

POULTRY SCIENCE

VOL. I

August—September, 1922

No. 6

THE INFLUENCE OF THE RATION FED TO GROW- ING CHICKENS ON THE LATER EGG PRODUCTION OF THE FEMALES. PRELIMINARY REPORT.

HORACE ATWOOD

West Virginia Agricultural Experiment Station, Morgantown, W. Va.

When chickens are raised by artificial means the conditions surrounding their early growth and development are frequently far from ideal. During the period of incubation the temperature may become too high or too low, or possibly not enough fresh air may be supplied during the latter part of the hatch when the need is greatest. After the chicks are placed in the brooder their anatomically poorly protected lungs may not be kept warm enough at night and many of them may be injured or may die through inflammation of this organ. Or the feed which they receive during the growing period may be too scanty in amount or its composition may be unsuitable for their requirements.

To what extent, if at all, do any or all of these or other related factors affect the future productivity of the females? This question opens a vast field for experimental inquiry, for if it should be shown that a certain method of handling the growing stock affects favorably or unfavorably the fecundity of the females or the vigor of their progeny then it would be necessary through repeated trials to determine the *best* method for handling the growing chickens so that their future fecundity would be at a maximum and their offspring most vigorous. The influence of early environment including the food supply upon the latter fecundity of the females and the vigor of their offspring is a fundamental problem of the poultry industry because it is possible that improved breeding and improved methods of feeding and handling the mature stock may not bring about the greatest possible benefits unless accompanied by proper methods of raising the chicks.

The solution of the problem is complicated by the forces of heredity which may cause one female to be an extra good layer and another to be a poor layer. In this experiment the production of sisters only is compared.

The work described in this paper has been carried out to determine whether the ration fed to growing chicks affects (1) either the number or weight of the eggs laid by the females after they have arrived at sexual maturity; (2) the effect of the ration on the mature live weight of the females and (3) the effect upon the age of the females when the first egg is laid.

The general plan of the experiment was as follows: Pedigreed chickens hatched in the same incubator, August 14, 1920, were divided into two lots similar in respect to parentage. Both lots were fed the same basic grain ration. In addition to this ration one lot received a liberal supply of skim milk, while the other lot was fed but little milk. The cockerels were removed at broiler age and somewhat later all pullets were removed except where there were sisters in each lot. As soon as the first egg was laid the two lots of sisters which had been fed the two contrasted rations were placed together in one flock, and a trap-nest record was kept of their egg production and the weight of the eggs laid. When the chickens were small each lot was weighed weekly. Later, after the pullets began to lay each pullet was weighed monthly.

GREATER GRAIN CONSUMPTION IN LOT A

Although each lot of chickens was fed equally as liberally in respect to their grain ration yet lot A which received the liberal supply of milk consumed more grain than lot B. Data show that on the 7th week and extending down to the 15th week lot A consumed practically twice as much grain per bird per week as in the case of lot B. At that time on account of the cold weather it seemed necessary to feed lot B more milk and a small amount of meat scrap, so during the last seven or eight weeks the difference in the amount of grain consumed is less marked. Both lots were provided with cabbage or sprouted oats as succulence.

RATE OF GAIN IN WEIGHT

Lot A grew so much faster than lot B, that on the 7th week the chickens fed the milk ration averaged twice as heavy as the

TABLE I

AGE IN DAYS WHEN FIRST EGG WAS LAID

Lot A Milk			Lot B Little Milk	
Band Number of Dam	Band Number of Daughter	Age First Egg	Number of Daughter	Age First Egg
Y9729	311	185	314	196
Y9779	317	183	310 344	218 202
66	308 313 322	200 182 189	338	190
104	330	176	303	194
138	327 351	190 188	341 337 339	199 183 198
Y9731	356	179	304	176
Y9791	349	161	346 321	210 193
45	333	174	312 350	219 211
46	328 307	193 177	343	191
12	301 309	175 160	305 316 323 306	180 178 184 194
22	325	176	319	198
49	324 320 342	178 171 182	329	208
10	332 355	172 184	353 352 335	219 196 198
28	336 331	169 176	354	207
7	302	185	348	221
19	326 315	168 183	334 345	217 197
37	347	177	340	207

others. On the thirteenth week they were almost three times as heavy, and although the difference later was not so marked yet it continued to the end.

AGE WHEN FIRST EGG WAS LAID

The first egg laid by any of the pullets was laid Jan. 21, 1921, and the birds were transferred to their permanent laying quarters on the following day. Thereafter both lots of pullets ran together in one flock under practically free range conditions.

Table 1 shows the band numbers of the dams and the band numbers of their daughters in each lot together with the age in days of each daughter when the first egg was laid.

In calculating the average age of laying the first egg the average of the "average daughter" was taken. For example, dam 66 had three daughters in lot A, namely 308, 313 and 322, and the average age of these three daughters or the age of the average daughter of dam 66 lot A was 190.33 days.

