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Morphometric development and changes in the growth and development dynamics of Japanese quail populations bred in Kyrgyzstan

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Abstract: The purpose of the present study was to determine the live weight development phases from hatchling to adolescent bird of Japanese quails bred in Kyrgyzstan, and to determine the age-related changes in body measurements. Adolescent birds were found to have a body length (distance between first vertebra thoracalis to end of sacrum) coefficient of 3.0, a sternum front to rear end length coefficient of 3.3, a tibia length of 2.34, and a pelvic width (distance between right and left acetabulum) coefficient of 1.58. This indicates good development of the quails' pectoral muscles and relative underdevelopment of their leg muscles. The main development phases were found to be between day 1 and 14 and again between day 35 and 42. During these phases, Japanese quails are very sensitive to external influences and require particular attention in their care. Based on findings and variation coefficients it was established that development is lowest during the first 7 days (10.21%-8.78%) and highest after day 7 up to day 49 (10.47%-25.06%) with growth returning to lower rates in the following phase. Quail chicks reach adolescence after 45 to 56 days with their body weight attaining 75% of the weight of full grown birds. This study was carried out in 2008 in the laboratory of the Department of Anatomy and Physiology of the Veterinary Faculty of the State University of Kyrgyzstan.

Key words: Growth and development, live weight, body measurements, growth coefficient, quail

Introduction

It is not known when quails became a part of human life. The first depiction of the bird dates back about 5000 years and is found in Egypt. Today wild quails are bred in South, East, and Central Asia as well as in Australia, North America, and Europe (1,2).

In Japan and China, quail breeding on modern poultry farms has a rather long tradition. In Japan quails are mentioned as pets for the first time in the 11th century; since the 20th century, their main purpose has been to provide eggs and meat. Currently, Japan is the world's leading quail farming country; however, in other countries like Korea, France, and China it has also developed into an important business. The USA, on the other hand, in the middle of the 20th century began to use quails as laboratory animals. The Japanese quail was used by American scientists in their space research for the Apollo programme (3).

German scientists have investigated the birds to elucidate the issue of genetic selection.

The former Soviet Union received its first domesticated Japanese quail in 1964 from the former Yugoslavia and in 1966 began breeding the birds (3). Quails exhibited at the International Poultry Congress Fair in Kiev were bought by the then USSR Poultry

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Research Institute and used for breeding. Later, they concentrated on cage breeding of the birds to obtain standardised eggs and meat and to further develop the birds' economic potential. In today's Russia the "Quail" project of the Scientific Industrial Council has proved remarkably successful in the development of industrial manufacturing technologies (1).

The Virus Pharmaceuticals Research Institute in Russia detected the lycos-causing virus in the blood of Japanese quails. Following this investigation Russian scientists began to produce antiviral pharmaceuticals from quail embryos and developed a live vaccination against Marek's disease using quail cell cultures (1,4-9).

Quail is a collective name for several genera of birds in the pheasant family. Quails are warm-blooded and agile animals and sensitive to external factors. Their short incubation time of just 17 days and their fast growth and development are features favouring their use in scientific research (1,4-9).

Five quail generations can be obtained in a single year. Currently 34 different quail species are being bred worldwide. The following quail breeds are officially recognised: Japanese, White English, British Black, Manchurian Gold, Smoking, Marmara, and Pharao. In all quail breeds, the female birds have a higher live weight than the males (1,4,6-9).

One of the most important properties of quails is their body heat. It is 2 °C higher than in other poultry and results in a very elevated metabolism (1,6-9).

The young hatchlings weigh between 6 and 9 g. They are very agile and grow fast. The birds reach adolescence within 45-56 days. With 280-315 eggs annually, egg production is very high. Eggs have an average weight of 12 g and can be of different colours (6-9).

Many countries have developed quail raising into an industry accompanied by a strong interest in scientific research. China and India have scientific institutes dedicated to quail research, while Japan has established a research centre for this purpose.

