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Certain Characteristics of Hen Eggs

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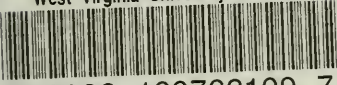
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DEPARTMENT OF POULTRY HUSBANDRY

Certain Characteristics of Hen Eggs

TECHNICAL BULLETIN



BY

Horace Atwood and Chas. E. Weakley, Jr.

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CERTAIN CHARACTERISTICS OF HEN EGGS

By HORACE ATWOOD and CHAS. E. WEAKLEY, Jr.

INTRODUCTION.

It is not unusual for chicks hatched by the same hen or in the same incubator to differ with respect to vigor. Some of them may be strong, thrifty, and have the ability to make a rapid growth when properly brooded and fed; while others may lack that robustness of constitution which is essential to normal development.

The eggs from which the chicks are hatched must be responsible for these easily observable and oftentimes pronounced differences, and the question arises whether eggs have any physical characteristics which may be correlated in any way with these differences in vigor.

In order to begin the study of this subject, the work on eggs reported in this bulletin has been carried out. So far no effort has been made to correlate the observed differences existing among eggs with the vigor of the resulting chickens, but the senior author has already pointed out that small eggs produce small chicks which have a high mortality and a slow growth.*

The investigations herein described were begun in January, 1915. Two pens of single comb White Leghorn pullets were selected and placed in two colony laying houses of similar type. Each pen consisted of twenty females and one male selected with respect to uniformity of age, breeding, and appearance.

During the first year the fowls were fed as follows: Pen 1 received cracked corn scattered in litter, together with a dry mash consisting of 90 percent corn meal and 10 percent beef scrap. This mash was fed in a hopper to which the fowls had constant access. Pen 2 received whole wheat scattered in litter together with hopper-fed mash consisting of 45 percent wheat bran, 45 percent wheat middlings, and

*W. Va. Agr. Exp. Sta. Bull. 124.

10 per cent beef scrap. Both lots were supplied, as is customary, with water, grit, oyster shell, green food, and charcoal. Each house was provided with two small runs which were alternately sown to rye and oats so as to provide the fowls with green food in season.

During the second year, the fowls were fed as previously described except that the amount of beef scrap in the mash was doubled. This increase in the amount of beef scrap was made in order to bring about a better egg production since the original ration lacked variety and seemed to be somewhat unpalatable. The mortality among the corn fed fowls was very low, but several of the wheat fed fowls died apparently from digestive troubles.

The fowls were trap nested and the eggs were examined by the junior author on the day following that on which they were laid. This examination consisted first in weighing the eggs as received at the chemical laboratory. Then each egg was opened and the yolk transferred to a piece of filter paper so as to absorb any trace of white which might adhere to it. The weight of the yolk was then determined at once. This method was found to be more satisfactory than that of separating the parts after boiling.

In the discussion of the results, the weights of the eggs and yolks examined in 1915 and in 1916 will first be considered; then the influence of the egg cycles on egg and yolk weight will be taken up; and finally the studies of the egg production of individual hens will be discussed.

INFLUENCE OF RATION ON WEIGHT OF EGG AND RELATIVE WEIGHT OF YOLK.

Results for 1915.

Table I which follows shows the number and average weight in grams of the eggs which were examined during 1915, arranged and averaged according to weeks. Table II shows the number and average weight of the yolks of the eggs which were examined during 1915, arranged and averaged according to weeks. Table III was derived from Tables I and II and shows what percentage of the eggs was yolk. Table IV classifies the eggs of Pen 1 according to weight and gives the percent yolk. Table V classifies the eggs of Pen 2 according to weight and gives the percent yolk.

TABLE I.—Average Weight and Number of Eggs Obtained From Pens 1 and 2 During 1915.

For Week Ending	Pen No. 1		Pen No. 2	
	Average Weight in Grams	No. of Eggs	Average Weight in Grams	No. of Eggs
March 7-----	50.88	13	53.96	26
March 14-----	52.16	19	54.24	37
March 21-----	51.60	44	55.03	40
March 28-----	51.83	42	55.38	48
April 4-----	52.79	51	56.42	58
April 11-----	52.79	59	55.76	44
April 18-----	52.65	64	55.20	69
April 25-----	52.49	59	53.20	33
May 2-----	51.96	55	51.87	24
May 9-----	51.64	27	51.42	28
May 16-----	52.43	32	54.68	26
May 23-----	---	---	---	---
May 30-----	52.65	25	54.59	34
June 6-----	53.62	21	54.63	26
June 13-----	47.57	11	54.13	1
June 20-----	49.26	11	54.01	4
June 27-----	53.54	14	53.08	38
July 4-----	54.14	17	52.37	11
July 11-----	52.66	28	51.25	18
July 18-----	52.74	23	54.37	32
July 25-----	51.34	24	56.71	27
Aug. 1-----	52.35	16	54.51	26

TABLE II.—Average Weight of Yolks Obtained From Pens 1 and 2 During 1915.

For Week Ending	Pen No. 1		Pen No. 2	
	Average Weight in Grams	No. of Yolks	Average Weight in Grams	No. of Yolks
March 7-----	15.28	13	16.22	26
March 14-----	15.44	19	16.00	37
March 21-----	15.90	44	16.33	40
March 28-----	16.09	42	16.45	48
April 4-----	16.08	51	16.79	58
April 11-----	15.83	59	16.70	44
April 18-----	15.73	64	16.06	69
April 25-----	15.72	59	16.15	33
May 2-----	15.63	55	15.36	24
May 9-----	15.28	27	14.87	28
May 16-----	15.48	32	16.06	26
May 23-----	---	---	---	---
May 30-----	15.47	25	16.03	34
June 6-----	16.45	21	15.90	26
June 13-----	14.89	11	16.34	1
June 20-----	15.47	11	14.88	4
June 27-----	16.47	14	16.33	38
July 4-----	16.42	17	16.45	11
July 11-----	16.02	28	15.00	18
July 18-----	16.06	23	16.19	32
July 25-----	15.67	24	16.72	27
Aug. 1-----	16.50	16	16.95	26

TABLE III.—Average Percentage of Yolk in Eggs Obtained from Pens 1 and 2 During 1915.

For Week Ending	Pen No. 1		Pen No. 2	
	Percent	Number of Eggs	Percent	Number of Eggs
March 7-----	30.00	13	30.08	26
March 14-----	29.60	19	29.51	37
March 21-----	30.81	44	29.67	40
March 28-----	31.04	42	29.70	48
April 4-----	30.10	51	29.76	58
April 11-----	29.98	59	29.96	44
April 18-----	29.87	64	29.10	69
April 25-----	29.95	59	30.36	33
May 2-----	30.08	55	29.61	24
May 9-----	29.59	27	28.92	28
May 16-----	29.52	32	29.37	26
May 23-----	-----	---	---	---
May 30-----	29.38	25	29.36	34
June 6-----	30.68	21	29.11	26
June 13-----	31.30	11	30.19	1
June 20-----	31.40	11	30.08	4
June 27-----	30.76	14	30.77	38
July 4-----	30.33	17	31.41	11
July 11-----	30.42	28	29.27	18
July 18-----	30.45	23	29.78	32
July 25-----	30.52	24	29.48	27
Aug. 1-----	31.52	16	31.09	26

This table shows that the percentage of the total egg that was yolk averaged somewhat smaller in the case of the wheat fed fowls.

TABLE IV.—Eggs of Pen 1 for 1915 Classified According to Weight.

Grouping	Number of Eggs and Yolks	Average Weight of Eggs in Grams	Average Weight of Yolks in Gr'ms	Percent Yolk
	6	43.46	12.989	29.89
	5	44.56	13.418	30.11
	13	45.56	13.994	30.72
	25	46.67	14.149	30.32
	29	47.48	14.838	31.25
	53	48.49	14.897	30.73
Average Between 45.00 and 49.99 Grams---	75	49.48	15.179	30.68
	195	48.29	14.841	30.73
	64	50.49	15.345	30.39
	58	51.49	15.778	30.64
	55	52.50	15.913	30.31
	47	53.46	16.024	29.97
Average Between 50.00 and 54.99 Grams---	48	54.44	16.292	29.93
	272	52.32	15.837	30.27
	46	55.43	16.362	29.52
	43	56.39	17.023	30.19
	36	57.48	16.995	29.57
	24	58.52	17.715	30.27
	17	59.52	17.657	29.67
Average Between 55.00 and 60.99 Grams---	11	60.48	17.764	29.37
	177	57.21	17.046	29.80
	3	61.17	18.593	30.40
	2	62.52	18.892	30.22
Average Between 45.00 and 60.99 Grams---	644	52.45	15.868	30.25
Total Average-----	660	52.38	15.844	30.25

TABLE V.—Eggs of Pen 2 for 1915 Classified According to Weight.

