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WEST VIRGINIA UNIVERSITY
AGRICULTURAL EXPERIMENT STATION
MORGANTOWN, W. VA.

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POULTRY EXPERIMENTS

The value of Skim Milk for Egg Production.

White Leghorns versus Mongrels.

BY J. H. STEWART AND HORACE ATWOOD.

[The Bulletins and Reports of this Station will be mailed free to any citizen of West Virginia upon written application. Address Director of Agricultural Experiment Station, Morgantown, W. Va.]

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THE VALUE OF SKIM MILK FOR LAYING HENS.

The experiments described below have been performed to determine the value of skim milk when fed to laying hens. On most farms the skim milk that is produced is fed to calves or pigs. Can fowls use it to better advantage?

Separator skim milk has been used in these experiments. Generally during the colder months of the year it has been sour when fed, and during the warmer periods it has been thick also.

Two experiments have been performed. The first was begun February 29, 1904, and was continued for 122 days. The second test was begun June 30, 1904, and was continued for three months or until September 30th. In the first tests two lots of Single Comb White Leghorn fowls were used, each lot containing 20 hens and two cocks. In the second test each lot of fowls consisted of 60 hens and six cocks.

The fowls were kept in the houses and runs described in former bulletins and the general method of conducting the experiment was the same as that employed heretofore. The skim milk was used for the purpose of moistening the ground feed. This was usually fed in the morning, while the whole grain was scattered in the afternoon in the litter covering the floors of the poultry houses. At no time were the fowls fed heavily as the eggs which were laid were used for hatching and it was not considered desirable to allow the hens to become too fat. It is quite possible that they were not fed as heavily as they might have been for best results during the first experiment as the following table shows that the hens decreased considerably in weight. Pen 1 refers to the fowls which received the skim milk, while pen 2 refers to the fowls whose mash was moistened with water.

WEIGHT OF FOWLS.

	Pen 1.		Pen 2.	
	Hens.	Cocks.	Hens	Cocks.
Average weight at the beginning of the test. . .	3.50 lbs.	4.25 lbs.	3.62 lbs.	4.50 lbs.
Average weight at the end of the test.	2.77 lbs.	4.75 lbs.	2.90 lbs.	4.65 lbs.

The table shows that the hens in each lot lost in weight about seven-tenths of a pound each, while the cocks gained slightly in weight.

The following table shows the amount and kind of food consumed by each lot of 22 fowls during the 122 days of the test. Both lots of fowls were fed exactly the same except that lot 1 received in addition 2 quarts of skim milk daily, or 244 quarts during the experiment:

Table showing the amount, kind and cost of the food consumed during the 122 days of the test by each lot of 22 fowls:

Gluten feed	60 pounds, at \$1.275 per cwt.	\$.765
Wheat bran	60 pounds, at 1.20 " "	.72
Ground oats	60 pounds, at 1.40 " "	.84
Oil meal	20 pounds, at 1.40 " "	.28
Beef scrap	20 pounds, at 2.00 " "	.40
Corn	115 pounds, at 1.05 " "	1.20
Wheat	115 pounds, at 1.66 " "	1.91
Oats	115 pounds, at 1.25 " "	1.437
Total cost		\$7.752

If the skim milk be valued at one cent per quart, which is practically equivalent to 50 cents per hundred pounds, an extremely high valuation for feeding purposes, then the total cost of food for pen 1 was \$10.19 and for pen 2 \$7.75.

The following table shows the number of eggs laid by each lot of fowls:

	Pen 1	Pen 2
Feb. 29—March 31	364	327
March 31—April 30	297	262
April 30—May 31	319	207
May 31—June 29.	264	200
Total	1244	996

The pen which received the skim milk laid 248 eggs more than the other lot of fowls, or practically an extra egg for every quart of skim milk that they received.

Valuing the skim milk at one cent per quart then the food cost of one dozen eggs was 9.8 cents for the fowls fed the skim milk and 9.3 cents per dozen for the other lot of fowls.

