CONTRIBUTIONS ON THE KNOWLEDGE OF EGGS QUALITY IN STANDARD TYPE ONDULATED BUDGERIGARS *(MELOPSITTACUS UNDULATUS)*

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Abstract

The investigations focused on the establishment of the main quality indexes for the eggs laid by undulated standard budgerigars "Melopsittacus undulatus". The assessments were run on 120 eggs, issued from three representative aviaries in Moldova, conventionally coded with L1, L2 and L3. They involved morphological, physical and chemical assays, run in accordance with the most used aviculture techniques. The achieved data revealed a good uniformity for most of the studied traits, as the lack of statistical significance of the differences found between groups proved it; however, significance occurred just for the eggs specific gravity. Quality indexes, established for the whole studied population presented various levels, as following: 2.51 g for the weight; 2.41 cm^3 for volume; 79.89% for shape index; 0.95 for specific gravity;0.25 mm for shell thickness and 0.177 kgf/cm^2 for shell breaking strength.

The results we achieved provide original data related to the quality of the eggs laid by standard type undulated parrot, contributing thus in making a larger picture of this species biology.

Key words: budgerigars, reproduction, eggs, quality, breeding

INTRODUCTION

As in other species of poultry, reproductive activity of standard undulated budgerigars (Melopsittacus undulatus) depends on the quality of breeders [2], the size of lay, but especially by the quality of laid eggs [3].

If in birds of economic interest, the indicators that define the qualities of hatching eggs are very well specified, these elements are unknown in budgerigars [6].

In this context, we aimed to determine the main indicators of the morphological, and physical quality of eggs from undulated standard budgerigars belonging to certain representative aviaries in Moldova.

MATERIAL AND METHOD

Researches have been carried out on 120 eggs, sampled from standard undulated budgerigars *„Melopsittacus undulatus"*, issued from three different aviaries, conventionally named L1, L2 and L3. Husbandry conditions did not differ significantly among aviaries.

Morphologic and physical quality indexes were assessed on 40 eggs/group (non-invasive methods), respectively on 10 eggs/group (invasive methods for internal content), while the chemical parameters were investigated on 3 eggs/group. The applied research methods are listed below:

- ***eggs weight*** (g) was assessed through weighting at the analytic scale;
- ***eggs volume*** (cm^3) was calculated through the relation: 0.519 x l x d^2 (l=large diameter of the egg; d=small diameter of the egg)*;*
- ***specific gravity***, through the computation of volume/weight ratio;
- ***eggshell thickness*** (mm), measured with the electronic calliper, on shell fragments from sharp, round ends and from middle area of the eggs, then average was calculated;
- ***shell breaking strength*** (kgf/cm^2) was established with the Schröder device, which exerts pressure on the vertically positioned egg;
- ***shape index*** (%), assessed through percent ratio between the small diameter (d) and the large diameter of the egg (D);

- ***albumen index*** - the ratio between albumen height (h) and its diameter (D);
- ***yolk index*** **–** the ratio between yolk height (h) and its diameter (D).

Achieved data were statistically processed, while the significance of the differences between means was tested through ANOVA single factor method.

RESULTS AND DISCUSSIONS

1. Eggs weight, is an important trait, which depends on the species, but also race, as a character with a strong genetic determinism [4] (h^2=0.47 to 0.53).

In birds of L1, egg weight showed a minimum of 2.12 g and a maximum of 2.87g, resulting in an average of 2.51 ± 0.03 g. In the case of the group L2, egg weight was at an average of 2.48±0.03 g, while for the birds in group L3 was determined the highest value of this parameter, of 2.54±0.03 g (tab. 1).

Table 1. Eggs weight (g) and the significance of the differences between groups

Notice (n=40)	$\overline{X} \pm s_{\overline{X}}$ (g)	V%	Min. (g)	Max. (g)
L1	2.51±0.03	7.74	2.12	2.87
L2	2.48±0.03	7.42	2.10	2.83
L3	2.54±0.03	8.60	2.15	2.98
Differences significance between groups	L1 vs. L2 = n.s.; F(0.5966) <Fα(3.9634) at 1:78 GL L1 vs. L3 = n.s.; F(0.3452) < Fα(3.9634) at 1:78 GL L2 vs. L3 = n.s.; F(1.7571) <Fα(3.9634) at 1:78 GL			

Among the three groups were not statistically significant differences identified. The character studied was very homogeneous for all cases examined, the evidence being small values of the coefficient of variation (V=7.42 to 8.60).

2. Eggs volume is an indicator of quality found in close correlation with the size and weight [6]. When we analyzed the volume of eggs showed a minimum value of 1.56cm^3 and a maximum of 3.09 cm^3, resulting in an average of 2.47±0.03 cm^3 in groupL1, of 2.38±0.05 cm^3 in group L2 and of 2.40±0.06 cm^3 in group L3 (tab. 2).

Although, among the groups were not statistically significant differences identified, the character had a very small variability in L1 (V%=8.78) and middle in groups L2 and L3 (V%=13.62 to 15.56).