Grouping	Number of Eggs and Yolks	Average Weight of Eggs in Grams	Average Weight of Yolks in Gr'ms	Percent Yolk
	1	42.07	11.441	27.20
	1	43.64	13.395	30.69
	1	44.75	14.340	32.04
	2	45.94	13.739	29.90
	7	46.46	13.089	29.89
	11	47.37	14.387	30.37
	18	48.48	14.695	30.31
Average Between 45.00 and 49.99 Grams---	30	49.57	14.934	30.12
	68	48.50	14.557	30.01
	36	50.44	15.134	30.00
	52	51.49	15.596	30.29
	53	52.52	16.146	30.74
	83	53.50	16.119	30.13
Average Between 50.00 and 54.99 Grams---	77	54.45	16.306	29.95
	301	52.86	15.964	30.20
	67	55.44	16.442	29.66
	54	56.39	16.346	29.02
	49	57.52	17.326	30.12
	30	58.39	17.239	29.52
	22	59.31	17.205	29.01
Average Between 55.00 and 60.99 Grams---	22	60.46	17.437	28.84
	244	57.23	16.841	29.43
	12	61.51	17.016	27.81
	9	62.51	17.508	28.01
	3	64.26	16.926	26.34
	2	65.46	17.407	26.59
	2	66.30	17.621	26.58
	2	68.44	16.979	24.81
Average Between 61.00 and 68.99 Grams---	30	63.13	17.254	27.33
Average Between 45.00 and 68.99 Grams---	643	54.54	16.210	29.72
Total Average-----	646	54.48	16.190	29.72

From the two preceding tables the following conclusions may be drawn:

1. The heavier the egg, the smaller the percent of the total egg that is yolk.
2. The lighter the egg, the greater the percent of the total egg that is yolk.
3. The heavier the egg, the heavier the yolk.
4. The hens in the corn fed pen laid lighter eggs than did the hens in the wheat fed pen.

5. The yolks of the eggs laid by the wheat fed fowls were heavier than those laid by the corn fed fowls, but the percentage of the total egg that was yolk was smaller.

Results for 1916.

Table VI which follows gives the number and average weight in grams of the eggs which were examined during 1916, arranged and averaged according to weeks. Table VII shows the number and average weight of the yolks of the eggs which were examined in 1916, arranged and averaged according to weeks. Table VIII was derived from Tables VI and VII and shows the percentage of yolk in the eggs examined. Table IX compares the averages for the years 1915 and 1916. Table X classifies the eggs of Pen 1 according to weight and gives the percentage of yolk. Table XI classifies the eggs of Pen 2 according to weight and gives the percentage of yolk.

TABLE VI.—Number and Average Weight of Eggs Obtained From Pens 1 and 2 During 1916.

For Week Ending	Pen No. 1		Pen No. 2	
	Average Weight in Grams	No. of Eggs	Average Weight in Grams	No. of Eggs
Feb. 27-----	56.18	15	58.05	4
March 5-----	57.36	25	60.44	5
March 12-----	56.95	32	59.91	18
March 19-----	56.53	31	59.35	23
March 26-----	55.31	17	58.94	19
April 2-----	56.68	37	58.01	26
April 9-----	58.91	33	58.57	24
April 16-----	58.99	23	57.96	18
April 23-----	58.92	12	55.72	7
April 30-----	57.76	29	56.36	24
May 7-----	57.63	25	56.75	21
May 14-----	55.23	12	57.15	12
May 21-----	55.29	23	54.88	11
May 28-----	54.54	19	54.12	17
June 4-----	53.39	10	52.69	6
June 11-----	55.69	16	56.21	20
June 18-----	55.68	17	55.07	20
June 25-----	54.08	15	56.17	24
July 2-----	54.21	8	54.56	19
July 9-----	58.11	6	54.46	5
July 16-----	56.52	16	54.77	8
July 23-----	55.56	20	53.69	12

TABLE VII.—Number and Average Weight of Yolks Obtained From Pens 1 and 2 During 1916.

For Week Ending	Pen No. 1		Pen No. 2	
	Average Weight in Grams	No. of Yolks	Average Weight in Grams	No. of Yolks
Feb. 27-----	18.013	15	18.004	4
March 5-----	17.882	25	18.098	5
March 12-----	18.063	32	18.384	18
March 19-----	17.703	31	18.374	23
March 26-----	17.668	17	18.362	19
April 2-----	17.636	37	17.987	26
April 9-----	18.502	33	17.933	24
April 16-----	18.350	23	18.149	18
April 23-----	18.820	12	17.666	7
April 30-----	17.991	29	17.492	24
May 7-----	17.659	25	17.774	21
May 14-----	17.364	12	17.996	12
May 21-----	17.405	23	17.481	11
May 28-----	17.067	19	16.733	17
June 4-----	16.397	10	16.183	6
June 11-----	16.359	16	17.766	20
June 18-----	16.770	17	17.815	20
June 25-----	15.968	15	18.081	24
July 2-----	17.079	8	17.523	19
July 9-----	17.151	6	17.754	5
July 16-----	17.788	16	18.068	8
July 23-----	16.730	20	17.171	12

TABLE VIII.—Number and Average Percentage of Yolks in Eggs Obtained From Pens 1 and 2 During 1916.

For Week Ending	Pen No. 1		Pen No. 2	
	Percent	Number of Eggs	Percent	Number of Eggs
Feb. 27-----	32.06	15	31.02	4
March 5-----	31.18	25	29.94	5
March 12-----	31.72	32	30.69	18
March 19-----	31.32	31	30.96	23
March 26-----	31.94	17	31.15	19
April 2-----	31.11	37	31.01	26
April 9-----	31.41	33	30.62	24
April 16-----	31.11	23	31.31	18
April 23-----	31.94	12	31.71	7
April 30-----	31.15	29	31.04	24
May 7-----	30.64	25	31.32	21
May 14-----	31.44	12	31.49	12
May 21-----	31.48	23	31.85	11
May 28-----	31.29	19	30.92	17
June 4-----	30.71	10	30.71	6
June 11-----	29.37	16	31.61	20
June 18-----	30.12	17	32.35	20
June 25-----	29.53	15	32.19	24
July 2-----	31.51	8	32.12	19
July 9-----	29.51	6	32.60	5
July 16-----	31.47	16	32.99	8
July 23-----	30.11	20	31.98	12

TABLE IX.—Comparison of the Averages for 1915 and 1916.

Pens	No. of Eggs		Average Weight in Grams		Average Wt. of Yolks in Grams		Average Percent of Yolks	
	1915	1916	1915	1916	1915	1916	1915	1916.
Pen 1--	660	441	52.38	56.60	15.844	17.598	30.25	31.09
Pen 2--	646	343	54.48	56.79	16.190	17.825	29.72	31.39

During both years the average weight of the eggs and yolks was somewhat greater from the wheat fed fowls, the difference being more pronounced in 1915 when the minimum amount of beef scrap was fed. Also, the average weight of the eggs and yolks in 1916 was greater than in 1915. Undoubtedly this difference was partially due to the age of the fowls, and possibly to a certain extent to the increased amount of beef scrap. The percentage of the total egg that was yolk was also greater during the second year but, contrary to the results obtained in 1915, the total percentage of the eggs that was yolk was greater in 1916 in the eggs from the wheat fed fowls.

TABLE X.—Eggs of Pen 1 for 1916 Classified According to Weight.

Grouping	Number of Eggs and Yolks	Average Weight of Eggs in Grams	Average Weight of Yolks in Gr'ms	Percent Yolk
	3	44.60	14.891	33.39
	2	45.65	13.529	29.64
	2	46.24	15.607	33.75
	4	47.68	15.781	33.10
	6	48.57	15.389	31.68
Average Between 45.00 and 49.99 Grams---	10	49.60	15.991	32.24
	24	48.41	15.568	32.16
	17	50.62	16.136	31.87
	19	51.55	15.952	30.94
	30	52.49	16.281	31.02
	40	53.52	16.560	30.94
Average Between 50.00 and 54.99 Grams---	42	54.41	16.795	30.87
	148	52.98	16.443	31.04
	48	55.56	17.295	31.13
	36	56.45	18.063	32.00
	27	57.44	18.284	31.83
	26	58.57	18.817	32.13
	36	59.53	18.636	31.30
Average Between 55.00 and 60.99 Grams---	13	60.59	18.720	30.90
	186	57.55	18.159	31.55

TABLE X (Cont'd).—Eggs of Pen 1 for 1916 Classified According to Weight.

Grouping	Number of Eggs and Yolks	Average Weight of Eggs in Grams	Average Weight of Yolks in Gr'ms	Percent Yolk
	15	61.53	19.111	30.99
	17	62.42	18.786	30.10
	13	63.56	19.563	30.78
	9	64.37	19.281	29.95
	13	65.42	18.647	28.50
	3	66.51	19.133	28.77
	2	67.53	20.714	30.67
Average Between 61.00 and 68.99 Grams---	79	68.35	19.312	28.25
		63.97	19.118	29.89
	1	69.61	20.931	30.07
Average Between 45.00 and 68.99 Grams---	437	56.66	17.609	31.08
Total Average-----	441	56.60	17.598	31.09

TABLE XI.—Eggs Of Pen 2 for 1916 Classified According to Weight.