During the time covered by the experiment the eggs produced were actually worth 20 cents per dozen. The 248 extra eggs produced by pen 1 when valued at this price were worth \$4.13, which would give to the skim milk a value of 1.6 cents per quart.

SECOND EXPERIMENT.

In this test six pens of Single Comb White Leghorn fowls were employed, each pen containing 20 hens and 2 cocks. The experiment was divided into two periods, the first beginning June 30, 1904, and ending August 5th, the second beginning August 6th, and ending September 30th. During the first period pens 1, 2, and 3 each receiving two quarts of skim milk daily which was used to moisten the ground feed as in the earlier experiment, while during the second period pens 4, 5, and 6 received the skim milk.

The following table shows the average weight of the fowls at the beginning and end of the first period:

AVERAGE WEIGHT OF FOWLS. PERIOD ONE.

	BEGINNING OF PERIOD		END OF PERIOD	
	Hens	Cocks	Hens	Cocks
Pen 1.	2.77	4.75	2.90	4.50
Pen 2.	2.90	4.25	3.10	4.50
Pen 3.	2.72	4.75	2.80	4.75
Average 1, 2, 3.	2.79	4.58	2.93	4.58
Pen 4.	2.77	4.50	2.97	4.50
Pen 5.	3.05	4.25	3.25	4.25
Pen 6.	2.90	4.50	3.07	5.00
Average 4, 5, 6.	2.90	4.42	3.09	4.58

The table shows that all of the hens increased slightly in weight during this period.

The following table shows the amount and kind of food consumed during the first period of 37 days and the cost of the same:

FOOD CONSUMED BY PENS 1, 2, AND 3.

Gluten feed	54 lbs., at \$1.275 per cwt.....	\$.688
Wheat bran	54 lbs., at 1.20 " "	.643
Ground oats	54 lbs., at 1.40 " "	.756
Beef scrap	18 lbs., at 2.00 " "	.36
Corn	59 lbs., at 1.05 " "	.619
Wheat	59 lbs., at 1.66 " "	.979
Gats	59 lbs., at 1.25 " "	.737
Total		\$3.87

FOOD CONSUMED BY PENS 4, 5, AND 6.

Gluten feed	60 lbs., at \$1.275 per cwt.....	\$.765
Wheat bran	60 lbs., at 1.20 " "	.72
Ground oats	60 lbs., at 1.40 " "	.84
Beef scrap	18 lbs., at 2.00 " "	.36
Corn	60 lbs., at 1.05 " "	.63
Wheat	60 lbs., at 1.66 " "	.99
Oats	60 lbs., at 1.25 " "	.75
Total cost.		\$5.05

Valuing the skim milk at one cent per quart, which as remarked above is an extremely high valuation for feeding purposes, then the cost of food for pens 1, 2, and 3 was \$6.09 and for pens 4, 5, and 6, \$5.05.

The following table shows the number of eggs laid by each pen of fowls during the 37 days of this period:

Pen 1	337 eggs
Pen 2	279 eggs
Pen 3	246 eggs
Total	862 eggs
Pen 4	207 eggs
Pen 5	202 eggs
Pen 6	223 eggs
Total	632 eggs

The balance in favor of the milk-fed fowls is 230 eggs, which extra egg production was brought about by feeding 222 quarts of skim milk, or slightly more than an extra egg for every quart of skim milk fed.

Valuing the skim milk at one cent per quart then the food cost of the eggs from the milk-fed fowls was 8.4 cents per dozen; and 8.3 cents per dozen for the other lot of fowls.

The eggs produced during this period were worth in the local market 25 cents per dozen. At this price the 230 extra eggs were worth \$4.79, which would give to the 222 quarts of skim milk an actual feeding value of slightly more than two cents per quart when fed in small quantities as in this experiment.

PERIOD TWO.

During the second period of 56 days skim milk was fed to pens 4, 5, and 6, instead of to pens 1, 2, and 3.

