GROWTH PROCESS IN FEMALES QUAIL CHICKS MATHEMATICAL ASSISTED

Monica PÂRVU[*], R. BURLACU[**], Ioana Cristina ANDRONIE[*]

Abstract

In order to work out a mathematical modelling, the growth process on quail chicks was studied. The experiment used 55 one day-old quail chicks raised in cages, assigned to 5 randomized groups (one control and four experimental groups). The experimental period was of 42 days. The chicks received isocaloric diets with three levels of feeding (ad libitum, 90% and 80% of ad libitum) and three protein levels (according to the standard and lower with 5% and 10%). The growth energy and the growth speed were significantly influenced by the level of feeding and by the dietary protein level. The highest daily weigh gain was assessed, by mathematical modelling, at 17.12 g, achieved at 25 days. The weight at maturity (39 days) was assessed, by mathematical modelling, with the highest value being 156 g.

***Key words**: mathematical modelling, quail*

Introduction

Mathematical modelling is based on the simulation of the processes of broiler growth and development considering the efficiency of nutrient utilization [2]. General equations are developed, which consider the initial weight and the chemical composition of the diet. The literature shows various mathematical models by species and production category, without mentioning the breed or hybrid that was used.

Materials and Methods

The experiment used 55 one day-old females quail chicks raised in the cages, assigned to 5 randomized groups (one control and four experimental groups). The experimental period was of 42 days.

The chicks received isocaloric formulations with different dietary levels of protein and amino acids. The experiment used various conditions of feeding in order to provide a wide range of applicability to the model. We used three levels of feeding (*ad libitum*, for the control group, 90% and 80% of *ad libitum* for the first and second experimental groups) and three protein levels (according to the standard for the control group, lower with 5% at experimental group 3 and 10% at experimental group 4).

Since the main aspects of the growth process, in the case of meat production, are the growth energy, the speed of growth and feed conversion ratio, throughout the experimental period we monitored the weight gain, feed intake and feed conversion ratio.

The environmental conditions were according to the standard of the growth technology.

The forage samples were assayed with the method of Weende and with an adiabatic calorimeter.

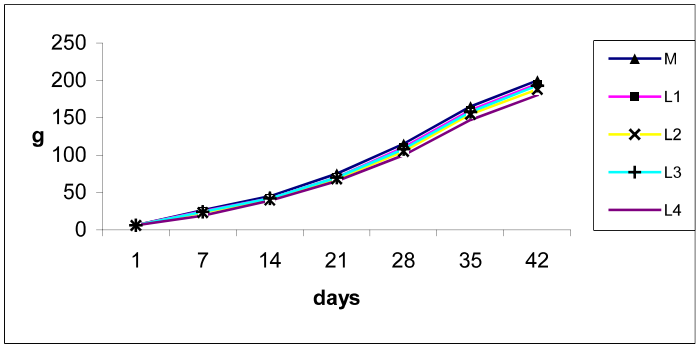
[*] Faculty of Veternary Medicine, *Spiru Haret* University.
[**] USAMV Bucharest.

The mathematical modelling of the growth process used Gompertz-type functions.

Results and Discussions

Growth energy (see the chart) was not the same throughout the growth period, being higher during the period 30-40 days. It was observed that related to the weight at hatching (initial weight), body mass at 14 days increased in average by 5.5 times (p≥ 0,5). Starting with the age of 28 days, the level of feeding and the level of dietary protein influenced significantly the growth energy ($p \leq 0.05$). At the age of 42 days, body mass had increased 21 times in the control group, 18 times in group 1, 17 times in group 2, 13 times in group 3 and 10 times in group 4.

The conditions of feeding (level of feeding and level of dietary protein) did not bear an influence on the overall curve, which was an "S" for all groups.



Growth energy

Growth speed (average daily gain) was 4.62 g in the control group, 4.15 g in group 1, 3.97 g in group 2, 4.30 g in group 3 and 3.38 g in group 4. The average daily gain was significantly influenced by the level of feeding ($p \leq 0.05$) and distinctly significant ($p \leq 0.01$) by the depression of the dietary protein level. The decrease of dietary protein and essential amino acids (lysine, methionine+cystine) level inhibited the growth and a high feed intake mare [1].

Processing statistically the data obtained from all groups with the Gompertz-type growth functions, we obtained the following equations:

$$\textit{Weight}\ W\ (g) = 6.5 \times e^{\frac{0.1271}{0.028} \times (1 - e^{-0.028 \times t})}$$

$$\textit{Average daily gain } \Delta W\ (g/day) = \Delta GW/dt = 0.1251 \times W \times e^{-0.028 \times t}, \textit{ where}$$

$$t = 25 \textit{ days}$$

$$\textit{Highest weight gain } \Delta W(t^x) = 17.12\ g/day$$

$$\textit{Highest weight } W_{max} = 156\ g$$

The highest daily weight gain was assessed at 17.12 g/day, at the age of 25 days. The highest weight at maturity was assessed at 156 g, at the age of 39 days.

Conclusions

1. The variability of the feeding conditions (both as quality and quantity) has to be provided for the development of a mathematical model for the simulation of growth processes in females quail.

2. The growth energy is significantly influenced by the level of feeding and by the dietary protein level.

3. The highest daily weigh gain was assessed, by mathematical modelling, at 17.12 g, achieved in 25 days.

4. The weight at maturity (39 days) was assessed, by mathematical modelling, with the highest value being 156 g.

Reference

1. Van, I, Gh. Marin, V. Cofas, A. Damian, Ana Maria Covaşă, Dana Custură, *Creşterea prepeliţelor domestice pentru carne şi ouă*, Ceres Publishing House, Bucharest, 2003.

2. Whitemore, C.T., *A Study of Growth Responses to Nutrient Inputs by Modelling*, Proc. Nutr. Soc, vol. 35, pp. 383-391.