Determination of Calcium, Magnesium and Phophorus in egg shell of different varieties of hen

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Introduction

The thickness, hardness and porosity of egg shell are important for marketing of eggs as the breaking strength[1,2] and stability of white and yolk of the egg depends on them. In addition to providing portals for the diffusion of respiratory gases, the shell contributes to the conservation of water and provides mechanical protection as well as scaffolding for the embryo. It has been reported that deficiency of calcium in poultry feed has adverse effects on egg production and majority of these eggs have weak shells[3]. In some cases the weak-shelled egg is broken in the uterus causing death of the bird[4]. As the hardness, thickness and porosity of the egg shell is directly related to the amount of magnesium and calcium present, the present work is important for grading and quality control of eggs.

Results and Discussion

Egg shells of 15 different varieties of hen were analyzed for calcium, magnesium and phosphorous and the results are reported in Table I. The percentage of these elements varied in different varieties under study. It was observed that the hardness and strength of the shell depended upon the amount of calcium and magnesium. For instance the eggs of varieties listed at No. 1 and 2 (Table I) had weaker shells than other varieties listed at No. 3 - 10. In another comparison between the eggs of the same variety (white leg-horn)of birds which were fed differently or were diseased, it was found that well-fed animals layed large in size and magnesium in their shells, proportions of calcium and magnesium in their shells, whereas in the egg shell of birds which were either diseased or were not so well fed the amount of cal-

Table 1. All values are reported on dry matter basis

No.	Variety of Hen	Colour of Shell	Ca %	Mg %	P %
1.	Chinese Hen	Brown	95.73	0.62	0.502
2.	Minny Flower	White	93.45	0.55	0.75
3.	Black Minorca	White	59.58	0.837	0.48
4.	Red Rhode	Brown	97.38	0.628	0.64
5.	Silkis Bantam	Brown	97.46	0.75	0.85
6.	Rose Comb Bantam	White	96.46	0.66	0.602
7.	Bab Cock	White	98.04	0.90	0.91
8.	Desi	Brown	98.55	0.87	0.85
9.	Desi	White	98.76	0.82	0.40
10.	White Leghorn	Brown	98.00	0.81	0.603
11.	Brown Queen	Brown	97.20	0.576	0.65
12.	White Leghorn Diseased bird abnormally small sized egg.	White	96.18	0.51	0.50
13.	White Leghorn Nomally fed	White	98.58	0.65	0.52
14.	White Leghorn well fed large sized egg	White	98.84	0.67	0.420
15.	P.I.A. Shaver 288	White	98.6	0.84	0.52

cium and magnesium decreased and the shell was weaker in strength. Phosphorous contents of shell were generally higher in brown eggs than white eggs.

In the colorimetric determination of phosphorous the molybedate phosphate complex is reduced by the addition of stannous chloride or 1,2,4,-amino-naphtho-sulphonic acid[5]. In this determination these reagents were replaced by ascorbic acid. With this change the phosphate concentration, even in lower range of 1-200 μg of phosphorous, could be measured with accuracy.

Experimental

Eggs were obtained from a local poultry farm. The reagents used were all of analytical grade.

Determination of Calcium and Magnesium Total amount of calcium and magnesium was obtained by titration of egg shell solution against EDTA using Erichrome Black T as indicator[6]. A similar titration using calcon as indicator gave the amount of calcium present. The amount of magnesium was obtained by difference.

Determination of Phosphorous The percentage of phosphorous was obtained by the method described by Pietrzyk[5] with the modification that 1,2,4-amino-naphtho-sulphonic acid was replaced in the same quantity by ascorbic acid.

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