Non-Starch Polysaccharides in Australian Cereals

J. S Kopinski, P. Martin, G. W. Blight, A. Pytko and P. Van Melzen

Queensland Department of Primary Industries, Animal Research Institute, Yeerongpilly Qld 4 105

Non starch polysaccharides (NSP) are a group of complex carbohydrates which comprise a large component of the cell wall of most cereals. The major components are pentosans and the (1-3),(1-4)-β-glucans. The anti-nutritive effects of these non-starch poly-saccharides are manifested by the depression of nutrient digestion and absorption (Antoniou and Marquardt, 1981). When poultry are fed a mainly barley-based diet the β-glucan present causes growth depression accompanied by sticky droppings which can be ameliorated by β-glucanase addition (Gohl et al. 1978). Similarly when poultry are fed rye-based diets (Antioniou and Marquardt, 1981) or even wheat-based diets (Choct and Annison, 1990) the pentosans present exhibit anti-nutritive activities with lower AME’s and growth depression. Little data is available on the levels of these non-starch polysaccharides in the three major cereals used in animal feeding in Australia. The present study examined the levels of β-glucans and pentosans in barley, wheat and sorghum crops grown in 1992. A total of 66 wheat samples (11 varieties x 6 sites), 40 barley samples (10 varieties x 4 sites) and 12 sorghum varieties at one site only, were analysed.

It is generally accepted that problems for poultry with the feeding of wheat can be a result of pentosan levels, while barley β-glucans also cause problems when used for animal feeding. The results in table 1 indicate that barley has a substantial pentosan content, equivalent to wheat. Thus when barley-based diets are fed to animals an underlying ‘pentosan’ problem may exist which is being masked by the β-glucan effect. Use of β-glucanases in barley diets will increase the importance of the pentosan content of barley on animal performance. Sorghum, although having an insignificant β-glucan content, has a pentosan level 50% of that present in wheat and barley. Site and variety comparisons indicate that wheat pentosans are influenced significantly by site (P<0.05) whereas in barley, variety and not site influences the pentosan content (P<0.05). β-glucan levels in wheat and barley are influenced by both variety and site (P<0.05).

It is important for nutritionists to be aware of the level of pentosan in barley, particularly as pentosans along with β-glucans can influence the energy digestibility of diets for non-ruminants, especially poultry, with deleterious effects on performance.

Table 1 The pentosan and β-glucan levels (on DM basis) in Australian cereals from 1992.

<table>
<thead>
<tr>
<th>Grain</th>
<th>Number</th>
<th>Pentosan%*</th>
<th>β-glucan%*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>66</td>
<td>5.91 ± 1.32</td>
<td>0.67 ± 0.17</td>
</tr>
<tr>
<td>Barley</td>
<td>40</td>
<td>6.04 ± 1.18</td>
<td>4.94 ± 0.96</td>
</tr>
<tr>
<td>Sorghum</td>
<td>12</td>
<td>3.15 ± 0.66</td>
<td>0.21 ± 0.18</td>
</tr>
</tbody>
</table>

* normal range expressed as x ± 2SD

References


Recent Advances in Animal Nutrition in Australia: July 1995
University of New England, Armidale NSW 23.51, Australia