

UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION

M. F. MILLER, *Director*

The Normal Growth of Chickens

H. L. KEMPSTER

COLUMBIA, MISSOURI

Summary

1. Weights by 4-week periods from time of hatching to 40 weeks of age are included for White Leghorn, White Rock, White Wyandotte, Rhode Island Red, and New Hampshire pullets.
2. At 40 weeks of age the Leghorn pullets weighed 3.5 lbs.; the White Rocks, 5.0 lbs.; Rhode Island Reds, 5.5 lbs.; and New Hampshires, 5.6 lbs.
3. The New Hampshire Red pullets were heavier than either of the other three breeds throughout the 40 weeks.
4. White Rock and Rhode Island Red pullets did not become heavier than Leghorns until after the fourth week. The New Hampshire Red pullets were approximately 20 per cent heavier than the other breeds at 4 weeks.
5. The greatest gains made by all breeds were from 9-12 weeks.
6. The difference in the growth of pullets and cockerels became apparent at 8 weeks and increased as the chicks grew older.
7. At 40 weeks of age there was no significant difference in the weights of pullet progeny from dams in their first year of production and from dams in their second year of production or older.
8. The time of season chicks are hatched affects their growth. Early hatched chicks grow faster than late hatched chicks during the first part of the growing periods. Late hatched chicks grow faster in the late growing periods. The time of the season pullets are hatched has no effect on body weight at 40 weeks of age.
9. The variations in the periodic gains of early and late hatched pullets are associated with climatic conditions, especially temperature.
10. Small chickens are less affected by periods of extreme heat than larger chickens.
11. Retarded growth is usually followed by compensatory growth while growth above normal is followed by a decline in the relative growth rate. These variations in the growth process do not affect the adult weight.
12. Birds which are eventually diagnosed as having paralysis grow at a normal rate. They usually lose weight rapidly when the disease symptoms become pronounced.

The Normal Growth of Chickens *

H. L. KEMPSTER

The poultry industry is of great economic importance in Missouri, contributing about one-eighth of the State's farm income and lending itself to quick expansion or contraction. Within 10 or 12 weeks the poultry raiser may produce a crop of broilers. Starting with day-old chicks, he can have pullets laying in 6 to 7 months.

It follows, therefore, that knowledge relative to the rate at which chickens grow should be of extreme interest to producers engaged in converting farm-grown grains into food for human consumption. The consumer also is interested because of the assurance that whenever demand justifies, the products to satisfy that demand will be available within a very short time.

The term "normal growth" as used in this bulletin, refers to the weight changes which occurred in certain breeds of chickens in the Experiment Station flock during the last decade. The numbers involved are sufficient to eliminate fluctuations in results which might occur within a season or when one year is compared with another. The breeds observed were Rhode Island Reds, White Rocks, White Leghorns, New Hampshires and White Wyandottes. The growth attained was limited of course by hereditary factors, and other strains of the same breeds might react in somewhat different manner.

During each season there were ten hatches, with a few exceptions. The first hatches were started the first Saturday in February and each succeeding hatch started the following Saturday. The hatching season extended from the first week in February through the second week in April. All birds were reared on the Missouri Agricultural Experiment Station Poultry Farm.

The chicks, when removed from the incubators, were placed in battery brooders and kept there until four weeks of age. They were then transferred to 10' x 12' colony brooder houses. The yards were 100 feet square and provided a reasonable amount of green feed except during extremely dry weather. The cockerels were removed at 8 to 12 weeks to prevent overcrowding the pullets.

*A portion of the data appears in Missouri Agricultural Experiment Station Research Bulletin 247, "The Normal Growth of Chickens Under Normal Conditions," by Kempster and Parker.

During the first 8 weeks the following all-mash rations were fed.

	1929, 31, 32	1933, 34, 35	1937	1938, 39
Yellow corn meal	50%	50%	50%	54%
Bran	15%	15%	10%	10%
Alfalfa leaf meal .....	....	....	5%	5%
Shorts	15%	15%	15%	15%
Dried milk	15%	10%	10%	5%
Meat scrap .....	....	5%	5%	10%
Bone meal	4%	2%	2%	....
Salt	1%	1%	1%	1%

NOTE—1 pint cod liver oil was added to each 100 lbs. of above mixtures.

From 8 weeks until the pullets were transferred to laying houses they received the following rations.

	1929-37	1938-39
Yellow corn meal	27%	27%
Bran	27%	27%
Shorts	27%	27%
Meat scrap	10%	10%
Dried milk	5%	5%
Alfalfa leaf meal .....	....	4%
Bone meal	4%	....
Salt	1%	1%

In addition to the above mash, cracked yellow corn was fed in hoppers.

After the pullets were put in the laying houses the ration recommended by this station for laying hens was fed. (See Missouri Extension Circular 424.)

The birds were weighed at 4-week intervals to 20 weeks of age. Subsequent weights were usually obtained on the first day of each month. Interpolations were made in some instances to obtain the 4-week weights after 20 weeks.

Normal Weights of Pullets at Various Ages

Table 1 and Figures 1 and 2 show the normal weights of pullets for 4-week periods from time of hatching to 40 weeks.

TABLE 1.—WEIGHTS OF PULLETS IN POUNDS FROM TIME OF HATCHING TO 40 WEEKS.

