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Impact of the physical structure of feed on performance, diet digestibility, and macroscopic anatomical changes in the oropharyngeal cavity of broilers

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Abstract: The study evaluated the impact of different pellet ratios on performance, diet digestibility, and changes in the oropharyngeal cavity in broiler chickens. One hundred sixty male broilers, aged 28 to 42 days, were distributed in a completely randomized design with four treatments and eight replicates of five birds each. These were M100 (control diet; 100% mash), P34 (34% pelleted), P66 (66% pelleted), and P100 (100% pelleted). At 28, 35, and 42 days of age, body weight gain (BWG), feed intake (FI), and feed conversion ratio (FCR) were assessed. At 42 days of age, ileal digesta was collected from two birds per repetition to determine the apparent ileal digestibility (AID) of dry matter (DM), crude protein (CP), and ileal digestible energy (IDE). In addition, the oropharyngeal cavity was analyzed to investigate possible alterations in these structures. At 42 days, samples of wood shavings were collected to determine the moisture content. The data was submitted to ANOVA and, when significant, compared using Dunnett's test at 5%. Birds in the P100 group had better FCR ($P < 0.05$) than birds in the M100 from 36 to 42 and 28 to 42 days. Birds fed the P100 and P34 diets had lower MS AID ($P < 0.05$), while birds in the M100 had better CP AID compared to those fed diets with some processing ($P < 0.05$). The treatments P66 and P34 had lower IDE than the control diet ($P < 0.05$). In conclusion, birds fed P100 performed better, while birds fed M100 had better AID.

Keywords: Fines, mash, pellet, poultry, processing

1. Introduction

Feed processing can affect broiler performance, improving body weight gain and feed conversion ratio (Teixeira Netto et al., 2019). The process of pelleting broiler diets, in particular, has advantages compared to diets in mash form since the benefits include reducing the segregation of ingredients, making it easier to grasp the diet, reducing the presence of pathogens, increasing metabolizable energy due to the lower time taken for consumption (Jensen et al., 1962; Meinerz et al., 2001; Glover et al., 2018; Khalil et al., 2021; Lemons et al., 2021), and increased digestibility of some dietary components (Abdollahi et al., 2013). However, these benefits promoted by pelleting will only be achieved if the pellets maintain their physical quality until the animal ingests the feed (Abdollahi et al., 2013; Muramatsu et al., 2015). Pellets must resist fragmentation and friction during handling without breaking to avoid a high proportion of fines (Burin Junior et al., 2019). Several factors can affect the quality of pellets, such as the nutritional composition of the diet, the particle size of the ingredients, and variables in the production process, such as moisture content, temperature control, and conditioning time (Thomas & Van Der Poel, 1996; Cutlip et al., 2008; Vukmirović et al., 2017). In this context, McKinney & Teeter (2004) compared diets made up of 100% pellets and 100% fines, observing that broilers fed a total pelleted diet had more significant body weight gain and better feed conversion ratio when compared to diets with 100% fines. Likewise, Lilly et al. (2011) observed that feed consumption and body weight gain were higher when birds were fed a diet containing 60% pellets than those with 30% or 0%.

Although there are several studies evaluating the effects of processing and the physical form of diets on performance and diet digestibility in broiler chickens (McKinney & Teeter, 2004; Corzo et al., 2011; Glover et al., 2015; Masuqueto et al., 2019; McCafferty & Purswell, 2023), there are few studies evaluating the proportion of fine and pellets in the diet with performance and digestibility parameters, as well as assessing whether this disuniformity in the physical form of the feed can cause visible changes in the structures of the oropharyngeal cavity.

One of the hypotheses of this study is that diets in mash form or with higher proportions of fines can result in alterations or even obstruction in the salivary ducts of broiler chickens. However, further studies are needed to confirm this hypothesis and improve understanding of the effects of these diets on the oropharyngeal cavity of poultry.

Therefore, the objective of this study was to evaluate the different proportions of pelleted feed throughout 28 to 42 days and investigate the effect of these proportions on body weight gain, feed consumption, feed conversion ratio, apparent ileal digestibility, litter moisture, and possible macroscopic changes in the oropharyngeal cavity of broiler chickens.

