

CHEMICAL ANALYSIS AND NUTRITIVE STUDY OF EGG COMPONENTS FOR DIFFERENT BREEDS AND CROSSES

By

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SUMMARY

The average percentage of the egg shell, white and Yolk are 12.26, 54.89 and 32.85 respectively. The percentage of the egg shell is the highest with the local breeds while it is the lowest with the foreign ones. The percentage of total edible part "T.E.P." (Yolk + white) follows on opposite direction to the percentage of egg shell. It appeared that the variations in the analysis of egg yolk or egg white are due to individuality rather than breed variations. It is also noticeable that the percentage of any nutrient in the egg yolk is more than in the egg white. The dry matter in the egg yolk is ca.4 times as much as that in the egg white (48.40% against 12.19%). The protein content in the yolk is about 1.5 times as much as in the white (17.47 against 11.30%). The fat in the white is practically nil, but constitutes the major nutrient in the yolk (28.18%). The average calorific value of the egg white is 466 cal. and that of egg yolk is 3273 Cal. per Kg. this is because the egg yolk contains more nutrients especially dry matter and protein as mentioned before. More over the egg white does not contain any fat (Being the highest physiological calorific value). During two laying seasons the local breed Baladi Red produced the least nutrients. It produced 4.580 Kg. total edible parts, 1.176 Kg. dry matter, 618.2 gm. total protein and 485.5 gm. total fat. The corresponding figures produced by its corresponding 50% cross breed with R.I.R. were 7.356 Kg., 2.467 Kg., 1278.9 gm. and 1030.0 gm. respectively. The calorific value obtained from the eggs produced by Baladi Red is about half as much as that of R.I.R. × Baladi Red (69607 cal. against 129812 cal.) The different cross breeds gave more nutrients from the egg they produced than both local and foreign breeds.

INTRODUCTION

The study was carried out to determine the percentage of the different parts of the egg, to study the chemical composition of the edible parts of the egg (egg yolk, egg white and whole egg) and to make a comparative study of the chemical analysis along with the calorific value of the eggs selected from 17 different breeds and crosses.

EXPERIMENTAL AND METHODS.

Eggs used

Three hundred and forty eggs were selected from 17 different breeds and crosses.

Methods of conducting the experiment

Twenty eggs laid at the same day and having nearly the same weight were selected from each of the 17 different breeds and crosses of fowls. Ten eggs were used for analysing the yolk and white separately, the other ten for analysing the whole edible part (yolk + white). The percentage of the different parts of the egg was also determined. The procedures were as follows:

A.—Determination of the different constituents of the egg

- 1.—The eggs were weighed to the nearest second decimal.
- 2.—A small hole of ca 2-3 mm. diameter was made in each egg.
- 3.—The white of the eggs was poured out from the holes in to a beaker.
- 4.—The egg shell was broken to take the egg yolk into another beaker
- 5.—The egg shell was collected in a third beaker.
- 6.—By the knowledge of the weight of each empty beaker and along with the contents (to the nearest 2nd decimal), the percentage of the yolk, white and egg shell were determined. The percentage of the whole edible parts was obtained by addition.

B.—Preparation of the samples for the chemical analysis

After collecting the 10 eggs yolk and white separately and the other 10 eggs mixed yolk and white, each sample was homogenized in a Waring blender of a suitable size. For analysis portions of ca 2-5 gm. were taken to the nearest fourth decimal, from a special weighing retort suitable for liquid analysis.

C.—Methods of the chemical analysis

Methods used followed the general conventional methods of the A.O.A.C., (1) using duplicate or triplicate samples for each determination.

1.—*Moisture*

It was determined by putting the sample in an aluminium dish provided with a tight fitting cover and having a diameter of ca 40 mm. Shredded filter paper had been put in the dish before putting the sample. The dish was put in an open air oven at 105°C for three hour (until constant weight).

2.—*Ash*

In a muffle furnace at 600°C for half an hour using glazed porcelain crucible containing shredded ashless filter paper.

3.—*Crude Protein*

Kjeldahl method was used (1) using mercury as catalyst with conc. H_2SO_4 (0.7 gm./30 ml.), digestion continued for 3 hrs. after clearing. The conversion factors for calculating protein were 6.62 for the egg yolk, 6.70 for the egg white and 6.68 for their mixture in the egg (4).

4.—*Crude Fat*

Ethyl ether was used for extraction using Soxhlet apparatus after drying the sample at 95°C for 24 hrs. in the thimbles fitted with shredded filter paper. A cooled stream of water (8°C) was used through the condensers, the rate of syphoning was 6 per hr. and the extraction continued for 8 hrs.

