THE PRODUCTION OF BROILERS IN STORAGE BROODERS

by

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INTRODUCTION

The broiler industry has experienced a very rapid growth in the last few years. The raising of early spring or winter broilers in storage brooders on a commercial basis is a relatively new development. H. P. Richards and M. F. Abell (1928) show that there was an increase of 139 per cent in the live broilers received by 12 large poultry dealers in New York City between 1925 and 1927. These men also made the statement that broilers reached their peak in price late in March 1921, selling then at $1.00 a pound. Since that time the price has been on a gradual decline until in 1928 the highest price paid per pound was 55 cents.

Under favorable conditions the net profit in broiler production is small. For this reason they are produced in large numbers in the eastern states near the large cities where prices are high and the marketing costs are low. Some broilers come from the central and western states but they are mostly a by-product in the raising of pullets for layers and as a rule they reach the market too late in the season to bring attractive prices.

To produce good broilers they must be grown rapidly. They should be ready for market when they are 10 to 12 weeks old, and average from one and one-half to two pounds

in weight. To get economical gains and a good quality meat, D. C. Kennard (1923) states that the birds should be confined. Using this method of production one person can manage a larger number of broilers and get better gains on less feed than when they are allowed free range. J. S. Hughes (1923) ran some experiments on the value of ultra violet light for poultry. He and other workers found that legweakness (rickets) was prevented by direct sunlight and not from the contact with the soil as it was previously thought. The discovery of ultra violet light and vitamin D made it possible to successfully grow chicks in confinement.

Comparatively little is known about the numerous details involved in the care and management of broilers to obtain the best results. It was to solve some of these problems that the following experiment was planned.

OBJECT OF EXPERIMENT

The object of this experiment was to study the practicability of raising broilers in storage brooders.

METHOD OF PROCEDURE

Source of Chicks

For the first three phases of the experiment the chicks were hatched in a No. 3 Electric Petersime Incubator at the Poultry Department of the Kansas State Agricultural College. The chicks for the remaining phases were purchased from commercial hatcheries.

Brooding and Equipment

All the chicks except the ones in Phases III and IV were started in a six-decked electrically-heated storage brooder[1] which was equipped with wire screen floors. Phases III and IV were brooded in a similar brooder but there was no electric heat supplied. After three weeks in the electrically heated brooder they were transferred to regular fattening batteries that had been equipped with additional two-inch wire netting to prevent the three-week

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1. An electrically-heated brooder was loaned by the Buckeye Incubator Company to be used in this experiment.

old chicks from escaping. Feed troughs and watering vessels were hung on the outside of each battery so the chicks had access to feed or water the entire distance around each deck. The chicks were held in these batteries until they were nine weeks old when they were taken to a local packing plant for finishing.

Each deck of the storage brooder as illustrated in Plate 1 is three feet square. The fattening batteries which are also shown in Plate 1 have two apartments to each deck. These two apartments combined measure two feet six inches by four feet.

Feeding

All-mash rations were fed during the experiment. The feed and water for each lot was kept before the chicks at all times. No grit or calcium carbonate except that included in the ration was supplied.

Temperature and Humidity

In the electric storage brooder the temperature was held as near as possible to the following degrees: First week 96F.; second week 95F.; and third week 90F. When the chicks were transferred to the fattening batteries the room temperature was held as near as possible to 85F. for the first week and then it was allowed to cool down to 80F.

Plate I.

where it was held for the remaining five weeks of each phase. An electric fan installed in a circulating air tube was used to distribute the air so as to keep the temperature approximately the same at all points in the room. The high temperature maintained in the room kept the relative humidity so low that it was necessary to sprinkle the floor with water every morning.

Records

The temperature was recorded every morning and evening. While the chicks were in the electric brooder the temperature was recorded for each deck. After they were transferred to the special batteries only the room temperature was recorded. Readings were taken from thermometers placed at the level of the chicks in the top and the bottom decks.

The chicks were weighed in lots at weekly intervals. Feed and water was removed from the chicks just before weighing. All the feed was weighed before it was placed in the feeders and that which remained at the end of the week was weighed back so the feed consumption for each lot could be determined each week.

