

**Comparative weight and metric traits of intestines in Japanese quails (*Coturnix coturnix Japonica*),
common quails (*Coturnix coturnix*, *Lineus*, 1758) and their hybrids**

Radoslav Mihaylov¹, Rosen Dimitrov^{2*}

¹Department of Animal Morphology, Physiology and Nutrition, Faculty of Agriculture, Trakia
University, 6000 Stara Zagora, Bulgaria

²Department of Veterinary Anatomy, Histology and Embryology, Faculty of Veterinary Medicine,
Trakia University, 6000 Stara Zagora, Bulgaria

ABSTRACT

A total of 26 quails (9 Japanese quails, 9 common quails and 8 Japanese females × common males hybrid quails) were studied. The individual live weight of birds was determined, as well as the weights of the duodenum, jejunum, ileum, caeca and rectum (g), and the length of these segments (cm). Data was statistically processed. The absolute and relative weights of intestinal segments were the highest in Japanese quails, followed by hybrid quails and the lowest – in common quails. In the three studied types of quails, the jejunum had the highest absolute and relative weight among intestinal segments, followed by the duodenum. The relative duodenal weight in the wild quail was by about 8.3% higher than in Japanese quails. A marked difference was also detected in caeca – their relative weight in Japanese quails was by 6.5% higher than in common quails. The highest absolute and relative length among all intestinal segments was that of the jejunum. The relative length of the duodenum in common quails was by 9% higher than in Japanese quails. The L/m index of the entire intestinal tract was the highest in wild quails, followed by hybrids and Japanese quails. In our belief, the common quail attains its ultimate body weight with relatively thinnest intestinal wall which indicated its higher functional activity as compared to the other studied groups of birds.

Key words: Anatomy, Morphometry, Intestinum, Quails.

INTRODUCTION

A number of researchers outline the digestive tract as a means of communication between the body and the environment. By virtue of this interaction, the organism becomes adapted to different feeds and diets (Gigov et al., 1985). The determination of morphological features of digestive organs allows for modelling and alteration of animal performance and keeping them healthy (Mihaylov, 2007; Mihaylov et al., 2007).

Mihaylov (2009) has investigated the intestinal tract of Muscovy and Pekin ducks and their hybrids and has presented the ratio of total intestinal tract length to its total weight as an index showing how many cm intestinal mass is contained in 1 g. According to the author, this index (L/m) could serve for evaluation of intestinal wall thickness – the higher the index, the thinner the intestinal wall.

The selection, feeding and breeding of Japanese and common quails are extensively studied, while investigations on the relationships between live weight gain and the development of the digestive tract of these birds are still few (Mihaylov et al., 2007).

Mihaylov et al. (2008) studied the age-related weight and metric traits of small and large intestines in Japanese quails and found out that they attained morphological and functional maturity between the 7th and 14th days post hatch.

It is established that domestic animals, in comparison to their wild ancestors, exhibited a marked reduction of the weight of some essential organs (heart, lungs, kidneys, endocrine glands, brain), shortening of facial bones, elongations of intestines. At the same time, domesticated animals are distinguished from wild ones by their higher live weight, higher performance and early maturity (O'Regan & Kitchener, A., 2005).

Data about the growth performance and digestive morphological traits in Japanese quails are reported by Lilja (1983), Tserveni-Gousi & Yannakopoulos (1986), Baumgartner et al. (1986), Starck (1996), but studies in wild quails are only few.

Data about common quails in scientific literature are mainly on its growth performance (Du Preez & Sales, 1997), hybridisation (Deregnaucourt et al., 2002), but to our best knowledge morphological data for the development of the alimentary system of this species and comparative studies between Japanese and common quails are not available.

The purpose of the present study was to investigate the weight and metric traits of intestinal tract in common quails (*Coturnix coturnix*, Lineus, 1758), Japanese quails (*Coturnix Japonica*) and their hybrids.

MATERIAL AND METHODS

The investigation was performed with 9 Japanese quails, 9 common quails and 8 hybrid quails (Japanese females × common males) – a total of 26 birds.

Japanese, common and hybrid quails were fed a standard commercial feed and studied at the age of 60 days.

The individual live weight of birds was determined on a commercial scale.