5.—*Total Carbohydrate*

It was obtained as the difference between 100 and the sum of the percentage of moisture, protein, fat and ash.

D.—**Method of calculating calorific value of egg nutrients**

It was calculated on the basis of the conventional physiological values, *i.e.*, 4 calories per one gram protein, 4 calories per one gram carbohydrate and 9 calories per one gram fat (4).

RESULTS AND DISCUSSION

A.—**Studying the percentages of the egg components of the different breeds and crosses**

The average percentage of the egg components for the different breeds and crosses can be summarized as shown in Table (1).

It appeared from this table that the average percentages of the egg yolk ranged between 30.00 and 36.28 for the egg of the different breeds and crosses with a general average 32.85%.

TABLE 1.—The average percentages of the egg components of different breeds and crosses

Breed	Yolk	White	Shell	T.E.P.*
	%	%	%	%
Local breeds	33.83	51.85	14.32	85.68
50% cross breeds of R.I.R.	34.00	52.58	13.42	86.58
75% cross breeds of R.I.R.	30.18	57.58	12.24	87.76
R.I.R.	32.21	57.49	10.30	89.70
75% cross breeds of L.S.	32.35	54.90	12.75	87.25
L.S.	33.98	54.63	11.39	88.61
75% cross breeds of Br. L.	30.00	57.74	12.26	87.74
Br. L.	36.28	52.38	11.34	88.66
Average for the different breeds	32.85	54.89	12.26	87.74

* T.E.P. = Total edible parts = egg yolk + egg white (Whole egg)

The average percentages of the egg white ranged between 51.85 and 57.74 for the different breeds and crosses with a general average 54.89%. It is usually noticed that the lower egg yolk percentage is associated with higher egg white content.

The average percentages of the egg shell ranged between 10.30 and 14.32 for the different breeds and crosses with a general average 12.26%.

The average percentages of the total edible parts ranged between 85.68 and 89.70 for the different breeds and crosses with a general average 87.74%.

B.—Chemical study and calorific value of the egg yolk egg white and the whole egg

1.—Egg yolk

Table (2) shows a comparative study of the chemical analysis and the calorific value of the egg Yolk for the different breeds and crosses.

From this table it appeared that the lowest moisture percentage was 50.32% for the 50% cross breeds of R.I.R. while the highest was 53.05% for the foreign breed Brown Leghorn and the average was 51.601.

The lowest protein percentage was 14.9% for the foreign breed L.S. and the highest was 18.25% for the 50% cross breeds of R.I.R. and the average was 17.47%.

The lowest fat percentage was 26.38% for the foreign breed R.I.R. and the highest was 31.41% for the foreign breed L.S. and the average was 28.18%.

TABLE 2.—The average chemical composition along with the calorific value of the egg yolk.

Breed	Moisture	Protein	Fat	Ash	Carbohy- drate	Calorific value per kg.
	%	%	%	%	%	Calories
Local breeds	51.67	18.07	26.96	1.63	1.67	3220
50% cross-breeds of R.I.R.	50.32	18.25	28.92	1.70	0.81	3330
75% cross breeds of R.I.R..	51.69	17.58	28.04	1.62	1.07	3290
R.I.R.	55.31	15.92	26.38	1.55	0.84	3040
75% cross breeds of L.S. . .	51.62	17.65	28.13	1.65	0.95	3260
L.S.	51.18	14.99	31.41	1.63	0.79	3460
75% cross breeds of Br.L. . .	50.95	18.06	27.99	1.69	1.31	3290
Br. L.	53.05	15.37	29.17	1.65	0.76	3270
Average for the different breeds	51.60	17.47	28.18	1.66	1.09	3273

The lowest ash percentage was 1.55 for R.I.R. and the highest was 1.70% for the 50 % cross breed of R.I.R. and the average was 1.66%.

The average of the calorific value per kg. egg yolk was 3273 cal. The lowest was 3040 cal. for the foreign breed R.I.R. and the highest was 3460 Cal. for the foreign breed L.S.

2.—Egg white

Table (3) shows a comparative study of the chemical analysis and the calorific value of the egg white for the different breeds and crosses.

TABLE 3.—The average chemical composition along with the calorific value of the egg white

Breed	Moisture	Protein	Fat	Ash	Carbohy- drate	Calorific value per kg.
	%	%	%	%	%	Calories
Local breeds	88.27	10.92	0	0.53	0.28	450
50%cross breeds of R.I.R. .	88.16	11.37	0	0.43	0.04	450
75%cross breeds of R.I.R. .	87.66	11.62	0	0.42	0.30	480
R.I.R.	87.64	10.62	0	0.69	1.05	470
75%cross breeds of L.S. . .	87.39	11.87	0	0.49	0.25	490
L.S.	87.39	10.11	0	0.60	1.90	440
75%cross breeds of Br.L. .	87.25	11.95	0	0.49	0.31	480
Br. L.	89.03	10.12	0	0.57	0.28	420
Average for the different breeds	87.81	11.30	0	0.51	0.38	466

From this table it appeared that the lowest moisture percentage was 87.39% for both the 75% cross breed of L.S. and the foreign breed L.S. The highest percentage was 89.03% for the foreign breed Br. L. and the average was 87.81%.

