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Effects of Beta-Glucanase Supplementation from Two Different Sources on Broiler Chickens Performance of Either Sex Fed Hull-less Barley Based Diets

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Abstract

This study was conducted to compare the effects of β -glucanase of two preparations on the male and female broiler performance. 540 day-old chicks from either sex were randomly assigned to 9 dietary treatments for 49 days (6 replicates of 10 chicks were used for each treatment). The experimental design was a completely randomized with factorial arrangement of treatments: 3×3 (kinds of enzyme \times levels of hull-less barley). Numbered plates dangled to day-old chicks shank and individuals weighted for determining of sex effects. The experimental design for weight gain and carcass performance was a completely randomized design with factorial arrangement of treatments: $3 \times 3 \times 2$ (kinds of enzyme \times levels of hull-less barley \times sex). In the end of experiment, two chicks were selected from each replicate and considered for carcass analysis. Results showed that weight gain from day 1-21 and 21-42 were significantly ($p < 0.05$) influenced by hull-less barley and enzyme levels; i.e., either enzyme significantly ($p < 0.05$) increased weight gain. Inclusion of enzyme and hull-less barley (HB) to diets had significant ($p < 0.05$) effect on feed intake (FI) and feed conversion (Fc). Locally produced (GP82 β -Glucanase) and commercial (ZY β -Glucanase) enzyme from day 1 to 49 increased FI significantly ($p < 0.05$) at 7.3, 4.3 and FC at 13.3, 9.4, respectively. No significant difference was observed between two kinds of enzymes. Enzyme inclusion from both preparations to HB diets appeared with significant increase ($p < 0.05$) on edible carcass and abdominal fat, but significantly ($p < 0.05$) decreased the visceral of both sexes. No significant differences were observed between two kinds of enzymes. Breast percentage (BP) again was influenced by enzyme, HB and sex. Locally produced enzyme led to significant ($p < 0.05$) increase in BP at 9.6, 8.7% and commercial enzyme at 8.7, 6.3% in male and female chicks, respectively. In conclusion, GP82 β -glucanase enzyme is of a great potential and comparable to commercial enzyme (β -glucanase hydrolysis).

Key Words: Beta-glucanase, Broiler, Carcass, Hull-less barley, Performance

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 3 ² (E₁)
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E₂ = 0/05 E₁ = 0/05

¹Bioavailability ²ZYβGlucanase
³GP82βGlucanase ⁴Hulless barley
⁵*Aspergillus niger* ⁶*Trichoderma longibrachiatum*

