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THE VARIATION BETWEEN THE PROPORTIONS OF EGG EXTERNAL AND INTERNAL TRAITS IN FOUR SPECIES OF BIRDS

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Abstract - This experiment was conducted in the Department of Animal production/Faculty of Agriculture / University of Sulaimani, to study the characteristics of internal and external eggs, as well as the proportions of egg components for four species of chickens (domestic chicken, quail, turkey and guinea chicken). A total of 291 fresh eggs were collected for four species from the local farms and includes 99,99,48, and 45 eggs of chicken, quail, turkey and guinea fowl, respectively. The Vernier was used to measure the external egg traits and the sensitive balance was used to measure the egg weight and its components. Highly significant differences were observed in all the egg proportions between the four species. Guinea fowl had the highest shape index followed by quail, chicken and turkey, and being 79.03, 78.80, 75.01, and 73.01, respectively. Proportion of yolk to the total egg weight was highest in guinea fowl 38.60%, while quail, chicken, and turkey, 36.15 %, 28.69 %, 28.37 % respectively. Chicken had the largest proportion of albumen 61.68 % followed by turkey, quail, and guinea fowl 61.36, 54.81, and 44.16 respectively. Guinea fowl had the largest proportion of eggshell 17.24 % followed by turkey, chicken, and quail, 10.27, 9.63, and 9.04 respectively. The ratio of Y/A was high in guinea fowl 0.93, followed by quail, chicken, and turkey, 0.69, 0.47, and 0.46 respectively. It could be concluded that there were statistically significant differences between the birds in their egg proportions of the components, which help to characterize the egg birds. And also the result used to help breeders to make long selection plan.

Keywords - Egg, Internal And External Traits, Proportion

I. INTRODUCTION

Gallinaceous birds like chicken, quail, turkey, and guinea fowl that share certain physical characteristics are found on every place except deserts and perpetual ice, and it is one of the first birds orders to be domesticated by humans. They commonly were breeding for fighting (Thomson, 1964), crowing (Kuwayama, et al., 1996), and food (meat and/or eggs) (Wood-Gush, 1959).Also, used to solve many health and immune problems (Bacon, et al., 2000; Mileusnic & Rose, 2010). Egg traits that concerning external and internal measurements are essential for understanding the bird biology. Both these measurements, although very important for hatch-ability (Vieira, et al., 2005; Narushin & Romanov, 2002; Kingóri, 2011), chick weight (Narushin, et al., 2002), acceptability to consumer (Stadelman, 1977), rupture force (Ebubekir & Sekeroglu, 2008; Nedomova, et al., 2009). Many researchers have done comparative investigation for these birds, Ricklefs (1977) who compared between five bird varieties, and he found significant differences between the egg components. Also, Song (2000) who compared the egg quality among pheasant, chukar, quail and guinea fowl, he found significant differences in egg external, internal, and proportion of egg components. Furthermore, Forson et al. (2011) evaluate some elements in raw egg yolk and white by using domestic chicken, guinea fowl, and duck, he found variation in their contents among the species.

The aim of study is to evaluate and compare between the proportions of egg internal, external and proportion components for these birds.

II. MATERIALS AND METHODS

The present study was carried out on June 2017 to February 2018 in the animal production department, college of agriculture, university of Sulaimani. The experiment was designated to evaluate some proportions of external and internal egg traits of chicken, quail, turkey, and guinea fowl. A total of 291 eggs were collected from chicken (99), quail (99), Turkey (48), and Guinea fowl (45) birds from local farms in Sulaimani.

All eggs were weighted individually immediately after collecting by using electronic balance with 0.01 g sensitive. Length and breadth of each egg were measured by using digital verniercaliper with accuracy of 0.01 mm to determine egg shape index by using the following equation described by Reddy et al. (1979):

Egg Shape Index (ESI) = Egg breadth / Egg length * 100

After finishing external measurements, eggs were broken. The weight of the yolk, albumin, and eggshell were measured for each egg in each species using electronic balance with (0.01g) sensitivity.

