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POULTRY FEEDING AND CONFINEMENT REARING EXPERIMENTS

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University of Arizona, Tucson

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POULTRY FEEDING AND CONFINEMENT REARING EXPERIMENTS

By H. B. Hinds

PART I.—THE COMPARATIVE NUTRITIVE VALUE OF CERTAIN LOCALLY PRODUCED POULTRY RATIONS

Introduction

Most Arizona poultrymen purchase all the feed eaten by their birds except green feed. This is due to the fact that commercial poultrymen usually are located near cities and on limited areas. In this section irrigation facilities are costly, and climatic conditions limit the kind of grains grown. Sorghum grains are exceptions in their adaptability to the arid regions of the Southwest, and they produce good yields with a minimum of water.

From time to time attempts have been made to incorporate locally produced grains—namely, barley and sorghum grains—into the poultry ration for laying birds. Results of these tests have not been entirely satisfactory or consistent. A check of the literature finds opinions and results very much divided as to the relative value of these grains for egg production. Moore (1) reports that the barley-fed pen compared very favorably with that fed the standard corn ration. The latter produced six more eggs per bird during the 10-month period but at a slightly greater cost per dozen. There was actually a greater profit derived from feeding the barley ration as compared with that containing corn. These results were in agreement with those of Halpin and Hayes (2) and Herner, Robinson, and Whidden (3) who also reported greater production on barley than on corn rations.

Crampton (4) summarizes several Canadian tests and concludes that "corn gave a somewhat greater egg production than barley." Titus and Godfrey (5) reported that 81 to 90 per cent as much feed per egg is required by birds receiving corn as those on barley diets. McBride (6) contends that corn increased body weight of birds somewhat faster than barley. Crampton (4) on the other hand states that a consistent factor is the superior body weight gained with barley, usually accompanied by a slight increase in feed consumption. Herner, Robinson and Whidden (3) found no difference between these grains in their ability to maintain body weight. Reports from the California Station (7) indicate that barley is unpalatable to poultry and that they will consume only small quantities if other grains are available.

Little information on the use of sorghum grains in poultry feeding is at hand. Payne (8) concludes that good quality kaffir or milo may replace either white or yellow corn pound for pound in a ration for growing chicks or laying birds when adequately supplemented. He further states that in the light of his tests that it is neither necessary nor advisable to ship corn into sorghum-growing areas to feed poultry.

These together with the results from flocks of local poultrymen who are using barley and milo in their rations presented a sufficient reason for a controlled check of these grains.

Stock

Since the White Leghorn breed predominates in this section, birds of this variety were selected for the test. The stock was from the regular University breeding pens and was equalized as to vigor, breeding, and condition in so far as possible. Pullets were used, and the periods of the tests were from October 1 until September 1. The experiments were repeated for 3 consecutive years with a new group of pullets starting each test.

Rations Used

Four rations were selected as being representative of those in use by local poultrymen. In some cases slight modifications were made to supply the necessary vitamins.

Table 1 shows the ingredients and the proportions used in each ration.

TABLE 1.—INGREDIENTS USED IN DIFFERENT RATIONS (LBS.).

Ingredients	Pen and ration			
	307 Corn meal	308 Barley	309 Check	310 Red milo
Yellow corn meal	30	....	15.20	....
Ground oats	20	20	15.20	....
Ground barley	....	30	.....	10
Ground red milo	....	....	.....	35
Ground wheat	....	....	.....	10
Bran	10	10	15.20	10
Middlings	10	10	15.20	....
Meat scraps	20	20	19.00	20
Dried buttermilk	....	....	3.80	5
Alfalfa leaf meal	10	10	3.80	5
Bone meal	3	3	3.80	2
Linseed meal	....	....	3.80	....
Oystershell flour	....	....	2.28	2
Charcoal	....	....	2.28	....
Salt	1	1	0.44	1
Wheat (whole)	50	....	28.6	50
Yellow corn (cracked)	50	50	28.6	....
Barley (whole)	....	50	.....	....
Red milo (whole)	....	....	.....	50
Hegari (whole)	....	....	28.6	....
Oats (whole)	....	....	14.2	....

Pen 307 was known as the corn meal pen from the fact that 30 per cent of the mash mixture was yellow corn meal. Cracked yellow corn comprised 50 per cent of the scratch grain mixture. Pen 308 had a similar amount of ground barley in the mash, and one half of the scratch grain was whole barley. This last was known as the barley ration. Pen 309, the check pen, was fed the U. of A. laying ration. Pen 310, the red milo lot, had 35 per cent

ground red milo in the mash and 50 per cent whole red milo in the scratch mixture.

