

UNIVERSITY OF IDAHO  
AGRICULTURAL EXPERIMENT STATION

Department of Poultry Husbandry

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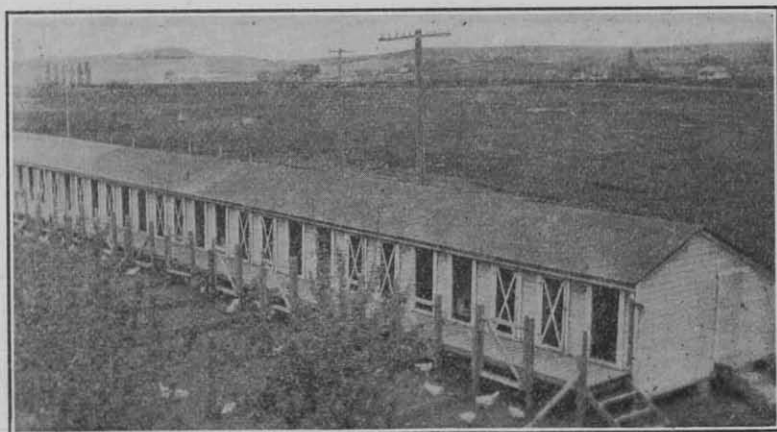
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The Value of Certain Protein Feeds For  
Production and Quality in Eggs

Three Years' Work—1920-23

By

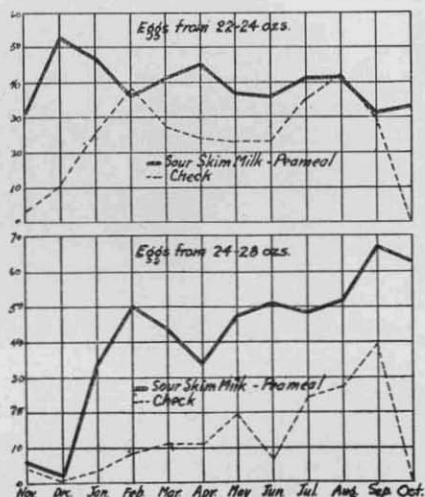
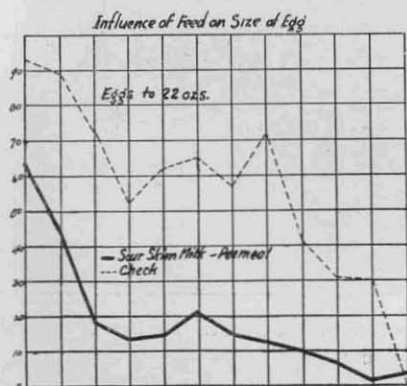
R. T. PARKHURST



The Laying House at the Agricultural Experiment Station Poultry Farm  
at Moscow

## SUMMARY

The ration containing peameal and sour skimmilk was outstanding in stimulating higher and more profitable egg production. When used alone, peameal was of comparatively little value for laying hens, while, in combination with sour skimmilk, more eggs, cheaper eggs and greater profits were obtained than with any other ration in the experiment. In addition, fewer small eggs resulted from this ration than from any other. Peameal can be used generally in Idaho as peas are available or can be grown with little trouble in most sections of the state and the expense of grinding them and putting them into the dry mash is very small. Sour skimmilk may be used as the only source of protein in the ration. The best results, however, are obtained when it is used in combination with peameal. It should be used in unlimited quantities when attainable at a reasonable price. High production and large eggs are obtained when meatmeal is used in the mash and unlimited sour skimmilk given. The profits, however, are not increased sufficiently, due to a higher feed cost, to justify the use of the additional meatmeal. When the feeding of sour skimmilk is impossible, tankage may be profitably used up to 30 per cent of the mash.



Monthly per cent of each size of eggs laid in the peameal and sour skimmilk and check pens during 1922-1923.

## THE VALUE OF CERTAIN PROTEIN FEEDS FOR PRODUCTION AND QUALITY IN EGGS

R. T. PARKHURST

Results of three years of feeding work with protein feeds show conclusively that they have a very important position in the ration of laying hens. This bulletin is a final report of the feeding experiment started November 1, 1920, and concluded October 31, 1923. Protein feeds such as: skim milk, milk whey, tankage, meatmeal, fishmeal, peameal, dried buttermilk and combinations of these feeds were studied.

### STOCK

The experiment was carried on at the University of Idaho Agricultural Experiment Station, Moscow. The pens consisted, at the beginning of each year, of twenty-five Single Comb White Leghorn pullets, selected to be as uniform as possible in size, maturity and breeding. The pens all were given identical management.