Grouping	Number of Eggs and Yolks	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
	2	47.44	14.735	31.06
	1	48.45	15.589	32.18
Average Between 47.00 and 49.99 Grams---	3	49.47	15.419	31.17
	6	48.62	15.220	31.30
	2	50.22	16.231	32.32
	18	51.59	16.367	31.73
	15	52.49	16.466	31.37
	28	53.46	17.343	32.44
Average Between 50.00 and 54.99 Grams---	37	54.41	17.274	31.75
	100	53.26	16.988	31.90
	35	55.44	17.420	31.42
	33	56.52	17.906	31.68
	45	57.43	18.128	31.57
	33	58.42	18.162	31.09
	35	59.44	18.589	31.27
Average Between 55.00 and 60.99 Grams---	27	60.48	18.728	30.97
	208	57.84	18.135	31.35
	7	61.45	18.770	30.55
	11	62.39	19.006	30.46
	3	63.04	19.042	30.21
	2	64.08	18.642	29.09
	3	65.52	19.628	29.96
	2	66.81	19.445	29.11
Average Between 61.00 and 66.99 Grams---	1	67.08	19.298	28.77
	29	63.14	19.032	30.14
Average Between 47.00 and 66.99 Grams---	343	56.78	17.825	31.39
Total Average-----	343	56.78	17.825	31.39

From these tables it may be observed that similar to the results obtained in 1915, the heavier the egg the heavier the yolk, but the heavier the egg, the smaller is the total percentage of the egg that is yolk.

EGG CYCLES.

When a hen lays on two or more days in succession the eggs laid consecutively constitute a cycle; consequently, cycles may consist of two or more eggs. It seemed wise to examine somewhat carefully the influence of the position of the egg in the cycle on its weight and on the weight of the yolk. In other words, suppose that a hen lays an egg on April 1, another on April 2, and still another on April 3 with no production on April 4 and then begins another cycle. How do the eggs which were laid consecutively on the different days compare with reference to their weight and the weight of their yolks?

INFLUENCE OF THE POSITION OF THE EGG IN THE CYCLE ON THE WEIGHT OF EGGS.

Two-Egg Cycles.—The eggs laid by each hen during the two years have been arranged according to cycles, and in the following table the average weights of the eggs laid on the first day and on the second day of the two-egg cycles have been brought together. It was not possible to weigh all of the yolks on account of the fact that some of the eggs were incubated and some of the yolks were broken in the separation; hence the results are discussed first with reference to the influence on the weight of the eggs, then consideration is given to those eggs in the various cycles the yolks of which were weighed. The following tables give the data for the two pens for 1915 and 1916:

TABLE XII.—Data on Pen 1 for 1915 Showing Number of Egg Cycles and Average Weights of Eggs for First and Second Days of Two-Egg Cycles.

Hen No.	No. Egg Cycles	Ave. Weight First Day	Ave. Weight Second Day
581	19	52.18	52.24
582	11	50.51	48.64
583	8	58.65	54.64
584	8	56.17	54.59
586	10	53.94	53.24
587	16	49.27	46.99
588	16	49.69	48.53
589	23	50.95	48.69
595	17	58.82	56.25
585	6	48.63	47.22
590	11	55.41	54.26
591	3	54.45	55.02
592	11	49.27	47.81
593	11	51.61	48.36
596	9	54.19	49.71
597	5	54.61	52.67
Average	184	52.69	50.83

TABLE XIII.—Data on Pen 2 for 1915 Showing Number of Egg Cycles and Average Weights of Eggs for First and Second Days of Two-Egg Cycles.

Hen No.	No. Egg Cycles	Ave. Weight First Day	Ave. Weight Second Day
654	20	54.31	52.82
634	5	51.35	51.09
625	16	57.00	54.74
629	15	50.87	49.35
680	12	56.87	53.59
694	12	53.87	53.41
678	21	56.53	53.94
671	14	56.05	53.64
645	12	61.08	58.38
202	6	56.30	53.37
615	9	61.54	58.36
623	3	54.37	53.02
620	8	53.57	54.28
669	15	56.78	56.37
631	10	56.67	53.93
660	9	54.41	55.59
617	4	51.85	53.50
Average	191	55.76	54.10

TABLE XIV.—Data on Pen 1 for 1916 Showing Number of Egg Cycles and Average Weights of Eggs for First and Second Days of Two-Egg Cycles.

Hen. No.	No. Egg Cycles	Ave. Weight First Day	Ave. Weight Second Day
581	11	58.00	56.23
583	11	64.18	59.56
584	9	55.98	55.18
585	9	52.10	50.12
587	13	56.94	53.39
588	7	53.25	51.30
589	12	52.67	49.44
590	13	61.98	57.69
591	10	65.85	62.43
592	17	53.53	50.85
593	14	51.48	48.58
595	14	61.25	59.50
596	7	55.85	52.00
597	7	57.52	55.24
Average	154	57.19	54.35

TABLE XV.—Data on Pen 2 for 1916 Showing Number of Egg Cycles and Average Weights of Eggs for First and Second Days of Two-Egg Cycles.

Hen. No.	No. Egg Cycles	Ave. Weight First Day	Ave. Weight Second Day
631	19	56.41	51.03
660	17	54.88	52.12
620	20	57.38	54.58
625	6	59.58	58.03
680	9	58.04	54.58
671	4	58.56	56.18
678	22	57.17	54.85
694	11	58.59	58.04
629	3	56.94	54.65
615	15	63.40	61.18
669	11	59.99	60.06
Average	137	58.03	55.46

The tables show that in practically all instances the first eggs laid were the heavier, the average difference varying between 1.6 and 2.8 grams, the smaller variation being in the first year of the test.

Three-Egg Cycles.—The following tables give the data on the weights of the eggs when three eggs were laid in succession:

TABLE XVI.—Data on Pen 1 for 1915 Showing Number of Egg Cycles and Average Weights of Eggs for First, Second, and Third Days of Three-Egg Cycles.

Hen No.	No. Egg Cycles	Average Weight First Day	Average Weight Second Day	Average Weight Third Day
581	2	54.51	53.62	53.81
582	3	60.41	56.01	55.37
584	7	56.46	56.75	56.39
586	2	57.27	55.36	53.14
587	2	49.61	49.44	49.05
588	8	50.57	49.54	48.75
589	7	49.75	49.03	47.68
595	2	57.78	56.13	57.36
585	4	50.44	50.21	47.88
590	1	56.53	55.63	58.10
592	4	48.56	49.49	48.91
593	1	51.28	47.99	46.07
596	2	53.62	51.31	51.47
597	1	56.78	57.13	51.38
Average	46	52.94	52.09	51.24

TABLE XVII.—Data on Pen 2 for 1915 Showing Number of Egg Cycles and Average Weights of Eggs for First, Second, and Third Days of Three-Egg Cycles.

Hen No.	No. Egg Cycles	Average Weight First Day	Average Weight Second Day	Average Weight Third Day
654	7	53.07	52.21	51.77
634	9	51.72	51.97	50.25
625	8	56.74	56.36	56.17
629	2	53.13	51.28	51.35
680	2	54.30	55.18	53.07
694	8	54.09	55.08	55.12
678	4	54.33	54.25	55.43
671	3	56.78	54.98	54.00
645	2	61.22	61.45	60.36
202	1	56.58	51.88	49.89
620	1	53.81	55.61	55.29
669	4	56.72	56.93	55.88
631	2	59.30	55.77	54.16
Average	53	54.83	54.51	53.87

TABLE XVIII.—Data on Pen 1 for 1916 Showing Number of Egg Cycles and Average Weights of Eggs for First, Second, and Third Days of Three-Egg Cycles.

Hen No.	No. Egg Cycles	Average Weight First Day	Average Weight Second Day	Average Weight Third Day
581	14	59.48	58.01	56.89
583	3	63.87	59.16	60.29
584	3	60.32	58.59	57.11
585	3	56.60	54.28	52.08
587	5	58.11	54.13	53.18
588	2	46.30	45.03	44.49
589	9	53.25	51.98	50.02
590	9	63.88	62.20	61.88
591	1	68.77	68.07	64.27
592	2	54.54	52.78	53.35
593	6	53.93	52.47	51.32
596	6	59.31	57.21	55.83
Average	63	58.25	56.32	55.25

TABLE XIX.—Data on Pen 2 for 1916 Showing Number of Egg Cycles and Average Weights of Eggs for First, Second, and Third Days of Three-Egg Cycles.

Hen No.	No. Egg Cycles	Average Weight First Day	Average Weight Second Day	Average Weight Third Day
631	6	57.21	51.82	50.46
660	6	53.32	53.32	48.23
620	6	55.57	55.02	54.04
625	16	58.88	56.85	55.33
680	7	57.40	55.46	52.69
671	4	54.82	54.59	52.90
678	6	57.29	55.93	54.07
694	2	54.36	54.16	55.26
629	1	55.50	52.00	52.95
615	11	65.25	63.62	61.45
669	13	60.83	59.12	57.94
Average	78	58.67	56.94	55.12

These tables are in agreement with the preceding ones, as the first eggs in the cycles are the heaviest, and the last eggs the lightest, the eggs laid on the second day being intermediate between the two extremes.