In the first two phases of the experiment only the total mortality for the week was recorded by lots. In the remaining phases the mortality was recorded by days. This

change was made so the average number of chicks for each week could be more accurately figured on the chick day basis.

Deformities such as crooked legs and crooked keels were recorded at the end of the ninth week before the chicks were taken to the local packing plant. The birds were examined again after they were killed and dressed at about twelve weeks of age and all deformities were again recorded.

Calculating Results

The average weight per chick, gain per chick, and feed consumption per chick was figured each week for each lot. The feed consumption after the first two phases was determined by first finding the average number of chicks for the week on the chick day basis and dividing this average into the total feed consumption.

To determine the cost of the chicks in the first three phases of the experiment the commercial custom hatching price of four cents per egg set was used. In the remaining phases the actual cost per chick was used.

The fuel cost is the average cost per chick figured on the basis of the number of chicks raised to nine weeks of age. Electricity used by the broilers was charged to each phase at the rate of five cents per kilowatt hour.

The total cost is a total of the cost per baby chick, plus feed and fuel cost per broiler. No charge was made for labor, interest or depreciation.

The feed cost of each ration was determined by finding the weighed price of all the different ingredients used during the experiment. This placed all the rations on the same basis, even though the price varied during the time of the experiment.

The results are tabulated in Tables I, II, and III in each of the phases.

Handling Broilers at the Local Packing Plant

The broilers were fed and cared for at the plant according to the manager's instructions. Most of the broilers were fed on a dry all-mash ration and finished off the last ten days on a wet mash. In figuring results the manager sold the broilers, deducted all his expenses and remitted the remainder to the experimental fund.

PHASES OF THE EXPERIMENT

During the entire experiment seven phases were completed. The first phase was started November 16, 1928 and the remaining phases followed in order at intervals of about one month.

Phase I

In this phase there were two main objects: first to study the practicability of raising broilers in storage brooders, and second, to determine whether there was any difference in the growth and livability of chicks brooded at different levels of the six-decked storage brooder.

Six hundred White Leghorn chicks hatched from hens' eggs from a commercial flock were evenly divided into six lots of one hundred each and placed in the six decks of the electrically heated storage brooder located in the brooder room at the Poultry Farm. Beginning at the top deck the lots were numbered consecutively from one to six.

All six lots were fed the Kansas State Agricultural College all-mash chick ration which at that time was:

Ground yellow corn	40	pounds
Ground oat groat	15	"
Ground wheat	15	"
Meat scrap	14	"
Dried buttermilk	5	"
Alfalfa leaf meal	5	"
Mineral		
Bone meal	2	"
Calcium carbonate	2	"
Salt	1	"
Cod liver oil	1	"

The following tables include the results of the phase at the end of the ninth week.

Table I. Mortality and Weights.

Lot number	Number live chicks	Per cent mortality	Weight of chicks	Average weight per chick
1	51	49	53.7 lbs.	1.05 lbs.
2	56	44	59.6 "	1.06 "
3	55	45	56.1 "	1.02 "
4	61	39	62.2 "	1.02 "
5	59	41	59.0 "	1.00 "
6	57	43	52.2 "	.915 "
Total	339		342.8 "	
Average		43.5		1.01 "

In this phase there was a high mortality probably due to the high temperature on the first morning after the chicks were placed in the brooder. At that time the circulating air tube had not been installed and the temperature in the top deck ran up to 108°F.

There was a difference in mortality from 49 to 43 per cent, regardless of the temperature rising up to 108°F. in the top deck, and a variation in weight from 1.05 to .915 pounds per chick from the top deck to the bottom deck.

Table II. Feed Consumption and Cost.

Lot No.	Total feed consumed	Feed consumed per chick	Feed cost per chick	Chick and fuel cost	Total cost per chick
1	186.16 #	3.65 #	$0.103	.384	.487
2	190.07 #	3.35 #	.095	.355	.450
3	195.91 #	3.56 #	.100	.361	.461
4	202.63 #	3.32 #	.093	.332	.425
5	195.62 #	3.31 #	.093	.341	.434
6	190.56 #	3.34 #	.094	.350	.444
Total	1160.95#				$152.25
Average		3.43 #	.097		.449

The local packing plant remitted $112.11 on this phase which amounted to a loss of $40.14 exclusive of the cost for labor, interest, and depreciation.