### FEEDS USED

A few minor changes were made in the basal ration and the proportion of feeds as the experiment progressed. These were the same in all pens. During 1922-1923, the scratch ration consisted of wheat. The basal mash was a mixture of equal parts of wheat bran, shorts, cornmeal and ground oats. Two pounds of charcoal and five ounces of salt per hundred pounds were added to the mash. In addition to the basal ration the pens were fed as follows:

Check pen received no additional protein feed.

Meatmeal pen received 20 per cent meatmeal in the mash.

Tankage pen received 20 per cent tankage in the mash.

Peameal pen received 20 per cent peameal in the mash.

Sour skim milk pen received unlimited sour skim milk.

Meatmeal and sour skim milk pen received a 12 per cent meatmeal mash and unlimited sour skim milk.

Peameal and sour skim milk pen received 20 per cent peameal in mash and unlimited sour skim milk.

Milk whey pen received unlimited sour skim milk.

Fishmeal and sour skim milk pen received 12 per cent fishmeal in the mash and unlimited sour skim milk.

Peameal and dried buttermilk pen received 25 per cent peameal in the mash and 12½ per cent dried buttermilk.

The milk whey pen was added to the experiment during 1921-1922 and was continued during 1922-1923. The fishmeal and sour skim milk pen was started November 1, 1922 and was of one year's duration. The peameal and dried buttermilk pen also was of one year's duration, during 1921 and 1922.

### METHODS OF FEEDING

The scratch feed was given in the litter after dark in order that the birds could get their feed when the lights were switched on at 4:00 A. M.

At 7:00 A. M., the birds were given a little more grain, if they were hungry. The evening scratch feed was given one-half hour before dark. The mash was fed in self-feeding hoppers which were left open at all times. As near as possible, one and one-half parts by weight of wheat were given for one part of dry mash consumed. There was no limit to the amount of feed as long as it was consumed in the proper proportion. All pens had grit, oyster shell, and bonemeal hopper-fed and some green feed. The pens that did not get sour skimmilk received water. No water was given in the sour skimmilk pens.

#### ANALYSIS OF FEED

All analyses of protein feeds and mashes were made by the department of agricultural chemistry. The composition of some of the feeds used in the experiment are given in the following table:

Total Composition of Feeds Used (100 Lbs.)

Material	Moisture	Ash	Fat	Fiber	Crude Protein	Nitrogen-free extract
Basal mash .....	9.82	4.17	4.76	9.74	12.61	58.90
Meatmeal .....	5.95	17.12	9.76	2.52	59.36	5.29
Tankage .....	4.34	32.74	13.05	2.94	40.45	6.48
Fishmeal .....	7.46	18.60	10.92	2.36	56.56	4.10
Peameal .....	9.77	2.97	1.37	5.37	26.00	54.52
Milk whey .....	94.03	0.75	.....	.....	Nitrogen 0.13	.....
Dried buttermilk .....	8.75	9.94	7.83	1.19	21.50	41.79

#### Cost of Feed

The average prices of feeds, per one hundred pounds, during the period of the experiment when each feed was used were as follows:

Feed	Price	Feed	Price
Wheat .....	\$ 1.94	Meatmeal .....	\$4.79
Wheat bran .....	1.40	Tankage .....	2.61
Shorts .....	1.53	Oyster shell .....	1.82
Corn meal .....	2.01	Grit .....	1.53
Ground oats .....	1.92	Salt .....	1.80
Peameal .....	3.79	Charcoal .....	5 07
Skimmilk .....	.46	Corn .....	1.98
Milk whey .....	.24	Barley .....	1.75
Dried buttermilk .....	14.20	Peas .....	3.00

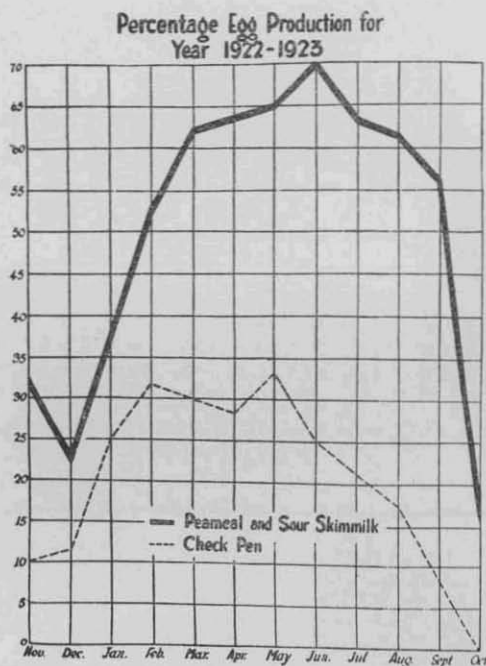
The prices quoted were the retail prices in Moscow.