Averaging the mean age in days of the daughters which were fed in the two different ways it is found that the pullets in lot A were 178.3 days old when they began to lay, while in the other lot they were 198.1 days old, a difference in favor of the well fed lot of 20 days in earliness of production.

WEIGHT OF PULLETS

Each pullet was weighed on a spring balance graduated to 1/10 lb. on January 22 when they were transferred to their laying quarters, and beginning March 1 they were weighed regularly at the beginning of each calendar month. In all cases this weighing was done at night soon after the pullets had gone to roost.

Basing the averages on the average weight of the full sisters in each lot data show that not only were the pullets in lot B smaller on Jan. 22nd when they were placed in the laying house with lot A but they permanently remained smaller. Due to the better balanced ration fed lot B, beginning Jan. 22nd, the pullets of this lot made a gain in live weight of almost one pound each by March 1st while the pullets of lot A increased in weight only about $\frac{1}{3}$ as much. The average weight of the average well fed daughter for September, October, November and December was 3.30 lbs., while those that had been poorly fed averaged 3.05 pounds or a difference of about 8 per cent. This indicates that

fowls that have been stunted by receiving a poor ration while young will not attain their normal weight later in the season even though fed a normal ration.

MANAGEMENT OF THE PULLETS

After the pullets were placed in their laying quarters they had free access to dry mash in a hopper, and once per day a mixture of corn and oats was scattered in the litter covering the floor of the poultry house. The dry mash was composed of corn meal two parts and one part each of wheat bran, wheat middlings, and meat scrap.

On the start for fear that they might nest outside and the eggs not be recorded the pullets were confined to the house until after practically all eggs for the day had been laid. Later in the season after they had become fully accustomed to the trap nests they were allowed free range on a blue grass sod.

In spite of the utmost care in trapping 2.4 per cent of the eggs were laid outside of the trap nests and in the following tables showing egg production and egg weights these eggs have been disregarded.

The eggs were weighed on a chemical balance sensitive to 1/100 gram regularly early in the morning following the day on which they were laid.

EGG PRODUCTION

During the period which ended March 1st the pullets that had been well fed while young laid about 4 times as many eggs as the others and in March they reached their maximum production for the season, averaging 22.94 eggs each. The maximum production of the poorly fed daughters was reached one month later with an average of 20.49 eggs each, this production being slightly greater than that of the other lot for that particular month.

From the two maxima in March and April the production dropped with fair regularity until the end of the period covered by this report. It is to be observed that Lot A, the daughters which had been well fed, led in production, with the exception noted, from month to month.

AVERAGE EGG WEIGHT

During the January-February period the eggs from lot A averaged about two (2) grams heavier than those from lot B, but during the next few months the difference was small, lot A laying slightly the larger eggs. In August this condition was reversed lot B laying the heavier eggs. This result, however, may have been due to the relatively heavy production of pullet 306 which laid 20 eggs, or more than $\frac{1}{8}$ of the entire number for lot B, with an average weight of more than 60 grams. In September lot B still led slightly in egg weight, but in October and November lot A led by about 1 gram per egg.

TABLE II
SUMMARY OF EGG PRODUCTION AND EGG WEIGHT TO DECEMBER 1, 1921
Lot A

Dam No.	Daughter number	No. of eggs laid	Total wt. of eggs	Av. Eggs per daughter	Av. total wt. of eggs per daughter	Av. egg wt. per daughter
Y 9729	311	180.	9121.11	180.	9121.11	50.67
66	308	56.	2766.82	129.	6588.17	51.07
	313	166.	8639.52			
	322	165.	8358.16			
104	330	84.	4155.15	84.	4155.15	49.46
138	327	149.	8046.39	129.	6670.33	51.71
	351	109.	5294.28			
Y 9731	356	150.	6933.15	150.	6933.15	46.22
Y 9791	349	165.	8703.98	165.	8703.98	52.75
45	333	140.	6931.33	140.	6931.33	49.51
12	301	146.	7204.57	165.5	8271.39	49.98
	309	185.	9338.22			
22	325	162.	7944.56	162.	7944.56	49.04
49	324	156.	7712.93	150.	7327.51	48.85
	320	125.	5823.34			
	342	169.	8446.27			
10	332	177.	9294.24	173.5	8910.64	51.36
	355	170.	8527.05			
28	336	122.	5621.45	143.5	7053.83	49.16
	331	165.	8486.22			
7	302	187.	9685.88	187.	9685.88	51.80
19	326	132	7003.25	148.	7824.49	52.87
	315	164.	8645.73			
37	347	130.	6408.03	130.	6408.03	49.29
Total	---	3554.	---	2236.5	112529.55	---
Average	---	148.08	---	149.1	---	50.31