Table 2. Eggs volume (cm^3) and the significance of the differences between groups

Notice (n=40)	$\overline{X} \pm s_{\overline{X}}$ (cm^3)	V%	Min. (cm^3)	Max. (cm^3)
L1	2.47±0.03	8.78	1.95	2.88
L2	2.38±0.05	13.62	1.56	3.09
L3	2.40±0.06	15.56	1.81	3.02
Differences significance between groups	L1 vs. L2 = n.s.; F(2.2031) <Fα(3.9634) at 1:78 GL L1 vs. L3 = n.s.; F(0.9115) <Fα(3.9634) at 1:78 GL L2 vs. L3 = n.s.; F(0.1122) <Fα(3.9634) at 1:78 GL			

3. Eggs shape index is the element of shape, in direct correlation with the hatching capacity [1]; between eggs shape and eggshell breaking strength have been identified forming negative phenotypic correlation (rf=-0.13).

Following the establishment of large diameter of the eggs revealed that the mean values were similar between groups, with an oscillation range between 19.34±0.18mm in group L3 and 19.43±0.15 mm at L1. Between groups differences were not found statistically significant. Character studied showed a very good homogeneity (V%=4.43 to 5.94%).

Regarding the small diameter of the eggs analyzed, measurements showed similar levels of experience among the groups (15.69±0.11 mm at L1, 15.34±0.12 mm in group L2, 15.42 ± 0.13 mm in group L3), hence the lack of statistical differences between groups, showed character and a very good homogeneity (V%=4.60 to 5.16).

The shape index was at average levels of 80.66±0.33% for eggs obtained from L1, of 79.22±0.24% in the L2 group and 79,78±0.24%, in those harvested from the L3 group. Between groups there were no statistically significant differences. Variability was very low, values calculated for the coefficient of variation being 2.97 to 5.45% (tab. 3).

Table 3. Eggs shape index (%) and the significance of the differences between groups

Notice	Groups (n=40)	$\overline{X} \pm s_{\overline{X}}$	V%	Min (%)	Max (%)
Large diameter (mm)	L1	19.43±0.15	4.79	15.24	20.93
	L2	19.36±0.14	4.43	17.24	21.12
	L3	19.34±0.18	5.94	16.94	21.17
	Differences significance between groups	L1 vs. L2 = n.s.; F(0.1030) <Fα(3.9634) at 1:78 GL L1 vs. L3 = n.s.; F(0.1338) <Fα(3.9634) at 1:78 GL L2 vs. L3 = n.s.; F(0.0087) <Fα(3.9634) at 1:78 GL			
Small diameter (mm)	L1	15.69±0.11	4.60	14.70	19.05
	L2	15.34±0.12	5.09	13.03	16.79
	L3	15.42±0.13	5.16	14.06	16.92
	Differences significance between groups	L1 vs. L2 = n.s.; F(0.4357) < Fα(3.9634) at 1:78 GL L1 vs. L3 = n.s.; F(2.5558) <Fα(3.9634) at 1:78 GL L2 vs. L3 = n.s.; F(0.2036) < Fα(3.9634) at 1:78 GL			
Shape index (%)	L1	80.66±0.33	5.45	75.63	103.02
	L2	79.22±0.24	2.97	73.28	86.54
	L3	79.78±0.24	2.98	75.67	86.54
	Differences significance between groups	L1 vs. L2 = n.s.; F(3.3609) <Fα(3.9634) at 1:78 GL L1 vs. L3 = n.s.; F(1.2478) <Fα(3.9634) at 1:78 GL L2 vs. L3 = n.s.; F(1.1299) <Fα(3.9634) at 1:78 GL			

4. Eggshell thickness. In birds of L1, the thickness of mineral shell presented a minimum of 0.2 mm and a maximum of 0.27 mm, resulting in an average of 0.25±0.008 mm (V% = 9.74) (tab. 4).

Table 4. Eggshell thickness (mm) and the significance of the differences between groups

Notice (n=10)	$\overline{X} \pm s_{\overline{X}}$ (mm)	V%	Min. (mm)	Max. (mm)
L1	0.25±0.008	9.74	0.20	0.27
L2	0.25±0.008	10.55	0.21	0.29
L3	0.26±0.009	10.61	0.22	0.30
Differences significance between groups	L1 vs. L2 = n.s.; F(0.1230) <Fα(4.4138) at 1:18 GL L1 vs. L3 = n.s.; F(1.2416) <Fα(4.4138) at 1:18 GL L2 vs. L3 = n.s.; F(0.5425) <Fα(4.4138) at 1:18 GL			

In L2 group, the thickness of the shell was at a level of 0.25 ± 0.008 mm, while birds in group L3 was given the greatest thickness of the shell, 0.26±0.009 mm (V%=10.55 to 10. 61), between groups there were no statistically significant differences.