Age in Weeks	White Leghorns	White Rocks	R. I. Reds	N. H. Reds	White Wyandottes
0	0.087	0.090	0.091	0.097	0.092
4	0.41	0.39	0.41	0.48	0.44
8	1.01	1.07	1.07	1.25	1.14
12	1.67	1.88	1.89	2.27	2.10
16	2.20	2.55	2.63	3.17	2.94
20	2.56	3.09	3.19	3.85	3.45
24	2.98	3.59	3.73	4.38	4.03
28	3.26	4.22	4.33	4.89	4.69
32	3.41	4.69	4.88	5.25	5.06
36	3.46	4.92	5.24	5.40	5.22
40	3.50	5.04	5.46	5.54	5.00

In the above table it is observed that the New Hampshire Red pullets were heavier than those of the other breeds throughout the 40-week period. The Wyandottes made gains slightly below those of the New Hampshires. At the age of 8 weeks the New Hampshire pullets were .18 pounds heavier than were the White Rock and Rhode Island Red pullets and were .39 pounds heavier at the age of 12 weeks. The Wyandottes were 12 per cent heavier than the Rhode Island Reds and White Rocks at the age of 12 weeks. The

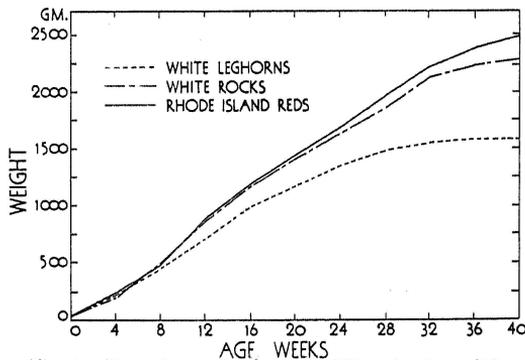


Fig. 1.—Normal growth curves for White Leghorn, White Rock, and Rhode Island Red pullets.

more rapid growth experienced at an early age is a very desirable characteristic from the standpoint of broiler production. There was

very little difference in the weight of the New Hampshire and the Rhode Island Reds at the age of 40 weeks. The Leghorn pullets were as heavy as the Rocks and R. I. Reds at 4 weeks, only slightly lighter at 8 weeks, but afterwards the weight differences became greater. (See Figures 1 and 2.)

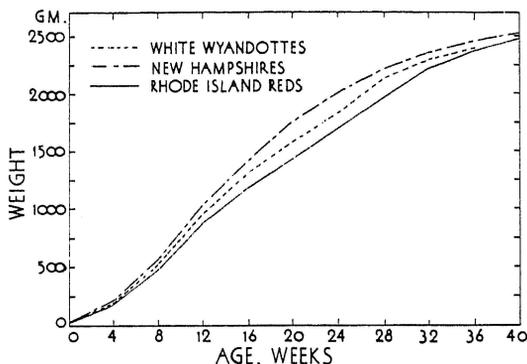


Fig. 2.—Normal growth curves for Rhode Island Red, White Wyandotte and New Hampshire pullets.

The Influence of Age on the Weight Increase of Pullets

Table 2 shows the gains made by the pullets of the various breeds by 4-week intervals.

TABLE 2.—NORMAL GAINS IN PULLET WEIGHTS BY FOUR WEEK PERIODS.

Period	White Leghorns	White Rocks	R. I. Reds	N. H. Reds	White Wyandottes
0- 4 Wks.	0.32	0.31	0.32	0.38	0.35
5- 8 "	0.61	0.68	0.66	0.77	0.70
9-12 "	0.66	0.81	0.82	1.03	0.96
13-16 "	0.53	0.68	0.75	0.90	0.84
17-20 "	0.36	0.54	0.56	0.68	0.51
21-24 "	0.42	0.50	0.54	0.52	0.59
25-28 "	0.28	0.64	0.60	0.51	0.66
29-32 "	0.16	0.47	0.56	0.36	0.36
33-36 "	0.05	0.24	0.37	0.16	0.17
37-40 "	0.03	0.13	0.22	0.14	—0.28

These data are graphically represented in Figure 3, which gives a comparison of the weight increases made by White Leghorn, R. I. Red, New Hampshire, White Rock, and White Wyandotte pullets. The periodic gains increased with age up to the 9- to 12-week period. The greatest growth for each of the breeds was experienced during this period.