Table III. Deformities of Broilers

Deformity	Per cent at ninth week	Per cent after dressing at packing plant
Crooked legs and enlarged hocks	7.7	12.0
Bowed legs	...[1]	25.3
Crooked keel	2.9	40.6
Both legs and keel crooked	0.0	0.0
Normal broilers	89.3	22.1

1. Bowed legs was a bending in the tibia which could not be determined readily before the broilers were dressed.

A number of chicks developed crooked legs in this phase and the potency of the cod liver oil was questioned. An experiment was run comparing the oil used with a fresh shipment of oil and there was apparently no difference.

According to the variations in mortality, weight per chick, and cost per chick from the top of the brooder to the bottom there seems to be only a slight difference as to the level on which the chicks were brooded in favor of the upper decks.

Phase II

The object of this phase was first, to determine whether the results from chicks hatched from hens' eggs as in Phase I could be duplicated with chicks hatched from pullets' eggs; and second, to secure supplementary data for Phase I.

Six hundred White Leghorn chicks hatched from pullet eggs from the College flock were evenly divided into six lots and placed in the six-deck electrically-heated storage brooder at the Farm.

All the different lots in this phase received the Kansas State Agricultural College chick ration as described in Phase I. The lots were also numbered the same as in the previous phase.

The results of this phase at the end of the ninth week

were as follows:

Table I. Mortality and Weights.

Lot number	Number live chicks	Per cent mortality	Weight of chicks	Average weight per chick
1	65	35	63.5 lbs.	.977 lbs.
2	66	34	68.9 "	1.04 "
3	66	34	67.2 "	1.02 "
4	70	30	73.0 "	1.04 "
5	64	36	62.3 "	.972 "
6	42	58	46.1 "	1.10 "
Total	373		380.9 "	
Average		37.8		1.02 "

In this phase the per cent mortality approached very closely that of Phase I and the weight per chick for the entire group varied only .01 of a pound but the weights for the different decks were more varied. Lot 5 was the lightest group of chicks of the phase, while Lot 6 was the heaviest. The large increase in weight per chick in Lot 6 was likely due to the high mortality which probably eliminated the weaker ones and left the remaining chicks more space.

Table II. Feed Consumption and Cost.

Lot No.	Total feed consumed	Feed consumed per chick	Feed cost per chick	Chick and fuel cost	Total cost per chick
1	241.11#	3.70#	$0.105	$0.304	$0.409
2	237.97#	3.60#	.102	.30	.402
3	242.51#	3.67#	.104	.30	.404
4	247.97#	3.54#	.100	.286	.386
5	237.96#	3.71#	.105	.307	.412
6	186.03#	4.42#	.125	.436	.561
Total	1393.56#				$156.73
Average		3.74#			.42

The local packing plant remitted $116.16 on the broilers of this phase which amounted to a loss of $40.57.

Table III. Deformities of Broilers

Deformity	Per cent at ninth week	Per cent after dressing at packing plant
Crooked legs and enlarged hocks	14.7	22.4
Bowed legs	.....[1]	18.8
Crooked keel	7.0	43.7
Both legs and keel crooked	0.0	0.0
Normal broilers	78.3	13.2

1. Bowed legs could not be detected before dressing.

There was a wide variation between the per cent of normal chicks at the end of nine weeks and after they were dressed at the local packing plant. The lack of agreement between the classification of deformities at the end of the experiment and after dressing is due to the fact that many deformities could not be seen before dressing.

Plate 2 illustrates the broilers of Phase II after they were dressed at the local packing plant. On the top row are some good examples of crooked legs and enlarged joints.

Due to the variation in the mortality and growth of the different lots located at various levels, the lots in the remaining phases were shifted each week as they were weighed. Lot 1 at the top of the brooder was placed in the bottom deck and each of the other lots was raised one deck each week.