Yolk %, Albumin %, Shell %, and ratio of Yolk to Albumin were calculated by equations below:

Yolk %= yolk weight/egg weight
Albumin %=albumin weight/egg weight
Shell %= shell weight / egg weigh
Yolk/Albumin ratio=yolk weight/albumin weight

Mean, standard error, coefficients of variation, and range of the external and internal egg traits were calculated using the descriptive statistics of SPSS/PASW for windows version 19. One-way analysis of variance was used to test the effect of verities on the ratio of ESI, yolk %, albumin %, and ratio of Albumin/ Yolk. Also, Duncan multiple range test was used to test the difference between means (Dancun, 1955).

III. RESULTS

Internal traits:

Mean, standard error, and coefficients of variation for the egg weight and internal traits of the four species are presented in table 1. The egg weight mean of Turkey followed by the chicken, guinea fowl, and quail, were 64.45, 50.93, 35.25, and 11.17 respectively. And same for yolk weight mean the turkey was the bigger followed by chicken, guinea fowl and quail, which were 18.28, 14.52, 13.72, and 4.01 respectively. Also in albumin weight mean the turkey was the bigger followed by chicken, guinea fowl and quail, which were 39.57, 31.52, 15.40, and 6.16 respectively. Moreover the eggshell weights mean was greater in turkey followed by guinea fowl, chicken and quail, which was 6.60, 6.12, 4.89, and 1.00 respectively. Furthermore, the coefficient of variation for the egg weight produced by the four species was lowest in quail (14.43 %), for the yolk weight was the guinea fowl 22.45%, for the albumen weight was quail 23.71%, and for the shell weight was the guinea fowl 25.90%.

External Traits:

Mean, standard error, and coefficients of variation for the egg external traits of four species of birds are presented in table 2. The egg length mean of Turkey followed by chicken, guinea fowl and quail, were 61.15, 54.90, 47.62, and 32.28 respectively. Egg breadth mean was greater in turkey followed by chicken, guinea fowl, and quail, which was 44.59, 41.14, 37.60, and 25.41 respectively. Eggshell thickness was greater in guinea fowl followed by turkey, chicken and quail, which were 0.58, 0.47, 0.42, and 0.26 respectively. Albumin high was greater in turkey followed by chicken, guinea fowl, and quail, which were 8.00, 5.36, 4.92, and 2.98 respectively. Yolk high was greater in turkey followed by chicken, guinea fowl and quail, which were 20.08, 16.30, 14.59, and 10.62 respectively. Yolk diameter was greater in turkey followed by guinea fowl, chicken and quail, which were 40.89, 39.63, 37.73, and 25.53 respectively. The higher coefficients of variation for both egg length (6.20%) and egg breadth (5.77%) were noticed in quail. For the shell thickness, albumen height and yolk height coefficients of variation were most variable in guinea fowl 34.70, 32.24, and 15.11 respectively; nevertheless yolk dimension was most variable in quail 18.25.

Proportions and index of egg components:

Weight of egg components of chicken, quail, turkey, and guinea fowl are shown in table 3. Highly significant differences were observed in all the egg proportions between the four species. Guinea fowl had the highest shape index followed by quail, chicken and turkey, and being 79.03, 78.80, 75.01, and 73.01, respectively. Proportion of yolk to the total egg weight was highest in guinea fowl 38.60%, while quail, chicken, and turkey, 36.15 %, 28.69 %, 28.37 % respectively. Chicken had the largest proportion of albumen 61.68 % followed by turkey, quail, and guinea fowl 61.36, 54.81, and 44.16 respectively. Guinea fowl had the largest proportion of egg shell 17.24 % followed by turkey, chicken, and quail, 10.27, 9.63, and 9.04 respectively. The ratio of Y/A was high in guinea fowl 0.93, followed by quail, chicken, and turkey, 0.69, 0.47, and 0.46 respectively.