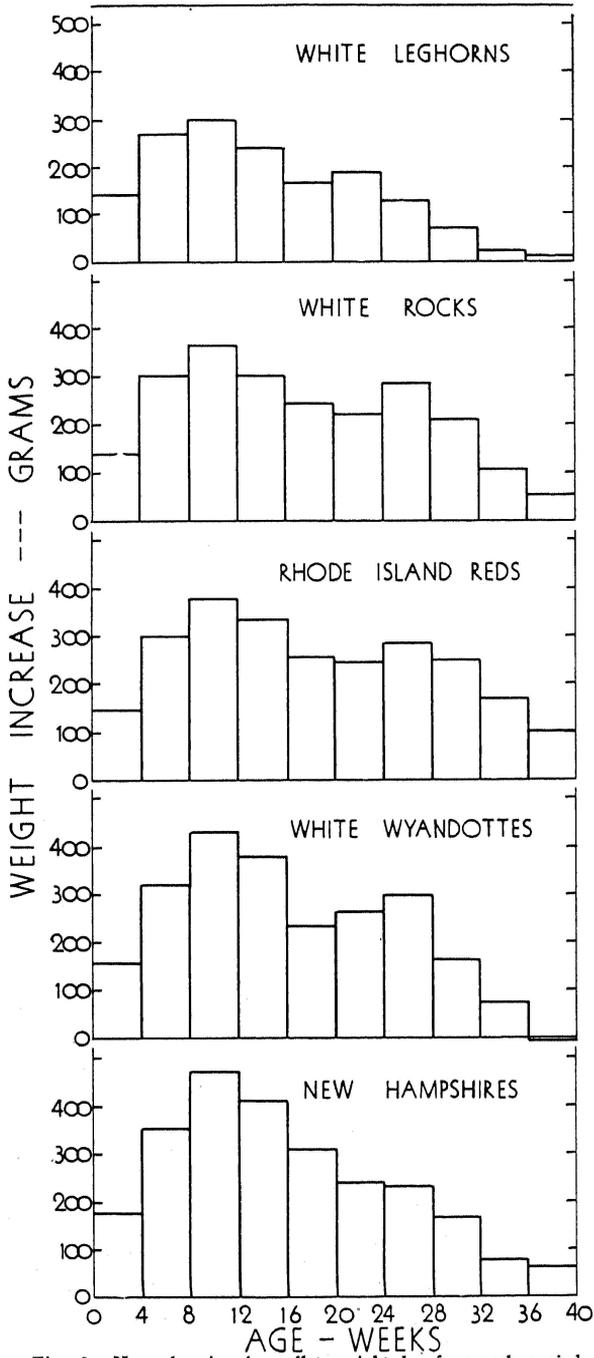


Fig. 3.—Normal gains in pullet weight by four-week periods, in grams.

In general, after the age of 12 weeks, the gains made per 4-week interval gradually declined. It is also interesting to note that the Leghorn and White Wyandotte pullets gained less during the 17-20 week interval than for either the succeeding or preceding 4-week interval. With the White Rock and Rhode Island Red pullets, the gains for both 17-20 week and 21-24 week periods were smaller than for the following interval. Since the 17-20 week period is during the month of July for the average of the hatches, it is suggested that hot summer temperatures may be partly responsible for these smaller gains for this period.

To 20 weeks of age the New Hampshire Red pullets made greater gains in every case than pullets of the other breeds. After 24 weeks the White Rock and Rhode Island Red pullets made better gains than did the other two breeds.

The Influence of Breed on Weight Increases

All breeds of chickens do not respond in the same manner in the way they grow. Some grow relatively faster when young and slower as they approach maturity, while others grow relatively slower when young and make relatively great weight increases as they approach maturity. One would expect different strains within a breed to exhibit similar differences. Table 3 shows the gain for Leghorns, Reds, Wyandottes and New Hampshires by 4-week intervals to the age of 40 weeks. The table also shows the percentage of the total gain experienced for each period as well as the percentage of cumulative gain up to different ages.

As pointed out earlier, all breeds made the greatest gain during the 9-12 week period. On a percentage basis this amounted to 19.4, 15.3, 18.67 and 18.85 per cent of the total weight increase for the Leghorns, Rhode Island Reds, White Wyandottes and New Hampshires, respectively. It is seen that the Reds made relatively slower gains for this period. On the other hand during the 29-32 week period the Reds made greater gains than any of the three other breeds. During this period Leghorns accumulated 4.6 per cent of their total gain, Reds, 10.3, Wyandottes 7 and New Hampshires 6.7.

While the differences for any given period may appear small, the cumulative effect is quite pronounced. For example at the age of 12 weeks Leghorns had accumulated 46 per cent of their total gain, Reds 33.5, Wyandottes 39 and New Hampshires 40. From the standpoint of broiler production a strain that acquires from 5½ to 6½ per cent more of its total weight increase by the time the chickens are 12 weeks old is of economic importance. The slower relative

TABLE 3.—COMPARISON OF PERIODIC GAINS, PERCENTAGES OF 0-40 WEEK GAIN, AND PERCENTAGES OF CUMULATIVE GAINS OF NEW HAMPSHIRE PULETS WITH THAT OF WHITE LEGHORN, RHODE ISLAND RED AND WHITE WYANDOTTE PULETS.

Period Weeks	White Leghorns Normal			Rhode Island Reds Normal			White Wyandottes Normal			New Hampshires Normal		
	*Gain	% 0 - 40 Weeks Gain	Cumulative %	*Gain	% 0 - 40 Weeks Gain	Cumulative %	*Gain	% 0 - 40 Weeks Gain	Cumulative %	*Gain	% 0 - 40 Weeks Gain	Cumulative %
0- 4	144	9.3	9.3	145	5.9	5.9	157	6.74	6.74	175	7.08	7.08
5- 8	274	17.7	27.0	299	12.3	18.2	320	13.74	20.5	348	14.08	21.2
9-12	300	19.4	46.4	374	15.3	33.5	435	18.67	39.2	466	18.85	40.
13-16	241	15.6	62.0	337	13.8	47.3	380	16.31	55.5	407	16.46	56.5
17-20	163	10.6	72.5	253	10.4	57.7	232	9.96	65.4	309	12.5	69.
21-24	190	12.3	84.8	243	10.0	67.7	266	11.42	76.8	238	9.63	78.6
25-28	126	8.2	93.0	272	11.1	78.8	300	12.88	89.7	231	9.34	88.
29-32	71	4.6	97.6	251	10.3	89.1	164	7.04	97.8	165	6.67	94.6
33-36	23	1.5	99.1	166	6.8	95.9	76	3.26	100.	71	2.87	97.5
37-40	14	0.9	100.	100	4.1	100.	0	...	100.	62	2.51	100.
0-40	...	100.	...	...	100.	...	...	...	...	...	...	...

