Enzyme improves turkey liveweight uniformity by more than 20%

The addition of a β-mannanase product to turkey feeds improved weight uniformity and feed conversion and increased bodyweights. -Dr ***Mark Jackson***

A series of studies has shown that a new feed enzyme can improve turkey liveweight uniformity by over 20%. Bodyweight uniformity is an important factor in determining the efficiency at which poultry processing plants are able to operate. Uniformity affects the percentage of valuable parts, such as breasts, that meet the plant's desired specifications. The economic value of improved uniformity in bodyweight depends upon the specifics of the processor's business, especially whether the end product is whole, cut-up or further-processed birds. For a broiler processing plant where a uniformly sized breast is important, the enzyme can provide a gross benefit of about US$5 per ton of feed, assuming that a change in product mix does not affect demand. Furthermore, the enzyme will improve feed efficiency, average daily gain and mortality, providing an additional benefit of $4 to $5 per ton of feed.

Soybean meal, the main source of protein in many turkey feeds, contains a high concentration of non-starch polysaccharides (NSP), including p-mannan polymers which interfere with normal nutrient digestion and absorption. A β-mannanase enzyme that degrades p-mannan polymers has shown the potential for improving the utilisation of typical poultry feeds. Furthermore, the enzyme also promotes bodyweight uniformity as well as improving breast yield, feed conversion, average liveweights and mortality.

Mode of action of β-mannanase

How can a feed enzyme have such a major effect on poultry plant efficiency? Soybean meal, the primary protein source in most turkey feeds, contains approximately 22% NSP that is virtually indigestible in the intestinal tract due to the absence of appropriate endogenous enzymes. The most critical NSP is β-mannan, found in the endosperm and hulls of soybean. Its ability to hold water may help prevent dehydration of the soybean plant during growth.

Previous studies have show that feeding even small quantities of p-mannan leads to reductions in nitrogen retention, fat absorption and metabolisable energy. It can also slow the rate of glucose absorption from the intestine and reduce amino acid uptake. In addition, intestinal water absorption is diminished by the presence of sufficient p-mannan in the diet, leading to higher moisture content in the excreta. The enzyme β-mannanase has demonstrated the ability to counter the adverse affects of β-mannans in soybean meal on animal performance.

Figure 1: Body weight distribution - turkey toms at 155 days of age

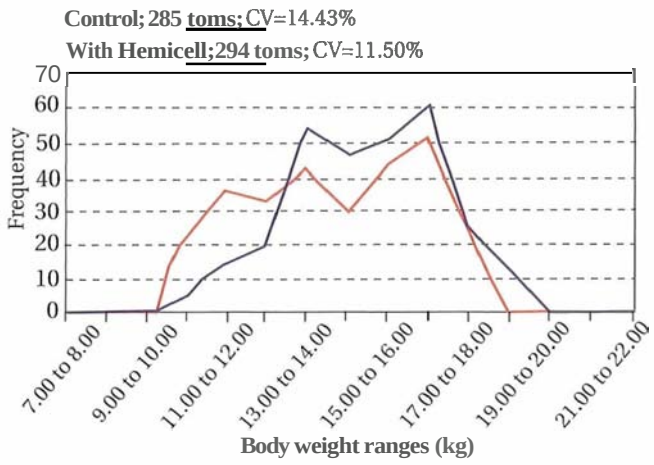
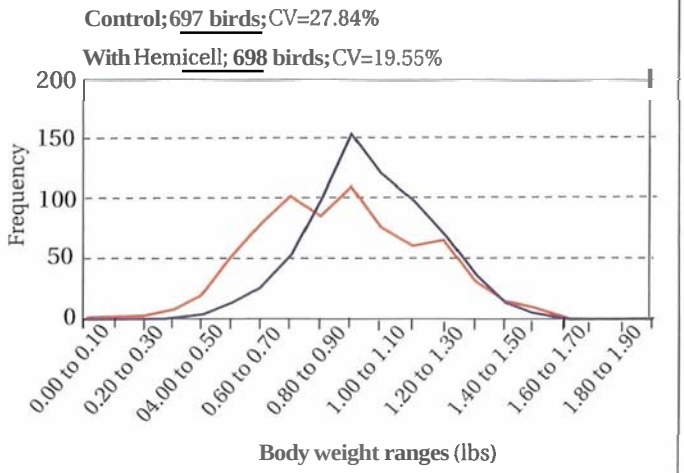


