Title :

Effect of phytobiotic blends on growth performances and digestive microbiota of broiler chickens in two rearing densities

Abstract:

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In poultry, phytobiotics are used to improve growth performances. However, the effect of these additives are variable, which may be partly explained by difference in poultry breeding conditions. Several mechanisms for growth enhancement have been proposed for phytobiotics. Due to their *in vitro* activities on bacteria, currently, digestive microbiota is thought to be the most likely target.

In this study, the effects of phytobiotic blends on the performances and digestive microbiota of chicken were studied according to stocking densities (normal and high density : 12 and 17 birds/m²). Three experimental dietary treatments were performed: a control diet , a Exp1 diet with a phytobiotic blend from d22 with an *in vitro* antimicrobial effect, and a Exp2 diet with a second phytobiotic blend with antioxidant and immunomodulator properties until d10, followed by the first phytobiotic blend. Body weights were recorded until d39. Digestive microbiota was studied in digestive content (crop, ileum, caeca) at 3 and 6 weeks by a fingerprint method. Analysis of similarity (ANOSIM) between the profiles were performed on the Pearson distance matrix (differences were taken into account for $p<0.05$ and $R>0.5$).

At normal density, Exp1 and Exp2 diets improved weight gain from d24 to d32 (9.9% and 11.1% respectively) and from d32 to d39 (8.1% and 10.8% respectively). At high density weight gain was improved with Exp2 diet from d24 to d32 (+8.0%).

At normal density Exp1 diet led to different fingerprints of caecal microbiota at 6 weeks than control --- (R=0.68), and Exp2 diet led to different fingerprints of microbiota in crop (R=0.69) and in caeca (R=0.75). At high density, the effects of experimental diets compared to control diet were more pronounced. With Exp1 diet, changes were observed at 6 weeks in ileum (R=0.55) and caeca (R=0.92), and with Exp2 diet, changes were observed as soon as 3 weeks in caeca (R=0.53) and later at 6 weeks in ileum (R=1) and caeca (R=0.90).

Thus the modifications of caecal microbiota as well as with Exp1 and Exp2 diets may be responsible for the beneficial effect observed on the growth performance at normal density. In the same manner, the higher performances observed with Exp2 diet at high density may be due in part to the high modifications of digestive microbiota. However, the lack of effect of Exp1 diet on growth performance at high density, whereas microbiota was also highly modified, showed that microbiota is not the one and only factor involved in the growth promoting effect of these phytobiotics.