#### RESULTS FOR THE THREE YEARS

##### Percentage Egg Production

The pen receiving peameal and sour skimmilk gave the highest average production for the three years as well as the highest for any year of the experiment. In this pen, the average for the three years period was 41.9 per cent production and 153.6 eggs per pullet. For 1922-1923 the

average production was 49.6 per cent and the pullets averaged 181.2 eggs. The check pen averaged 24.3 per cent production for the three years and only 20.4 per cent for 1922-1923. All the pens in the experiment gave better production than did the check pen. The increased production resulting from the use of animal protein feeds and combinations of the animal and vegetable protein feeds clearly demonstrates their value.



Monthly production of the peameal and sour skimmilk and check pens during 1922-1923.

#### Influence of Feeds on Weight of Eggs

The use of protein feeds influences definitely the size of the eggs produced. The fewest small eggs and the most large eggs were obtained with rations containing animal and vegetable proteins. The highest percentage of small eggs was obtained from the check pen in which no protein feed was given. The fewest large eggs were produced in the peameal pen, indicating that it is the animal protein feeds that cause the increase in size of eggs. The influence of sour skimmilk and dried buttermilk in increasing the weight of eggs was especially noticeable. During 1922-1923, 62.5 per cent of the eggs produced in the check pen were below 22 ounces per dozen and would have brought a lower price, if marketed where standard grades are used.

#### Profit Over Feed Cost

The increased profits from the use of protein feeds justified their use. The feed cost of the check pen was the lowest of all the pens. The profit over feed cost for that pen was also the lowest.

## Feed Cost Per Dozen Eggs and the Price Received for Eggs.

Month	1920-1921			1921-1922			1922-1923		
	Check	Peameal Sour Skimmilk	Price Received	Check	Peameal Sour Skimmilk	Price Received	Check	Peameal Sour Skimmilk	Price Received
November .....	.19	.18	.75	.53	.35	.45	.46	.22	.50
December .....	.15	.13	.60	.44	.25	.60	.32	.22	.50
January .....	.19	.15	.50	.66	.14	.40	.17	.19	.45
February .....	.21	.18	.25	.21	.24	.40	.16	.15	.30
March .....	.17	.18	.20	.16	.15	.35	.19	.17	.23
April .....	.09	.10	.20	.13	.13	.30	.18	.12	.20
May .....	.08	.08	.22	.14	.17	.20	.15	.14	.23
June .....	.07	.07	.22	.23	.20	.22	.19	.09	.25
July .....	.12	.11	.25	.40	.18	.22	.10	.09	.25
August .....	.15	.17	.25	.48	.22	.22	.24	.11	.27
September .....	.25	.23	.40	.19	.16	.30	.28	.09	.29
October .....	.27	.48	.45	.90	.35	.45	.36	.24	.44
Yearly average ..	.15	.13	.37	.23	.19	.34	.21	.14	.33

The meatmeal and sour skimmilk gave a higher average per cent production during the experiment than the sour skimmilk pen, but less profit over feed cost. During 1922-1923, the peameal and sour skimmilk pen made a profit over feed cost of \$2.33 per pullet compared to \$0.66 per pullet for the check pen. Due to lower feed cost, the tankage pen made a greater profit over feed cost than did the meatmeal pen. It always was profitable to feed animal protein feeds.

## Feed Cost Per Dozen Eggs

The feed cost per dozen eggs is obtained by dividing the total feed cost for each pen by the total number of dozens of eggs produced by that pen. This factor varies with both the production and the cost of feeding the pen. Even at a low feed cost, the check pen produced eggs at a high expense. The increased production due to the use of protein feeds in most cases over-balanced the increased feed cost and gave a low feed cost of producing eggs.

## COMPARISON OF FEEDS

## Peameal and Sour Skimmilk

During the three years, 1920-'23, the peameal and sour skimmilk pen gave an average of 41.9 per cent production, averaged 153.6 eggs per pullet and produced eggs at an average feed cost of 15.3 cents. In all these factors, the peameal and sour skimmilk pen was the best of the ten pens.

During 1922-1923, this pen gave 49.6 per cent production, averaged 181.2 eggs per pullet, made an average profit over feed cost of \$2.33 and produced eggs at an average feed cost of only 14 cents per dozen. The pullets consumed 34 pounds of wheat, 21.8 pounds peameal mash and 148.2 pounds of sour skimmilk. The cost of feed was \$2.08 per pullet. The nutritive ratio of the actual feed consumed was 1 to 3.86.