Procedure

The birds were placed in similar pens and were fed and trapped by the regular attendants. No forcing methods were employed. Green feed was given once a day at the same time that other pens received their allowance.

The criteria used as a measurement for the value of the different feeds were: (1) feed consumption, (2) egg production, (3) weight of eggs, (4) return above cost of feed, and (5) mortality during the laying year.

Feed Consumption

In most feeding tests an all-mash system is used. This method precludes the possibility of free choice selection of certain grains by individual birds. In the tests being reported, however, ranch methods of handling were followed, and the grain and mash were fed separately.

TABLE 2.—POUNDS OF FEED CONSUMED PER BIRD, OCTOBER 1 TO SEPTEMBER 1 (11 MONTHS).

Group	Corn meal	Barley	Check	Red milo
First year	54.71	60.35	55.45	54.66
Second year	60.95	63.87	60.09	60.81
Third year	55.13	57.93	59.72	57.42
Average (3 years)	56.93	60.72	58.42	57.63

It will be noticed in Table 2 that the feed consumption by all groups was practically the same. It is interesting to note that in the barley lot slightly more feed per bird was consumed even though this grain is generally considered relatively unpalatable for poultry.

Each lot consumed more grain than mash. The check group's consumption of mash and grain, however, was very nearly the same, 50.8 per cent grain and 49.2 per cent mash. The corn lot ate 45.3 per cent mash and 54.7 per cent grain; the barley group ate 43.4 per cent mash and 56.6 per cent grain; and the red milo group consumed 44.1 per cent mash and 55.9 per cent grain. This indicates a preference for grain in all lots.

All calculations were made on a hen-day basis so as to include those birds that did not live to the completion of the test.

Egg Production

The average number of eggs laid per bird is the criterion most often used to measure the value of any method of poultry management.

In these tests all birds were trap-nested throughout the entire period. To secure the average egg production, however, floor and

unidentified eggs were added to the pen totals and calculations made on a hen-day basis.

TABLE 3.—EGG PRODUCTION PER BIRD.

Pen	Yrly. av.—no. eggs per bird			Average for entire period
	1st year	2nd year	3rd year	
Corn meal	138.76	128.86	117.53	128.38
Barley	135.10	130.53	132.71	132.78
Check	141.88	159.40	132.99	144.76
Red milo	135.52	148.97	129.63	138.04

The birds in the group receiving the check ration laid more eggs than those in any other lot. This was the case in each of the 3 years of the test. In only three of the monthly periods (January, May, and June) were they surpassed. In these months the milo-fed lot exceeded the average production of the check pen as did the barley group for May and June.

If the production of the check lot is taken as 100 per cent, milo would rate 95.35 per cent, barley 91.72 per cent, and corn 88.68 per cent.

Weight of Eggs

Certain feedstuffs, particularly barley, have been thought to produce eggs that are underweight. In order to determine if there is foundation for such assumption, eggs from each of the four groups were individually weighed. Due to the fact that hot weather normally causes a slight drop in weight of eggs, the months of May, June, July, August, and September were selected as the period in which to secure this data.

TABLE 4.—THREE YEAR AVERAGE WEIGHT OF EGGS (MAY, JUNE, JULY, AUGUST, SEPTEMBER).

Pen	Total no. eggs weighed	Total weight eggs (ounces)	Average wght. eggs (oz.)	
			Each	Per dozen
Corn meal	1,257	2,201.00	1.75	21.00
Barley	1,216	2,185.85	1.80	21.60
Check	1,499	2,699.85	1.80	21.60
Red milo	1,467	2,664.80	1.81	21.72

There was no practical difference in weight of eggs in any lot. The red milo group produced the heaviest eggs, and the corn meal lot the lightest. The barley and the check pen hens laid eggs of the same weight. There was little difference in weight in any lot during any monthly period. This would indicate that from a weight-of-egg standpoint, locally produced feeds, especially barley, should not be penalized.

Return above Feed Cost

The cost of producing a dozen eggs is one means of measuring the value of a ration. This is determined by the amount of feed

necessary to produce a dozen eggs and the cost of the ingredients. The former may be determined by palatability as well as by composition.

TABLE 5.—NUMBER OF POUNDS OF TOTAL FEED (GRAIN AND MASH) NECESSARY TO PRODUCE A DOZEN EGGS AND FEED COST.

