5.0	5
salt	1	1	1.0	1.0	1
potatoes			140.0	140.0	

Note: (a) Free choice of ground raw potatoes

(b) Free choice of mashed cooked potatoes

(c) Raw ground potatoes incorporated in mash

(d) Mashed cooked potatoes incorporated in mash

Table II. Analysis of Rations for Laying Hens

Pen Number	H_2O	Ash	Protein	Crude Fiber	Calcium	Phosphorus
	%	%	%	%	%	%
3	58.04	3.09	6.64		.307	.335
4	56.31	3.07	6.69		.307	.315
5	10.65	5.18	14.93	6.55	.678	.711
4a*	10.51	7.01	16.40	7.56	.989	.901

* The analysis of 4a was the ration for Pens 3 and 4 before adding potatoes. Analysis by Mr. O. B. Winter, Michigan State College Chemistry Experiment Station.

Table III. Feed Ingredients in Ration for Growing Chicks

Ingredients in pounds	Pen 1	Pen 2	Pen 3	Pen 4	Pen 5
yellow corn meal	36			18	18
wheat bran	20	20	20	20	20
fine ground oats	20	20	20	20	20
dried skim milk	10	10	10	10	10
meat scraps	5	5	5	5	5
alfalfa leaf meal	5	5	5	5	5
bone meal	2	2	2	2	2
salt	1	1	1	1	1
cod liver oil	1	1	1	1	1
dried ground raw potatoes			36		18
dried ground cooked potatoes		36		18	
total	100	100	100	100	100

Table IVa. Analysis* of Rations for Growing Chicks (first trial)

Pen Number	H_2O %	Ash %	Protein %	Crude Fiber %	Calcium %	Phosphorus %
1	9.86	7.26	16.06	6.49	1.40	1.11
2	8.30	10.93	17.44	7.30	1.85	1.52
3	8.51	9.07	16.15	7.54	1.47	1.21
4	8.72	8.01	15.87	7.60	1.34	1.14
5	8.95	6.99	16.63	7.39	1.03	.996

Table IVb. Analysis* of Rations for Growing Chicks (second trial)

Pen Number	H_2O %	Ash %	Protein %	Crude Fiber %	Calcium %	Phosphorus %
1	9.49	7.11	15.13	7.54	1.24	1.08
2	7.93	8.91	15.06	6.96	1.34	1.09
3	8.25	8.98	16.00	7.44	1.22	1.05
4	8.10	8.92	15.81	6.88	1.54	1.16
5	9.19	8.27	15.81	7.41	1.28	1.07

* Analysis by Mr. O. B. Winter, Michigan State College Chemistry Experiment Station.

Table V. Analysis* of Dried Ground Raw and Dried Mashed Cooked Potatoes

Ingredient	H_2O	Ash	Protein	Crude Fiber	Calcium	Phosphorus
	%	%	%	%	%	%
dried ground raw potatoes (as received)	5.50	5.97	11.36	2.45	.077	.326
dried ground raw potatoes (dry basis)		6.32	12.02	2.60	.082	.345
dried ground mashed potatoes (as received)	6.64	5.88	11.04	2.45	.071	.346
dried ground mashed potatoes (dry basis)		6.30	11.82	2.62	.076	.371

* Analysis by Mr. O. B. Winter, Michigan State College Chemistry Experiment Station.

Table VI. Feed Consumption, in pounds, per Hen Day

Ingredients	Pen	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Ave.	Total
raw potatoes	1	.0582	.0645	.0483	.0845	.0553	.0585	.0633	135.27
mash		.1377	.1643	.2333	.2741	.3217	.3040	.2414	515.87
shell		.0022	.0032	.0049	.0070	.0111	.0062	.0070	14.96
bone		.0115	.0086	.0219	.0162	.0072	.0158	.0136	29.06
cooked potatoes	2	.1904	.2202	.1993	.2594	.2070	.2034	.2161	426.15
mash		.0954	.1131	.1723	.1997	.2359	.2308	.1745	344.11
shell		.0027	.0039	.0014	.0113	.0128	.0015	.0061	12.05
bone		.0164	.0085	.0283	.0161	.0110	.0137	.0159	31.35
mash with raw potatoes	3	.2429	.4972	.5935	.6516	.5947	.5991	.5504	1186.66
shell		.0013	.0058	.0006	.0054	.0101	.0021	.0040	8.62
bone		.0160	.0056	.0323	.0335	.0141	.0151	.0201	43.34
mash with cooked potatoes	4	.3218	.4641	.5323	.6023	.5977	.5891	.5290	1140.05
shell		.0049	.0030	.0032	.0085	.0104	.0113	.0066	14.23
bone		.0102	.0097	.0269	.0160	.0127	.0122	.0153	32.99
mash	5	.1498	.2155	.2556	.2951	.3153	.3475	.2618	551.19
shell		.0027	.0028	.0035	.0068	.0128	.0093	.0061	12.58
bone		.0142	.0067	.0261	.0185	.0117	.0162	.0106	21.57

Table VII. Feed Consumption, in pounds, per Dozen Eggs

Ingredients	Pen 1	Pen* 2	Pen 3	Pen 4	Pen 5
raw potatoes	2.652				
cooked potatoes		8.066			
mash with raw potatoes			34.728		
mash with cooked potatoes				25.266	
mash	10.115	6.515			9.003
bone	.570	.593	1.268	.673	.565
shell	.293	.227	.252	.290	.210

* Two birds produced no eggs. Adjustment made in consumption.