*Gain, grams.

growth of this particular strain of Rhode Island Reds when young is further evidenced by the differences in the cumulative percentage of weight increase at the age of 24 weeks. At this age the Leghorns had made 84.8 per cent of their total weight increase as compared to 78.6 for the New Hampshires, 76.8 for the Wyandottes and 67.7 for the Reds. Later the Reds made relatively greater gains so that at the age of 40 weeks they weighed approximately the same as the other two general purpose breeds. The cumulative weight increases as expressed in percentage of the total is shown in Figure 4.

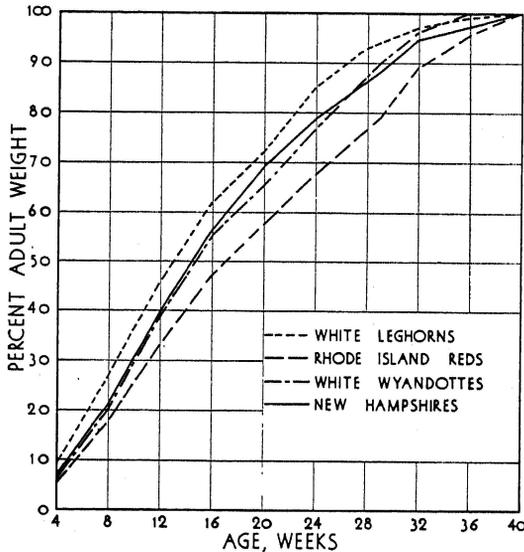


Fig. 4.—Cumulative per cent of adult weight according to age. At age of 16 weeks the Leghorns had acquired 62 per cent of their adult weight as compared to 47.7, 55.5, and 56.5 per cent for the Rhode Island Reds, White Wyandottes, and New Hampshires respectively.

The Growth of Pullets and Cockerels

Data on the growth of pullets vs. cockerels were available for 1932 and 1933. The comparative studies are based upon more than 3,000 White Leghorn, White Rock and Rhode Island Red chicks. Most of the cockerels were marketed at ages of 8 to 12 weeks, therefore, data on cockerels of older ages are for those birds that were retained for prospective breeding purposes. Selection of cockerels to be retained was not made upon a basis of body weight. Adequate data were not available on the males after 20 weeks of age.

At time of hatching and at 4 weeks of age there is very little difference in the weights of cockerels and pullets of the three breeds.

A marked sex differential in weight is first noticed at 8 weeks of age, being greatest with the White Leghorns and smallest with the Rhode Island Reds. The difference in weights of the sexes increased as the chicks grew older. At 20 weeks the pullets weighed only about 80 per cent as much as the cockerels.

Table 4 shows a comparison of the 4-week gains made by cockerels and pullets.

TABLE 4.—COMPARISON OF COCKEREL AND PULLET WEIGHTS BY 4-WEEK PERIODS. 1932-1933. WEIGHTS IN POUNDS.

Age in Weeks	White Leghorns		White Rocks		R. I. Reds	
	Ckls.	Pullets	Ckls.	Pullets	Ckls.	Pullets
0	0.089	0.087	0.090	0.089	0.093	0.092
4	0.45	0.42	0.41	0.39	0.41	0.41
8	1.24	1.08	1.22	1.09	1.16	1.07
12	2.20	1.77	2.41	1.93	2.26	1.94
16	2.90	2.28	3.20	2.63	3.14	2.67
20	3.44	2.66	4.03	3.15	3.99	3.22

The greatest gains in all cases were during the 9-12 weeks interval. During the first 4 weeks there was very little difference between the gains of pullets and cockerels. It is observed that the largest gains for the initial 4-weeks period were with White Leghorns. The following period the heavy breeds gained more and continued to do so to 20 weeks of age. (Table 5.)

TABLE 5.—COMPARISON OF COCKEREL AND PULLET GAINS. 1932-1933. WEIGHTS IN POUNDS.

Age in Weeks	White Leghorns		White Rocks		R. I. Reds	
	Ckls.	Pullets	Ckls.	Pullets	Ckls.	Pullets
0-4	.36	.33	.32	.30	.32	.31
5-8	.79	.67	.81	.70	.75	.67
9-12	.96	.69	1.19	.84	1.10	.86
13-16	.70	.51	.79	.70	.88	.73
17-20	.55	.38	.84	.52	.85	.56

Growth of Progeny from Hens versus Progeny from Pullets

For the year 1929 data were collected on pullet progeny from hens in their first laying season and from hens in their second year of production or older. From a study of these data it was concluded that progeny from the younger breeders grew as rapidly and attained the same adult weights as did the progeny from older breeding stock. Later investigations with White Leghorns warrant similar conclusions.