5. Mineral shell breaking strength is directly subject to its thickness [7] and has a high repeatability (r=0.79).

In L1 has been averaged at 0.17±0.002 kgf/cm^2 shell, with a minimum 0.165 and a maximum 0.185 kgf/cm^2. For the L2 group, the mean was 0.18±0.005 kgf/cm^2, very close to the group L3, which was 0.18±0.004 kgf/cm^2; there were not recorded statistical differences. The character studied was very homogeneous, as is evident below 10% values of the coefficient of variation (V%=5.55 to 7.86) (tab. 5).

Table 5 Breaking strength (Kg force/cm^2) and the significance of the differences between groups

Notice (n=10)	$\overline{X} \pm s_{\overline{X}}$ (Kgf/cm^2)	V%	Min. (Kg f/ cm^2)	Max. (Kg f/ cm^2)
L1	0.17±0.002	3.89	0.165	0.185
L2	0.18±0.005	9.59	0.142	0.195
L3	0.18±0.004	7.24	0.159	0.195
Differences significance between groups	L1 vs. L2 = n.s.; F(0.0245) <Fα(4.4138) at 1:18 GL L1 vs. L3 = n.s.; F(0.3977) <Fα(4.4138) at 1:18 GL L2 vs. L3 = n.s.; F(0.0891) <Fα(4.4138) at 1:18 GL			

6. Specific gravity. Maximal value for this trait was assessed in group L2, of 1.08, while the minimal one in group L1, of just 0.75 (tab. 6).

Table 6. Specific gravity and the significance of the differences between groups

Notice (n=10)	$\overline{X} \pm s_{\overline{X}}$	V%	Min.	Max.
L1	0.94±0.02	7.72	0.75	0.99
L2	1.00±0.02	7.86	0.81	1.08
L3	0.90±0.01	5.55	0.81	0.99
Differences significance between groups	L1 vs. L2 = n.s.; F(3.9205) <Fα(4.4138) at 1:18 GL L1 vs. L3 = **; F(11.9281) >Fα(8.2854) at 1:18 GL L2 vs. L3 = n.s.; F(1.5856) <Fα(4.4138) at 1:18 GL			

Per groups, the highest average specific gravity of eggs was recorded in L2 group, 1.00±0.02, followed by 0.94±0.02 in L1 and then L3 group, with only 0.90±0.01. Regarding the significance of the difference between the means, we could mention the existence of distinct significant differences between groups L1-L3.

7. The white index showed similar levels among the groups studied, with an average of 0.12±0.009 in group L1, of 0.12±0.010 in group L2 and of 0.11±0.007 at L3. The lowest value for this indicator was found in group L3, 0.07, and the highest in groups L1and L2, 0.19. Between groups statistical differences were not identified, but instead, character analysis showed a high variability (V% = 34.89 to 38.78) (tab. 7).

Table 7. Albumen index and the significance of the differences between groups

Notice (n=10)	$\overline{X} \pm s_{\overline{x}}$	V%	Min.	Max.
L1	0.12±0.009	35.79	0.09	0.19
L2	0.12±0.010	38.78	0.08	0.19
L3	0.11±0.007	34.89	0.07	0.14
Differences significance between groups	L1 vs. L2 = n.s.; F(0.1859) <Fα(4.4138) at 1:18 GL L1 vs. L3 = n.s.; F(1.5389) <Fα(4.4138) at 1:18 GL L2 vs. L3 = n.s.; F(0.1100) <Fα(4.4138) at 1:18 GL			

8. Yolk index was within the range of 0.32, a value determined in group L3 and 0.47, in groups L1 and L3. The mean values recorded were 0.41±0.01 in group L1, 0.40±0.01 in group L2 and 0.40±0.02 in group L3 (tab. 8).

Table 8. Yolk index and the significance of the differences between groups

Notice (n=10)	$\overline{X} \pm s_{\overline{x}}$	V%	Min.	Max.
L1	0.41±0.01	11.27	0.33	0.47
L2	0.40±0.01	8.77	0.36	0.46
L3	0.40±0.02	12.19	0.32	0.47
Differences significance between groups	L1 vs. L2 = n.s.; F(0.1859) <Fα(4.4138) at 1:18 GL L1 vs. L3 = n.s.; F(1.5389) <Fα(4.4138) at 1:18 GL L2 vs. L3 = n.s.; F(0.1100) <Fα(4.4138) at 1:18 GL			

Variability within batches was low and middle (V% = 8.77 to 12.19).

CONCLUSIONS

1. Study on egg quality laid by standard undulated budgerigars (*Melopsittacus undulatus*) revealed a good uniformity within the studied population, which demonstrates that even in this species, most quality traits have a high genetic determinism.

2. Measurements showed an average eggs weight of 2.51 g, a volume of 2.41 cm^3, a specific gravity of 0.95 and a shape index of 79.89%. Mineral shell presented an average thickness of 0.253 mm and a resistance to breaking of 0.177 kgf/cm^2. The albumen index stood at an average of 0.117, while the yolk, of 0.403.

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