**SUMMARY OF AVERAGES THREE YEARS (1920-1923)**

	Meatmeal	Tankage	Peameal	Sour Skimmilk	Meatmeal Sour Skimmilk	Peameal Sour Skimmilk	Milk Whey	Check	Peameal Dried buttermilk	Fishmeal Sour Skimmilk
							(1)		(2)	(3)
Average number of pullets per pen....	24.30	23.90	24.00	21.77	23.25	23.60	17.40	21.60	23.05	21.60
Average yearly feed cost per pullet....	\$1.72	\$1.59	\$1.55	\$2.11	\$2.23	\$1.96	\$1.50	\$1.38	\$2.43	\$1.94
Average yearly income per pullet .....	\$2.96	\$3.01	\$2.70	\$3.84	\$3.88	\$4.04	\$2.59	\$2.23	\$3.33	\$3.49
Average yearly profit over feed cost..	\$1.21	\$1.42	\$1.14	\$1.85	\$1.64	\$2.08	\$1.09	\$1.01	\$ .90	\$1.55
Average production, per cent .....	31.60	31.40	29.20	39.90	41.70	41.90	29.20	24.30	35.30	39.60
Eggs per pullet per year .....	115.20	120.00	106.40	145.90	152.70	153.60	105.90	89.00	128.40	144.30
Average feed cost per dozen eggs .....	\$ .18	\$ .16	\$ .18	\$ .176	\$ .176	\$ .153	\$ .19	\$ .195	\$ .23	\$ .16
Grain consumed per pullet, lbs. ....	45.90	46.80	43.00	41.90	43.00	45.30	37.70	46.72	48.40	44.60
Mash consumed per pullet, lbs. ....	27.10	28.80	20.20	22.00	21.40	23.60	22.90	23.60	34.30	18.80
Milk consumed per pullet, lbs. ....				167.00	189.00	64.50	130.78			131.00
Shell consumed per pullet, lbs. ....	1.62	1.71	1.75	1.675	2.10	1.84	1.46	1.41	1.90	2.30
Grit consumed per pullet, lbs. ....	1.04	.945	.945	1.385	1.11	.81	1.04	1.065	.87	.63
Total feed per pullet without milk, lbs.	74.90	77.00	65.90	66.00	66.60	70.90	63.10	69.10	82.70	66.33
Total feed per pullet with milk, lbs...				232.96	255.44	135.50	105.10			197.33
Size of eggs, 22 oz. per doz., per cent..	28	29	38	21	14	18	33	35	11	16
Size of eggs, 22-24 oz. per doz., per cent	43	45	43	37	37	42	46	42	47	37
Eize of eggs, 24-28 oz. per doz., per cent	29	26	19	42	49	40	21	23	42	47

(1)—1921-1923

(2)—1921-1922

(3)—1922-1923

### **Sour Skimmilk**

The best results were obtained from this pen during the first year. During 1920-1921, the sour skimmilk pen gave 47.4 per cent production and an average of 174.9 eggs per pullet. The results of the past two years and the three-year average place this pen second to the peameal and sour skimmilk pen.

### **Check**

The check pen, getting the basal ration consistently gave unsatisfactory production, low profits and small eggs.

### **Meatmeal and Sour Skimmilk**

The meatmeal and sour skimmilk pen produced large eggs. The high feed cost cut down the profits and made the ration less desirable than that of either the peameal and sour skimmilk or the sour skimmilk pens.

### **Peameal**

The peameal pen did not give very promising results. The addition of this vegetable protein feed did not prove valuable for egg production, unless supplemented by sour skimmilk. In percentage production, profits over feed cost and increase in size of eggs the peameal pen was not much better than the check pen.

### **Milk Whey**

The average for the two years showed only slightly increased production over the check pen and practically no greater profits. The size of eggs was no larger than for the check pen.

### **Meatmeal versus Tankage**

The three-year average showed that, altho the meatmeal pen gave slightly better production, the tankage pen yielded greater profits over feed cost and a cheaper feed cost per dozen eggs. There was little difference in the influence of the two feeds on the size of eggs produced.

### **Peameal and Dried Buttermilk**

Only one year trial was given this ration. Production was high, but profit—due to too high a price paid for dried buttermilk—was poor. Dried buttermilk has the advantage over the liquid skimmilk in being easier to handle.

### **Fishmeal and Sour Skimmilk**

This ration was used only during 1922-1923. In percentage production and profits over feed cost, it was inferior to the other pens getting sour skimmilk. The eggs averaged well above standard size.