Phase III

The object of this phase was to determine if possible the cause of the enlarged joints and crooked legs that developed among the chicks of Phases I and II.

In this phase there were three lots of White Leghorn chicks. Lot 1 and Lot 2 had 200 chicks and Lot 3 had 195.

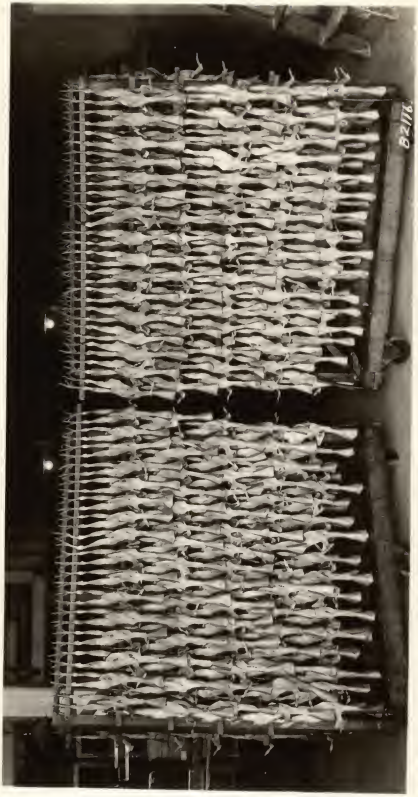

Plate II.

The chicks were brooded in a six-deck brooder but without electric heat. For the first six and one-half weeks they were brooded in the brooding laboratory in the West Wing of Waters Hall on the campus. The chicks were then moved to the building at the Poultry Farm where the other phases were brooded. Radiators supplied the heat while the chicks were in the brooding laboratory which was distributed by a fan and circulating air tube.

The rations fed these three lots were:

Lot 1 - Kansas State Agricultural College all-mash chick ration with the two per cent bone meal omitted.

Lot 2 - Kansas State Agricultural College all-mash chick ration with all the mineral omitted and replaced with a commercial mineral.

Lot 3 - Regular Kansas State Agricultural College chick ration as it was fed in the first and second phases.

The results of this phase at the end of the ninth week were as follows:

Table I. Mortality and Weights.

Lot number	Number live chicks	Per cent mortality	Weight of chicks	Average weight per chick
1	132	34.0	140.7 lbs.	1.06 lbs.
2	93	53.5	94.3 "	1.01 "
3	89	56.9	88.2 "	.991 "
Total	314		323.2 "	
Average		47.2		1.02 "

The high mortality in this phase was probably due to starting with weak chicks. There was also loss due to enlarged joints and crooked legs.

Table II. Feed Consumption and Cost

Lot No.	Total feed consumed	Feed consumed per chick	Feed cost per chick	Chick and fuel cost	Total cost per chick
1	497.90#	3.77#	$0.10	$0.227	$0.327
2	370.29#	3.98#	.115	.303	.417
3	333.84#	3.75#	.10	.323	.423
Total	1202.04#				$119.50
Average		3.83#			.381

In Lot 1 the chicks on the ration without the bone meal showed the lowest mortality, the heaviest chicks, and the lowest cost per chick.

The local packing plant remitted $86.10 on this phase which amounted to a loss of $33.40.

Table III. Deformities of Broilers.

Deformity	Per cent at ninth week			Per cent after dressing at packing plant		
	Lot 1	Lot 2	Lot 3	Lot 1	Lot 2	Lot 3
Crooked legs and enlarged hocks	20.5	24.2	43.8	12.2	15.9	13.0
Bowed legs	....	....	....	9.3	11.0	5.8
Crooked keel	14.4	17.8	22.5	17.7	30.5	28.9
Both legs and keel crooked	12.9	36.8	29.2	3.7	12.3	26.1
Normal broilers	52.3	21.1	4.5	57.4	30.4	26.1

Lot 1 shows the best results in Table III. It appears that the omission of the two per cent bone meal improved the ration. However, this is not born out consistently in later experiments.

Phase IV

In this phase the object was to determine the cause of the enlarged joints and crooked legs the same as in Phase III.

