Feed form and energy concentration of the diet affect growth performance and digestive tract traits of brown-egg laying pullets from hatching to 17 weeks of age[1]

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ABSTRACT The influence of feed form and energy concentration of the diet on growth performance and the development of the gastrointestinal tract (GIT) was studied in brown-egg laying pullets. Diets formed a 2 x 5 factorial with 2 feed forms (mash vs. crumbles) and 5 levels of energy differing in 50 kcal AME_n/kg. For the entire study (0 to 17 wk of age) feeding crumbles increased ADFI (52.9 vs. 49.7 g; $P < 0.001$) and ADG (12.7 vs. 11.6 g; $P < 0.001$) and improved feed conversion ratio (FCR; 4.18 vs. 4.27; $P < 0.001$). An increase in the energy content of the diet decreased ADFI linearly ($P < 0.001$) and improved FCR quadratically ($P < 0.01$) but energy intake (kcal AME_n/d) was not affected. BW uniformity was higher ($P < 0.05$) in pullets fed crumbles than in those fed mash but was not affected ($P > 0.05$) by energy content of the diet. At 5, 10, and 17 wk of age, the relative weight (RW, % BW) of the GIT and the gizzard, and gizzard digesta content were lower ($P < 0.05$ to $P < 0.001$) and gizzard pH was higher ($P < 0.05$ to $P < 0.001$) in pullets fed crumbles than in pullets fed mash. Energy concentration of the diet did not affect any of the GIT variables studied. In summary, feeding crumbles improved pullet performance and reduced the RW of the GIT and gizzard, and increased gizzard pH at all ages. An increase in the energy content of the diet improved FCR from 0 to 17 wk of age. The use of crumbles and the increase in the AME_n content of the diet might be used adventageously when the objetive is to increase the BW of the pullets. However, crumbles affected the development and weight of the organs of the GIT, which might have negative effects on feed intake and egg production at the beginning of the egg laying cycle.

Key words: BW uniformity, crumble diet, gizzard pH, mash diet

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INTRODUCTION

Pelleting results usually in increases in feed intake (**FI**) and improvements of ADG and feed conversion ratio (**FCR**) in poultry (Abdollahi et al., 2013; Guzmán et al., 2015; Jiménez-Moreno et al., 2015). When the diets are fed as pellets, feed wastage is reduced (Serrano et al., 2013) and nutrient utilization is increased (Lemme et al., 2006; Abdollahi et al., 2011). Pelleting reduces the relative weight (**RW**; % BW) of the gizzard and increases gizzard pH in poultry (Preston et al., 2000; Abdollahi et al., 2011), effects that might be less pronounced in pullets because of their reduced growth rate and lower ingesta capacity (Frikha et al., 2009b; Guzmán et al., 2015). However, the information available on the influence of feed form on growth performance and the development of the gastrointestinal tract (**GIT**) in pullets is limited.

Energy concentration of the diet affects ADFI and growth performance of broilers (Brickett et al., 2007), pullets (Frikha et al., 2009a; Guzmán et al., 2015), and laying hens (Grobas et al., 1999a; Pérez-Bonilla et al., 2012). Birds eat to satisfy their energy requirements and therefore, voluntary FI decreases as the energy content of the diet increases (Leeson et al., 1996; Veldkamp et al., 2005). However, the adaptation of the digestive tract of the birds to regulate FI with changes in energy concentration of the diet might not be complete. For example, high energy diets contain more fat and are more palatable than low energy diets which may result in an increase in energy intake (**EI**) and BW gain (Grobas et al., 1999b). Moreover, an increase in the fat content of the diet reduces digesta transit time and improves the utilization of other components of the diet (Mateos and Sell 1980, 1981). In contrast, if the diet is diluted excessively, birds might not be able of maintaining their EI constant, resulting in poor performance (Nielsen, 2004; Pérez-Bonilla et al., 2012). On the other hand, when the energy concentration of the diet is reduced, fiber

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