Influence of Time of Hatching on Growth of Pullets

One of the important recommendations usually listed in "plans" for successful poultry management is to start chicks relatively early

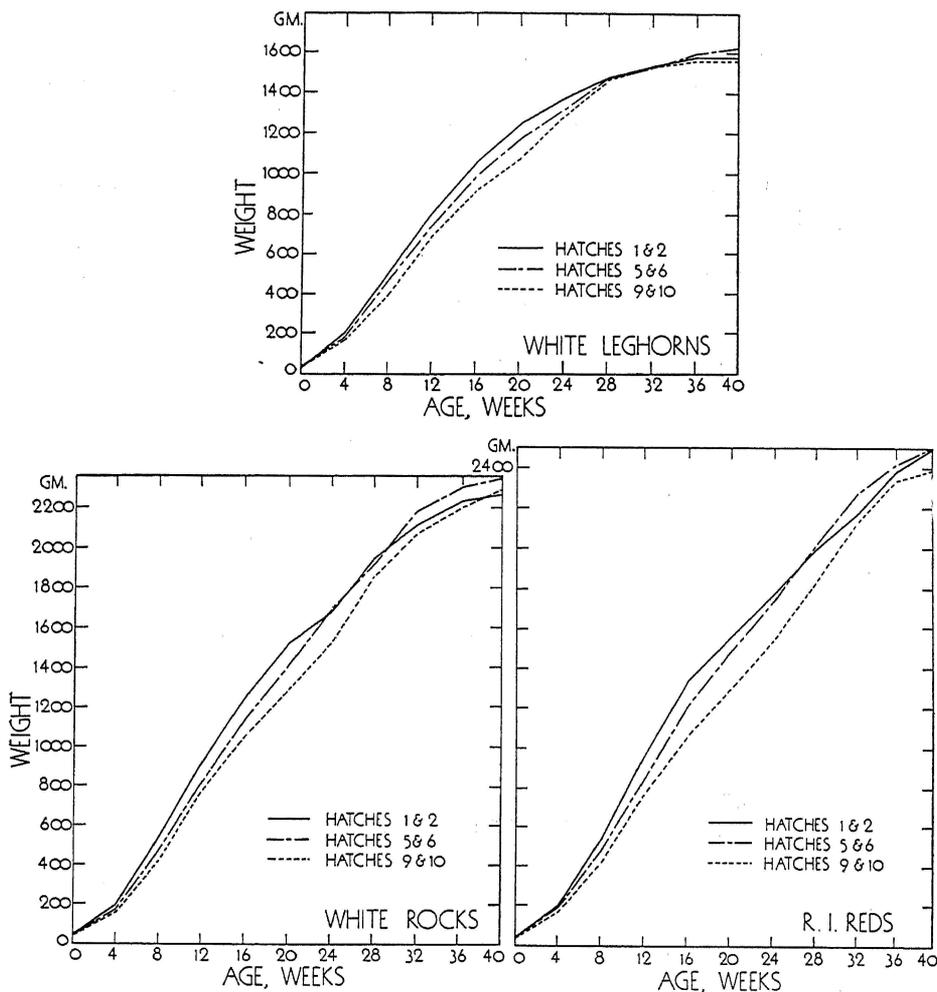


Fig. 5.—The influence of hatching date on the growth curves of White Leghorn, White Rock, and Rhode Island Red pullets. Six year average for Leghorn and Reds—five year average for White Rocks.

in the season. One of the arguments in favor of early hatching is because early hatched chickens grow faster. Growth data on chicks hatched at different times during the hatching season were available for White Leghorns, White Rocks, New Hampshire and Rhode Island Red pullets. Figure 5 shows the influence of time of hatching on the growth of pullets. It will be recalled that hatches one and two occurred early in February and hatches 9 and 10 in early April. The average day-old weight was not influenced by the time of hatching, but as the chicks became older the difference between the

weights of the three groups became increasingly greater to about 20 weeks of age, following which time there was a tendency for the weight differences to decrease. At 28 weeks of age White Leghorn chicks hatched late in the season were as heavy as the earlier hatched birds. Although the late hatched White Rock and Rhode Island Red chicks grew at a more rapid rate following the 20 weeks period, they did not quite equal the weights of chicks of the first two hatches during the 40 weeks studied.

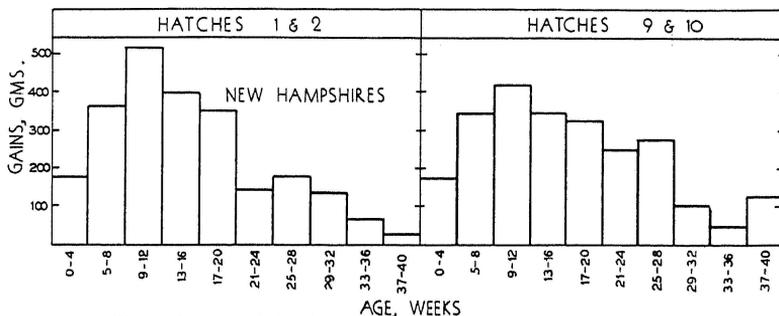


Fig. 6.—The influence of hatching date on the periodic weight increases of New Hampshire pullets. The weight increases up to the age of 16 weeks were much greater for the February-hatched pullets than for those hatched in April. At the age of 40 weeks the two groups weighed the same.

Figure 6 shows the influence of hatching date on the growth of New Hampshire pullets by 4-week intervals. As with the other breeds the pullets from hatches 1 and 2 made much greater weight increases when young, but the later hatched pullets made correspondingly greater gains as they approached maturity. At the age of 40 weeks both groups weighed exactly the same.

Figure 7 shows the distribution of weight increases of four-week intervals for chickens hatched the first week in February as compared to those hatched the second week in April. A discussion of these results together with a possible explanation of this variation in growth follows.