Pen	First year		Second year	
	No. lbs. feed per dozen eggs	Cost feed per dozen eggs (cents)	No. lbs. feed per dozen eggs	Cost feed per dozen eggs (cents)
Corn meal	5.41	11.67	5.76	12.44
Barley	6.40	12.59	6.08	12.05
Check	5.42	9.64	4.51	8.86
Milo	5.71	11.24	5.03	9.90
	Third year		Average	
Corn meal	5.68	12.27	5.62	12.13
Barley	8.59	17.04	7.02	14.90
Check	6.26	12.22	5.39	10.69
Milo	6.09	10.29	5.61	11.05

Reference to Table 5 shows the total number of pounds of feed (grain and mash) necessary to produce a dozen eggs and the feed cost. It will be noted that the check lot required less feed than any other group. These birds ate 5.39 pounds for each dozen eggs. The red milo pen consumed 5.61 pounds; the corn meal pen, 5.62 pounds; and the barley group, 7.02 pounds of feed per dozen eggs produced.

On the basis of July 1, 1941, prices the check group produced eggs at the lowest figure. The feed cost in this lot was 10.69 cents per dozen eggs. The red milo pen had a cash cost of 11.05 cents; the corn meal lot 12.13 cents; and the barley pen 14.90 cents.

Mortality during Laying Year

The mortality in all lots was very high. The losses were distributed through all pens but could not be attributed to any specific outbreak.

The red milo groups had the smallest mortality and the check pens the highest. In the 3 years of the test the red milo group had a consistently higher livability. If this livability is designated as normal, the barley lot would be 8.73 per cent below normal; the corn meal pen 9.36 per cent; and the check group 20.16 per cent. Exclusive of feed, the same management practices were followed.

Summary

Arizona poultrymen purchase most of the feed consumed by their chickens except green feed. A large percentage of this material is purchased from outside the state in spite of the fact that

large quantities of sorghum grains and barley are available locally. A possible reason is the idea that these grains are unsuited for poultry feeds, due to unfavorable results obtained when not properly supplemented with foods containing vitamin A.

In order to get definite information on the value of sorghum grains and barley, four rations representative of those used by poultrymen were selected. The following were the criteria used in making this test.

1. Feed consumption.—There was very little difference in the total amounts of feed consumed in any lot. In all cases the preference was for the grain portion of the ration. This indicates that palatability in any of the feeds used was not a factor.

2. Egg production.—The check pen produced the largest number of eggs. If this lot is taken as 100 per cent, the red milo lot would lay at a rate of 95.35 per cent; the barley group, 91.72 per cent; and the corn group, 88.68 per cent.

3. Weight of eggs.—Barley has been penalized as a producer of small eggs. This did not prove to be the case in these tests. The heaviest eggs were produced in the red milo lot and the lightest in the corn meal group. The barley and the check pens produced eggs of the same weight and intermediate with the other groups.

4. Return above feed cost.—The birds in the check groups required the smallest amount of feed to produce a dozen eggs. They were followed by the red milo, the corn meal, and the barley lots in the order named. The cash cost was in the same order.

5. Mortality.—The mortality in all lots was high. Livability was highest in the red milo, followed by the barley, the corn meal, and the check groups in this order.

These tests would indicate that locally produced grains, red milo and barley, may be used in poultry rations, provided proper vitamin supplements are added.

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PART II.—FEEDING TESTS

Introduction

These feeding tests involve low protein, intermittently fed rations; liquid milk supplementing local grains; dehydrated carrots in laying rations; and mashes compounded on the basis of price alone. To the knowledge of the writer there has been no work reported on the use of dehydrated carrots and the intermittent system of feeding laying birds.

Carrots have been used for some time to prevent vitamin A deficiency in growing birds. Davis and Beach (1) found that yellow or red carrots were adapted to this purpose. At the Washington Agricultural Experiment Station (2) it was reported that dehydrated carrots compared favorably with dehydrated alfalfa in vitamin A. Livestock producers claim that carrots produce a gloss to the hair. Broiler growers likewise report a high pigmentation on the shanks of market birds.

The intermittent method of feeding allows the birds to have access to the mash hopper at regular intervals each day. Wet mash and grain are fed during the period when the mash hoppers are closed. Advocates of this system contend that a low protein diet so fed will result in higher egg production with less mortality.

The supplementing of locally produced grains with liquid milk is also practiced by some poultrymen. Definite results have not been available on this practice.