Four-Egg Cycles.—The following table gives the data for the four-egg cycles:

TABLE XX.—Number of Egg Cycles and Average Weight of Eggs in Four-Egg Cycles.

Year	Pen	No. Cycles	First Day	Second Day	Third Day	Fourth Day
1915 -----	1	10	53.68	53.07	52.13	52.44
1915 -----	2	10	54.10	53.08	53.51	53.55
1916 -----	1	16	55.78	54.30	52.77	52.36
1916 -----	2	27	56.64	56.45	54.90	53.88
Average --		63	55.53	54.83	53.70	53.21

The table shows that the average weight of the eggs diminishes as the position of the egg in the cycle advances.

Five-Egg Cycles.—The following table gives the data for the five-egg cycles:

TABLE XXI.—Number of Egg Cycles and Average Weight of Eggs in the Five-Egg Cycles.

		No. Cycles	First Day	Second Day	Third Day	Fourth Day	Fifth Day
1915 -----	2	3	54.05	52.61	53.68	53.40	51.67
1916 -----	1	4	54.94	53.22	52.70	52.51	51.08
1916 -----	2	10	58.41	58.28	57.78	55.96	54.65
Average ----		17	56.83	56.09	55.87	54.70	53.28

This table is in agreement with the preceding ones as the weight of the egg decreases as the position of the egg advances in the cycle.

Other cycles were obtained containing as many as nine eggs, but the available data are so few that reliable averages cannot be obtained.

INFLUENCE OF THE POSITION OF THE EGG IN THE CYCLE ON THE YOLK WEIGHT.

From the standpoint of the vigor of the embryo, a variation in the weight of the yolks of eggs is probably at least of as great importance as the weight of the egg. In the following tables are arranged the cycles in which the weight of the yolks were determined for all the eggs in each cycle.

In the discussion of these data, it may be observed that the number of cycles in 1916 is considerably smaller than in 1915. This is partly due to the fact that in 1916 it seemed to be more difficult to separate the yolks from the whites, as the vitelline membrane seemed to be weaker.

This apparent weakness may have been due to the narrower ration fed in 1916, as it has been observed (Cornell Experiment Station Bulletin 25) that a nitrogenous ration seems to weaken the membrane surrounding the yolks.

The following tables give the average weight of eggs and yolks laid by the various hens in the two-egg cycles:

TABLE XXII.—Average Weight of Eggs and Yolks in Two-Egg Cycles From Pen 1 in 1915.

Hen No.	Eggs	Day	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
581	17	1	52.53	17.041	32.44
581	17	2	52.33	16.677	31.87
582	9	1	50.44	15.737	31.20
582	9	2	48.51	15.427	31.80
583	5	1	58.36	16.571	28.39
583	5	2	55.30	16.887	30.54
584	6	1	56.49	17.155	30.37
584	6	2	54.39	16.839	30.96
586	8	1	54.96	15.666	28.50
586	8	2	53.78	15.437	28.70
587	12	1	48.90	14.197	29.03
587	12	2	47.11	14.029	29.78
588	13	1	49.98	15.806	31.63
588	13	2	48.55	15.460	31.84
589	15	1	51.26	15.297	29.84
589	15	2	49.13	15.076	30.69
595	14	1	58.40	17.964	30.76
595	14	2	56.60	17.621	31.13
585	3	1	50.45	15.198	30.12
585	3	2	48.25	14.284	29.61
590	6	1	54.82	14.857	27.10
590	6	2	54.35	15.243	28.05
591	1	1	55.86	13.699	24.52
591	1	2	53.65	14.186	26.44
592	2	1	51.03	16.475	32.29
592	2	2	48.80	16.138	33.07
593	2	1	50.93	15.342	30.12
593	2	2	48.05	15.092	31.41
596	3	1	54.05	14.391	26.62
596	3	2	50.05	14.022	28.02
597	2	1	54.42	17.198	31.60
597	2	2	52.37	16.447	31.41
Total	118	1	52.98	16.007	30.21
	118	2	51.34	15.757	30.69

TABLE XXIII.—Average Weight of Eggs and Yolks in Two-Egg Cycles From Pen 2 in 1915.

Hen No.	Eggs	Day	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
654	16	1	54.30	17.488	32.21
654	16	2	53.10	17.093	32.19
634	6	1	50.98	14.675	28.79
634	6	2	50.79	14.946	29.43
625	15	1	56.85	17.472	30.73
625	15	2	54.46	17.218	31.62
629	12	1	50.51	15.333	30.46
629	12	2	49.55	15.439	31.16
680	5	1	56.40	16.525	29.30
680	5	2	52.71	15.862	30.09
694	9	1	53.68	16.328	30.42
694	9	2	53.83	16.472	30.60
678	12	1	55.08	17.485	31.75
678	12	2	53.19	16.821	31.63
671	10	1	55.96	13.857	24.76
671	10	2	53.29	13.479	25.29
645	10	1	61.41	16.913	27.54
645	10	2	58.22	16.646	28.59
202	2	1	56.77	16.278	28.67
202	2	2	54.45	15.855	29.12
615	3	1	61.33	18.691	30.48
615	3	2	59.38	18.958	31.93
620	6	1	53.10	16.947	31.91
620	6	2	54.09	17.153	31.71
669	5	1	55.59	15.340	27.60
669	5	2	54.85	15.539	28.33
631	2	1	58.11	15.250	26.24
631	2	2	58.44	15.593	26.68
660	5	1	55.06	15.012	27.26
660	5	2	55.89	14.745	26.38
Total	118	1	55.24	16.391	29.67
	118	2	53.81	16.199	30.10

TABLE XXIV.—Average Weight of Eggs and Yolks in Two-Egg Cycles From Pen 1 in 1916.

Hen No.	Eggs	Day	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
581	8	1	58.20	19.780	33.99
581	8	2	56.04	19.012	33.93
583	5	1	66.03	19.855	30.07
583	5	2	61.76	20.183	32.68
584	5	1	57.18	18.016	31.51
584	5	2	55.99	18.021	32.19
585	1	1	55.39	17.077	30.83
585	1	2	53.90	16.576	30.75
587	9	1	57.62	17.061	29.61
587	9	2	54.05	16.598	30.71
588	6	1	53.35	17.398	32.61
588	6	2	51.10	16.690	32.66
589	2	1	51.62	16.486	31.94
589	2	2	50.08	16.370	32.69
590	1	1	64.02	19.601	30.62
590	1	2	60.82	18.701	30.75

TABLE XXIV (Cont'd).—Average Weight of Eggs and Yolks in Two-Egg Cycles From Pen 1 in 1916.

Hen No.	Eggs	Day	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
591	5	1	64.87	17.713	27.31
591	5	2	63.03	17.786	28.22
593	1	1	52.38	16.583	31.66
593	1	2	51.47	15.769	30.64
595	7	1	62.53	19.622	31.38
595	7	2	63.17	19.172	30.35
596	1	1	55.86	15.876	28.42
596	1	2	52.99	16.011	30.22
Total	51	1	59.08	18.305	30.98
	51	2	56.99	17.952	31.50

TABLE XXV.—Average Weight of Eggs and Yolks in Two-Egg Cycles From Pen 2 in 1916.

Hen No.	Eggs	Day	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
631	5	1	60.60	17.573	29.00
631	5	2	54.13	17.493	32.32
620	6	1	58.19	18.414	31.64
620	6	2	54.46	17.510	32.15
660	1	1	62.34	18.113	29.05
660	1	2	54.18	16.870	31.14
625	2	1	59.67	18.890	31.66
652	2	2	57.81	18.959	32.80
680	1	1	56.73	16.643	29.34
680	1	2	53.08	16.676	31.42
671	4	1	58.56	15.873	27.10
671	4	2	56.18	15.900	28.30
678	10	1	57.14	18.538	32.44
678	10	2	54.61	17.748	32.50
694	2	1	57.36	19.341	33.72
694	2	2	56.39	18.820	33.37
629	1	1	59.36	19.910	33.54
629	1	2	54.35	18.741	34.48
615	1	1	62.52	21.387	34.21
615	1	2	61.67	21.191	34.36
669	5	1	63.88	18.489	28.94
669	5	2	64.17	19.333	30.13
Total	38	1	59.27	18.215	30.73
	38	2	56.34	17.876	31.73

It may be observed from the preceding tables that the weight of the first egg and the weight of its yolk are greater than the weight of the second egg and the weight of its yolk, but the percentage of the weight of the egg that is yolk is greater in the second egg. In other words, it would appear that the yolk being the more essential part of the egg, is less affected than the white by previous production.

The following tables give the data for the three-egg cycles:

TABLE XXVI.—Average Weight of Eggs and Yolks in Three-Egg Cycles From Pen 1 in 1915.