The Influence of Certain Climatic Factors on Growth of Pullets

Previous investigations have suggested that variations in climatic conditions might account for differences in the growth rates of chicks hatched at different times during the hatching season. The growth of pullets of three breeds in the first and tenth hatches for the 6-year period was studied in relation to certain climatic conditions. The first group was hatched on the first Saturday in February and the tenth group was hatched on the second Saturday in April.

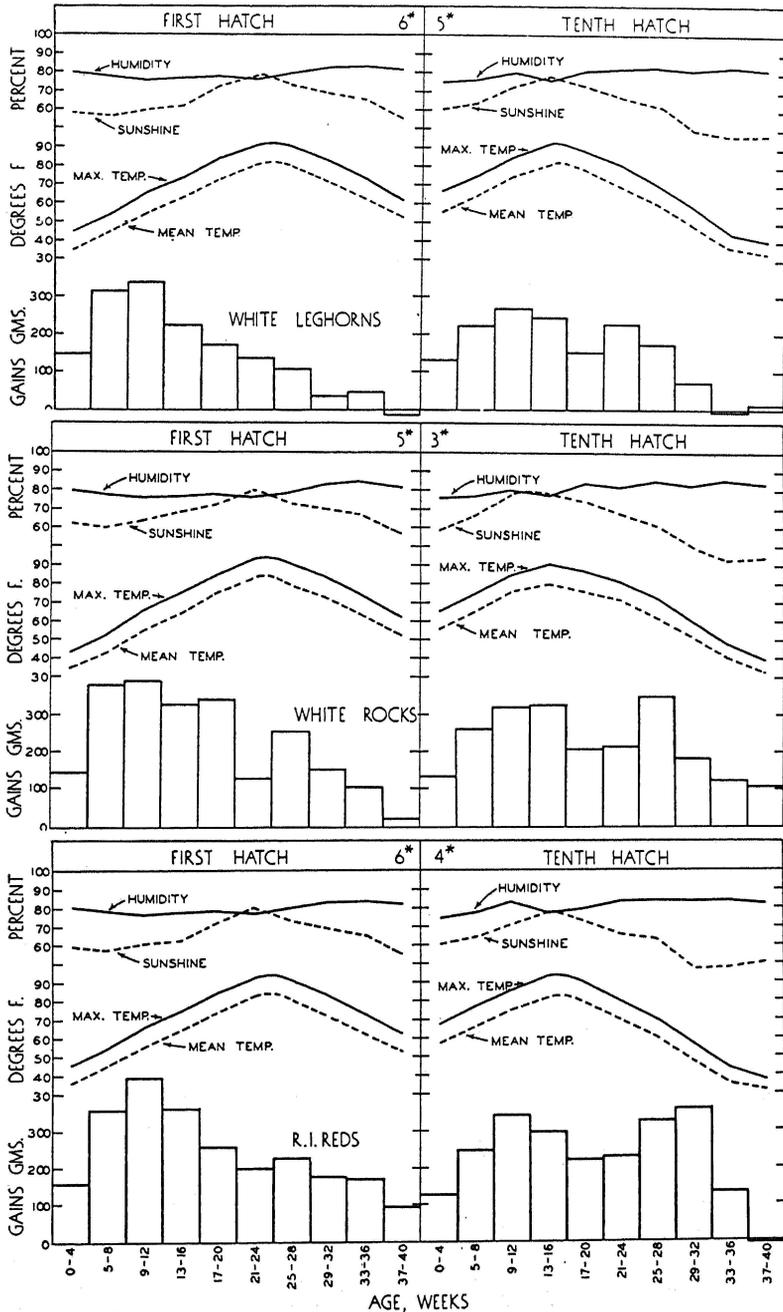


Fig. 7.—Relation of average monthly maximum temperature, mean temperature, humidity, and sunshine to pullet gains. Starred figures represent year's numbers.

Temperature.—Figure 7 shows that the prevailing temperatures have a pronounced effect on the growth of the pullets. With the three breeds it is readily apparent that the gains made by the first hatch to 20 weeks of age were much greater than those of the tenth hatch. It is also observed that the average monthly* mean and maximum temperatures prevailing during the earlier growing periods were lower in the case of the first hatch than for the later hatched chicks. During the later growing periods, 25-36 weeks, when the late hatched pullets made appreciably more gains than the earlier ones it may be observed that the monthly temperatures, both mean and maximum, were considerably below those temperatures prevailing during corresponding periods for the first hatch. Generalizing, it might be said that periods of high temperatures are periods of slow growth. It is thus apparent that the poultryman who desires to obtain rapid growth with his chicks during the early periods of growth should endeavor to hatch or buy his chicks early in the season.

Sunshine.—Since all chicks received cod liver oil in their rations until 8 weeks of age, it would be impossible to determine the effects of sunshine on the growth of these younger chickens. Figure 4 indicates that, in general, periods of high percentages of sunshine** are periods of slow growth. It is probable that the high temperatures prevailing during these periods were responsible for the retarded growth rather than any harmful properties of the sunshine.

Humidity.—In these studies the average monthly percentages of humidity*** did not fluctuate more than approximately ten per cent for the entire forty weeks growth periods of either the first or tenth hatches. Humidity, within the ranges included in this experiment, had no pronounced influence on the growth of pullets.

