Effect of Hulled and Hull-Less Barley With and Without Beta-Glucanase Enzyme on Performance of Broiler Chicks

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Abstract
Three hundred and sixty one-day-old chicks (Arian) were used in a completely randomized design with five treatments and four replicates for each treatment. The experimental treatments included: control group (without barley) with and without enzyme, 20% hulled barley with and without enzyme, 20% hull-less barley with and without enzyme. Body weights, feed intake and feed conversion were determined weekly. At 49d four chicks were chosen randomly from each pen and killed, abdominal fat pad, liver, pancreas, gizzard and digestive tract were removed, weighed and expressed as percentage of live weight. The ME values of hulled and hull-less barley with and without enzyme were determined with adult roosters. The results indicated AMEn and TMEn values of hull-less were higher than hulled barley. De-hull processing and inclusion of beta-glucanase enzyme did not improve growth performance at 20% usage of barley in broiler diets.
Key words: Broiler, Hulled and hull-less barley, Enzyme, Metabolizable energy, Performance

Introduction

Barley is the preferred grain for cultivation in many areas in the world due to its resistance to drought and ability to mature in climates with a short growth season. Its use for poultry has however been limited by the considerable amounts of fiber contained in the grain. The soluble fiber fraction, which mainly consists of mixed-linked (1-3)(1-4) beta-glucans, is associated with an increased gut viscosity, which in turn inhibits digestion and absorption of nutrients. The very successful introduction of enzymes that degrade soluble fiber have reduced this problem and increased the potential for use of barley in poultry diets. The majority of the insoluble fiber fraction consists of the hull, which will reduce the nutrient concentration of the grain, whilst having no anti-nutritive effect. (Scott et al.,1998). The use of barley in commercial broiler chicken diets is often restricted to 25% due to the potential risk of the occurrence of sticky droppings and depressive effect on performance (Oscarsson, 1997). Viscosity can be reduced by enzyme supplementation (Hesselman and Aman 1986; Brenes et al.,1993; Mohammed, 1995). A good estimation of barley energy value, with and without enzyme addition, is essential to establish an accurate quality: price ratio for feed formulation (Villamide et al. 1997).Extensive work has been done to study the effect of enzyme addition to poultry diet on the energy value of barley (Rotter et al., 1990; Friesen et al.,1992;Garcia et al. 2003). A significant increase due to enzyme addition was found for AMEn values, however, no differences were found for TMEn values determined with adult roosters (Rotter et al., 1990; Fuenet et al., 1995).
The objectives of this study were: 1) to determine the energy value of hulled and hull-less barley, 2) to study the effect of enzyme addition to hulled and hull-less barley on performance of broiler chicks.

Materials and Methods

Three hundred and sixty one-day-old (Arian) chicks were allocated to one of six treatments of 60 chicks in each treatment in a completely randomized design. Each treatment was represented by four replicates of fifteen birds within per pen .All chicks were fed by isocaloric and isonitrogenous diets, formulated to meet all their nutrients need, according to the NRC (1994), from 7 to 49d. The experimental treatments included: control group (without barley) with and without enzyme, 20% hulled barley with and without enzyme, 20% hull-less barley

with and without enzyme. The enzyme used in the study was, beta-glucanase (Safizym GP 500, 5600 unit/g) and 3 g/kg inclusion in diets. Body weight gain, feed intake and feed conversion were determined when the birds were 7, 21, 42 and 49 days of age. At 49 day of age four chicks were chosen randomly from each pen, killed and abdominal fat pad, gizzard, liver and intestine were removed, weighed and expressed as a percentage of live body weight. Twenty white leghorn cockerels in a completely randomized design were used to determine metabolizable energy content (AME, AMEn, TME ,TMEn) of hulled and hull-less barley with and without enzyme (Sibbald, 1986). Data from all responses variable were subjected to a one-way analysis of variance (SAS Institute, 1990) and Duncan's procedure was used to determine statistical significance among means.

Results and Discussion

The AMEn value obtained with hull-less barley significantly (P<0.05) was higher than hulled barley (2870 vs 2730 Kcal/kg). TMEn content of hull-less was also higher than hulled barley (3210 vs 3105 Kcal/kg). Increase in the metabolizable energy content of the hull-less barley is from de-hulling process that eliminates dilution effect of the fibrous hull. The TMEn and AMEn values of hull-less barley were increased 2.1% and 0.7% due to enzyme supplementation. However Enzyme inclusion did not significantly influence TMEn and AMEn values of hulled barley. These results are consisted with the finding of Rotter et al.(1990) and Fuenet et al. (1995), who reported a significant increase due to enzyme addition, for AMEn values, however, no differences were found for TMEn values determined with adult roosters. Body weight gain significantly increased (P<0.05) in the broilers in control groups in 7 to 21d, but in grower and finisher period, there are no significant differences among the treatments. Enzyme inclusion significantly (P<0.05) increased weight gain of broilers especially in hull-less barley at 7 to 49d (Table 1). It is because of beta- glucan content in the hull-less barley is relatively higher than hulled barley and enzyme is more effective. Broiler fed with hull-less barley diets had tendency towards increasing feed intake but it was not significant. The removal of fibrous hull of barley with anti-nutrient factor during the de-hull processing will in fact improve palatability. This, therefore, increased feed intake. Enzyme inclusion did not significantly influence feed intake of broilers in different ages. No significant differences were observed between treatments but feed conversion of birds fed with enzyme supplementation were improved at 7 to 49d especially in hull-less barley (Table 1). Abdominal fat pad, liver, pancreas and gizzard weight as a percentage of live body weight were not affected by treatments. Birds fed barley diets have been shown to have elevated intestinal weight, which negatively affects the carcass yield. This negative effect is reduced in enzyme supplementation diets. These results agreed with Brenes et al.

Table 1: Effect of hulled and hull-less barley with and without enzyme on weight gain(g/d) and feed conversion of Broilers

Treatments	7-21 d		21-42 d		42-49 d		7-49 d	
	Weight Gain	Feed Conversion	Weight Gain	Feed Conversion	Weight Gain	Feed Conversion	Weight Gain	Feed Conversion
Control +	23.9a	1.84	58.2	1.91	62.8	2.4	45.2b	2.22
Control -	24.6a	1.81	59.3	1.8	59.1	2.46	46.7b	2.21
20% H B +	22.6ab	1.88	57.8	1.89	55.1	2.67	47.8ab	2.15
20% H B -	21b	1.93	57.2	1.89	58.7	2.5	45b	2.23
20% HL B +	22.9ab	1.9	59.4	1.83	61	2.46	49.2a	2.12
20% HL B -	22.1ab	1.86	58.3	1.85	57.4	2.6	46.3b	2.2
MSE	2.08	0.008	6.1	0.01	7.86	0.08	3.22	0.06

Means in a column with no common superscripts differ significantly (P<0.05)
+: with enzyme ; -: without enzyme
HB: Hulled Barley ; HL B: Hull-Less Barley

(1993) that high beta-glucan barley strain inclusion increased the relative weight of the duodenum, jejunum and ileum. Almirall et al. (1995) also obtained similar result with decreased relative weight in the GI tract by supplementation with beta-glucanase.

Conclusion

The de-hulling process in barley increases ME values (AMEn and TMEn) and inclusion of exogenous beta-glucanase improves AMEn. De-hull processing and inclusion of beta-glucanase did not improve growth performance at 20% usage of barley in broiler diets.

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