Figure 2: Body weight distribution - turkey hens at 21 days of age



Liveweight variation in turkey toms

In a recent pen study conducted at the PARC Institute, the impact of β-mannanase on the growth characteristics of turkey toms was evaluated. Two series of diets were tested, with and without the enzyme, resulting in a total of four treatments. Each series was composed of seven diets reflecting commercial feeding practice. Both series contained similar crude protein levels but series 2 was higher in energy by about 125 kcal/kg. Each treatment consisted of eight replicates, each comprising 20 BUTA toms at a stocking density of 3.8 square feet per bird.

To assess the impact of a variable (in this case, the β-mannanase enzyme) on bodyweight uniformity, it is necessary to weigh each individual bird so that a measure of the uniformity can be deterrnined for each pen. The coefficient of variation (CV) was used as this measure. The treatments were compared for differences in average uniformity and the statistical significance of those differences were evaluated.

The toms were grown to 155 days of age and their bodyweights were individually measured on days 49,77, 98 and 155. The CV at 155 days for the series 1 control was 14.67% compared to 11.43% with the enzyme. For series 2, the CV for the control was 14.46%and 11.25% with the enzyme. Both differences are significant ($P<0.05$).On average, the enzyme improved bodyweight uniformity by 22.2%.

At the earlier weigh points, percentage improvements in CV with the enzyme ranged from 19.6% to 42.0%. These improvements are also statistically significant ($P<0.05$). Breast meat yield was higher in the birds that were fed the enzyme (15.68% vs. 15.27% for series 1 and 16.06% vs. 15.68% for series 2). Figure 1 compares the bodyweight frequency distribution of toms at 155 days, with and without the enzyme (both series combined).

Liveweight variation in turkey hens

In trial at the PARC Institute with turkey hens, β-mannanase was added to the feeds of six turkey production companies. Each of these companies either supplied the feed directly to the test facility or supplied the feed formulation that was used to make feed. Turkey hens were grown out to 56 days but individual liveweights were taken only at 21 days. Each treatment was made up of six replicates, each comprising 20 BUTA turkey hen poults.

The CV for liveweight of birds given the control feeds (without enzyme) ranged from 20.55% to 24.56% and averaged 22.69% while that for birds raised on feed containing β-mannanase ranged from 15.44% to 19.29% and averaged 16.75%. Overall, the enzyme improved the uniformity of the birds by 26.1%, which is statistically significant ($P<0.01$).

Figure 2 compares the bodyweight frequency distribution of the birds, showing that the weights of the birds grown with the enzyme are grouped within a tighter range and more specifically that the effect of the enzyme is to shift the bodyweights of the lower-weight birds to the right. There were about 700 birds in each group, each individually weighed.

The effects on weight and feed conversion

In the first study described above, the toms fed series 1 with the enzyme were heavier than those fed the control diet by 2.38 pounds (1.08 kg). The toms fed series 2 with β-mannanase weighed more than those fed the control diet by 1.35 pounds (0.61 kg). The feed to gain ratio (F/G) was lower for the toms fed the enzyme-supplemented diets in both series. The F/G improvements, when corrected for mortality, were 7.8 and 4.1 points in series 1 and 2, respectively. For both series of diets, the addition of the enzyme also improved mortality.

In the turkey hen trial, the bodyweights and the F/G were improved at 56 days by an average of 0.10lbs (45g) and 4.2 points, respectively. The difference in FIG was significant at $P<0.05$.

All in all, the addition of this β-mannanase enzyme product to turkey feeds improved weight uniformity and feed conversion and increased bodyweights.

Dr Mark Jackson, ChemGen Corp, USA.

β-mannanase is available as a product called Hemicell® from ChemGen Corp., USA. The enzyme is available as a dry powder or as a liquid concentrate for post-pelleting application. The inclusion rate of this enzyme is 1lb per US ton of complete feed for the dry powder and 0.1 per US ton for the liquid concentrate.

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