The methods used in this phase were the same as in Phase III except Barred Plymouth Rock chicks were used in place of White Leghorns and the lots were started at

different levels. In Lot 1, the chicks were fed the Kansas State Agricultural College chick rations with the two per cent bone meal omitted and they were started in the two-center decks of the brooder. Lot 2 chicks were fed the commercial mineral and started in the two bottom decks. Lot 3 chicks were fed the regular Kansas State Agricultural College chick ration and started in the two top decks.

These chicks were brooded without electric heat the same as in Phase III and were moved to the Farm when they were four weeks old.

The results of this phase at the end of nine weeks were as follows:

Table I. Mortality and Weights.

Lot Number	Number live chicks	Per cent mortality	Weight of chicks	Average weight per chick
1	95	52.5	95.8#	1.01#
2	103	47.2	48.5#	.698#
3	75	62.5	64.1#	.848#
Total	273		251.9#	
Average		54.1		.923#

The mortality of Lot 2, the chicks fed the commercial mineral, was the lowest in this phase. However, the lot

on the Kansas State Agricultural College ration with the bone meal omitted was the heaviest as in the former phase.

Table II. Feed Consumption and Cost

Lot No.	Total feed consumed	Feed consumed per chick	Feed cost per chick	Chick and fuel cost	Total cost per chick
1	377.49#	3.93#	$0.111	$0.304	$0.415
2	341.30#	3.31#	.10	.281	.381
3	262.88#	3.50#	.099	.372	.471
Total	981.67#				$114.00
Average		3.60#			.418

The local packing plant remitted $74.90 on the broilers of this phase which amounted to a loss of $39.10.

Table III. Deformities of Broilers.

Deformity	Per cent at end of ninth week		
	Lot 1	Lot 2	Lot 3
Crooked legs and enlarged hocks	40	77.7	46.6
Crooked keels	0	1.0	0.0
Both legs and keel crooked	1.1	1.0	1.3
Normal broilers	58.9	20.4	52.0

Part of the broilers in this phase were shipped alive so the deformities on the remaining ones were not recorded in Table III.

The Barred Rocks were very poorly feathered in all three lots. In Lot 2 there was 77.7 per cent crooked legs, the poorest lot of chicks produced during the experiment.

Plate 3 shows three chicks out of this phase that have crooked legs, enlarged joints, or both.

The Department of Bacteriology reported 29 chicks as dying of Baccillary White diarrhea in this phase. There was a number of chicks gaping about the third and fourth weeks. The cause for this was never determined.

Phase V

In this phase the object was primarily to find a ration that would produce broilers free from enlarged joints and crooked legs.

In this phase only 50 chicks to a lot were used since 100 in a deck was somewhat crowded. Three hundred White Plymouth Rock chicks were divided into six lots of 50 each, and placed in the electrically-heated storage brooder.

All six lots were fed different rations. The rations were:

Lot 1 - Commercial chick starter designated as A.

Lot 2 - Commercial chick starter designated as B.

Lot 3 - Regular Kansas State Agricultural College chick ration with clover steam meal added to increase the

Plate III.

fiber content to six per cent.

Lot 4 - Regular Kansas State Agricultural College ration with no changes.

Lot 5 - Regular Kansas State Agricultural College ration with the two per cent bone meal omitted and replaced by corn meal.

Lot 6 - The Kansas State Agricultural College chick ration with the regular mineral replaced with five per cent commercial mineral.

The results of this phase at the end of the ninth week were:

Table I. Mortality and Weights.

Lot number	Number live chicks	Per cent mortality	Weight of chicks	Average weight per chick
1	37	26	42.2 lbs.	1.14 lbs.
2	30	40	43.2 "	1.44 "
3	42	16	55.8 "	1.328 "
4	39	22	47.0 "	1.205 "
5	26	48	33.0 "	1.269 "
6	26	48	25.8 "	.992 "
Total	200		247.0 "	
Average		33.3		1.235 "

The broilers in Lot 2 which received the commercial ration B were the heaviest and best feathered chicks of this phase or of any chicks raised up to this time. These

chicks for some reason were very pale and anemic. Lot 3, which received the Kansas State Agricultural College ration made up to six per cent fiber, was very near the B ration lot in weight, but was not so well feathered and as shown in Plate 3 there was a lower percentage of normal chicks.