Slaughter analysis was conducted (by means of Sartorius- PT 120 balance, precision 0.01 g). After removal of the mesentery, the weight of the duodenum, jejunum, ileum, caecum and rectum (g), and by means of a ruler – the length of these segments (cm).

The analysis of data was done by statistical software (Data Analysis of the StatMost for Windows (1994).

RESULTS AND DISCUSSION

The live weight of Japanese quails was 180.85 ± 1.56 g, in common quails: 81.80 ± 0.97 g, while in hybrids between Japanese female × wild males: 134.90 ± 0.75 g.

The absolute and relative weights of the intestinal tract were the highest in Japanese quails followed by hybrids and finally, common quails (Fig. 1 and Fig. 2).

Among studied intestinal segments, the share of the jejunum from intestinal absolute and relative weights was the highest for the three types of birds, followed by the duodenum. However, while in the three groups of birds the relative weights of the jejunum were comparable – from 42.29% in common quails to 44.52% in Japanese quails, the relative weight of the duodenum in wild quails was

by about 8.3% higher compared to Japanese quails . A pronounced difference was detected with respect of the caecum as well. Its relative weight in Japanese quails was by 6,5% higher than that of wild quails (Fig. 1, Fig. 2).

The lengths of the different intestinal segments showed highest absolute and relative lengths of the jejunum in the three types of birds (Fig. 3 and Fig. 4). At the same time, the relative duodenal length in wild birds was by 9% higher vs that of the Japanese quail (Fig. 4).

The results allowed concluding that the relative weight and length of the duodenum of the common quail was by 8.3% and 9% higher compared to the respective parts of Japanese quail intestines. It could be suggested that probably, the morphofunctional importance of the duodenum in wild quails was the highest among studied types of birds.

The values for absolute and relative weights and lengths of intestinal tract parts in hybrid quails were intermediate which could be attributed to the heterosis effect (Fig. 1, Fig. 2, Fig. 3 and Fig. 4).

Fig. 5 depicts the total length to total weight ratio of the intestinal tract as well as ratios between length (L) and weight (m) of the different intestinal segments. The results demonstrate how many cm intestinal tract is contained in 1 g. The ration represents an index (L/m) of intestinal wall thickness. Therefore, the higher the index, the higher the number of intestinal loops in one weight unit of intestines. Of course, the higher values of the index are indicative for thinner intestinal wall.

Data on Fig. 5 show that the L/m index for the total intestinal tract was the highest in common quails, followed by hybrids and Japanese quails. In our view, the common quail attains its live weight with relatively thinnest intestinal wall, suggesting a higher functional activity than in other studied types of birds.

Our data about relative metric and weight traits of intestines in studied birds support the belief of **Gigov et al. (1985)** about the interaction of the intestinal tract and the environment, and the potential for adaptation of the organism to food.

Data about absolute weight and metric traits of studied birds could be useful in the determination of morphological traits of digestive organs with regard to regulation of the performance and protection of bird' health in line with the studies of **Mihaylov (2007)** and **Mihaylov et al. (2007)**.

Unlike the investigations of **Mihaylov et al. (2008)** on the age-related differences in weight and metric features of small and large intestines in Japanese quails, this experiment aimed to study these quantitative traits in mature birds from three species with regard to performance of partial morphometric analysis of the intestinal tract in studied subjects.

Our data about the total intestinal length to weight (L/m) in quails are not in agreement with the results of **Mihaylov (2009)**, where the L/m index was the highest in hybrid ducks by reason of the heterosis effect. Our data in quails showed a different tendency as the L/m index in hybrid quails was lower than that of wild quails, so the possible explanation could be sought in the better adaptation potential of the wild quail with respect to migration as compared to Japanese and hybrid quails, both reared and thus dependent on humans.

