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EFFECT OF DIETARY SODIUM DIFORMATE ON PERFORMANCE AND LITTER QUALITY IN BROILER TILL 42 DAYS POST-HATCH

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ABSTRACT

Formic acid and its salts are well known to improve productivity. By acting against pathogens, they help to decrease pressure on the animal's immune system, thus more nutrients will be available for productive functions such as growth. The double sodium salt of formic acid, while having the same antimicrobial properties as formic acid, has become more commonly used in poultry production due to improved handling properties. In a recent trial conducted at a research farm in Vietnam, sodium diformate (NDF) was tested at two different dosages (0.1% and 0.3% NDF) in a commercial broiler diet, against the same diet containing no acidifier. 384 day-old birds (Cobb 500) were randomly selected and divided into 3 treatment groups with 96 chicks each. Feed and water were available *ad libitum*. The effects of NDF on performance (final weight, feed conversion) and litter quality (water content, bacterial load) were examined after 42 days.

Performance was enhanced in birds fed 0.3% NDF. Treated birds tended (P=0.09) to be heavier (2365 g *vs.* 2264 g); and the FCR tended (P=0.07) to be improved (1.81 *vs.* 1.89); whereas the FCR in the 0.1% NDF-fed group was significantly enhanced (P<0.01). Litter quality, based on reduced moisture content, was significantly (P<0.05) improved in birds at both NDF-dosages. In conjunction with the improved litter quality, were significantly reduced (P<0.05) faecal levels of *Escherichia coli* in both treated groups.

This study demonstrates that including sodium diformate in broiler diets has beneficial effects on performance by lowering bacterial pathogen load and improving feed efficiency.

KEYWORDS: sodium diformate, broiler, weight gain, litter quality

INTRODUCTION

Animal husbandry suffers from losses due to contamination with pathogenic bacteria. Their resultant impacts in animals include lower weight gains and increased mortality. Banning the use of in-feed antibiotics (AGPs) in livestock, as has happened in the EU, placed more pressure on animal producers and feed millers. In this context, organic acids have long been used to counteract gram-negative pathogenic bacteria in animal feed; and the beneficial effects of feeding organic acids to monogastric animals on animal performance and health are well accepted.

One of the first reports of improved broiler performance when diets were supplemented with single acids was for formic acid (Vogt *et al*., 1981). Later, Izat *et al*. (1990) found significantly reduced levels of *Salmonella spp.* in carcass and caecal samples, after including calcium formate in broiler diets.

The use of pure formic acid in breeder diets reduced the contamination of tray liners and hatchery waste with *S. enteritidis* drastically (Humphrey and Lanning, 1988). Hinton and Linton (1988) examined how salmonella infections could be controlled in broiler chickens,

using a mixture of formic and propionic acids. They demonstrated that under experimental conditions, 0.6% of this organic acid blend was effective in preventing intestinal colonization with *Salmonella spp.* from naturally or artificially contaminated feed.

Improving broiler performance or hygienic conditions with the aid of organic acids has been reported by many sources (Desai *et al*., 2007), as mentioned above. An important limitation, however, is that organic acids are rapidly metabolised in the fore-gut (crop to gizzard) of birds, which will reduce their impact on growth performance. A new molecule (diformate, a double salt of formic acid) has been proven to be effective against pathogenic bacteria, including salmonella, along the whole gastro-intestinal tract (Lückstädt and Theobald, 2009). The reduced impact of pathogenic bacteria on the broiler, as well as the improved gut microflora, leading to a state of eubiosis in treated chickens, suggests that including diformate in broiler diets will also result in improved bird performance. This hypothesis formed the impetus for the present study with sodium diformate (NDF).

MATERIALS AND METHODS

In a recent trial conducted at the research farm of the University of Agriculture and Forestry in Ho Chi Minh City, Vietnam, sodium diformate (NDF) was tested at two different dosages (0.1% and 0.3% NDF) in a commercial broiler diet, against the same diet containing no acidifier. 384 day-old birds (Cobb 500) were randomly selected and divided into 3 treatment groups with 96 chicks each. The initial weight of day-old chicks was 46 g. Feed and water were available *ad libitum*. The effects of NDF on performance (final weight, feed conversion) and litter quality (water content, bacterial load) were examined after 42 days. Data were recorded at the end of the trial. Statistical analysis was based on the t-test and a confidence level of 95% was defined for these analyses.

RESULTS AND DISCUSSION

Data on final weight after 42 days of trial period, the feed conversion ratio and litter quality are displayed in Table 1.

Performance was enhanced in birds fed 0.3% NDF. Treated birds tended (P=0.09) to be heavier (2.365 kg *vs.* 2.264 kg), while the FCR tended (P=0.07) to be improved (1.81 *vs.* 1.89) as well. It should be noted that the 0.1% inclusion of NDF led to a significantly (P<0.01) improved FCR against the control (1.74 *vs.* 1.89), whereas the final weight of birds fed with that dosage differed only numerically from the control (2.324 kg *vs.* 2.264 kg). Litter quality, based on reduced moisture content, was significantly (P<0.05) improved in birds at both NDF-dosages. In conjunction with the improved litter quality, were significantly reduced (P<0.05) faecal levels of *Escherichia coli* in both treated groups.

The described results are in agreement with previously reported data. Lückstädt and Theobald (2011) found dose dependent effects on weight gain in broilers fed over a trial period of 38 days. Likewise, the European Broiler Index was enhanced dose-dependently. Furthermore, an inhibition of *E. coli* after feeding diets with dietary diformate had been reported by Øverland *et al*. (2000).

CONCLUSION

The present study therefore confirms once

Table 1 - Performance parameters and litter quality in broilers fed with or without sodium diformate.

	Control	**0.1% NDF**	**P-level *vs.* Control**	**0.3% NDF**	**P-level *vs.* Control**
Final weight [kg]	2.264±0.19	2.324±0.19	0.20	2.365±0.21	0.09
FCR	1.89±0.11	1.74±0.07	<0.01	1.81±0.10	0.07
E. coli [MPN/g faeces]	4.0×10^7	1.2×10^6	0.02	1.4×10^6	0.02
Faecal moisture [%]	57.2	53.2	0.03	54.3	0.04

more that dietary sodium diformate in dosages between 0.1% and 0.3% has beneficial impacts on the performance of broilers, as well as on the litter quality, measured as bacterial load and faecal moisture. A balanced acidifier, such as diformate, is a sustainable option for maintaining or improving broiler growth and efficiency, without resorting to supplementation with an antibiotic growth promoter.

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