FERMENTED FEED FOR BROILERS

A. WHITEHEAD\textsuperscript{1} AND T.A. SCOTT\textsuperscript{1}

Summary

Wheat-based mash broiler starter diets with or without xylanase were fed \textit{ad libitum} in three forms (dry, wet (1.2g water: 1g feed), and wet plus a commercial silage inoculant (\textit{Lactobacillus plantarum} and \textit{Enterococcus faecium}) fermented for 24h) to six cages of six male broilers from 0 to 21 d of age. The inoculated wet diet pH decreased from 6.6 to 4.2 following the 24h fermentation period and appeared to be well accepted by broiler chicks. The body weight of the broilers at day 21 fed fermented diets though not significantly greater than those fed wet diets, were 19% greater than those fed the equivalent diets in a dry form. The increase in body weight was matched to an increase in feed intake and the FCR was not significantly different between feed forms, although numerically lower for the birds fed fermented diets. The study confirms that feed intake of dry-fed wheat-based diets is limited by broilers and suggests that it may be possible to incorporate the pro- and pre-biotic value of fermented diets for feeding broilers into wet feeding programmes.

RESULTS AND DISCUSSION

The advantage of wet feeding broiler chickens has been recently reviewed by Forbes (2003); and specifically referenced by Scott (2002) and Scott and Silversides (2003) as being a valuable tool in our understanding of limits in feed intake by broiler chickens fed wheat-based diets. Although merits were observed with wet feeding, there was a strong concern with regards to the potential for microbial proliferation in wet feed, either directly challenging the bird or producing harmful toxins to contaminate the feed. Although preliminary studies (Scott, 2002) did not show an advantage in feeding propionic acid in wet feeds to control microbial growth, the present study was conducted to determine if fermented feed, similar to that used for feeding pigs, would be acceptable to broiler chickens.

A preliminary study was conducted to determine the optimum (low stable pH) fermentation conditions using a commercial silage inoculant (SI-LAC: Genesearch, Australia). Based on several trials, it was found we could decrease the initial pH of wet (1.2g water: 1g feed) diets from 6.6 to a stable pH of 4.2 by using recommended broth applications and maintaining the feed anaerobically (semi-sealed plastic bags) for 24 h at 30°C.

Wheat-based broiler starter diets were prepared, split and one portion remixed with added xylanase (Avizyme 1302; Feedworks Pty Ltd). These two diets were fed \textit{ad libitum} to six cages of six male broilers from 0 to 21 d of age in three forms: a) dry (as is); b) wet (prepared each morning by adding 1.2 g water: 1g dry feed, mixed and fed in plastic-lined feeders with all left over feed weighed back and discarded); and c) wet feed inoculated with SI-LAC (a broth prepared from a commercial ensilage inoculant of \textit{Lactobacillus plantarum} and \textit{Enterococcus faecium}) that was allowed to anaerobically ferment (30°C) for 24h before feeding as per the wet diets. The feed intake of all birds is expressed on a dry basis. The growth and efficiency of the birds fed the six diet combinations were monitored and four birds / diet were sacrificed at 21d for assessment of digesta pH and gut segment measurement. Based on digesta viscosity measures and performance we concluded that the soluble non-starch polysaccharide levels of the wheat used in this study were not high and

\footnote{1 Faculty of Veterinary Science, University of Sydney, NSW 2006 - Australia}

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minimal enzyme response was observed. Therefore, we have only reported the effects of diet form in Table 1.

Table 1. The mean variable response of male broilers (0 to 21 d) to wheat-based mash diets (with or without xylanase) fed in three forms.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dry</th>
<th>Wet (1.2 g water: 1 g feed)</th>
<th>Fermented wet diets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed intake (g/b/d) 0-21 d</td>
<td>46.4±2.34&lt;sup&gt;b&lt;/sup&gt;</td>
<td>54.3±2.03&lt;sup&gt;i&lt;/sup&gt;</td>
<td>53.5±3.22&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Body weight (BW) g – 21 d</td>
<td>711±44.2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>830±39.3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>847±54.4&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
<td>FCR</td>
<td>1.46±0.079&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.43±0.049&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.41±0.067&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
<td>Crop pH</td>
<td>5.5±1.15&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.2±0.62&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.5±0.08&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Gizzard pH</td>
<td>2.8±0.36&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.6±0.28&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.6±0.28&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Gizzard wt / BW</td>
<td>2.04±0.28&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.95±0.28&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>1.72±0.30&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Liver wt / BW</td>
<td>4.34±0.62&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.79±0.65&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.62±0.22&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a,b,c</sup> – mean values with different superscripts indicate significant differences (P<0.05).

It is evident from the data that there was no serious consequence of feeding fermented diets with regards to growth and FCR. There was a significant lowering of crop pH, of particular interest is the low std deviation for fermented crop pH, indicating consistency in the crop. We also did not determine the survival of the inoculated microorganisms in the digesta of the gut, however based on work by others this would be expected to exist.

The fermentation process has been credited with changes in nutrient availability; for example, Carlson and Poulsen (2003) demonstrated marked changes in phytate P availability with fermented wheat- and barley-based diets. Some of the benefits of this may relate to activation of endogenous cereal phytases as well as those from the bacteria during fermentation. Heres et al. (2003a,b) demonstrated that the pre- and pro-biotic activity of fermented diets was effective in controlling Salmonella and Campylobacter colonisation of the gut. A component of this was the lowering of the pH of the diet prior to ingestion and halting multiplication of these pathogens, and in some cases destroying them. A second component was the minimisation of cross contamination, due to increased resistance and a reduction in shedding. It is evident that the contribution of wet feeds and the practice of controlling microbial growth by ensilage / fermentation will require further work to determine its practical application for feeding of poultry.

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REFERENCES