Effect of Bee Bread on Growth Performance of Janapese Quails (*Coturnix Japonica*)

Nikoleta Šimonová¹, Anna Kalafová², Marcela Capcarová³, Rudolf Dupák⁴, Monika Schneidgenová⁵, Emília Hanusová⁶, Cyril Hrnčár⁷, Juraj Čuboň⁸, Peter Haščík⁹

Slovak University of Agriculture in Nitra¹²³⁴⁵⁸⁹, Faculty of Biotechnology and Food Science, Institute of Applied Biology¹²³⁴⁵, Institute of Food Sciences⁸⁹

Trieda Andreja Hlinku 2, 949 76 Nitra, Slovak Republic

National Agricultural and Food Center⁶, Research Institute of Animal Production

Hlohovecká 2, 951 41 Lužianky, Slovak Republic

Institute of Animal Husbandry⁷, Faculty of Agrobiology and Food Resources,

e-mail: xsimonovan1@uniag.sk¹

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Abstract

Bee bread is a product from the beehive which has unique properties and offers not only well absorbed nutrients such as fat, carbohydrates, and protein, due to the process of fermentation, but also whole spectrum of bioactive compounds. Bee products such as honey, bee venom, royal jelly is widely studied, but bee bread has not been well studied yet and there is a space for further experiments to study its impact. The present study was conducted to evaluate the effect on the growth performance of Japanese quails by adding bee bread into feeding mixture. Japanese quails (n = 80) were divided into four groups according to administered bee bread into feed mixture HYD 11, which was given ad libitum, as follows: P1 (n = 20) 2 g.kg⁻¹ of bee bread, P2 (n = 20) 4 g.kg⁻¹, P3 (n = 20) 6 g.kg⁻¹, and the control without additives (n =20). The groups were kept under the same conditions. Data were collected from three weighing done on KERN PLE 4200-2N (Kern & Sohn, Germany) on the 1st day, when they were put into cages, then on the 28th day, and on the 56th day. A significant increase in weight (P ≤ 0.05) on 28th day in group P1 compared with control group K was noticed. As a result of the research, we can conclude that bee bread has a significant (P ≤ 0.05) effect on elevating growth performance by addition 2 g.kg⁻¹ of bee bread into feeding mixture. The effect of bee bread on growth performance shows positive impact, nevertheless, the results can be used for further examination.

Keywords: bee bread, bee product, growth performance, Japanese quails

1. Introduction

Bee bread is a valuable source of food for honeybees, because it provides well absorbed nutrients, thanks to the technological process of fermentation, which takes place naturally in honeycombs, bioactive compounds which are vital for a bee hive. It is banned by legislative to use antibiotics or any growth promoters into animal nutrition, therefore there is a significant motivation to find natural alternatives for improving quality of life for animals and also promote growth and being accepted by consumers. Bee bread is formed by the fermentation of pollen mixed with honey, wax and bee saliva in honeycombs. It is characterized by its antibacterial, antioxidant, antiallergic, hepatoprotective and antitumor properties. It is well digested and has a rich nutritional composition (Yucel et al., 2017). Protein digestibility is 94.7%, in contrast to pollen, where digestibility is only between 38.7% and 85.3%. Bee bread contains more than hundred species of fungi, more than 80 types of yeast, more than 40 species...
of bacteria from the population of microorganisms. It also contains building and protective substances naturally presented in pollen (proteins, fats, carbohydrates, vitamins, minerals, polyphenols, and flavonoids) (Milojkovic, 2018; Urcan, 2017).

The Japanese quail (Coturnix japonica) is considered as one of the most widely used animal models in many fields of research for the study of meat and egg quality, but also for the effect of aging and various diseases (Huss et al., 2008). Japanese quails are characterized by their rapid growth rate and sexual maturity, making their generation interval short. They are more resistant to disease compared to other animal models of birds. They are also characterized by their high laying (highest at 8 weeks of age) and low feed and space requirements (Jatoi et al., 2013; Hanusova et al., 2016). Quail eggs and meat are considered a delicacy and we are seeing an increasing trend in consumption in many countries (Hanusová et al., 2013). Due to its nutritional content, meat also has a place in therapeutic nutrition (Cunha, 2009). Nutrition of the quails has a significant effect on meat and egg quality and quantity (Hanusová et al., 2013). Based on previous research on the use of bee products in animal nutrition, our aim will be to determine whether the use of bee bread as a feed supplement in various concentrations affects the growth rate of Japanese quail (Coturnix japonica) in both genders.

2. Data and Methods

Bee bread was originated from the National Botanical Garden of the National Academy of Sciences, Kiev, Ukraine. The bee bread was weighed on the analytical weight depending on the feed intake and subsequently homogenized. The feeding mixture HYD 11 with the content of 11.7 MJ.kg\(^{-1}\) ME (Tekro, Slovak Republic) together with bee bread and water were consumed \textit{ad libitum}. The composition of feeding mixture we can see on Table 1. A total number of 80 Japanese quail (Coturnix japonica) were divided into four groups. The experimental group P1 (n = 20) received bee bread at a dose of 2 g.kg\(^{-1}\), P2 (n = 20) 4 g.kg\(^{-1}\) and P3 (n = 20) 6 g.kg\(^{-1}\) feed mixture. The control group K (n = 20) was without the addition of bee bread.
Table 1: The composition of feed mixture HYD 11

| Composition          | Declared quality features          |
|----------------------|------------------------------------|
| corn 32 %            | nitrogenous substances min 200 g/kg |
| extracted soybean meal 19.2 % | fibre max 60 g/kg               |
| wheat 15 %           | ash max 160 g/kg                   |
| CaCO3 10 %           | ME min 11.7 MJ/kg                  |
| rapeseed meal 7 %    | lysine min 7.5 g/kg                |
| sunflower meal 4.5 % | methionine and cysteine min 6 g/kg |
| animal fat 4 %       | linoleic acid min 10 g/kg          |
| malt flower 3 %     | Ca min 35 g/kg                     |
| monocalcium phosphate 1 % | P min 5 g/kg                 |
| premix additives 1 % | Na min 1.6 g/kg                    |