Hen No.	Eggs	Day	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
581	1	1	53.33	16.988	31.85
581	1	2	52.75	17.184	32.58
581	1	3	52.43	16.495	31.46
583	2	1	57.56	17.150	29.79
583	2	2	55.69	17.717	31.81
583	2	3	55.27	17.831	32.26
584	5	1	56.13	16.565	29.51
584	5	2	56.43	16.805	29.78
584	5	3	55.29	16.277	29.44
586	1	1	57.33	16.489	28.75
586	1	2	55.64	16.631	29.89
586	1	3	53.40	15.284	28.62
587	2	1	49.61	14.923	30.08
587	2	2	49.44	15.274	30.89
587	2	3	49.05	14.944	30.47
588	7	1	49.43	15.553	31.46
588	7	2	48.80	15.257	31.26
588	7	3	48.09	14.862	30.90
595	1	1	55.63	17.617	31.67
595	1	2	50.99	15.245	29.90
595	1	3	55.23	16.952	30.69
585	1	1	50.89	15.659	30.77
585	1	2	51.21	15.723	30.70
585	1	3	51.36	15.788	30.74
592	1	1	49.28	15.713	31.89
592	1	2	49.77	16.452	33.06
592	1	3	49.85	16.216	32.53
Total	21	1	52.73	16.110	30.55
	21	2	52.11	16.097	30.89
	21	3	51.71	15.795	30.55

TABLE XXVII.—Average Weight of Eggs and Yolks in Three-Egg Cycles From Pen 2 in 1915.

Hen No.	Eggs	Day	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
654	5	1	52.57	17.255	32.82
654	5	2	52.17	17.045	32.67
654	5	3	52.12	16.850	32.33
634	6	1	51.44	15.533	30.20
634	6	2	51.83	15.928	30.73
634	6	3	50.21	15.773	31.41
625	4	1	55.38	16.991	30.68
625	4	2	55.44	17.526	31.61
625	4	3	54.83	17.165	31.31
629	2	1	53.13	16.497	31.04
629	2	2	51.28	15.754	30.72
629	2	3	51.35	16.156	31.46
694	7	1	53.62	16.455	30.69
694	7	2	54.93	16.867	30.70
694	7	3	54.92	16.645	30.31

TABLE XXVII (Cont'd).—Average Weight of Eggs and Yolks in Three-Egg Cycles From Pen 2 in 1915.

Hen No.	Eggs	Day	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
678	1	1	57.65	18.424	31.96
678	1	2	53.48	18.150	33.94
678	1	3	56.17	18.239	32.47
671	3	1	56.78	14.595	25.70
671	3	2	54.98	14.514	26.40
671	3	3	54.00	14.396	26.66
645	2	1	62.19	17.397	27.97
645	2	2	61.45	18.047	29.37
645	2	3	60.36	17.017	28.19
202	1	1	56.58	17.355	30.67
202	1	2	51.88	17.297	33.34
202	1	3	49.89	15.656	31.38
620	1	1	53.81	17.320	32.19
620	1	2	55.61	17.329	31.16
620	1	3	55.29	17.188	31.09
669	2	1	56.92	16.038	28.18
669	2	2	57.59	16.431	28.53
669	2	3	56.50	15.984	28.29
631	1	1	64.08	16.326	25.48
631	1	2	54.10	15.848	29.29
631	1	3	54.97	15.607	28.39
Total	35	1	54.72	16.448	30.06
	35	2	54.25	16.617	30.63
	35	3	53.73	16.350	30.43

TABLE XXVIII.—Average Weight of Eggs and Yolks in Three-Egg Cycles From Pen 1 in 1916.

Hen No.	Eggs	Day	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
581	7	1	59.99	19.512	32.53
581	7	2	57.89	19.343	33.41
581	7	3	56.52	18.381	32.52
583	1	1	68.89	21.236	30.83
583	1	2	62.39	20.236	32.44
583	1	3	61.91	19.981	32.27
584	2	1	60.32	18.977	31.46
584	2	2	58.59	19.246	32.85
584	2	3	56.94	18.008	31.63
587	4	1	57.89	17.024	29.41
587	4	2	53.45	16.042	30.01
587	4	3	52.98	15.749	29.73
591	1	1	68.77	19.164	27.87
591	1	2	68.07	19.695	28.93
591	1	3	64.27	18.603	28.94
596	2	1	57.58	16.566	28.77
596	2	2	56.76	17.075	30.08
596	2	3	57.26	17.230	30.09
Total	17	1	60.29	18.598	30.85
	17	2	57.66	18.361	31.84
	17	3	56.59	17.689	31.26

TABLE XXIX.—Average Weight of Eggs and Yolks in Three-Egg Cycles From Pen 2 in 1916.

Hen No.	Eggs	Day	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
625	11	1	58.73	19.219	32.72
625	11	2	56.74	18.771	33.08
625	11	3	55.85	18.442	33.02
680	2	1	57.20	16.723	29.23
680	2	2	55.46	16.309	29.41
680	2	3	51.52	16.039	31.13
671	2	1	55.36	15.333	27.70
671	2	2	56.48	15.560	27.55
671	2	3	54.80	14.935	27.25
678	2	1	57.55	18.899	32.84
678	2	2	57.33	19.090	33.00
678	2	3	55.13	18.128	32.88
Total	17	1	58.01	18.430	31.77
	17	2	56.62	18.141	32.04
	17	3	55.13	17.709	32.12

As the position of the egg advances in the cycle the yolk averages somewhat smaller, but with one exception the percentage of the total egg that is yolk is greater on the second day.

TABLE XXX.—Average Weight of Eggs and Yolks in Four-Egg Cycles From Pens 1 and 2 in 1915 and Pens 1 and 2 in 1916.

No. Hens.	Eggs	Day	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
Pen 1, 1915.					
6	7	1	55.35	16.474	29.76
6	7	2	52.91	15.958	30.16
6	7	3	53.04	16.345	30.82
6	7	4	53.58	15.989	29.84
Pen 2, 1915.					
4	7	1	54.36	14.818	27.26
4	7	2	53.11	15.519	29.22
4	7	3	53.81	15.389	28.60
4	7	4	54.06	15.517	28.70
Pen 1, 1916.					
3	5	1	58.23	17.963	30.85
3	5	2	56.14	18.139	32.31
3	5	3	54.79	17.889	32.65
3	5	4	54.83	17.796	32.46
Pen 2, 1916.					
3	7	1	58.07	19.087	32.87
2	7	2	58.05	19.100	32.90
2	7	3	56.90	18.675	32.82
2	7	4	55.03	18.044	32.79

TABLE XXXI.—Summary of the Results of Four-Egg Cycles.

Eggs	Day	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
26	1	56.37	17.018	30.19
26	2	54.97	17.105	31.12
26	3	54.62	17.012	31.15
26	4	54.34	16.763	30.85

The average weight of the yolks does not vary greatly from one day to another, but the percentage of the total egg that is yolk seems to be somewhat larger on the second and third days. The average weight of the eggs decreases as the position in the cycle advances.

CHARACTERISTICS OF EGGS LAID BY DIFFERENT HENS.

As already pointed out it has been established by various investigators that the eggs laid by certain hens usually hatch well and produce strong, vigorous chicks, while the eggs from other hens neither hatch well nor produce strong chicks, and it has seemed wise to study the available data with reference to the weight of the yolks and the percentage of the total egg that is yolk, as laid by the different hens under observation.

The following tables show the number of eggs laid by the different hens, with their average weight, the average weight of the yolks, and the percentage of the total egg weight that was yolk:

TABLE XXXII.—Number of Eggs, Their Average Weight, Weight of Yolks, and the Percent Yolk of Eggs Laid by the Different Hens in Pen 1 in 1915.

Hen No.	No. Eggs	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
581	61	52.34	16.824	32.14
582	56	50.26	15.615	31.07
583	39	56.62	16.869	29.79
584	46	55.70	16.741	30.06
586	41	54.60	15.610	28.59
587	54	47.95	14.104	29.41
588	64	49.12	15.560	31.68
589	60	50.16	14.989	29.88
594	23	56.21	16.211	28.84
595	60	57.28	17.663	30.84
585	23	50.30	14.910	29.64
590	20	53.84	14.697	27.30
591	10	55.61	13.858	24.92
592	19	48.74	15.682	32.17
593	23	51.71	15.381	29.75
596	15	52.07	14.118	27.11
597	11	54.40	17.285	31.77
Total--	625	52.44	15.819	30.17

TABLE XXXIII.—Number of Eggs, Their Average Weight, Weight of Yolks, and the Percent Yolk of Eggs Laid by the Different Hens in Pen 2 in 1915.

Hen No.	No. Eggs	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
629	47	50.54	15.505	30.68
625	69	55.73	17.320	31.08
654	67	53.16	17.142	32.25
634	47	51.62	15.489	30.01
680	42	55.47	16.621	29.96
694	56	53.51	16.395	30.64
678	53	52.48	17.207	32.79
671	66	54.17	14.003	25.85
645	47	60.26	16.732	27.77
202	22	55.12	16.390	29.74
615	14	59.32	18.642	31.43
623	4	53.97	17.037	31.57
620	32	52.83	16.650	31.52
669	24	55.55	15.476	27.86
631	17	56.34	15.174	26.93
660	16	54.34	14.373	26.45
617	9	53.93	15.860	29.41
Total--	632	54.46	16.213.	29.77

TABLE XXXIV.—Number of Eggs, Their Average Weight, Weight of Yolks, and the Percent Yolk of Eggs Laid by the Different Hens in Pen 1 in 1916.