Table II. Feed Consumption and Cost

Lot No.	Total feed consumed	Feed consumed per chick	Feed cost per chick	Chick and fuel cost	Total cost per chick
1	138.52#	3.74#	$0.159	$0.262	$0.421
2	140.53#	4.68#	.215	.306	.521
3	161.36#	3.84#	.106	.24	.346
4	182.73#	4.65#	.144	.252	.396
5	130.89#	5.03#	.14	.342	.482
6	103.95#	3.99#	.121	.342	.463
Total	807.87#				$85.71
Average		4.04#			.499

The local packing plant remitted $73.28 which amounted to a loss of $12.43.

Table III. Deformities of Broilers.

Deformity	Per cent at end of ninth week					
	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6
Crooked legs	5.4	13.3	35.7	30.8	50.0	50.0
Crooked keels	21.6	10.0	4.8	10.3	3.8	0.0
Both legs and keel crooked	8.1	20.0	11.9	5.1	11.5	30.8
Normal broilers	64.9	56.7	47.6	53.8	34.6	19.2

Part of the broilers had been sold alive and were not accessible for inspection after dressing so the deformities after dressing are not recorded.

Lot 1, the chicks fed the ration A, were the most even and best appearing chicks of the phase up to the fourth week when they had a bad siege of cannibalism. The reason for this trouble is unexplainable and was uncontrollable in this case.

Lot 4 was fed a scratch feed made up of three parts of corn and one of wheat. This was fed in separate hoppers along with the mash after the chicks were two weeks old. The mortality was the lowest in this lot of any in this phase. However, the per cent of normal chicks was also low.

Due to decreasing the number of chicks to a lot it appears that better results were obtained.

Phase VI

The object of this phase was to try new rations with the hope of perfecting one that will grow normal broilers. The method of this phase was the same as Phase V except that different rations were fed.

The rations fed were:

Rations	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6
Ground yellow corn	44 #	40#	42#	50#	44#	49#
Ground oat groat	15	15	15	15	15	15
Ground wheat	15	15	15	15	15	15
Meat scrap	19	0	9.5	5	14	14
Dried buttermilk	0	19	9.5	5	5	5
Alfalfa leaf meal	5	5	5	5	5	0
Bone meal	0	4	2	3	0	0
Salt	1	1	1	1	1	1
Cod liver oil	1	1	1	1	1	1

The results of this phase at the end of the ninth week were as follows:

Table I. Mortality and Weights.

Lot number	Number live chicks	Per cent mortality	Weight of chicks	Average weight per chick
1	37	26	54.1 lbs.	1.462 lbs.
2	34	32	45.3 "	1.332 "
3	27	46	31.7 "	1.174 "
4	35	30	40.0 "	1.143 "
5	33	36	41.1 "	1.284 "
6	36	38	50.0 "	1.389 "
Total	201		262.2 "	
Average		33		1.304 "

Table II. Feed Consumption and Cost

Lot No.	Total feed consumed	Feed consumed per chick	Feed cost per chick	Chick and fuel cost	Total cost per chick
1	143.12#	3.87#	$0.101	$0.261	$0.362
2	124.68#	3.67#	.126	.279	.405
3	101.49#	3.76#	.114	.332	.446
4	129.37#	3.70#	.094	.273	.367
5	121.50#	3.80#	.104	.292	.396
6	134.66#	3.74#	.103	.261	.369
Total	754.82#				$78.00
Average		3.76#			.388

The local packing plant remitted $60.96 on the broilers of this phase which gave a loss of $17.04.

Table III. Deformities of Broilers

Deformity	Per cent at end of ninth week					
	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6
Crooked legs and enlarged hocks	56.8	64.7	59.3	31.4	56.3	59.3
Crooked keel	0.0	0.0	0.0	0.0	0.0	0.0
Both legs and keel crooked	0.0	0.0	0.0	0.0	3.1	5.6
Normal broilers	43.2	35.3	40.7	68.6	40.6	38.1

The table of deformities of the broilers after dressing was omitted in this phase because part of the broilers were sold live weight.