The popular conception of feeding for egg production is to avoid any sudden changes in the diet after the birds have reached heavy production. If for any reason a change of feed is necessary, it should be made gradually over approximately a 2-weeks period, otherwise a premature molt may result. Results at the Mississippi State College (3) do not bear out this theory. Four sudden changes were made during the year resulting in increased production over a check group with feed unchanged. Changes in feed formulas are usually in the interest of economy or inability to secure certain ingredients. With the idea of securing the cheapest possible efficient ration an experiment was outlined, one part of which called for a ration revision each month on the basis of price alone.

Objectives

The objectives of these tests are as follows:

1. To determine whether a low protein (14 per cent) ration will maintain satisfactory egg production and reduce mortality in laying birds when fed intermittently.
2. Can price alone be the determining factor in compounding a satisfactory laying ration?
3. Can liquid milk successfully supplement locally produced grains?

4. Will dehydrated carrots be of value in supplementing a laying ration?

Stock

White Leghorn pullets were used. All lots were selected on the basis of vigor, breeding, and condition and equalized in so far as possible. The experiments were repeated yearly for 4 years with a new group of birds starting each year. Unless otherwise indicated the tests ran from October 1 until September 1 of each year.

Rations

An intermittent system of feeding was employed in Group 1, which consisted of the following ration: mash: 100 pounds yellow corn meal, 100 pounds bran, 100 pounds shorts, 100 pounds ground oats, 100 pounds meat scraps, 15 pounds charcoal, 15 pounds oystershell flour, 3 pounds salt; grain: 125 pounds yellow cracked corn, 50 pounds barley, 50 pounds wheat, and 25 pounds oats.

The method of feeding was as follows: (1) In the morning a damp mash (water) was given in an amount that would be eaten in about 45 minutes; (2) the mash hoppers were opened at 11 a.m. and closed at 2 p.m.; (3) in the evening all the grain was given that the bird would clean up.

Group 2 (local grains supplemented with milk).—A mash was obtained by grinding together 100 pounds red milo, 100 pounds wheat, and 50 pounds barley. This together with liquid milk was available for the birds at all times. The above grains were fed night and morning as a scratch feed. Liberal quantities of freshly cut alfalfa were always before the birds.

Group 3 (compounded on basis of price alone).—The rations fed this lot were changed monthly, depending entirely on the cost of the different ingredients.

Group 4.—The check lot, received the regular University of Arizona laying ration, consisting of the following: mash: 100 pounds wheat bran, 100 pounds yellow corn meal, 100 pounds ground oats, 100 pounds shorts, 125 pounds meat scraps, 25 pounds linseed meal, 25 pounds alfalfa meal, 25 pounds dried milk, 25 pounds bonemeal, 25 pounds oystershell flour, 15 pounds charcoal, 5 pounds salt; grain: 200 pounds whole wheat, 200 pounds cracked yellow corn, 200 pounds hegari, and 100 pounds whole oats.

Mash was available at all times, and grain was fed night and morning.

Group 5 (dehydrated carrot supplement).—This pen was given the check ration used in Group 4 supplemented with 5 per cent dehydrated carrots.

All lots received the usual daily green feed allowance.

Procedure

All groups were housed in similar pens with yards of the same size. No method of forcing production was employed, and the birds did not receive any special treatment aside from the difference in the rations.

In attempting to measure the value of the different feeds, the following were given particular attention: (1) production, (2) feed consumption, (3) return above feed cost, and (4) mortality.

Egg Production

Table 6 gives the average number of eggs laid per bird for each year of the test. All birds were trap-nested throughout the period under consideration. Floor and unidentified eggs were credited to the pen totals in arriving at average production. All calculations were made on a hen-day basis in order to include all birds and feed involved in the test.

TABLE 6.—EGG PRODUCTION PER BIRD (NOV. 1 TO SEPT. 1).

Type of feed	Average production per bird				Average for entire period
	First year	Second year	Third year	Fourth year	
Intermittent system	133.00	166.97	143.81	181.69	156.37
Milk supplement	110.82	154.42	149.90	154.25	142.69
Economy	93.75	120.41	141.24	119.14	118.63
Check	142.55	143.08	155.70	174.56	153.97
Dehydrated carrots	.....	.....	145.00	183.61	169.30

Only 2 years' records were obtained on the ration supplemented with dehydrated carrots. Incidentally these 2 years were the ones in which the highest average production was secured in all lots. As was to be expected the economy fed birds consistently produced the smallest number of eggs during the entire period. The intermittently fed pens produced the second highest number of eggs, closely followed by the check lots. Birds fed local grains supplemented with milk followed in average number of eggs per bird.

