

# Productive performance of brown-egg laying pullets from hatching to 5 weeks of age as affected by fiber inclusion, feed form, and energy concentration of the diet<sup>1</sup>

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**ABSTRACT** The effects of fiber inclusion, feed form, and energy concentration of the diet on the growth performance of pullets from hatching to 5 wk age were studied in 2 experiments. In Experiment 1, there was a control diet based on cereals and soybean meal, and 6 extra diets that included 2 or 4% of cereal straw, sugar beet pulp (SBP), or sunflower hulls (SFHs) at the expense (wt/wt) of the whole control diet. From hatching to 5 wk age fiber inclusion increased ( $P < 0.05$ ) ADG and ADFI, and improved ( $P < 0.05$ ) energy efficiency (EnE; kcal AME<sub>n</sub>/g ADG), but body weight (BW) uniformity was not affected. Pullets fed SFH tended to have higher ADG than pullets fed SBP ( $P = 0.072$ ) with pullets fed straw being intermediate. The feed conversion ratio (FCR) was better ( $P < 0.05$ ) with 2% than with 4% fiber inclusion. In Experiment 2, 10 diets were arranged as a 2×5 factorial with 2 feed forms

(mash vs. crumbles) and 5 levels of AME<sub>n</sub> (2,850, 2,900, 2,950, 3,000, and 3,050 kcal/kg). Pullets fed crumbles were heavier and had better FCR than pullets fed mash ( $P < 0.001$ ). An increase in the energy content of the crumble diets reduced ADFI and improved FCR linearly, but no effects were detected with the mash diets ( $P < 0.01$  and  $P < 0.05$  for the interactions). Feeding crumbles tended to improve BW uniformity at 5 wk age ( $P = 0.077$ ) but no effects were detected with increases in energy concentration of the diet. In summary, the inclusion of moderate amounts of fiber in the diet improves pullet performance from hatching to 5 wk age. The response of pullets to increases in energy content of the diet depends on feed form with a decrease in feed intake when fed crumbles but no changes when fed mash. Feeding crumbles might be preferred to feeding mash in pullets from hatching to 5 wk age.

**Key words:** crumble feed, mash feed, straw, sugar beet pulp, sunflower hulls

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## INTRODUCTION

The inclusion of fibrous ingredients in poultry diets reduces feed intake (**FI**) (Kondra et al., 1974; Sklan et al., 2003) and nutrient digestibility (Rougière and Carré, 2010), and might affect the incidence of enteric disorders in poultry (Montagne et al., 2003; Shakouri et al., 2006; Mateos et al., 2012). Recent research conducted with young broilers, however, have shown that the inclusion of moderate amounts of insoluble fiber sources, such as oat hulls (**OHs**) and sunflower hulls (**SFHs**), in the diet stimulates the development and physiology of the gastrointestinal tract (**GIT**) (González-Alvarado et al., 2008; Svihus, 2011; Sacranie et al., 2012) and might improve broiler performance (Jiménez-Moreno et al., 2009b; González-Alvarado et al., 2010). However, the information avail-

able on the effects of including fiber sources differing in physico-chemical characteristics on growth performance of pullets is very limited.

Pelleting improves the ADG and feed conversion ratio (**FCR**) in broilers (Amerah et al., 2007; Serrano et al., 2012; Abdollahi et al., 2013) with most of the benefits associated to higher FI and reduced feed wastage (Serrano et al., 2013). However, the information available on the influence of feed form of the diet on productive performance in pullets is scarce (Frikha et al., 2009b). Probably pelleting of the feed might be of less benefit in pullets than in broilers because of the lower growth rate and reduced capacity for voluntary FI of pullets.

Energy concentration of the diet affects FI and growth performance in broilers (Brickett et al., 2007), pullets (Frikha et al., 2009a), and laying hens (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). High-energy diets contain usually more fat and are more palatable than low-energy diets which might favor energy intake (**EnI**) of the birds (Frikha et al., 2009a). Moreover, supplemental

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