In Kyrgyzstan quail farming is still mainly an individual pursuit or small family business that cannot be compared with Japanese-style production; however, interest in quail raising is growing steadily.

Kyrgyz quail farmers have bred the Kyrgyz variety of the Japanese quail. However, no reliable statistical data or analyses exist as yet on the occurrence and productivity of Japanese quails in this country. Moreover, this country is home to a number of wild breeds that are necessary for cultivation, improvement, and the prevention of degeneration. They are used as a genetic pool.

The Kyrgyz quail variety, obtained through changes and modifications of the Japanese quail's genotype and phenotype, is steadily improved with respect to live weight and productivity. For this reason we chose to investige the live weight development of birds from hatchling to adolescence, and to determine their age-dependent body measurements.

Materials and methods

Twenty-five birds each of 7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 120 and 165 days old were obtained from a private farm and the following productivity features examined (10):

Body length (BL): distance from end of last neck vertebra to end of sacrum,

Pectoral length (PL): distance between sternum front and rear end,

Pectoral depth (PD): distance between neck root and sternum front end,

Calf length (CL): distance between the tibia's proximal and distal end,

Midfoot length (MFL): distance between the tarsometatarsus proximal and distal end,

Pelvic width (PW): distance between right and left acetabulum.

For the weight measurements of the chicks and grown birds, a VLKT-500 model balance with an accuracy of ±0.01 g was used.

For the body measurements callipers were used.

For the analysis of the growth and development phases, the absolute growth rate (AGR) and the growth intensity (GI) ratio were calculated using the Schmalgauzen formula.

Statistics for Windows 6.0 was used for data evaluation; $td > 2.5$ and $P < 0.05$ was used as confidence coefficient.

Measurements on the following days served as reference values for the determination of changes: 1-day-old hatchling (the day they hatched), 7 days (week of age), 28 days (1 month of age), 42 days (adolescence), 63 days (physiological age), 100 days (technological grown-up age), and 165 days (full grown quail).

Results

The growth rates (GRs) determined in this study at various reference points are compiled in Tables 1 and 2. As can be seen in Table 1, BL was 1, 1.6, 2.4, 3.0, 3.5, 3.9, and 4.15; PL was 1, 1.9, 2.8, 3.3, 4.8, 6.5, and 7.7; PD was 1, 1.2, 2.4, 2.6, 3.2, 3.9, and 3.94; CL was 1, 1.2, 1.99, 2.34, 2.65, 3.39, and 3.97; MFL was 1, 1.49, 2.05, 2.55, 2.64, 3.37, and 3.63; and PW was 1, 1.02, 1.13, 1.58, 1.89, 2.49, and 3.34.

Adolescent birds were found to have a BL coefficient of 3.0, a PL coefficient of 3.3, a CL coefficient of 2.34, and a PW coefficient of 1.58. This indicates a faster pectoral muscle development as compared with their hind leg muscles. Similar results were found for the following reference points.

Discussion

In line with the general growth and development law of domesticated mammals and poultry, their GI varies between 1.16% and 96.12%. According to Bogolybskiye (11) under modern poultry raising conditions stress factors may have a negative impact on the growth and development phases of chicks.

In Japanese quails, the most intensive live weight gain phases are the first and third 7-day period, with gains of 96.12% and 52.90%, respectively. The most prominent growth rate phases on the other hand are the second (49.19%), sixth (42.58%), and seventh (46.40%) 7-day period, and the last weeks of the study period (30.55%). The results of this research show that between day 1 and 14 and again between day 35 and 42, the chicks go through a period of accelerated development. An important aspect in this context is the high potential of damage the chicks can suffer in these phases through external influences.

The variation coefficient of the measured values is lowest in the first 7-day period (10.21%-8.78%) and highest in the other periods (10.47%-27.06%) with the exception of the 49-day period. These values indicate that the Japanese quail has a medium-level

Table 1. Postnatal measurements of quail body dimensions (cm).