IV. DISCUSSION

The internal and external traits of the egg are mportant in production and consumer desire. There were significant differences in the internal characteristics of the egg, due to differences in the size of birds, as well as the external characteristics of the egg and the proportions of its components. A coefficient of variation was high in the internal components due to the different environmental and genetic factors. As for the external specifications of the egg was the lowest level and for all birds in the characteristics of the breadth of the egg and this indicates the genetic similarity in this trait (Baker, 1960). Regarding to the proportions of the egg components, converged result was found by (Ricklefs, 1977) who studied several birds species and these variations between the results maybe because of the artificial slection through the past decades. The egg shape in the Japanese quail and guinea fowl was approximately approach to the results of (Song, et al., 2000), which was 78.93, and 79.57 for quail and guinea fowl respectively. was the lowest level of 3.80, which also indicates the similarity of the shape of the egg in this bird compared to the other birds. The highest in egg proportions were in turkeys, which were ESI, Y%, A%, Sh%, and Y/A, 9.95, 9.95, 4.23, 9.18, and 13.97

respectively. These results indicate the similarity of the turkey breed and also the flock age.

V. CONCLUSION

It could be concluded that there were statistically significant differences between the birds in their egg proportions of the components, which help to characterize the egg birds. And also the result used to help breeders to make long selection plan.

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REFERENCE

[1] Bacon, L., Hunt, H., & Cheng, H. 2000. A review of the development of chick lines to resolve genes determining resistance to diseases. Poultry science. 79: 1082-1093.
[2] Baker, C. 1960. The genetic basis of egg quality. British Poultry Science. 1 (1-3): 3-16.
[3] Dancun, D. B. 1955. Multiple range and multiple F test. Biometrics. 11: 1-42.
[4] Ebubekir, A., & Sekeroglu, A. 2008. Effect of egg shape index on mechanical properties of chicken eggs. Journal of food engineering.85: 606-612.
[5] Forson, A., Ayivor, J., Banini, G., Nuviadenu, C., & Debrah, S. 2011. Evaluation of some elemental variation in raw egg yolk and egg white of domestic chicken, guinea fowl, and duck eggs. Annals of biological research. 2 (6): 676-680.
[6] Kingóri, A. 2011. Review of the factors that influence egg fertility and hatchability in poultry. International journal of poultry science.10 (6): 483-492.
[7] Kuwayama, T., Ogawa, H., Munechika, L., Kono, T., & Ichinoe, K. 1996. Crowing characteristics of jungle fowl, Japanese native breeds, and white leghorn breed of chicken. Jpn. Poult. Sci.33: 89-95.
[8] Mileusnic, R., & Rose, S. 2010. The chick as a model for the study of the cellular mechanisms and potential for Al zheimer's disease. International journal of al zheimer's disease.10.
[9] Narushin, V., & Romanov, M. 2002. Egg physical characteristics and hatchability. World's poultry science journal. 58: 297-303.
[10] Narushin, V., Romanov, M., & Bogatyr, V. 2002. Relationship between pre-incubation egg parameters and chick wight after hatching in layer breeds. Biosystems Engineering. 83 (3): 373-381.
[11] Nedomova, S., Severa, L., & Buchar, J. 2009. Influence of hen egg shape on eggshell compressive strength. Int. Agrophysics. 23: 249-256.
[12] Reddy, P., Reddy, V., Reddy, C., & Rap, P. 1979. Egg weight, shape index, and hatchability in Khaki Campbell duck egg. Ind. J. Poult, Sci. 14: 26-31.
[13] Ricklefs, R. 1977. Composition of eggs of several bird species. The Auk.94: 350-356.
[14] Song, K., Choi, S., & Oh, H. 2000. A comparison of egg quality of pheasant, chukar, quail, and guinea fowl. Asian-Aus. J. Anim. Sci.13 (7): 986-990.
[15] Stadelman, W. 1977. Quality identification of shell eggs in egg science and technology (2 ed.). Westport: AVI publishing company INC.
[16] Thomson, A. L. 1964. A new dictionary of birds. London, England: Nelson.
[17] Vieira, S., Almeida, J., Lima, A., Conde, O., & Olmos, A. 2005. Hatching distribution of eggs varying in weight and breeder age. Brazilian journal of poultry science. 7 (2): 73-78.
[18] Wood-Gush, D. 1959. A history of the domestic fowl from antiquity to the 19th century. Poultry science. 38: 321-326.

