

Mathematical Estimate of Growth Process in Mangalitsa Piglets

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Abstract

The purpose of researches was to develop a mathematical model to simulate the growth process in piglets. The experiment was conducted on 53 Mangalitsa piglets, with initial weight (Wi) of 0.95 kg. The final weight was 30.7 kg. The piglets have been fed *ad libitum* with standard diets. Body weight, compound feed intake and feed conversion ratio were monitored throughout the experimental period. Housing environmental parameters were according to the growth technology. The feed samples were analyzed according the Weende scheme. The crude protein was determined by Tecator – Kjeltec Auto Analyze, the ether extract by Soxtec System HT and the brute cellulose by gravimetric method. The Gompertz-type functions were used for the mathematical modelling of the growth process. Gompertz function is a type of mathematical model for a time series, with sigmoid appearance. The weight evolution was evaluated from the initial weight (Wi). Based on data on the evolution of body weight was made a mathematical model that allows estimation of growth in standard conditions of maintenance.

Keywords: growth, Mangalitsa, piglet

1. Introduction

Mathematical modelling is based on the simulation of the processes of broiler growth and development considering the efficiency of nutrient utilization [1]. 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. The aim of experiment was to monitoring the weight dynamic in piglets, without affecting the welfare of animals [2]. The data obtained were the basis for elaborating a mathematical model simulating the growth process.

2. Materials and methods

The experiment used 53 Mangalitsa piglets one day-old, with initial weight (Wi) 0.9 kg. The final weight was 30.7 kg. Beginning at 12 days, the piglets were used to standard diets.

Since the main aspects of the growth process are the growth energy and the speed of growth, throughout the experimental period were monitored the weight dynamic, weight gain, weaning age and age when achieved 30 kg.

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

Weight dynamics data were statistically ANOVA and in mathematical modeling of growth process was used Gompertz-type functions.

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3. Results and discussion

Data on growth dynamics are presented in Table 1.

Table 1. The growth dynamic

Specification	
Initial weight (Wi), kg	0.9
Weaning weight, kg	7.0
Final live weight, kg	30.7
Weaning age, d	48
Age when achieved 30 kg	136
Average daily gain, g	219.11

The weaning weight was 7 kg and was made at the age of 48 days. According with literature data, compared with other races, Mangalitsa is a late breed, weaning accomplished with a week later than the Large White or Landrace and weaning weight is less than 2-3 kg [3].

Weight of 30 kg was reached at 136 days old. Compared with improved breeds, at Mangalitsa the technological weight of 30 kg was achieved with 17 days later [3].

The average daily gain was 219.11 g, significantly lower than that achieved by early races.

Processing statistically data obtained with the Gompertz-type growth functions (figure 1), we obtained the following equations:

$$\frac{0.0265}{0.0046}x(1 - e^{-0.0046xt})$$

$$\text{Weight } W \text{ (kg)} = W_i \times e$$

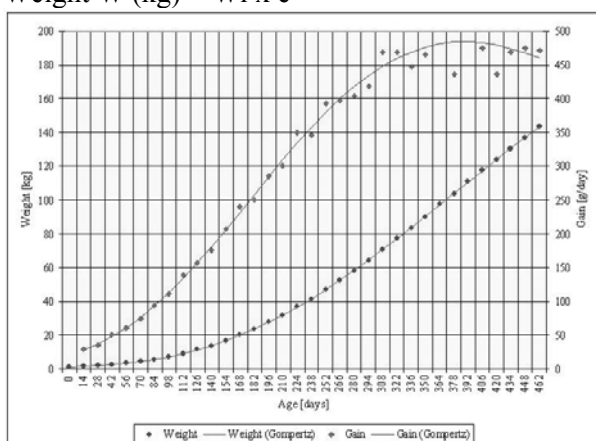


Figure 1. Growth Gompertz function

4. Conclusions

At Mangalitsa, the average daily gain was significantly lower, the weaning weight and the technological weight of 30 kg being performed later than improved breeds.

According to mathematical model, the highest daily weigh gain was assessed at 483.87 g, achieved at 55 weeks.

The weight at maturity was assessed, by mathematical modelling, at 286 kg.

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