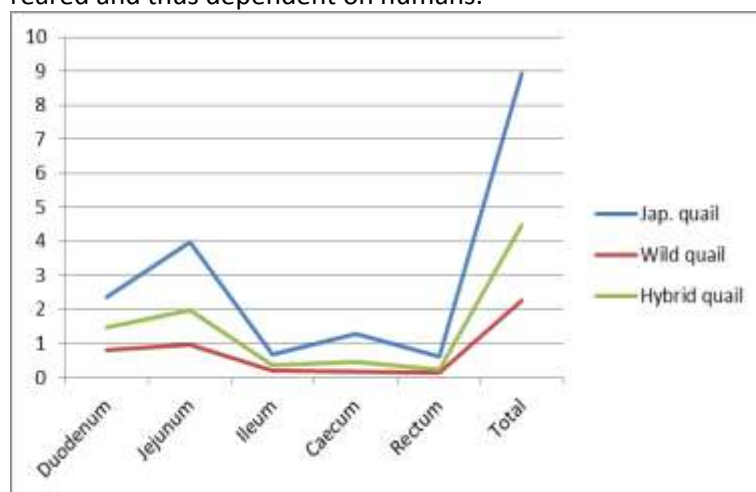


Fig. 1. Weights (g) of different parts of the intestinal tract

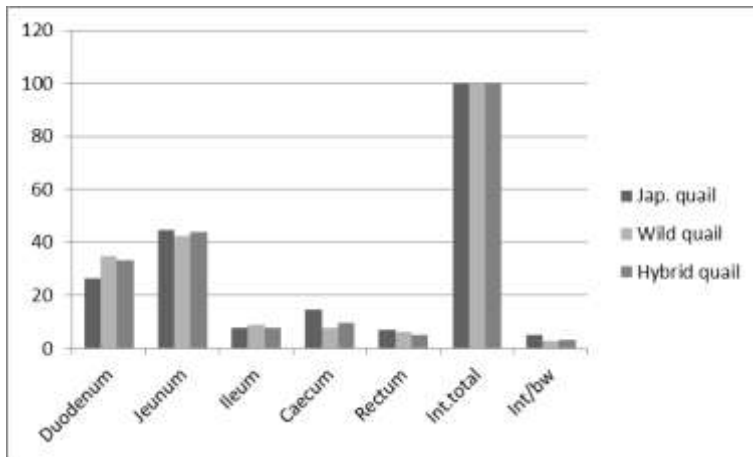


Fig. 2. Relative weights (%) of the different parts of the intestinal tract

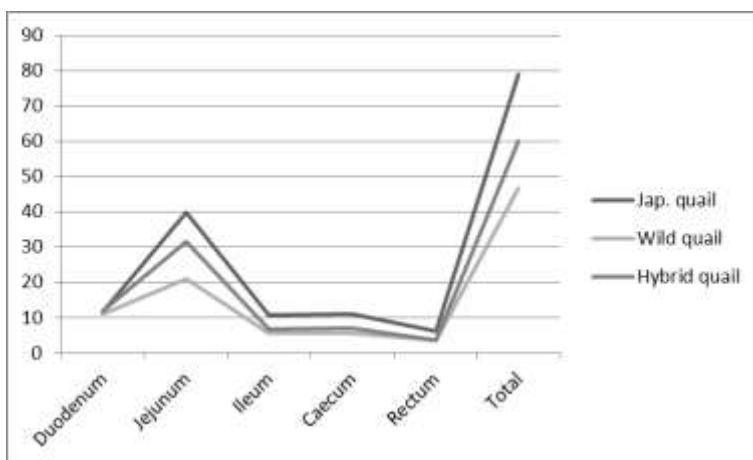


Fig. 3. Lengths (cm) of the different parts of the intestinal tract

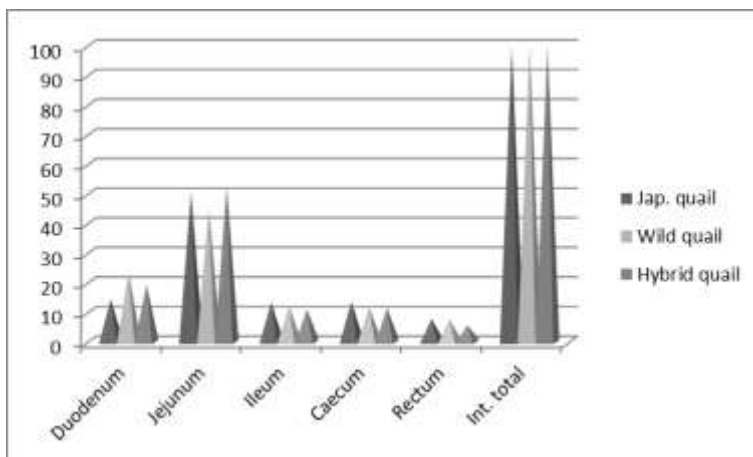


Fig. 4. Relative lengths (%) of the different parts of the intestinal tract

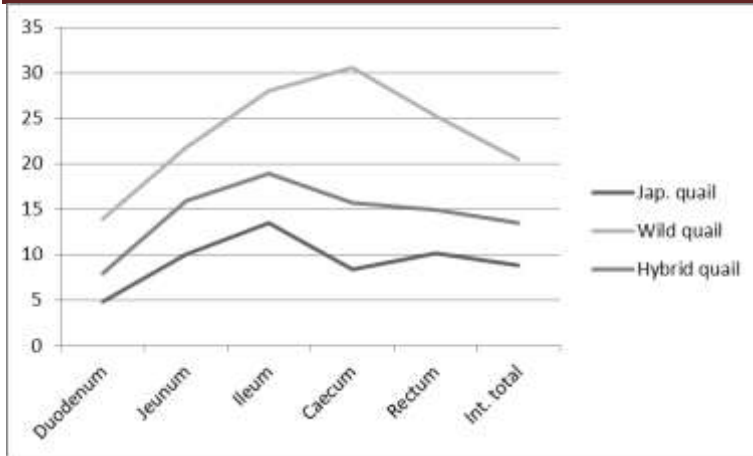


Fig. 5. Ratio of length (L) to weight (m) of the different parts of the intestinal tract (L/m)

REFERENCES

- Baumgartner J., Illes V., Somogyinova E. & Končekova Z., 1986. Changes in body weight and size of some internal organs in growing Japanese quail cocks. *Hidinarstvo*, 22, 117-124.
- Deregnacourt, S., Guyomarch, J. & Aebischer, N. J., 2002. Hybridization between European Quail *Coturnix coturnix* and Japanese Quail *Coturnix Japonica*, *Ardea*, 90 (1), 15-21.
- Du Preez J. & Sales J., 1997. Growth rate of different sexes of the European quail (*Coturnix coturnix*). *British Poultry Science*, 38 (3), 314-315.
- Gigov Ts., Dinov D., Kovachev G., Vitanov S., Gadzhev S., Georgiev G. & Tomov S., 1985. Morphological and topographic changes in intestines of newborn and growing calves up to 6 months of age. Scientific Works of HIZVM, FVM – Stara Zagora, vol XXX, part I, Zemizdat, 21-40.
- Lilja C., 1983. A comparative study of postnatal growth and organ development in some species of birds. *Growth*, 47 (4), 317-339.