Table VIII. Average Body Weight, in pounds, per Hen

	1935				1936							
Pen	11-15	11-29	12-13	12-27	1-11	1-24	2-7	2-21	3-6	3-20	4-3	4-17
1	4.07	3.90	4.02	3.99	4.21	4.30	4.58	4.36	4.31	4.51	4.41	4.45
2	3.99	3.70	3.95	3.98	4.18	4.31	4.45	4.08	3.92	4.23	4.28	4.18
3	4.21	3.82	3.79	3.86	4.14	4.39	4.60	4.41	4.41	4.41	4.21	4.31
4	4.31	3.86	3.98	3.94	4.25	4.50	4.59	4.48	4.51	4.59	4.40	4.67
5	3.94	3.86	4.00	3.96	4.16	4.32	4.43	4.25	4.27	4.42	4.29	4.44

Table IX. Percentage Egg Production per Pen

Pen	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Average
1	9.52	6.45	14.06	33.74	58.33	51.58	28.64
2*	13.22	2.64	20.53	44.82	59.87	58.28	32.15
3	6.67	0.00	1.84	25.65	45.16	36.97	19.02
4	20.95	3.69	9.91	30.79	54.84	51.26	27.27
5	13.33	6.22	15.42	32.36	62.23	54.41	28.98

* Two birds produced no eggs. Adjustment made in production.

Table X. Laying Hen Mortality

Pen	Mortality (in numbers)
1	1
2	2
3	0
4	0
5	2

Table XIa. Weekly Feed Consumption, in grams, per Chick Day

Pen	First Trial				
	1-28-36* to 2-11-36	2-11-36 to 2-18-36	2-18-36 to 2-25-36	2-25-36 to 3-3-36	total
1	12.14	13.89	17.28	25.30	11,929.7
2	10.35	11.09	19.85	31.19	10,296.7
3	10.33	16.36	23.76	37.80	6,259.6
4	11.15	13.89	20.06	28.08	12,474.0
5	11.83	16.37	20.44	34.39	9,843.1

* Two weeks' consumption.

Table XIb.

Pen	Second Trial						
	3-20-36 to 3-27-36	3-27-36 to 4-3-36	4-3-36 to 4-10-36	4-10-36 to 4-17-36	4-17-36 to 4-24-36	4-24-36 to 5-1-36	total
1	11.02	12.15	15.39	18.47	25.92	33.94	15,944.0
2	11.59	10.57	15.00	17.93	25.40	36.59	14,832.8
3	11.66	7.83	15.52	19.11	22.32	32.45	14,016.3
4	11.34	14.46	17.05	20.97	29.16	38.54	17,645.0
5	11.64	11.85	17.39	21.83	27.63	40.42	17,486.4

Table XIIa. Average Weekly Weights, in grams, for Growing Chicks (both trials)

	1st week			2nd week			3rd week			4th week			5th week		
Pen	♂	♀	Av.	♂	♀	Av.	♂	♀	Av.	♂	♀	Av.	♂	♀	Av.
1	53.9	50.6	52.3	75.1	73.8	74.5	110.6	100.8	105.7	159.4	145.8	151.6	220.0	200.0	210.0
2	44.2	45.2	45.7	73.0	67.7	70.4	115.0	97.3	106.2	176.0	155.5	165.8	262.0	211.8	236.9
3*	49.8	54.0	51.9	67.0	70.0	68.5	101.0	90.0	95.5	146.0	120.0	L33.0	204.0	140.0	172.0
4	56.6	47.1	51.9	81.4	62.0	71.7	126.4	94.0	110.2	186.8	135.0	160.9	262.7	192.5	227.6
5	50.8	51.1	51.0	78.3	76.4	77.4	115.8	108.6	112.2	159.2	147.1	153.2	238.2	211.4	224.9

* Average for one female

	1st week			2nd week			3rd week			4th week			5th week			6th week		
Pen	♂	♀	Av.	♂	♀	Av.	♂	♀	Av.	♂	♀	Av.	♂	♀	Av.	♂	♀	Av.
1	56.3	56.8	56.6	81.3	84.0	82.7	125.0	125.9	125.5	161.9	170.0	166.0	220.6	227.7	224.2	291.8	300.0	295.9
2	57.8	53.5	55.7	87.3	77.0	82.5	126.4	113.0	119.7	167.8	154.5	161.2	232.1	219.0	225.6	322.8	287.5	305.2
3	53.3	50.0	51.7	79.2	66.8	73.0	117.5	96.8	107.2	155.0	120.9	138.0	205.0	155.0	180.0	274.2	194.5	254.4
4	57.0	58.8	57.9	86.5	88.8	87.7	132.5	132.2	132.4	186.5	180.0	183.0	256.0	255.5	255.8	343.5	343.3	343.4
5	54.0	55.5	54.8	81.0	81.6	81.3	120.0	125.0	122.5	157.0	162.8	159.9	216.5	229.4	223.0	277.5	308.3	305.2

Weekly averages are for the males and females finishing the experiment.

Table XIII. Total Chick Mortality (both trials)

Pen	1st trial Mortality (in numbers)	2nd trial Mortality (in numbers)
1	1	1
2	6	3
3	13	3
4	1	1
5	8	1