The following table shows the average weight of the fowls at the beginning and end of this period.

AVERAGE WEIGHT OF FOWLS. PERIOD TWO.

	BEGINNING OF PERIOD		END OF PERIOD	
	Hens	Cocks	Hens	Cocks
Pen 1	2.90	4.50	3.10	5.00
Pen 2	3.10	4.50	3.15	5.00
Pen 3	2.80	4.75	3.08	4.75
Average 1, 2, 3.	2.93	4.58	3.11	4.91
Pen 4	2.97	4.50	3.40	4.75
Pen 5	3.25	4.25	3.45	4.50
Pen 6	3.07	5.00	3.30	5.25
Average 4, 5, 6.	3.09	4.58	3.38	4.83

During this period the hens which received the skim milk increased in weight slightly more than those whose mash was moistened with water.

The following table shows the kind, amount and cost of the food consumed during this period:

FOOD CONSUMED BY PENS 1, 2, AND 3.

Corn meal	105 lbs., at \$1.25 per cwt.	\$1.31
Wheat bran	105 lbs., at 1.20 " "	1.26
Ground oats	105 lbs., at 1.40 " "	1.47
Beef scrap	33 lbs., at 2.00 " "	.66
Corn	180 lbs., at 1.05 " "	1.89
Oats	180 lbs., at 1.25 " "	2.25
Total cost		\$8.84

FOOD CONSUMED BY PENS 4, 5, AND 6.

Corn meal	101 lbs., at \$1.25 per cwt.	\$1.262
Wheat bran	101 lbs., at 1.20 " "	1.212
Ground oats	101 lbs., at 1.40 " "	1.414
Beef scrap	33 lbs., at 2.00 " "	.660
Corn	149 lbs., at 1.05 " "	1.564
Oats	149 lbs., at 1.25 " "	1.862
Total cost		\$7.74

Valuing the six quarts of skim milk which were fed daily to pens 4, 5, and 6 at one cent per quart then the total cost of food for these pens was \$11.10 and for the other fowls \$8.84.

The following table shows the number of eggs laid by each pen of fowls during the second period:

Pen 1	302 eggs
Pen 2	363 eggs
Pen 3	313 eggs
Total	978 eggs
Pen 4	452 eggs
Pen 5	382 eggs
Pen 6	386 eggs
Total	1,220 eggs

During this period there were fed 336 quarts of skim milk which increased the egg production 242 eggs, or at the rate of three-fourths of an egg for every quart of skim milk fed. The eggs produced during this period were worth 25 cents per dozen in the local market. Valuing the 242 extra eggs at this price it is seen that the skim milk had a feeding value in this case of one and one-half cents per quart.

SUMMARY.

In both experiments more eggs were produced when skim milk was substituted for water for moistening the mash.

Under the conditions prevailing in these experiments and with eggs selling for twenty or twenty-five cents per dozen the skim milk used for moistening the mash had a feeding value of from one and one-half to two cents per quart.

In these trials 802 quarts of skim milk were fed, resulting in an increase in the egg production of 702 eggs.

WHITE LEGHORNS COMPARED WITH MONGRELS FOR EGG PRODUCTION.

During the winter months fresh eggs are very high in price and difficult to procure, and the question arises is this condition of the egg market due to the fact that the common fowls of the country are poor winter layers, or is it due to their being poorly housed and insufficiently fed?

In order to throw some light on this subject and also to determine whether White Leghorns or mongrels are more profitable as egg producers the experiment described below has been performed.

In the summer of 1904 fifty young pullets, which were typical of the common mixed stock of the country, were bought from farmers living in the vicinity of Morgantown. A few of them showed traces of Barred Plymouth Rock and Light Brahma blood. Two or three resembled Barred Plymouth Rocks in color but were provided with a crest, and the rest of them were of various colors. They were allowed to run at large until fall. Then they were divided into two lots and placed in the laying houses provided for them. (For a description of these houses see bulletin No. 71.) Fifty Single Comb White Leghorn pullets of approximately the same age as the mongrels were selected and placed in two similar houses.