Influence of Temperatures on Percentage of Normal¹ Gains

In order to study further the effect of the hot summer weather on pullet growth, average monthly maximum and minimum temperatures were plotted against the percentages of normal monthly gains made by pullets in 1934 and 1935. The data for 1936 are for maximum temperatures only. The ages of the chicks ranged from 4 to 32 weeks. The percentages of normal gains are the averages for the three breeds (White Leghorns, White Rocks, and R. I. Reds) in 1934 and for only the Leghorns and Reds in 1935 and 1936.

*Monthly = 4 weeks period.

**Percentage of the number of hours of possible sunshine for each day.

***Per cent of relative humidity at 7 a. m. daily.

¹"Normal" refers to the five and six year average periodic weights.

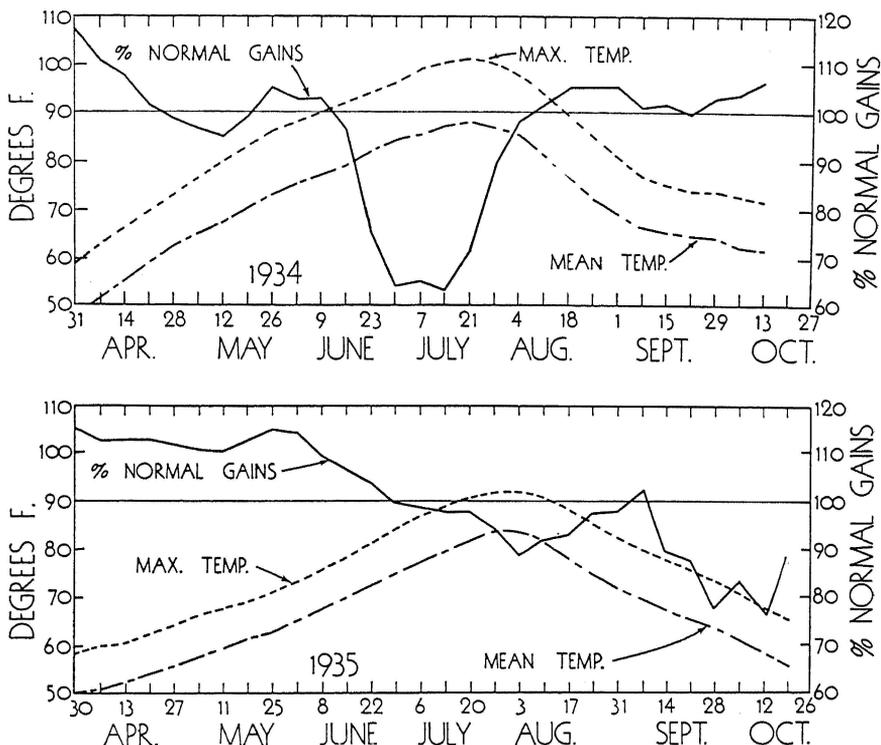


Fig. 8.—Relation of average monthly temperatures on percentage of normal monthly gain of pullets.

NOTE: In Figure 8 the points were plotted at the mid-points of each 4-weeks period for both temperatures and gains. Since the chicks were hatched weekly, the mid-points for the several periods are a week apart. A five-weeks moving average was used for both years to eliminate fluctuations.

From 1929 to 1933, with the exception of 1930, the summer temperatures were not characterized by extended periods of excessive heat and there was little evidence of a marked decline in the rate of weight increase in chickens because of high temperatures. The summer of 1934, however, was characterized by a long period of excessive heat. For a period of two months, June 16 to Aug. 19, the average maximum temperature was above 90, reaching a high point of 106 for the week of July 14 to 21. Normal growth was experienced until the middle of June but the percentage of normal growth declined to nearly 50 per cent during the period of extreme heat. After mid-August the percentage normal growth rose to 100 when lower temperatures prevailed. Some groups of chickens failed to gain during the period of extreme heat.

The year 1935 presents a different picture. The period in which the maximum temperature rose above 90 extended over a period of three weeks. Growth above or approximately normal was experienced until the latter part of July. There was a dip in the percentage normal growth curve the first of August. Of interest is the below normal growth experienced in September and October. Because of the more favorable growing season in 1935 the chickens had accumulated a greater proportion of their adult weight by September 1. Consequently the growth for the later period was below that usually expected at that period of the year.

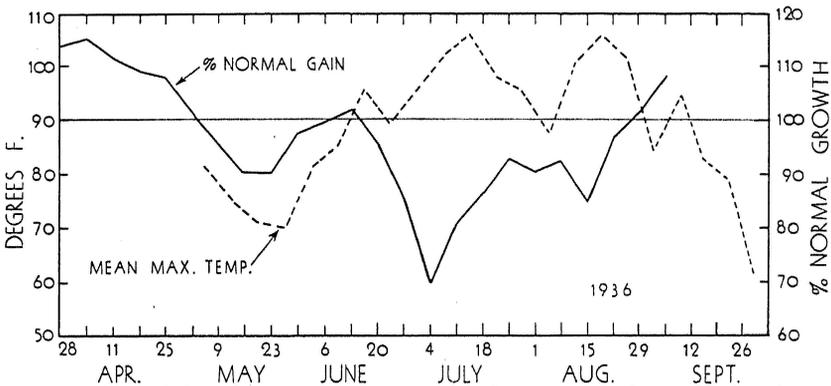


Fig. 9.—The relation of summer temperatures on the percentage of normal gains of pullets (1936).