Day	Body Length	Sternum Length	Sternum Depth	Calf Length	Midfoot Length	Pelvic Width
	22.83 ± 1.60	7.33 ± 1.38	13.83 ± 0.48	19.00 ± 0.73	12.67 ± 0.49	15.95 ± 0.67
7	35.40 ± 0.96	14.07 ± 0.90	16.60 ± 0.24	22.87 ± 0.46	18.85 ± 0.28	16.33 ± 3.77
14	43.82 ± 1.70	16.95 ± 0.38	16.62 ± 0.69	25.72 ± 1.50	19.50 ± 0.73	16.33 ± 0.51
21	52.05 ± 3.09	17.43 ± 1.65	25.77 ± 1.40	33.73 ± 0.98	25.03 ± 0.67	17.65 ± 0.85
28	54.50 ± 1.61	20.20 ± 0.13	32.83 ± 2.21	37.83 ± 2.77	26.00 ± 0.52	18.00 ± 1.83
35	61.65 ± 2.76	21.32 ± 0.85	35.52 ± 2.52	40.87 ± 2.59	29.00 ± 0.55	23.90 ± 0.84
42	68.53 ± 2.26	24.23 ± 2.29	35.62 ± 4.64	44.38 ± 1.78	32.30 ± 0.96	25.28 ± 0.64
49	72.50 ± 0.92	29.60 ± 0.88	42.80 ± 2.00	48.25 ± 1.50	32.72 ± 1.37	26.48 ± 0.99
56	77.68 ± 1.18	33.40 ± 0.49	42.93 ± 0.66	49.87 ± 0.61	33.27 ± 0.76	27.92 ± 1.46
63	79.57 ± 3.56	35.00 ± 1.04	44.42 ± 3.70	50.35 ± 1.11	33.45 ± 0.85	30.20 ± 0.86
70	83.95 ± 0.67	35.80 ± 0.44	45.15 ± 0.27	51.73 ± 0.83	42.55 ± 0.51	31.30 ± 1.31
100	88.72 ± 1.91	47.50 ± 0.64	54.35 ± 0.59	64.45 ± 1.03	42.72 ± 0.49	39.68 ± 2.97
165	94.67 ± 1.56	56.33 ± 1.23	54.50 ± 1.28	75.50 ± 1.18	46.00 ± 0.52	53.33 ± 1.05

Table 2. Growth rate coefficients in the postnatal ontogenesis of quail.

Day	Body Length	Sternum Length	Sternum Depth	Calf Length	Midfoot Length	Pelvic Width
	1	1	1	1	1	1
7	1.6	1.9	1.2	1.2	1.49	1.02
28	2.4	2.8	2.4	1.99	2.05	1.13
42	3.0	3.3	2.6	2.34	2.55	1.58
63	3.5	4.8	3.2	2.65	2.64	1.89
100	3.9	6.5	3.9	3.39	3.37	2.49
165	4.15	7.7	3.94	3.97	3.63	3.34

Table 3. Age-related live weight of Japanese quail.

Quail age	Live weight (g)	Cv	td	GR	AGR	GI (%)
Daily (n = 25)	3.61 ± 0.07	10.21	-	-	-	-
7 (n = 25)	10.30 ± 0.18	8.78	35.2	2.85	1.12	96.12
14 (n = 25)	17.02 ± 0.85	25.06	7.72	4.71	0.96	49.19
21 (n = 25)	29.26 ± 1.43	24.45	7.37	8.11	1.75	52.90
28 (n = 25)	38.66 ± 1.36	17.58	4.77	10.71	1.34	27.68
35 (n = 25)	45.12 ± 1.88	20.86	1.20	12.49	0.92	15.42
42 (n = 25)	69.48 ± 3.16	22.76	6.62	19.25	3.48	42.58
49 (n = 25)	111.46 ± 24.71	110.91	1.68	30.88	6.00	46.40
56 (n = 25)	114.00 ± 2.69	14.33	0.10	31.58	0.36	2.25
63 (n = 25)	119.64 ± 3.46	13.72	1.29	33.14	0.81	4.83
70 (n = 25)	121.04 ± 3.28	14.29	0.29	33.53	0.20	1.16
100 (n = 25)	128.04 ± 2.68	10.47	1.65	35.47	0.23	5.62
365 (n = 25)	174.20 ± 3.99	11.45	9.59	48.25	0.17	30.55