Hen No.	No. Eggs	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
581	69	57.43	19.088	33.24
583	55	59.87	18.478	30.86
584	34	55.72	17.516	31.44
585	12	53.69	16.738	31.18
587	63	54.24	15.932	29.37
588	52	51.35	16.935	32.98
589	33	52.90	16.321	30.85
590	8	61.63	18.239	29.58
591	44	63.45	17.800	28.05
592	9	53.46	18.264	34.16
593	6	52.19	16.385	31.40
595	26	60.24	19.051	31.63
596	14	56.04	16.441	29.34
597	5	61.42	20.092	32.71
Total--	430	56.66	17.606	31.07

TABLE XXXV.—Number of Eggs, Their Average Weight, Weight of Yolks, and the Percentage Yolk of Eggs Laid by the Different Hens in Pen 2 in 1916.

Hen No.	No. Eggs	Average Weight of Eggs	Average Weight of Yolks	Percent Yolk
631	18	54.67	17.469	31.95
660	9	55.20	16.324	29.57
620	37	56.07	17.999	32.10
625	68	57.52	18.753	32.60
680	21	56.05	17.009	30.35
671	63	56.57	15.917	28.14
678	41	55.94	18.274	32.67
694	51	55.82	18.573	33.27
629	13	56.20	18.505	32.93
615	5	58.92	20.362	34.56
669	13	63.68	18.740	29.43
Total--	339	56.64	17.832	31.48

It is to be observed from the preceding tables that the average weight of the yolks of the eggs laid by the different hens varied considerably.

Hen 591 in 1915 laid ten eggs the yolks of which were separated from the whites. These eggs averaged 55.61 grams and the average weight of the yolks was 13.858 grams, or 24.92 percent of the total egg. Hen 615 laid five eggs which were examined in 1916. These averaged 58.92 grams, and the yolks 20.362 grams, or 34.56 percent of the total egg. This is a very striking and important variation and may be a reason why the chicks from certain eggs are stronger than from others.

The following tables give the weight of the eggs laid by certain hens, together with the weight of the yolks and the percent of the total egg that was yolk:

TABLE XXXVI.—Weight of Eggs, Weight of Yolks, and the Percent Yolk of Eggs Laid by Hen 581 From Pen 1 in 1915.

Date	Weight of Eggs	Weight of Yolks	Percent Yolk
Feb. 24-----	56.51	19.673	34.81
Feb. 25-----	52.16	17.194	32.96
Feb. 27-----	53.21	17.883	33.61
March 14-----	51.68	16.977	32.85
March 16-----	54.34	18.119	33.34
March 17-----	54.45	18.104	33.25
March 19-----	52.84	19.060	36.07
March 21-----	52.84	18.051	34.16
March 24-----	50.78	16.610	32.71
March 26-----	48.76	15.609	32.01
March 27-----	52.32	16.864	32.23
March 29-----	53.33	16.988	31.85
March 30-----	52.75	17.184	32.58
March 31-----	52.45	16.495	31.45
April 2-----	53.07	16.622	31.32
April 3-----	50.43	15.087	29.92
April 5-----	50.77	15.530	30.59
April 6-----	50.45	15.505	30.73
April 8-----	50.23	16.037	31.93
April 9-----	50.94	16.470	32.33
April 11-----	51.85	16.839	32.48
April 12-----	52.54	16.933	32.23
April 14-----	53.29	17.105	32.10
April 15-----	51.23	16.370	31.95
April 18-----	50.91	16.538	32.49
April 26-----	55.40	14.212	25.65
April 28-----	48.43	15.372	31.74
April 30-----	49.09	15.369	31.31
May 1-----	47.14	14.458	30.67

TABLE XXXVI (Cont'd).—Weight of Eggs, Weight of Yolks, and the Percent Yolk of Eggs Laid by Hen 581 From Pen 1 in 1915.

Date	Weight of Eggs	Weight of Yolks	Percent Yolk
May 3	48.41	15.035	31.06
May 6	50.11	15.446	30.83
May 8	50.75	15.743	31.02
May 10	48.70	14.612	30.00
May 28	52.00	17.287	33.24
May 30	57.76	17.866	30.93
May 31	56.33	18.473	32.79
June 1	57.11	18.122	31.73
June 2	55.70	18.340	32.93
June 4	54.07	18.152	33.57
June 5	54.61	17.542	32.12
June 8	51.79	16.391	31.65
June 9	51.18	16.630	32.49
June 11	51.34	16.078	31.32
June 12	51.99	16.714	32.15
June 14	53.38	17.454	32.70
June 15	53.51	17.334	32.39
June 17	50.04	16.316	32.61
July 7	43.92	13.290	30.26
July 9	49.69	16.840	33.89
July 10	55.12	17.594	31.92
July 12	54.65	17.732	32.45
July 14	55.69	18.614	33.42
July 15	54.50	17.923	32.89
July 18	55.61	18.419	33.12
July 19	53.44	16.876	31.58
July 21	56.01	17.931	32.01
July 22	54.73	17.197	31.42
July 24	53.26	17.524	32.90
July 25	53.38	16.640	31.17
July 27	50.19	16.713	33.30
Aug. 1	49.54	16.198	32.70
Average	52.34	16.824	32.14

TABLE XXXVII.—Weight of Eggs, Weight of Yolks, and the Percent Yolk of Eggs Laid by Hen 581 from Pen 1 in 1916.

Date	Weight of Eggs	Weight of Yolks	Percent Yolk
March 3	57.62	19.709	34.21
March 8	61.08	21.673	35.48
March 9	58.04	21.241	36.60
March 11	60.74	21.210	34.92
March 12	57.76	19.872	34.40
March 14	55.55	18.285	32.92
March 16	53.94	17.914	33.21
March 31	58.61	20.593	35.14
April 1	59.80	20.491	34.27
April 3	58.96	20.302	34.43
April 4	59.34	20.349	34.29
April 6	62.13	20.602	33.16
April 7	59.66	20.470	34.31
April 8	58.03	19.057	32.84
April 10	62.32	20.158	32.35

TABLE XXXVII (Cont'd).—Weight of Eggs, Weight of Yolks, and the Percent Yolk of Eggs Laid by Hen 581 From Pen 1 in 1916.

Date	Weight of Eggs	Weight of Yolks	Percent Yolk
April 11	58.59	19.714	33.65
April 12	59.99	19.595	32.66
April 14	63.95	20.826	32.57
April 20	60.47	20.074	33.20
April 21	58.58	20.139	34.38
April 23	59.90	20.644	34.46
April 24	56.20	19.132	34.04
April 26	57.12	18.570	32.51
April 27	55.70	19.000	34.11
April 28	56.00	18.585	33.19
April 30	56.72	18.716	33.00
May 1	52.94	18.333	34.63
May 3	57.08	19.336	33.88
May 4	57.65	19.335	33.54
May 7	59.29	18.634	31.43
May 8	58.83	19.608	33.33
May 9	54.42	17.598	32.34
May 15	60.52	19.336	31.95
May 16	56.44	19.255	34.12
May 17	56.64	18.415	32.51
May 19	59.35	19.558	32.95
May 20	58.73	19.698	33.54
May 22	56.19	18.079	32.18
May 24	61.27	19.816	32.34
May 25	55.40	18.538	33.46
May 26	54.02	17.406	32.22
June 2	58.93	19.762	33.53
June 3	57.65	19.489	33.81
June 4	57.05	18.518	32.46
June 6	57.74	19.343	33.50
June 7	57.44	18.195	31.68
June 8	55.52	17.785	32.03
June 10	59.50	19.237	32.33
June 13	59.05	18.752	31.76
June 14	56.61	18.669	32.98
June 15	53.98	17.700	32.79
June 17	56.65	18.949	33.45
June 18	56.19	18.241	32.46
June 20	55.07	16.886	30.66
June 22	54.07	17.528	32.42
June 24	55.95	18.291	32.69
June 26	54.68	17.885	32.71
June 29	57.60	19.551	33.94
July 1	54.88	18.534	33.77
July 2	55.65	17.672	31.76
July 4	55.29	17.880	32.34
July 9	53.63	17.530	32.69
July 13	56.57	18.872	33.36
July 15	57.66	19.696	34.16
July 16	54.76	18.640	34.04
July 18	56.92	18.603	32.68
July 20	58.94	19.156	32.50
July 21	53.62	17.748	33.10
July 23	55.59	18.121	32.60
Average	57.43	19.088	33.24

TABLE XXXVIII.—Average Weight of Eggs, Weight of Yolks, and the Percent Yolk of Eggs Laid by Hen 588 From Pen 1 in 1915.