Lot 2, the chicks on the high protein (dried buttermilk) ration, was the poorest group of the phase. They were very poorly feathered, had the highest per cent of crooked legs, and the lowest per cent of normal chicks.

Lot 1, the chicks on the high protein (meat scrap) ration, had the heaviest average weight per chick of the groups. However, they showed a high percentage of crooked legs. These broilers had the cheapest feed cost per pound of any chicks raised. The cost was 6.9 cents per pound.

Plate 4 shows the chicks in Lots 1, 2, and 3 of Phase VI. In Lot 1 (19 per cent meat scrap) the chicks were fairly well feathered and were the largest of any of

Plate IV.

this phase. In Lot 2 (19 per cent dried buttermilk) the chicks were very poorly feathered but good in weight. In Lot 3 (9.5 per cent dried buttermilk and 9.5 per cent meat scrap) the chicks were about half way between the other two lots as to feathering but lighter in weight as shown in Table I.

Lot 5, the chicks on the ration with the fiber increased to six per cent, did not do as well in this phase as they did in Phase V.

According to this phase, high protein gave faster growth but the deformities are greater than when low protein is fed as in Lot 4.

Phase VII

In this phase still more rations were tried with the object of finding one that would grow normal broilers in storage brooders. The same methods were used in this phase as in Phase VI except different rations were fed.

The rations fed were as follows:

Rations	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
Ground yellow corn	38#	48#	44#	53#	48#
Ground oat groat	15	15	15	15	15
Ground wheat	15	15	15	0	0
Wheat bran	0	0	0	15	15
Wheat germ meal	10	0	0	0	0
Meat scrap	10	10	9.5	10	10
Dried buttermilk	5	5	9.5	5	5
Alfalfa leaf meal	5	5	5	0	5
Salt	1	1	1	1	1
Cod liver oil	1	1	1	1	1

Lot 6 was fed the same commercial mash as Lot 2 in Phase V, ration B. In Lot 4, wild lettuce was fed in place of the five per cent alfalfa leaf meal as fed in Lot 5.

This phase was only run for eight weeks and the following tables only include data up to that time.

Table I. Mortality and Weights.

Lot number	Number live chicks	Per cent mortality	Weight of chicks	Average weight per chick
1	45	10	51.4 lbs.	1.142 lbs.
2	39	22	27.7 "	.710 "
3	41	18	44.4 "	1.083 "
4	42	16	42.0 "	1.000 "
5	33	34	35.6 "	1.079 "
6	42	16	46.0 "	1.095 "
Total	242		247.1 "	
Average		19.3		1.020 "

Table II. Feed Consumption and Cost.

Lot No.	Total feed consumed	Feed consumed per chick	Feed cost per chick	Chick and fuel cost	Total cost per chick
1	134.1#	2.98#	$0.085	$0.185	$0.27
2	108.5#	2.78#	.075	.206	.281
3	123.9#	3.02#	.09	.198	.288
4	127.0#	3.02#	.076	.195	.271
5	111.7#	3.38#	.088	.234	.322
6	134.2#	3.20#	.147	.195	.34
Total	739.4#				$71.21
Average		3.06#			.294

The local packing plant remitted $60.50 which amounted to a loss of $10.71.

Table III. Deformities of Broilers.

Deformity	Per cent at end of eighth week					
	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6
Crooked legs and enlarged hocks	4.4	2.6	14.6	9.5	15.2	14.3
Crooked keels	.0	,0	.0	.0	.0	2.4
Both legs and keels crooked	.0	.0	.0	.0	.0	.0
Normal broilers	95.6	97.4	85.4	90.5	84.8	83.3

These chicks have not been dressed at the local packing plant so the data on the deformities after dressing are not available.

The chicks fed the ration containing ten per cent wheat germ meal were the heaviest chicks of the phase. They were also very good as to the per cent of normal chicks.

Wild lettuce which was fed to Lot 4, did not give as good gains as alfalfa leaf meal which was fed to Lot 5 in a similar ration. However, in Lot 4 there were slightly less crooked legs.