The year 1936 is clearly remembered for its periods of extreme heat. There were two periods of extreme heat. The first heat wave reached its peak in July. Growth dropped to 70 per cent of normal. In early August the maximum temperature dropped below 90 and the percentage normal growth rose to 93. Then the maximum temperature rose to 106. The percentage of normal growth declined to 85 and then rose to above normal as the fall temperatures became more reasonable.

The results plainly show that when the summer temperatures are high the growth is below normal and that more favorable gains were made during those periods when the prevailing temperatures were relatively low.

The Influence of High Temperatures on the Growth of Chicks of Different Sizes

Apparently small chicks are less affected by periods of extreme heat than are larger ones. This phenomenon is shown in Figure 7. It is observed that during the periods of extreme heat in the summer of 1936 the rate of growth of chicks was greatly retarded, but the smaller chicks (initial weight of 680 grams) were not affected as

much as heavier birds. On July 11 when the maximum temperature was at a peak the rate of growth of the 680-gram chicks declined to 24. (Normal for chicks of this weight is 30.)

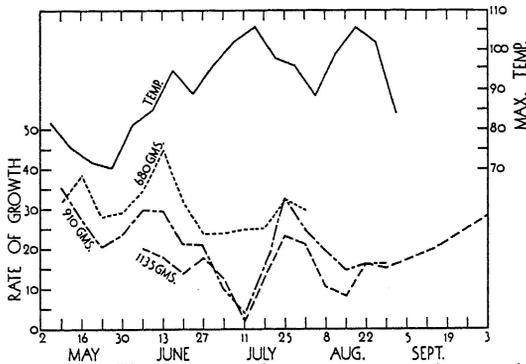


Fig. 10.—The influence of temperature on the growth rate of White Leghorn pullets for 1936.

The growth rate of White Leghorn pullets having an initial weight of 2 pounds (910 grams) declined from 30 for the first half of June to 4 for July 11 when the heat wave was at its height. The growth rate then rose to 33 in response to lower temperature in early August. The 2.5 pound (1135 grams) chicks were affected in the same manner as the 2 pound birds. It is thus seen that chickens are sensitive to environmental conditions and that the type of growth curve varies depending upon the date the chicks are hatched and the temperatures that prevail during the growing season.

Compensatory Growth

An interesting behavior of growth is revealed by the fact that if growth is retarded the individual at some later time experiences growth above normal which compensates for the previous below-normal growth, so that eventually the bird attains normal size. There are of course cases in which the retarded growth may be permanent, as in stunting because of coccidiosis or other intestinal parasites, but so long as the bird remains healthy compensatory growth will occur. Thus the poultryman need not be alarmed should his chicks at some time fail to make normally rapid growth, unless the slower growth is due to overcrowding or unsanitary causes.

It is well known that early hatched chickens grow faster when young than do late hatched chickens but this is only half the story, because later in the summer the growth of the early hatched chickens is slower and that of the late hatched chickens is faster than normal. Again rapid growth when young may be attained by feeding

rations designed to stimulate growth, such as high protein diets well fortified with growth promoting substances but eventually the chicks on other rations will attain the same weight.

In 1938 at the age of 8 weeks the average New Hampshire pullet weighed 490 grams as compared to the normal (567 grams) but at 32 weeks they were normal in size. Below normal growth occurred before May 15 but from May 15 to June 26 growth was above normal. A similar behavior was observed in 1940. These variations cannot be explained on the basis of temperature, nor on the basis of nutrition for the same feed formulas were employed.

During the last two decades a marked change in the method of growing chickens has occurred. Because of present knowledge relative to nutrition, poultrymen are securing much more rapid growth in chickens during the early part of the growing period. Based on present growth standards, growth below normal in chickens was experienced in 1922 and also in 1929 up to the middle of August. After August 15 a marked "growth above normal" was experienced. Poultry feeding stations complain that they cannot secure the gains in fattening they formerly did. The fundamental reason for this is that at present a much greater proportion of the weight increase in chickens is secured at an earlier age. The adult weight of chickens raised in 1922 was the same as at present. It is thus seen that retarded growth, due to periods of extreme heat or rations not so rich in proteins is no cause for alarm. If the bird remains healthy it will eventually attain the weight it is capable of attaining.

The Influence of Paralysis on Growth

Since 1928 "Range Paralysis" has been present in many Missouri flocks. This disease, or combination of diseases, is known as the avian-leukosis complex. Badly infected birds are usually undersized and might appear to have been undersized throughout life. This, however, is an erroneous conclusion. Data on White Leghorn pullets which were eventually diagnosed as having paralysis show that they experienced normal growth until just prior to showing evidence of having the disease. Similar data for Rhode Island Reds were obtained. The data are shown in Table 6. (See next page.)

TABLE 6.—GROWTH OF NORMAL AND PARALYSIS AFFECTED WHITE LEGHORN AND RHODE ISLAND RED PULLETS. (WEIGHTS IN GRAMS.)

Age in Weeks	White Leghorns		Rhode Island Reds	
	Paralysis	Normal	Paralysis	Normal
0	40	40	41	41
4	188	184	199	186
8	471	458	499	485
12	770	757	886	859
16	1000	998	1225	1195
20	1170	1162	1445	1449
24	1311	1352	1734	1692
28	1443	1478	1961	1964
32	1491	1549	2325	2214
36	1541	1573	2452	2380
40	1571	1587	2520	2480

Normal Growth—Missouri Research Bulletin 247.