TABLE III
SUMMARY OF EGG PRODUCTION AND EGG WEIGHT TO DECEMBER 1, 1921
LOT B

Dam No.	Daughter number	No. of eggs laid	Total wt. of eggs	Av. eggs per daughter	Av. total wt. of eggs per daughter	Av. egg wt. per daughter
Y 9729	314	140	7267.11	140.	7267.11	51.91
66	338	92	4486.40	92.	4486.40	48.76
104	303	94	4773.68	94.	4773.68	50.78
138	341	106	5380.25	110.67	5656.78	51.12
	337	98	5075.33			
	339	128	6514.75			
Y 9731	304	112	4745.10	112.	4745.10	42.37
Y 9791	346	74	3680.65	119.	5733.97	48.18
	321	164	7787.35			
45	312	83	4358.49	77.5	3935.01	50.77
	350	72	3511.53			
12	305	180	8808.38	172.	8877.57	51.61
	316	138	7107.70			
	323	183	8913.99			
	306	187	10680.22			
22	319	163	8155.41	163.	8155.41	50.03
49	329	100	5340.81	100.	5340.81	53.40
10	352	135	6417.38	123.	6119.30	49.75
	335	111	5821.22			
28	354	143	7389.22	143.	7389.22	51.67
7	348	78	4032.28	78.	4032.28	51.70
19	334	126	6289.50	129.	6653.78	51.58
	345	132	7018.06			
37	340	74	3627.98	74.	3627.98	49.03
Total	—	2913	—	1727.17	86794.40	—
Average	—	121.37	—	115.14	—	50.25

Tables II and III summarize the production until December 1st at which time practically all the fowls in each lot were moulting and had ceased to lay. These tables show the total number and the total weight in grams of the eggs laid by each pullet until December 1st, the average number and weight of eggs laid, and the average egg production and egg weight of the average daughter in the two lots.

MEAN EGG PRODUCTION

The mean egg production until December 1st of the average daughter in lot A was 149.3 ± 4.23 and of the average daughter in lot B 115.6 ± 4.81 , or a difference of about 34 eggs per bird in favor of the well fed lot. The 24 well fed pullets laid 3554 recorded eggs or 148.1 eggs per fowl, while the 24 poorly fed ones laid 2913 eggs or 121.4 eggs, a difference of 26.7 eggs in favor of the well fed pullets. Whichever way the results are calculated the differences in egg production are large and striking.

It may be observed here that if a poorly balanced ration fed to little chickens can be the means of restricting the number of eggs that the pullets can lay later, then the reverse should be true that an ideal ration should be the means of increasing the number of eggs. It is undoubtedly true that in order to obtain the maximum egg production skillful breeding and skillful feeding and brooding of little chickens must go hand in hand.

MEAN EGG WEIGHT

When the average egg weight for the two lots is considered the difference is found to be small. For lot A, $M = 50.24 \pm .29$ and for lot B, $M = 50.20 \pm .43$. What difference there is seems to be in favor of the well fed lot, but the data do not show definitely that the size of the egg has been reduced by the insufficient ration received by the pullets of lot B. The difference if any would naturally be small, at least in the first generation.

Since the preceding paragraph was written data covering seven additional months has been secured as shown in Table IV.

TABLE IV.
EGG PRODUCTION AND EGG WEIGHT TO JULY 1, 1922

	Lot A		Lot B	
	Total No. Eggs laid	Average egg weight	Total No. Eggs laid	Average egg weight
December 1922	23	57.97	39	57.59
January	20	58.69	22	59.78
February	136	57.71	126	57.28
March	375	57.70	407	56.37
April	487	56.75	454	55.37
May	507	55.48	494	55.10
June	486	54.44	454	54.08

During December and January the egg production was so small that the average egg weights for these months is of very little

value, but it is to be observed that for the five following months the average egg weight for lot B was smaller than the corresponding averages of lot A in every instance, and the indications are that the weight of the eggs of lot B has been slightly reduced by the poorly balanced ration which those fowls received during their early development.

If the eggs laid by lot B are measurably smaller than those laid by lot A this fact might indicate that the vigor of the progeny may be affected by the early environment of the parent stock.

HEREDITY

Reverting to tables II and III the data show that in some cases heredity is such a powerful force that it is able to override and overcome any ordinary adverse environmental factor which might affect the individual during the formative period. Pullet 306 a daughter of hen No. 12 although poorly fed while young laid as many eggs, 187, as any member of the flock, laid the heaviest eggs, the greatest total weight of eggs, and moreover was the heaviest bird in either lot A or lot B.

Of the three pullets which laid 180 or more eggs in lot B all were daughters of hen No. 12, and of the two birds of lot A laying 180 or more eggs one was a daughter of hen 12. In other words of the five individuals laying 180 eggs or better, four were daughters of No. 12.

CONCLUSIONS

The results so far secured seem to justify the following conclusions.

1. A poorly balanced ration fed to young chickens not only reduced the rate of gain in live weight but also reduced, at least for the first year, the mature weight of the females.
2. A poorly balanced ration fed to young chicks increased the age of the pullets before reaching sexual maturity, or in other words before laying the first egg.
3. A poorly balanced ration fed to young chicks materially reduced the number of eggs laid by the pullets during the first laying season.
4. A poorly balanced ration fed to young chicks apparently reduced somewhat the average egg weight of the mature females.