Feed Consumption

The amount of feed required to produce a dozen eggs is a basis often used to indicate the efficiency of a ration. Table 7 gives these data.

The check groups required the smallest amount of feed to produce a dozen eggs. Taking this as 100 per cent, the dehydrated carrot lot would require 101.4 per cent; the intermittent system, 105.5 per cent; the milk supplement group, 123.0 per cent; and the economy lot, 135.5 per cent of feed.

TABLE 7.—FEED REQUIRED TO PRODUCE A DOZEN EGGS.

Type of feed	Av. no. lbs. feed per dozen eggs				Average for entire period
	First year	Second year	Third year	Fourth year	
Intermittent system	4.63	5.63	5.03	6.59	5.47
Milk supplement	4.93	5.50	6.61	7.77	6.20
Economy	6.40	5.72	7.45	8.56	7.03
Check	4.65	5.02	5.30	5.36	5.04
Dehydrated carrots	.....	.....	4.52	5.70	5.11

Return above Feed Cost

The actual cash outlay required to produce eggs is of vital importance to the poultryman. Since feed is the largest single item, being approximately 60 per cent of the total cost, Table 8 is of interest.

TABLE 8.—FEED COST PER DOZEN EGGS.

Type of feed	Av. cost (¢) feed per dozen eggs				Average for entire period
	First year	Second year	Third year	Fourth year	
Intermittent system	9.12	11.09	9.90	12.98	10.77
Milk supplement	10.05	11.22	13.48	15.84	12.64
Economy	11.71	10.46	13.63	15.65	12.86
Check	9.11	9.84	10.39	10.50	9.88
Dehydrated carrots	.....	.....	9.56	12.33	11.03

A study of Table 8 shows the check group producing eggs for a feed cost of 9.88 cents per dozen. The lowest feed cost for any year under consideration was 9.11 cents, and the highest was 10.50 cents. The intermittent lot was second in average feed cost with 10.77 cents per dozen. These birds had a low cost of 9.12 cents and a high outlay of 12.98 cents per dozen. The dehydrated carrot pens required an expenditure of 11.03 cents per dozen. The milk-supplement birds' food cost 12.64 cents and the economy lot, 12.86 cents for each dozen eggs laid. This would indicate that even though the ration in the economy fed pens was cheaper in first cost, the total cost per dozen eggs was higher.

Mortality

The mortality was consistent in all lots. Death loss was especially heavy in 1 year of the test but was equally divided among all pens. This indicates that the systems of feeding as employed in this series of tests did not have direct bearings on the mortality.

Considerable feather picking and cannibalism appeared in the

economy group on one occasion. This was handled by the addition of extra salt in the ration.

Summary

Four objectives prompted this series of tests:

1. To determine whether a low protein ration fed intermittently will maintain satisfactory egg production and reduce mortality.
2. Can price alone be a safe guide in compounding a ration?
3. Can liquid milk successfully supplement local grains?
4. What is the value of dehydrated carrots as a supplement in the ration of laying birds?

Five systems of feeding for egg production were reported. Tests were repeated for 4 years with the exception of one lot, the dehydrated carrot supplemented group, which was over a 2-year period.

A low protein diet intermittently fed was found under the conditions of these tests to be satisfactory for egg production, though the mortality was not reduced.

The compounding of rations on the basis of price alone with the consequent sudden changes of rations resulted in lower average egg production and a higher cost per dozen eggs.

The supplementing of local grains with milk will make a satisfactory ration for laying birds. If either or both are available on the ranch, their use is to be strongly recommended.

The supplementing of a laying ration with 5 per cent dehydrated carrots did not prove of sufficient value to warrant their use.

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PART III.—CONFINEMENT REARING

Introduction

The rearing of chicks in semiconfinement and confinement has become a common practice. Many poultrymen start their chicks in confined areas and later transfer them to range houses on clean range. Various systems are employed, some utilizing battery brooders, others wire floors, while still others use concrete floors and runways. Tomhave and Mumford (1) report a preference for wire sun porches while Buckner, Martin, and Insko, Jr. (2) found that battery-brooder-started and colony-house-raised birds were more vigorous, active, and healthier in appearance than those raised indoors without direct sunshine.