The experiment began November 14, 1904, and this report gives the results for the first year of the test. The general plan of conducting the experiment was as follows: The feed was carefully weighed for each lot and placed in covered boxes in the houses. The actual feeding of the fowls was entrusted to a little colored boy, who, it is believed, gave the fowls at least as careful attention as they would have received on the average farm. He was instructed to feed only what the fowls seemed to require, but as he was naturally a liberal feeder it is probable that a portion of the time the fowls were somewhat too fat for best results. They were fed whole grain scattered in litter in the morning and a mash at night. The whole grain consisted of equal parts by weight of corn and oats. No wheat was fed owing to

its high price. The ground feed consisted principally of corn meal, ground oats, and wheat middlings to which was added about ten per cent. of beef meal. During the first eleven months of the year the ground grain was moistened with skim milk, the rest of the time with water.

The average weight of the mongrels at the beginning of the test was 3.41 pounds, and at the end of the first year 4.61 pounds, while the Leghorns weighed 3.14 pounds at the beginning and 3.35 pounds at the end of the test. Consequently the mongrels gained considerably more in weight than the Leghorns.

The following table shows the kind, amount and cost of food consumed, per head, by the mongrels and Leghorns during the year:

				MONGRELS	WHITE LEGHORNS
Corn meal at \$1.25	per cwt.	7.3 lbs....	\$.091	7.2 lbs....	\$.090
Wheat bran "	1.20 " "	1.7 lbs....	.020	1.6 lbs....	.019
Ground oats "	1.40 " "	6.5 lbs....	.091	6.4 lbs....	.089
Gluten feed "	1.275 " "	3.4 lbs....	.043	3.4 lbs....	.043
Beef meal "	1.80 " "	3.9 lbs....	.070	3.8 lbs....	.068
Middlings "	1.20 " "	5.6 lbs....	.067	5.6 lbs....	.067
Corn "	1.05 " "	19.8 lbs....	.207	17.1 lbs....	.179
Oats "	1.25 " "	18.6 lbs....	.232	15.9 lbs....	.198
Milk "	.005 " quart	20 quarts.	.100	20 quarts.	.100
Total cost				.921	.853

The total amount of food consumed by the mongrels per head, without taking into consideration the skim milk, was 66.8 pounds, and for the Leghorns 61 pounds, and the total cost of food at the prices given in the table was \$0.921 and \$0.853 for the mongrels and Leghorns respectively.

The following table shows the number of eggs produced by each lot of fowls for each month of the year, together with their value calculated according to local retail prices:

MONTH	Price per dozen. Cents.	MONGRELS		LEGHORNS	
		No. eggs laid	Value	No. eggs laid	Value
1904					
November 14th.....	30	6	\$.150	165	\$ 4.125
December	35	39	1.137	269	7.846
1905.					
January	35	149	4.346	260	7.583
February	30	170	4.250	335	8.375
March	20	761	12.683	919	15.316
April	20	820	13.666	858	14.300
May	20	598	9.966	733	12.216
June	20	521	8.683	563	9.383
July	20	505	8.416	574	9.566
August	23	425	8.146	421	8.069
September	24	447	8.940	452	9.040
October	28	283	6.608	248	5.786
November 14th	30	83	2.075	27	.675
Total		4,807	89,061	5,824	112,280
Average per hen.....		96.1	1.78	116.5	2.24

The mongrels produced eggs to the value of \$1.78 and the Leghorns to the value of \$2.24. If we deduct, in each case, the cost of food from the value of the eggs there remain balances of \$0.86 and \$1.39 for the mongrels and Leghorns respectively. If we take into consideration only the cost of the food consumed and the value of the eggs produced then the Leghorns gave 53 cents per head more profit than the mongrels. The mongrels gained in weight one pound per head more than the Leghorns. Valuing this at 13 cents per pound then the Leghorns gave 40 cents more net profit per hen than the mongrels.