Japanese quails were housed in the Research Institute of Animal Production in Lužianky. Until the 14th day of age, the quails were placed in specialized kennels at a temperature of 30 - 32 °C, from the 14th day they were transferred to heated aviaries with feeders with a temperature of 20 - 22 °C and from the 35th day of age they were divided into a four-story cage system. (Venturi, Italy) with a temperature of 21 ± 2 °C and 64 ± 2 % humidity. The experimental conditions were continuously monitored. The quails were weighed three times by using a KERN PLE 4200-2N analytical balance (Kern & Sohn, Germany). For the first time, 1st weighing, before their placement in the cages and by number, their weights were recorded. The second weighing was performed on day 28 and the third on day 56. Individual weights were recorded by quail number and weight gain was compared between quail groups. The data were analysed using the One Way ANOVA test by using GraphPad Prism 9 statistical software (GraphPad Software Inc., La Jolla, CA, USA). Differences between treatments were tested for significance at P ≤ 0.05.

3. Results and Discussion

When evaluating the growth intensity, the differences between the individual groups were statistically significant (P ≤ 0.05) on 28th Day of measurement between the experimental control P1 (114 ± 20.24 g) and control group K (99.39 ± 24.29 g), as we can see on Figure 2. The increased weight is shown on the 56. day, although not significant. The weight of the quail ranged on the 1st weighing from 9.224 ± 0.96 g to 9.398 ± 0.85 g. Weights from the last weighing (day 56) ranged from 198.6 ± 25.03 g to 207.2 ± 32.99 g. The average growth intensity corresponds to the average weight values of quails due to Hanusová et al. (2013).
Figure 2: Weights of Japanese quails
Legend: P1 – bee bread in dosage 2 g.kg⁻¹ of feeding mixture, P2 – bee bread in dosage 4 g.kg⁻¹ of feeding mixture, P3 – bee bread in dosage 6 g.kg⁻¹ of feeding mixture, K – control group without adding bee bread

Table 2: Weights of Japanese quails

|       | P1 (g)   | P2 (g)   | P3 (g)   | K (g)    | P value |
|-------|----------|----------|----------|----------|---------|
| 1 day | 9.398 ± 0.85 | 9.224 ± 0.96 | 9.311 ± 0.91 | 9.343 ± 0.87 | P > 0.05 |
| 28. day | 114.0 ± 20.24 | 110.9 ± 14.92 | 111.2 ± 20.39 | 99.39 ± 24.29 | P ≤ 0.05 |
| 56. day | 207.2 ± 32.99 | 200.0 ± 28.63 | 203.0 ± 28.56 | 198.6 ± 25.03 | P > 0.05 |

Due to the small number of studies on the effect of bee bread application in quail feed and growth rate assessment, we also used studies with other applied substances and animal models to compare our results. Babaei et al. (2016) report positive weight gain results after the addition of propolis, pollen, honey, and royal jelly in different concentrations. In addition to the effect on growth intensity, the authors also found a positive effect on increasing the resistance of quails to infections. Biavatti et al. (2003) and Denli et al. (2005) also confirmed the trend of increasing average weight after the addition of propolis extract. The same results as in our experiment were recorded by Acikgoz et al. (2005) on the application of propolis to broiler chicken feed and Canogullari (2009) after the addition of propolis and pollen to Japanese quail. We can also conclude the effect of bee bread on growth performance, which is shown on the 28th day.

Mahgoub et al. (2019), after adding cold-pressed rosemary oil to the feed of Japanese quail, found a trend in increasing weight. In a study done by Guler et al. (2005), where coriander seeds were indicated as a potential growth promoter, also found a positive effect on growth intensity. Hussein et al. (2019) also report results on the positive effect on weight gain after the addition of cold-pressed clove oil. Various natural substances might have positive effect on various markers of health and have effect on increasing the body weight. Determining the
optimal dosage of bee bread is the biggest challenge, because there are not many similarly focused experiments. In comparison with the control group, we observed in our experiment a significant increase of body weight on 28th day in experimental group P1 compared to control group. Our results can contribute to extending the knowledge about bee bread, studying its effect on organism and provide the introduction of new potential natural products we can use in the food technology.

4. Conclusion
There is evidence that natural products when used as feed additives might have a positive effect on animal health and production. A weight gain is one of the indicators of increasing meat yield. The intensity of the growth and weight changes of Japanese quails by adding bee bread into feeding mixture in three different concentrations was monitored. The body weight on day 1, 28 and 56 was evaluated. We did find significant increase in experimental group P1 compared to control group, what indicated that bee bread in certain concentrations might be beneficial for improving growth performance. Further research is needed to evaluate its effects on different indicators, such as effect on quality of meat, eggs, and blood biochemistry.

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