In all cases the confinement system has become popular with poultrymen that have experienced trouble with contaminated ranges. The confinement method of rearing helps to protect birds from diseases and worm infestation during a very susceptible period of their lives.

The results of the study herein reported deal with methods of management and their effects on the growth of White Leghorn chickens.

Procedure

The chicks, all White Leghorns, were divided into three groups, each of which had access to a brooder room, 14 by 16 feet, with a concrete floor. The rooms were adjoining and similar. Lot A had access to a concrete porch of the same size as the room. In Lot B the concrete floor and a sun porch of the same size were covered with half-inch hardware cloth. Lot C had free access to an outside run that had previously been sown to barley.

At 10 weeks of age the cockerels were removed and the pullets continued on test for another 8 weeks. During the 3-year period 656 chicks were started under each set of conditions. Weekly weights were taken.

The ration fed all lots was that used on the station plant and known as the U. of A. laying ration and consisted of:

	Pounds		Pounds
Wheat bran	100	Alfalfa leaf meal	25
Yellow corn meal	100	Dried buttermilk	25
Ground oats	100	Bonemeal	25
Shorts	100	Oystershell (flour)	15
Meat scrap	125	Charcoal	15
Linseed meal	25	Salt	3

The grain mixture consisted of 200 pounds of whole wheat, 200 pounds of cracked yellow corn, 200 pounds of hegari, and 100 pounds of whole oats.

Green cut alfalfa was fed as a green feed once a day.

For a starting ration 41 pounds of the above mash was mixed with 44 pounds of yellow corn meal, 8 pounds of dried buttermilk,

and 1 pound of tested cod-liver oil. This is known as the U. of A. starting ration.

The average weekly weights are given in Table 9. The weights for the first 10 weeks are for the pullets and cockerels combined; for the eleventh to the eighteenth week, inclusive, the weights are for the pullets.

It will be noted that the average weight to 10 weeks is the greatest in Lot C. These birds weighed 24 grams more than those in Lot B and 59 grams more than those in Lot A.

At the conclusion of the test the pullets in Lot C were the heaviest. The pullets in Lot A weighed 32 grams less than those in Lot C and 38 grams more than those in Lot B. The only explanation available as to why the chickens in Lot B, which aver-

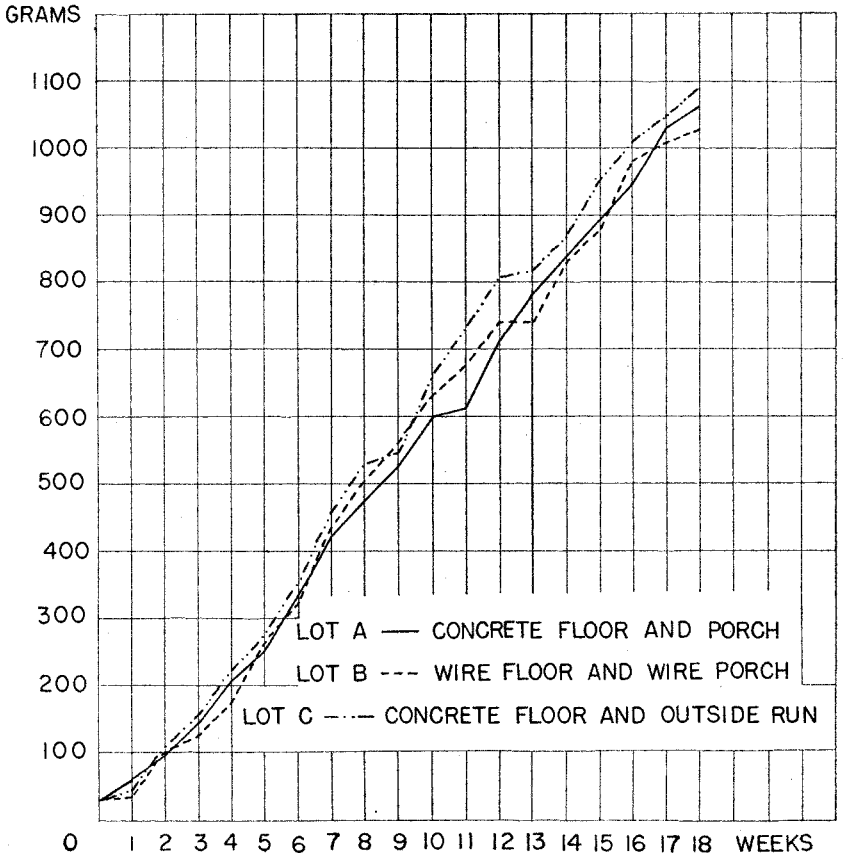

Figure 1.—Growth curves of the three lots for 18 weeks. The birds in lots A and C showed little difference in appearance. The vigor and vitality together with the comb and wattle development were apparently the same. Lot B appeared quite healthy and vigorous, but the plumage was very rough and ragged.