Date	Weight of Eggs	Weight of Yolks	Percent Yolk
Feb. 25	52.06	15.908	30.56
Feb. 27	52.07	15.803	30.35
Feb. 28	50.53	16.078	31.82
March 17	49.00	14.449	29.49
March 19	49.52	15.763	31.83
March 20	50.47	16.138	31.98
March 22	51.50	16.823	32.67
March 23	51.48	17.255	33.52
March 25	51.82	16.818	32.46
March 26	48.39	15.915	32.89
March 28	48.80	15.289	31.33
March 30	47.92	14.891	31.07
April 12	49.26	15.522	31.51
April 13	48.96	15.920	32.52
April 14	48.45	15.631	32.26
April 17	51.94	17.250	33.21
April 18	51.54	17.030	33.04
April 21	53.29	16.947	31.80
April 24	52.67	17.508	33.24
April 25	51.26	16.318	31.83
April 26	48.78	15.695	32.18
April 27	48.66	15.931	32.74
April 29	50.28	16.307	32.43
April 30	51.22	15.945	31.13
May 1	49.87	15.665	31.41
May 4	51.19	15.442	30.17
May 5	50.01	15.058	30.11
May 7	50.50	15.918	31.52
May 8	49.10	15.085	30.72
May 9	46.92	14.171	30.20
May 11	49.56	15.666	31.61
May 12	47.30	14.889	31.48
May 13	46.87	14.451	30.83
May 15	49.54	15.705	31.70
May 16	49.98	15.743	31.50
May 25	47.36	15.196	32.09
May 27	44.02	14.260	32.39
June 8	47.76	14.734	30.85
June 9	45.05	14.735	32.71
June 11	48.69	15.332	31.49
June 12	47.63	15.289	32.10
June 14	50.13	16.575	33.06
June 15	47.06	15.042	31.96
June 17	46.18	15.281	33.09
June 19	47.67	14.481	30.38
June 21	49.29	15.271	30.98
June 28	49.03	15.368	31.34
June 30	49.70	15.208	30.60
July 1	46.84	15.211	32.47
July 3	47.63	15.115	31.73
July 5	48.93	15.702	32.09
July 6	48.29	15.168	31.41
July 8	49.66	15.490	31.19
July 10	50.73	16.310	32.15
July 11	49.42	15.400	31.16

TABLE XXXVIII (Cont'd).—Average Weight of Eggs, Weight of Yolks, and the Percent Yolk of Eggs Laid by Hen 588 From Pen 1 in 1915.

Date	Weight of Eggs	Weight of Yolks	Percent Yolk
July 13	51.23	15.974	31.18
July 14	46.48	14.812	31.87
July 15	46.51	14.836	31.90
July 18	48.88	15.006	30.70
July 20	49.38	15.858	32.11
July 21	48.00	15.104	31.47
July 22	47.23	14.856	31.45
July 24	48.10	15.268	31.74
July 25	45.96	13.950	30.35
Average	49.12	15.560	31.68

TABLE XXXIX.—Average Weight of Eggs, Weight of Yolks, and the Percent Yolk of Eggs Laid by Hen 588 From Pen 1 in 1916.

Date	Weight of Eggs	Weight of Yolks	Percent Yolk
Feb. 25	52.64	17.237	32.75
Feb. 29	51.39	14.076	27.39
March 2	52.11	16.998	32.62
March 4	54.00	17.873	33.10
March 6	50.51	16.628	32.92
March 13	49.03	15.917	32.46
March 15	54.00	17.678	32.74
March 17	56.14	18.194	32.41
March 18	51.04	16.734	32.79
March 20	54.16	18.196	33.60
March 21	51.75	16.915	32.63
March 23	50.97	16.789	32.94
March 24	50.60	16.519	32.65
March 26	52.01	17.170	33.01
March 27	50.97	16.840	33.04
March 29	53.69	17.523	32.64
March 30	53.85	17.540	32.57
April 1	50.56	15.854	31.36
April 2	52.81	17.665	33.45
April 3	51.02	16.439	32.22
April 4	54.91	18.092	32.95
April 6	55.79	19.363	34.71
April 7	57.25	19.673	34.36
April 8	56.29	19.142	34.01
April 9	53.33	17.457	32.73
April 11	56.30	18.819	33.43
April 12	52.43	17.608	33.58
April 13	51.78	17.259	33.33
April 20	53.10	18.017	33.93
April 22	52.56	16.825	32.01
April 24	53.01	17.369	32.77
April 25	53.45	17.720	33.15
April 26	51.80	17.014	32.85
April 27	53.09	17.476	32.92
April 30	53.15	16.513	31.07
May 1	48.36	15.588	32.23
May 3	51.14	16.582	32.42
May 4	52.16	17.262	33.09
May 5	50.28	16.859	33.53
May 6	50.17	16.639	33.17

TABLE XXXIX (Cont'd).—Average Weight of Eggs, Weight of Yolks, and the Percent Yolk of Eggs Laid by Hen 588 From Pen 1 in 1916.

Date	Weight of Eggs	Weight of Yolks	Percent Yolk
May 9	49.97	16.462	32.94
May 10	49.66	16.341	32.91
May 15	44.78	14.780	33.01
May 16	44.92	14.696	32.72
May 18	48.92	16.919	34.58
May 19	47.97	16.152	33.67
May 20	46.12	15.548	33.71
May 22	48.73	16.510	33.88
May 23	47.57	15.932	33.49
May 24	46.36	15.666	33.79
June 2	47.44	16.374	34.52
June 4	44.11	15.197	34.45
Average	51.35	16.935	32.98

TABLE XL.—Average Weight of Eggs, Weight of Yolks, and the Percent Yolk of Eggs Laid by Hen 625 From Pen 2 in 1915.

Date	Weight of Eggs	Weight of Yolks	Percent Yolk
Feb. 28	53.59	15.711	29.32
March 1	54.17	16.179	29.87
March 3	55.32	17.053	30.83
March 4	56.66	17.892	31.58
March 5	56.19	17.521	31.18
March 7	57.70	17.597	30.50
March 8	54.34	17.273	31.79
March 10	55.38	17.647	31.87
March 11	53.15	17.162	32.29
March 13	55.65	17.268	31.03
March 16	54.58	16.236	29.75
March 17	53.78	16.798	31.24
March 19	56.14	16.432	29.27
March 20	55.01	16.812	30.56
March 22	56.93	17.756	31.19
March 23	57.33	17.685	30.85
March 27	57.70	17.811	30.87
March 29	59.31	18.296	30.85
March 30	57.74	18.008	31.19
April 1	58.64	17.859	30.46
April 2	57.43	17.969	31.29
April 4	58.73	18.719	31.87
April 5	57.22	18.593	32.49
April 7	53.76	17.625	32.79
April 8	47.77	16.385	34.30
April 11	54.45	16.376	30.08
April 14	55.56	17.120	30.81
April 15	53.95	16.821	31.18
April 17	58.03	17.911	30.87
April 18	57.40	18.844	32.83
April 21	57.36	18.668	32.54
April 22	55.89	18.216	32.59
April 23	56.37	17.733	31.46
April 25	53.85	16.866	31.32
April 27	54.69	16.420	30.02
April 28	52.43	16.370	31.22

TABLE XL (Cont'd).—Average Weight of Eggs, Weight of Yolks, and the Percent Yolk of Eggs Laid by Hen 625 From Pen 2 in 1915.

Date	Weight of Eggs	Weight of Yolks	Percent Yolk
April 30	53.52	16.143	30.16
May 1	53.12	16.079	30.27
May 2	51.11	15.889	31.09
May 4	53.29	16.057	30.13
May 5	50.42	15.399	30.54
May 7	54.58	15.992	29.30
May 9	54.34	15.808	29.09
May 11	55.09	16.574	30.09
May 13	56.02	16.864	30.10
May 28	55.33	16.100	29.10
May 29	56.11	17.919	31.94
May 30	55.66	17.517	31.47
June 1	59.73	18.668	31.25
June 3	57.08	17.767	31.13
June 10	54.13	16.349	30.20
June 20	55.21	15.627	28.30
June 21	54.02	17.236	31.91
June 23	56.01	17.954	32.05
June 24	55.11	17.188	31.19
July 2	55.20	17.295	31.33
July 5	54.78	17.542	32.02
July 7	53.82	16.104	29.92
July 16	53.37	15.804	29.61
July 18	58.27	17.833	30.60
July 19	58.66	18.816	32.08
July 20	58.44	18.758	32.10
July 21	60.49	19.117	31.60
July 23	63.60	20.026	31.86
July 24	54.64	16.988	31.09
July 26	59.13	18.658	31.55
July 27	57.75	18.791	32.54
July 29	58.19	18.505	31.80
Aug. 1	55.12	18.059	32.76
Average	55.73	17.320	31.08

TABLE XLI.—Average Weight of Eggs, Weight of Yolks, and the Percent Yolk of Eggs Laid by Hen 625 From Pen 2 in 1916.