Traits	Chicken N=99		Quail N=99		Turkey N=48		Guinea fowl N=45	
	Mean±S.E	CV	Mean±S.E	CV	Mean±S.E	CV	Mean±S.E	CV
EW	50.93±0.66	12.89	11.17±0.16	14.43	64.45±1.09	11.70	35.25±0.71	13.51
YW	14.52±0.20	13.66	4.01±0.08	20.98	18.28±0.42	15.91	13.72±0.46	22.45
AW	31.52±0.52	16.52	6.16±0.15	23.71	39.57±0.73	12.74	15.40±0.36	15.66
ShW	4.89±0.07	13.86	1.00±0.01	12.43	6.60±0.12	12.08	6.12±0.24	25.90

Table1: Internal egg traits for the four species
EW= egg weight, YW= yolk weight, AW= albumen weight, ShW= shell weight.

Traits	Chicken N=99		Quail N=99		Turkey N=48		Guinea fowl N=45	
	Mean±S.E	CV	Mean±S.E	CV	Mean±S.E	CV	Mean±S.E	CV
EL	54.90±0.28	5.00	32.28±0.20	6.20	61.15±0.42	4.81	47.62±0.39	5.51
EB	41.14±0.20	4.77	25.41±0.15	5.77	44.59±0.21	3.32	37.60±0.30	5.42
ShTh	0.42±0.01	17.88	0.26±0.00	17.31	0.47±0.01	10.52	0.58±0.03	34.70
AH	5.36±0.12	22.84	2.98±0.07	23.05	8.00±0.17	14.35	4.92±0.24	32.24
YH	16.30±0.20	12.11	10.62±0.08	7.25	20.08±0.29	10.04	14.59±0.33	15.11
YD	37.73±0.27	7.16	25.53±0.47	18.25	40.89±0.41	7.00	39.63±0.89	14.99

Table 2: External egg traits for the four species
EL= egg length, EB= egg breadth, ShTh= shell thickness, AH= Albumen high, YH= yolk high, YD= yolk diameter.

Traits	Chicken N=99		Quail N=99		Turkey N=48		Guinea fowl N=45		Sig.
	Mean±S.E	CV	Mean±S.E	CV	Mean±S.E	CV	Mean±S.E	CV	
ESI	75.01±0.33 [c]	4.38	78.80±0.30 [b]	3.80	73.01±0.33 [d]	9.95	79.03±0.46 [a]	13.63	0.000
Y%	28.69±0.35 [c]	12.11	36.15±0.70 [b]	19.29	28.37±0.41 [d]	9.95	38.60±0.78 [a]	13.63	0.000
A%	61.68±0.35 [a]	5.63	54.81±0.71 [c]	12.87	61.36±0.37 [b]	4.23	44.16±1.11 [d]	16.88	0.000
Sh%	9.63±0.10 [c]	10.02	9.04±0.12 [d]	13.45	10.27±0.14 [b]	9.18	17.24±0.49 [a]	18.99	0.000
Y/A	0.47±0.01 [c]	17.55	0.69±0.02 [b]	33.06	0.46±0.01 [d]	13.97	0.93±0.06 [a]	40.35	0.000

Table 3: Proportion and index of egg components to the egg weight (%)
ESI= egg shape index, Y%= yolk percentage, A%= albumen percentage, Sh%= shell percentage, Y/A= yolk albumen ratio. Means on the row with different superscripts are significantly different.

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