TABLE 9.—AVERAGE WEEKLY WEIGHTS OF FOWLS IN GRAMS. CONFINEMENT. (3-YEAR AVERAGE.)

Weeks	Lot A Concrete floor—concrete porch		Lot B Wire floor—wire porch		Lot C Concrete floor—outside run	
	Cockerels and pullets	All pullets	Cockerels and pullets	All pullets	Cockerels and pullets	All pullets
	33	.....	35	.....	34	.....
1	61	.....	53	.....	59	.....
2	97	.....	99	.....	101	.....
3	144	.....	122	.....	149	.....
4	202	.....	186	.....	212	.....
5	260	.....	264	.....	267	.....
6	339	.....	336	.....	335	.....
7	431	.....	432	.....	450	.....
8	488	.....	501	.....	532	.....
9	526	.....	564	.....	552	.....
10	600	.....	635	.....	659	.....
11	.....	614	.....	684	.....	721
12	.....	710	.....	732	.....	801
13	.....	784	.....	740	.....	814
14	.....	843	.....	842	.....	866
15	.....	897	.....	894	.....	957
16	.....	944	.....	971	.....	1,004
17	.....	1,026	.....	1,004	.....	1,056
18	.....	1,067	.....	1,029	.....	1,099

aged 35 grams more than those in Lot A at 10 weeks of age, should average.38 grams less at 18 weeks is that severe cannibalism was prevalent in this lot during the latter part of the test in each year.

The mortality was above the average in all lots. From day old to 10 weeks of age, 21.37 per cent of the birds died in Lot B. During the same period 13.86 per cent died in Lot C and 11.33 per cent in Lot A. From 11 to 18 weeks 5.64 per cent were lost in Lot A, 4.22 per cent in Lot B, and 2.26 per cent in Lot C. The total mortality was least in the birds having an outside run. This group sustained a loss of 16.12 per cent. The next lowest mortality was 16.97 per cent in the birds confined on a concrete porch, while those in the wire-floor pen had a death rate of 25.59 per cent.

At the tenth week and at the conclusion of the test, five birds in each lot were autopsied. Both round- and tapeworms were found in the birds having access to an outside run. The infection, however, was not severe. A few very small tapeworms were found in the intestines of the birds from both the confined groups.

Battery-brooded Chicks

The second phase of confinement rearing had to do with the advisability of starting chicks in battery brooders before transferring them to colony houses. The growth and development of chicks started in batteries for 2-, 4-, and 6-week periods were checked against those of chicks started in colony houses.

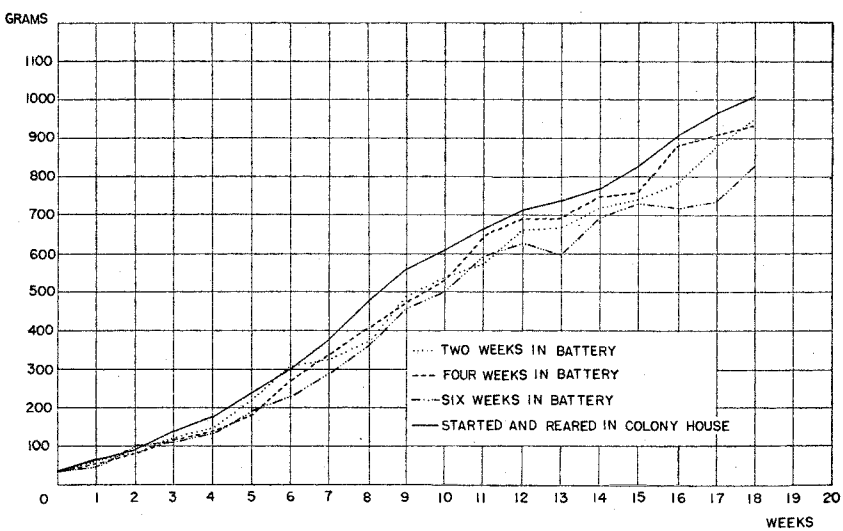

Figure 2.—Growth curves of the four groups for 18 weeks. First 12 weeks include cockerels and pullets; last 6 weeks, pullets only.