- Mihaylov R., 2007. Comparative studies on morphological traits of the digestive tract in Japanese quails (*Coturnix coturnix Japonica*) and common quails /*Coturnix coturnix L.*/ PhD Thesis, Stara Zagora, 31-106.
- Mihaylov R., 2009. Comparative weight and metric traits of some digestive tract organs in Muscovy ducks, Pekin ducks and mulards. *Animal Science (Sofia)*, 4, 57-60.
- Mihaylov R., Tanchev S., A. Genchev & Blohin I., 2007. Age-related features of the digestive system development of Japanese quails (*Coturnix Japonica*) and common quails (*Coturnix coturnix*). Conservation of the diversity of animals and hunting reserves in Russia. Proceedings of the 2nd International Scientific Practical Conference, Moscow, 375-379.
- Mihaylov R., Genchev A. & Kabakchiev M., 2008. Metric and weight development of some digestive tract organs in Japanese quails (*Coturnix Japonica*) from hatching to sexual maturity. *Animal Science (Sofia)*, 1, 63-71.
- O'regan, H. & Kitchener, A., 2005. The effects of captivity on morphology of captive, domesticated and feral mammals. *Mammal Review*, 35 (3-4), 215-230.
- Starck, J., 1996. Intestinal growth in altricial European starling/*Sturnus vulgaris*/ and precocial Japanese quail (*Coturnix coturnix Japonica*). *Acta Anatomica*, 156, 289-306.
- StatMost for Windows, 1994. DataMost Corporation, USA, 87-96.
- Tserveni-Gousi, A. & Yannakopoulos, A., 1986. Carcase characteristics of Japanese quail at 42 days of age. *British Poultry Science*, 27, 123-127.