2. Material and Methods

2.1. Animals, facilities, and experimental design

One hundred sixty-one-day-old male broiler chicks (Ross 308 AP95, Ross Brazil Ltda, São Paulo, Brazil) were obtained from a commercial hatchery. The experimental period lasted from 28 to 42 days of age.

From 1 to 42 days of age, the birds were randomly allocated to 32 floor pens of 1.72 m² each (five birds/box) equipped with tubular feeders, nipple drinkers, and wood shavings as litter. Each box was considered an experimental unit. The birds were provided water and feed ad libitum, and the ambient temperature and animal mortality were checked daily. The temperature recommendations

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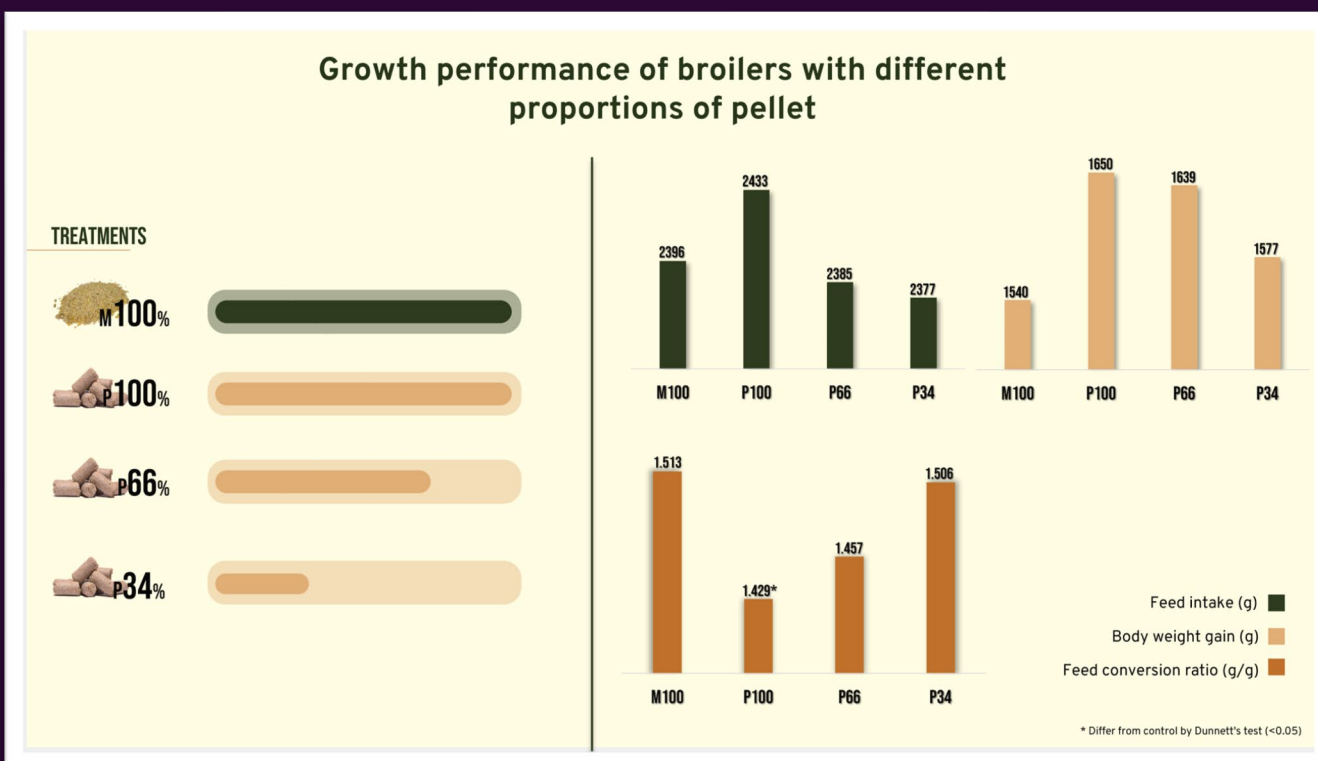
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GRAPHICAL ABSTRACT



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