The feathering of the chicks in Lots 4, 5, and 6 was much better than the others. These three rations contained bran instead of ground wheat and there might be something in bran that develops better feathers.

Lot 6, the chicks fed on the commercial B ration, was the best feathered lot of the group. These chicks were

again very anemic as were the ones grown on this same ration in Phase V.

The two following tables contain the grand totals or grand averages of the first six phases that were carried through the ninth week. This is regardless of rations fed or the breed of chicks.

Table I.

Number chicks raised	Average per cent mortality	Total weight of chicks raised	Average weight per chick raised
1700	43.1	1808 lbs.	1.06 lbs.

Table II.

Total feed consumed	Average feed consumed per chick	Average feed cost per chick	Average chick and fuel cost per chick	Average total cost per chick
6300.9 lbs.	3.71 lbs.	$0.108	$0.307	$.415

This table does not include Phase VII where the chicks were held for eight weeks only.

DISCUSSION

All the chicks in this experiment were nervous and uneasy. The chicks seemed to be especially frightened when the dropping trays were drawn out and cleaned. The handling of the chicks each week when they were weighed no doubt had an effect on the developing of the nervousness.

When the chicks were placed in the coop for weighing they would settle down and scratch, showing a desire for a natural habit which they were unable to carry out on the wire screen floors. Due to the lack of scratching the chicks developed long and very sharp toe-nails. Many of the chicks had bare backs and long cuts in their skin due to the chicks climbing over each other with their long, sharp toe-nails.

Before the chicks were reduced to 50 to a lot, there were a few chicks that would stand around and gap. The exact cause of this gaping was not determined.

Due to the chicks staying on the screen all the time some of them developed calluses or corn-like growths on the bottom of their feet and toes.

Cannibalism appeared to varying degrees in all the lots raised. Whether it is due to the ration, lighting, close confinement or the lack of something to do is yet to be

determined. The worst siege of cannibalism started the fourth week, just after the chicks were moved from the commercial storage brooder. Cannibalism showed up in all ages of chicks raised in this experiment.

A commercial chick peck remedy was used as a control of cannibalism with little if any effect. Chicks that were picked were removed from the lot and placed in separate pens until fairly well healed.

The first crooked legged chick appeared when it was 24 days old. They always appeared first in the fastest growing and best looking chicks. As a rule it was in the fourth week when the leg trouble started to appear and increased in number as the chicks grew older. This proved to be the most serious problem during the entire experiment.

There was a wide variation in the percentage of crooked legs during the time of the experiment. In Phase IV there was the highest per cent of crooked legs and in the last phase the per cent was the lowest. This brings up the question of seasonal factors which probably enters into the raising of chicks.

Feathering is a large factor in determining the quality of a broiler. In most cases the chicks raised were very poorly feathered. This was markedly improved in the last phase by placing wheat bran in the ration instead of ground whole wheat.

The per cent of mortality varied from 62.5 in Phase IV to 10 in Phase VII. However, the chicks in Phase VII were only eight weeks old at the end of the experiment. All the chicks in this experiment were obtained from Bacillary white diarrhea tested flocks. However, in Phase IV and Phase V, Bacillary white diarrhea was reported by the Department of Bacteriology.

The heaviest chicks produced in the entire experiment were fed the 19 per cent meat scrap ration in Phase VI. These chicks averaged 1.46 pounds for the lot at nine weeks of age. The lightest chicks produced were in Phase VII, averaging .71 pounds at eight weeks for the lot.

During the entire experiment, 1,943 broilers were raised from 3,290 baby chicks, or a total mortality of 40.9 per cent. There were 18 different rations fed and of all the rations fed there was not one lot of broilers that could be classed as top grade broilers at the end of the ninth week.

CONCLUSIONS

The raising of chicks up to the age of three weeks in storage brooders is very successful, but after that age, according to the results obtained in this experiment, it was impractical.

The difficulties encountered were:

1. Enlarged joints and crooked legs.
2. Slow rate of growth.
3. Poor feathering.
4. High mortality.
5. Cannibalism.

More research work will be necessary in order to correct these conditions.

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