The absolute growth rate (AGR) and the growth intensity (GI) ratio, the growth rate (GR)

genetic influence on the Kyrgyz quail population's live weight.

The quail chicks reach adolescence between day 49 and 56, with their body weight attaining 75% of the weight of full grown birds.

Growth is one of the most important functions of metabolism. For this reason, the mechanism of growth is today still as important as in the past. Despite extensive research on this subject, the view held by some researchers that "growth at first sight seems to be a simple affair, which upon closer scrutiny turns out to be very complicated" cannot be refuted (12,13). According to Mina and Klevezala (14), only after the results of comprehensive experimental research have been evaluated and put into practice in their entirety can maximum live growth be achieved.

We are of the opinion that also the growth differences of different ecological and systematic groups need to be investigated in order to elucidate the growth process in different breeds. Only if this path is pursued can the results of experimental research be fully evaluated, opening the way towards a growth process that can be maintained at the highest possible level.

We are convinced that the present study will be of great help for further research on similar subjects.

References

1. Karapetyan, R.: Biological and efficiency quality of quails. Breeding Birds, 2003; 8: 29-30. (article in Russian).
2. Pigareva, M.D., Afanasiyev, G.D.: Quail Farming. Rosagropromizdat, Moscow. 1989. (in Russian).
3. Guşin, B., Kroik, L.: Quail Culture Development. Breeding birds; Quail Culture Development. 2003; 6: 22-23. (article in Russian).
4. Altan, Ö., Oğuz, I.: Effects of heat stress on some egg characteristics on acid-base balance in two lines of Japanese quail, unselected and selected for four week body weight. Tr. J. Veterinary and Animal Sciences 1996; 20: 211-214.
5. Altan, Ö., Oğuz, I., Akbaş, Y.: Effects of selection for high body weight and age of hen on egg characteristics in Japanese quail (*Coturnix coturnix japonica*). Tr. J. Veterinary and Animal Sciences 1998; 22: 467-473.
6. Dore, M.: Phosphorus-Calcium Exchange of Immunological System Bodies in Race Faraon quail. Kiev. 1994. (doctoral thesis in Russian).
7. İşutina, G: Technological developments in poultry. Breeding birds. Moscow. 2003; 8: 34-35. (article in Russian).
8. Kavuncu, O., Kesici, T.: Effects of Selection for Body Weight on Fitness in Japanese Quails. 1989; TÜBİTAK Final Report.
9. Türkmut, I., Altan, Ö., Oğuz, I., Yalçın, S.: Effects of selection for four week body weight on reproductive performance in Japanese quail. Tr. J. Veterinary and Animal Sciences 1999; 23: 229-234.
10. Koçiş, İ.İ., Petraş, M.G., Smirnov, S.B. Poultry Breeding. Moscow. 2003. (in Russian).
11. Bogolyubskiy, S.N.: The Statutory Requirements in the Development of Individual Animals in Agriculture Animals Ontogenesis Management Operations. Moscow. 1964. (in Russian).
12. Pomeroy, R.V. Growth and Development of live animals, Pet Physiology Innovations. Moscow. 1959; 75-78. (in Russian).
13. Tanner, D.: Structure and growth in humans. Human Biology. Moscow. 1968. (in Russian).
14. Mina, M.V., Klevezal, G.A.: Growth in Animals. Moscow. 1976. (in Russian).