SUMMARY.

1. Fifty White Leghorns were compared with fifty mongrels for one year as to cost of food and egg production, ordinary care and attention being given them such as they would receive on the average farm.

2. In addition to skim milk used to moisten the mash the Leghorns consumed 61 pounds of food costing 85.3 cents, and the mongrels consumed 66.8 pounds of the same materials costing 92.1 cents.

3. During the year the Leghorns laid 116.5 eggs worth \$2.24 per hen, and the mongrels 96.1 eggs worth \$1.78 per hen.

4. The Leghorns gave a profit over the cost of food of \$1.39 and the mongrels a profit of 86 cents.

5. The mongrels gained in weight one pound per head more than the Leghorns. If this increase in weight is taken into consideration then the Leghorns gave a profit of 40 cents per hen more than the mongrels.

6. The highest prices for fresh eggs usually prevail during the months of November, December, January and February. During these four months the mongrels laid only 364 eggs and the Leghorns 1029 or practically three times as many.

THE ERROR INCIDENT TO EXPERIMENTS CONCERN-
ING EGG PRODUCTION.

In conducting poultry experiments, or in fact experiments of any kind, it is important to know how nearly duplicate results can be obtained when the conditions are all as nearly the same as it is possible to obtain them. For example, when one wishes to compare the value of two foods say beef scrap and ground fresh meat and bone for egg production, one of these materials is added to the ration for one lot of fowls and the other material is added to the ration for another similar lot of fowls and the observed difference in the egg production of the two lots of fowls is

attributed to a difference in the food value of the two feeding stuffs under consideration. In such a case as the one just mentioned the assumption must necessarily be made that the egg production of the two lots of fowls would have been identical provided that both lots of fowls had been fed alike. But are we justified in assuming that this is true, for we know that the normal production of eggs in different individuals even of the same breed differs considerably.

In the test of White Leghorns versus mongrels opportunity was given to study this matter. The two flocks of Leghorns were composed of pullets of the same breed, of the same age, and practically of the same weight, and they were fed on the same foods, and as nearly as possible the same amount.

The following table shows the average weight of the fowls at the beginning and at the end of the test, and the amount of food consumed by each lot of 25 fowls during the year:

	Average weight at beginning.	Average weight at end.	Pounds food consumed.
Lot 1.	3.08	3.30	1,522
Lot 2.	3.20	3.40	1,538

The following table shows the egg production by months for the year. The second and fourth columns give the total number of eggs produced at the end of each calendar month and at the end of the test. The fifth column gives the difference between these totals and the sixth column shows the percentage variation in the egg production of the two lots of fowls based in each case upon the lower egg yield:

	Lot 1	Totals	Lot 2	Totals	Difference	Variation per cent.
November 14th. ...	77	77	88	88	11	14.2
December 1905.	130	207	139	227	20	9.6
January 1905.	116	323	144	371	48	14.8
February 1905.	187	510	148	519	9	1.7
March 1905.	458	968	461	980	12	1.2
April 1905.	416	1,384	442	1,422	38	2.7
May 1905.	373	1,757	360	1,782	25	1.4
June 1905.	275	2,032	288	2,070	38	1.8
July 1905.	279	2,311	295	2,365	54	2.3
August 1905.	228	2,539	193	2,558	19	.7
September 1905.	239	2,778	213	2,771	7	.25
October 1905.	105	2,883	143	2,914	31	1.07
November 14th. ...	18	2,901	9	2,923	22	.75
Total for the year..	2,901		2,923			

The table shows that after the test had been running three and one-half months the variation in the egg yield dropped down to 1.7 per cent., and that at no time thereafter was the variation larger than 2.7 per cent.

These results indicate that in poultry experiments of this class in which twenty-five or more fowls are used in each lot the results of a six months trial will be practically as accurate and reliable as though the test were continued for an entire year. Also that the error, almost inseparably connected with experiments of this nature should not exceed three per cent. after the test has been conducted for four or five months.