Procedure

The chicks, all White Leghorns, were divided into four groups of 150 each. Group 1 was started in a battery brooder for 2 weeks and then transferred to a colony house. Group 2 was held for 4 weeks in a battery, while Group 3 spent the first 6 weeks in a battery before being transferred outside. Group 4, the outside run lot, was used as a check pen.

All groups received the regular station ration. Commercial cod-liver oil was added in sufficient quantities to adequately protect against rickets.

At 12 weeks the cockerels were removed, and the pullets remained until 18 weeks of age. Weekly weights were taken and averaged on a gram-weight basis. This phase was carried for 1 year.

The results in Table 10 show that the chicks started and reared in a colony house were the heaviest at 18 weeks of age. They averaged 65 grams more per head than those spending the first 2 weeks in a battery. The advantage in weight was 75 grams over those started for 4 weeks in a battery and 176 grams over the 6-week battery chicks. The chicks held in the battery for 2 weeks had a weight advantage of 10 grams over the birds fed 4 weeks, and 111 grams over those confined for 6 weeks. Those held in the battery for 4 weeks weighed 101 grams more than those spending the first 6 weeks in the battery.

At the conclusion of the test there was no apparent difference in the birds from any lot outside of the weight. Some difficulty was experienced with the 4- and 6-week old lots when transferring from the batteries. These birds had a tendency to crowd and had to be watched closely for several days.

The mortality was quite severe in all lots. For the 2-, 4-, and 6-week battery chicks, it was 30, 22.7, and 25.3 per cent respectively. The death rate for the chicks started in a colony brooder was 8.9 per cent.

Summary

Three methods of rearing chickens are reported. These tests were repeated for 3 consecutive years and the weights averaged as being representative of the condition of rearing.

The methods tested were: (1) chicks being confined on concrete runs, (2) confined on wire floors, and (3) allowed outside run on barley range.

There was little difference in the rate of growth between lots. The order of growth as indicated by the average weight of the birds, from the heaviest to the lightest, was outside run, concrete porch, and wire floor.

There was little difference in the appearance of the birds in the outside-run and concrete-confined groups. The wire-floor lot appeared quite vigorous but had rough and ragged plumage.

Mortality was above normal in all lots. The order of the greatest loss to the least was wire floor, outside run, and concrete floor.

TABLE 10.—WEEKLY WEIGHTS OF FOWLS IN GRAMS. BATTERY BROODING.

Weeks	Transferred from battery to colony house at 2 weeks of age		Transferred from battery to colony house at 4 weeks of age		Transferred from battery to colony house at 6 weeks of age		Reared in colony house from start	
	Cockerels and pullets	All pullets	Cockerels and pullets	All pullets	Cockerels and pullets	All pullets	Cockerels and pullets	All pullets
	35	.....	35	.....	35	.....	34	.....
1	64	.....	58	.....	49	.....	56	.....
2	85	.....	85	.....	88	.....	90	.....
3	120	.....	113	.....	114	.....	131	.....
4	151	.....	149	.....	146	.....	179	.....
5	217	.....	187	.....	189	.....	240	.....
6	304	.....	266	.....	227	.....	301	.....
7	328	.....	334	.....	287	.....	385	.....
8	381	.....	403	.....	375	.....	482	.....
9	486	.....	480	.....	465	.....	562	.....
10	530	.....	528	.....	500	.....	608	.....
11	587	.....	641	.....	591	.....	666	.....
12	665	.....	690	.....	624	.....	709	.....
13	.....	665	.....	680	.....	599	.....	729
14	.....	716	.....	743	.....	692	.....	775
15	.....	743	.....	756	.....	737	.....	830
16	.....	788	.....	880	.....	713	.....	907
17	.....	883	.....	915	.....	736	.....	959
18	.....	940	.....	930	.....	829	.....	1,005

A method of starting chicks in batteries and later transferring them to colony houses is discussed. Four systems were tested: (1) chicks held in batteries for 2 weeks, (2) chicks held in batteries for 4 weeks, (3) chicks held for 6 weeks, and (4) chicks started and reared in a colony house.

Chicks started in a colony house made the greatest growth followed by chicks held for 2 weeks in a battery. Chicks held for 4 weeks made the next best gain, while those confined to batteries for 6 weeks made the least growth.

Difficulty was experienced in getting the battery-started chicks to using the colony brooder.

References

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