Date	Weight of Eggs	Weight of Yolks	Percent Yolk
March 16	59.19	17.382	29.37
March 18	60.58	18.933	31.25
March 20	61.68	19.301	31.29
March 22	60.18	18.522	30.78
March 23	57.90	18.793	32.46
March 28	59.21	18.622	31.45
April 1	60.51	19.431	32.11
April 3	60.98	19.020	31.19
April 4	59.28	18.375	31.00
April 5	57.28	17.245	30.11
April 8	58.28	18.219	31.26
April 9	56.99	17.671	31.01
April 11	59.69	18.871	31.62
April 12	58.15	18.636	32.05
April 13	58.25	18.649	32.02
April 14	56.47	17.452	30.91
April 21	60.89	19.719	32.38

TABLE XLI (Cont'd).—Average Weight of Eggs, Weight of Yolks, and the Percent Yolk of Eggs Laid by Hen 625 From Pen 2 in 1916.

Date	Weight of Eggs	Weight of Yolks	Percent Yolk
April 23	57.85	19.276	28.41
April 25	61.09	19.509	31.94
April 26	58.70	19.141	32.61
April 27	60.44	19.232	31.82
April 29	60.86	19.650	32.29
April 30	59.73	19.915	33.34
May 1	57.62	18.725	32.50
May 2	57.91	18.942	32.71
May 4	60.29	19.584	32.48
May 6	57.27	18.667	32.59
May 8	59.16	19.259	32.55
May 9	57.72	19.124	33.13
May 15	53.48	18.013	33.68
May 17	57.74	18.581	32.18
May 22	57.53	18.744	32.58
May 23	57.00	18.758	32.91
May 24	55.24	18.020	32.62
May 25	54.72	17.834	32.59
June 3	54.33	18.434	33.93
June 5	58.41	19.169	32.82
June 6	56.92	19.054	33.48
June 7	56.75	18.801	33.13
June 10	59.24	19.062	32.18
June 11	57.31	19.316	33.70
June 12	56.97	19.171	33.65
June 14	58.52	19.474	33.28
June 15	56.59	18.887	33.37
June 16	56.78	18.763	33.04
June 18	57.58	18.758	32.58
June 19	57.33	18.997	33.14
June 20	55.77	18.483	33.14
June 22	60.87	20.530	33.73
June 23	54.07	17.476	32.32
June 24	53.67	18.030	33.59
June 27	57.88	19.432	33.57
June 28	55.74	18.710	33.57
June 29	54.05	18.566	34.35
July 1	58.46	19.354	33.11
July 2	55.38	18.417	33.26
July 3	53.90	18.332	34.01
July 5	57.93	18.970	32.00
July 9	56.37	18.606	33.01
July 10	57.02	19.308	33.86
July 11	54.25	18.123	33.41
July 13	58.41	19.689	33.71
July 14	54.69	18.439	33.72
July 17	56.60	18.494	32.67
July 18	55.75	18.807	33.73
July 19	54.52	18.119	33.23
July 22	56.51	18.553	32.83
July 23	53.11	17.098	32.19
Average	57.52	18.753	32.60

TABLE XLII.—Average Weight of Eggs, Weight of Yolks, and the Percent Yolk of Eggs Laid by Hen 694 From Pen 2 in 1915.

Date	Weight of Eggs	Weight of Yolks	Percent Yolk
March 3	51.02	15.553	30.48
March 7	51.58	16.101	31.22
March 10	50.70	15.719	31.00
March 15	53.91	17.296	32.08
March 17	57.88	17.796	30.75
March 18	57.68	17.931	31.09
March 20	59.01	18.886	32.00
March 21	57.72	17.660	30.59
March 23	57.35	17.975	31.34
March 24	56.14	17.721	31.57
March 27	57.72	18.197	31.53
March 28	56.04	17.173	30.64
March 29	57.90	18.507	31.96
March 31	57.10	17.989	31.50
April 1	58.01	18.343	31.62
April 2	59.30	17.481	29.48
April 4	53.71	16.715	31.12
April 5	54.13	16.866	31.16
April 7	52.83	16.642	31.50
April 8	54.24	16.232	29.93
April 10	56.96	16.550	29.06
April 11	52.94	16.005	30.23
April 13	52.09	15.121	29.03
April 14	53.08	15.940	30.03
April 15	54.54	15.854	29.07
April 17	52.10	16.150	31.00
April 19	53.48	15.891	29.71
April 21	53.54	16.748	31.28
April 22	54.85	16.441	29.97
April 23	52.45	15.604	29.75
April 25	52.74	15.892	30.13
May 9	47.16	13.168	27.92
May 11	49.63	15.054	30.33
May 12	51.69	15.892	30.74
May 14	51.06	16.022	31.38
May 15	53.49	16.580	31.00
May 16	54.81	16.254	29.65
May 25	52.88	16.244	30.72
May 26	53.19	15.581	29.29
May 28	53.83	15.526	28.84
May 29	53.64	15.834	29.52
May 30	50.17	14.456	28.81
June 1	52.73	15.550	29.49
June 25	51.38	15.748	30.65
June 26	49.95	15.913	31.86
June 27	52.83	17.152	32.47
June 28	49.98	16.517	33.05
June 30	49.27	16.230	32.94
July 6	52.23	14.591	27.94
July 8	49.62	13.620	27.45
July 9	49.81	14.462	29.03
July 26	50.61	15.445	30.52
July 27	53.10	17.622	33.19
July 29	50.03	15.579	31.14
July 30	55.39	17.760	32.06
July 31	55.26	18.356	33.22
Average	53.51	16.395	30.64

TABLE XLIII.—Average Weight of Eggs, Weight of Yolks, and the Percent Yolk of Eggs Laid by Hen 694 From Pen 2 in 1916.

Date	Weight of Eggs	Weight of Yolks	Percent Yolk
Feb. 27	56.13	19.654	35.01
March 2	62.26	21.545	34.61
March 4	60.28	18.024	29.90
March 7	59.53	20.861	35.04
March 10	60.13	20.032	33.31
March 12	62.03	21.065	33.96
March 15	59.70	20.201	33.84
March 16	57.80	19.762	34.19
March 18	60.77	20.472	33.69
March 28	60.03	20.060	33.42
March 30	60.91	20.000	32.84
April 2	59.55	19.092	32.06
April 3	59.20	19.852	33.53
April 4	60.83	19.014	31.26
April 5	55.48	18.099	32.62
April 7	59.80	19.582	32.75
April 8	58.00	19.125	32.97
April 9	56.70	18.927	33.38
April 10	51.61	17.627	34.15
April 12	55.54	17.822	32.09
April 14	55.54	17.582	31.66
April 20	51.62	16.146	31.28
April 21	50.43	16.329	32.38
May 3	51.94	16.780	32.31
May 5	51.54	16.903	32.80
May 6	53.98	17.991	33.33
May 7	53.38	18.426	34.52
May 8	54.04	18.149	33.58
May 9	54.42	18.236	33.51
May 10	53.55	17.631	32.92
May 16	53.19	18.665	35.09
May 17	53.01	18.062	34.07
May 21	54.02	17.594	32.57
May 22	52.04	16.701	32.09
May 23	55.01	16.134	29.33
June 13	53.80	18.632	27.51
June 14	53.13	18.205	34.27
June 15	51.16	17.884	34.96
June 16	52.27	18.419	35.24
June 17	53.92	19.146	35.51
June 19	54.98	19.464	35.40
June 20	57.75	18.978	32.86
June 21	57.94	20.166	34.80
June 22	59.42	20.261	34.10
June 24	55.02	18.480	33.59
June 25	54.98	17.878	32.52
June 27	56.74	17.610	31.04
June 29	54.09	18.206	33.66
June 30	56.55	18.439	32.61
July 1	51.69	17.224	33.32
July 2	49.63	16.096	32.43
Average	55.82	18.573	32.27

The preceding tables show that the eggs laid by individual hens vary considerably in respect to their weight, the weight of the yolk, and the percent of the total egg weight that is yolk. To what extent these variations are due to excitement, digestive disturbances, fluctuations in temperature, or other causes is impossible to determine from the available data, and should be made the subject of further inquiry.

CONCLUSIONS.

- (1). The heavier the egg, the heavier the yolk.
- (2). The heavier the egg, the smaller is the total percentage of the egg that is yolk.
- (3). When eggs are laid in cycles the first egg in the cycle is usually the heaviest, the other eggs decreasing in weight according to their position in the cycle.
- (4). The weight of the yolk usually decreases according to the position of the egg in the cycle.
- (5). In general, the first egg in all cycles has a lower percentage of total egg that is yolk than has any of the other eggs.
- (6). The eggs laid by individual hens not only vary widely in regard to their average weight and the average weight of their yolks, but the average percentage of the total egg that is yolk also varies widely.
- (7). The results indicate that the presence of a considerable amount of animal protein in the ration for laying hens tends to weaken the vitelline membrane.
- (8). The eggs and yolks from the wheat fed fowls averaged somewhat heavier than the eggs and yolks from the corn fed fowls.
- (9). In 1915 with the smaller amount of scrap in the ration the percentage of the total egg that was yolk was greater in the eggs from the corn fed fowls; but in 1916 with a larger amount of scrap, the percentage was smaller than in the eggs from the wheat fed fowls.
- (10). During the second year of the test, the weight of eggs and yolks and the percentage of the total egg that was yolk, were greater than during the first year.