The lowest protein percentage was 10.11 for the foreign breed L.S. while the highest was 11.95 for the 75% cross breeds of Br. L. and the average was 11.30%.

The fat in the egg white is always nil for all the breeds and crosses.

The average percentage of the ash and carbohydrate was 0.51% and 0.38% respectively.

The average of the calorific value of the egg white was 466 calories. The lowest was 420 for the foreign breed Br. L. and the highest was 490 for the 75% cross breed of L. S.

3.—Whole egg

Table (4) shows a comparative study of the chemical analysis and the calorific value of the whole egg of the different breeds and crosses.

Form this table it appeared that the moisture percentage was 72.40 for the local breeds, the highest was 75.10 for the foreign breed R.I.R. and the average was 73.86%.

The lowest protein percentage was 12.46 for the foreign breed R.I.R., the highest was 14.63% for the 75% cross breeds of R.I.R. and the average was 13.68%.

The lowest fat percentage was 9.33 for the 75% cross breeds of R.I.R., the highest was 11.44 for the local breeds and the average was 10.70%.

The average of ash and carbohydrate was 0.95% and 0.81% respectively for the different breeds and crosses. The average of the calorific value of the whole egg was 1543 calories. The lowest was 1450 for the 75% cross breeds of R.I. R. and the highest was 1630 for the local breeds.

TABLE 4.—The average chemical composition along with the calorific value of the whole egg

Breed	Moisture	Proiten	Fat	Ash	Carbohy- drate	Calorific value per kg.
	%	%	%	%	%	caloires
Local breeds	72.40	14.18	11.44	0.97	1.01	1630
50%cross breeds of R.I.R. .	73.03	13.77	11.28	1.00	0.92	1610
75%cross breeds of R.I.R. .	74.45	14.63	9.33	0.92	0.67	1450
R.I.R.	75.10	12.46	10.58	0.89	0.95	1460
75%cross breeds of L.S. . .	74.28	13.25	10.94	0.95	0.58	1540
L.S.	74.74	12.77	10.53	0.96	1.00	1500
75% cross breeds of Br.L. .	74.71	13.53	10.24	0.90	0.62	1510
Br. L.	73.83	12.79	11.36	1.05	0.97	1570
Average for the different breeds	73.86	13.68	10.70	0.95	0.81	1543

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التركيب الكيماوى والقيمة الغذائية لمكونات البياضة من خلطان أنواع مختلفة

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الملخص

وجد أن متوسط النسبة المئوية لقشر البيض ، البياض والصفار هو ١٢ر٢٦ ٪ ، ٥٤ر٨٩ ٪ ، ٣٢ر٣٥ ٪ على التوالي . ولوحظ أن النسبة المئوية لقشر بيض الدجاج البلدى بلغت أعلاها بينما كانت النسبة المئوية لقشر بيض الدجاج الأجنبى أقلها .

ومن نتائج التحليل الكيماوى وجد أن النسبة المئوية للمركبات الغذائية فى الصفار تزيد عنها فى البياض بحيث بلغت المادة الجافة لصفار البيض ٤٨ر٤ ٪ بينما كانت ١٢ر١٩ ٪ للبياض . ووجد أن النسبة المئوية للبروتين فى الصفار ١٧ر٤٧ ٪ وكانت هذه النسبة ١١ر٣ ٪ فى البياض . وبينما نجد أن البياض خال تماما من الدهن نجد أن النسبة المئوية للدهن فى الصفار ٢٨ر١٨ ٪ .

وجد كذلك أن القيمة الحرارية للبياض تقل كثيرا عنها فى الصفار ، فبينما نجد أن القيمة الحرارية للبياض ٤٦٦ سعرا كبيرا نجدها ٣٢٧٣ سعرا للصفار وذلك لكل كيلو جرام واحد منها وهذا يرجع الى أن الصفار يحتوى على المركبات الغذائية بنسبة عالية وخاصة المادة الجافة والبروتين علاوة على أن البياض لا يحتوى على الدهن الذى يعطى قيمة حرارية عالية . أما بالنسبة للبيض الكلى (الصفار + البياض) فقد وجد أنه يقع وسطا بين الصفار والبياض .