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| 522 | 587 | 1126 ^a | 1275 ^a | 420 ^{ab} | 450 ^{ab} | 0 | |
| 470 | 533 | 1002 ^c | 1075 ^c | 321 ^d | 345 ^{cd} | 40 | |
| 463 | 514 | 989 ^d | 1009 ^d | 311 ^d | 318 ^d | 60 | |
| 526 | 580 | 1120 ^a | 1268 ^a | 430 ^{ab} | 477 ^a | 0 | |
| 496 | 566 | 1072 ^a | 1259 ^{ab} | 404 ^{ab} | 430 ^{ab} | 40 | |
| 491 | 565 | 1009 ^c | 1087 ^c | 356 ^c | 382 ^{bc} | 60 | |
| 529 | 590 | 1135 ^a | 1287 ^a | 447 ^a | 487 ^a | 0 | |
| 521 | 579 | 1065 ^{ab} | 1257 ^{ab} | 418 ^{ab} | 444 ^{ab} | 40 | |
| 481 | 552 | 1012 ^b | 1170 ^{bc} | 345 ^{cd} | 365 ^c | 60 | |
| 40/5 | 37/2 | 50/5 | 47/3 | 16/2 | 15/7 | | SEM (E) |
| 509 | 551 | 1109 ^a | 1248 ^a | 402 ^a | 452 ^a | | |
| 512 | 577 | 1079 ^a | 1194 ^a | 379 ^{ab} | 416 ^a | | |
| 464 | 542 | 982 ^b | 1040 ^b | 352 ^b | 356 ^b | | () (HB) |
| 515 | 570 | 1092 ^a | 1219 ^a | 417 ^a | 420 ^a | 0 | |
| 504 | 555 | 1087 ^a | 1200 ^a | 399 ^a | 424 ^a | 40 | |
| 490 | 545 | 952 ^b | 1119 ^b | 333 ^b | 343 ^b | 60 | (S) |
| 557 ^a | | 1181 ^a | | 396 | | | |
| 495 ^b | | 1070 ^b | | 383 | | | |
| NS | | * | | ** | | | E |
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| 1/63 ^a | 1/63 ^{ab} | 1/44 ^a | 3573 ^{ab} | 1798 ^{bc} | 722 ^a | 0 |
| 2/11 ^c | 1/96 ^c | 1/84 ^c | 3339 ^c | 1643 ^d | 652 ^{bc} | 40 |
| 2/39 ^d | 2/16 ^d | 2/02 ^d | 2968 ^d | 1503 ^e | 646 ^c | 60 |
| 1/64 ^a | 1/61 ^a | 1/49 ^a | 3645 ^{ab} | 1895 ^{ab} | 736 ^a | 0 |
| 1/81 ^{ab} | 1/75 ^{ab} | 1/58 ^{ab} | 3494 ^b | 1781 ^{bc} | 712 ^{ab} | 40 |
| 1/92 ^b | 1/87 ^{bc} | 1/65 ^{ab} | 3438 ^c | 1705 ^{cd} | 702 ^{abc} | 60 |
| 1/68 ^a | 1/6 ^a | 1/55 ^{ab} | 3714 ^a | 1965 ^a | 735 ^a | 0 |
| 1/78 ^a | 1/73 ^{ab} | 1/64 ^{ab} | 3503 ^b | 1759 ^{cd} | 716 ^{ab} | 40 |
| 1/94 ^b | 1/86 ^b | 1/68 ^b | 3346 ^c | 1728 ^{cd} | 685 ^{abc} | 60 |
| 0/11 | 0/15 | 0/21 | 216/6 | 107/1 | 54/3 | SEM (E) |
| 1/76 ^a | 1/74 ^a | 1/63 ^a | 3528 ^a | 1890 ^a | 717 ^a | |
| 1/84 ^a | 1/74 ^a | 1/55 ^a | 3429 ^{ab} | 1830 ^{ab} | 713 ^a | |
| 2/03 ^b | 1/91 ^b | 1/79 ^b | 3287 ^b | 1708 ^b | 647 ^b | () (HB) |
| 1/69 ^a | 1/62 ^a | 1/51 ^a | 3472 ^a | 1876 ^a | 704 ^a | 0 |
| 1/88 ^{ab} | 1/81 ^b | 1/69 ^{ab} | 3348 ^{ab} | 1774 ^{ab} | 642 ^{ab} | 40 |
| 2/15 ^b | 1/97 ^b | 1/77 ^b | 3223 ^b | 1743 ^b | 627 ^b | 60 |
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| 7 | 6 | 5 | 4 | 2 | 1 | 7 | 6 | 5 | 4 | 2 | 1 | 7 | 6 | 5 | 4 | 2 | 1 | | |
| 0/05 | 0/05 | | | 0/05 | | 0/05 | 0/05 | | | 0/05 | | 0/05 | 0/05 | | | 0/05 | | | |
| 60 | 40 | 60 | 40 | | | 60 | 40 | 60 | 40 | | | 60 | 40 | 60 | 40 | | | | |
| 13/38 | 30/42 | 13/35 | 30/52 | 65/77 | 65/9 | 10/6 | 27/68 | 9/68 | 27/79 | 63/89 | 64 | 3/81 | 20/78 | 3/78 | 20/76 | 56/64 | 56/75 | | |
| 16/77 | 21/05 | 16/94 | 21/06 | 24/1 | 24/07 | 17/9 | 22/13 | 19/23 | 22/14 | 27/94 | 27/94 | 22/24 | 26/6 | 22/41 | 26/78 | 29 | 29 | | |
| 1/24 | 0/11 | 1/12 | 1 | 1 | 1 | 3/32 | 2/23 | 2/53 | 2/21 | 1/6 | 1/59 | 5/06 | 3/89 | 4/95 | 3/78 | 5/16 | 5/14 | | |
| 5/5 | 4/98 | 5/5 | 4/94 | 3/57 | 3/52 | 5 | 4/47 | 5/3 | 4/43 | 2/71 | 2/67 | 5/5 | 5 | 5/5 | 5 | 3/43 | 3/38 | | |
| | | | | 2 | 2 | | | | | | | | | | | 2 | 2 | | |
| 0/72 | 0/83 | 0/73 | 0/84 | 0/72 | 0/72 | 0/71 | 0/82 | 0/8 | 0/82 | 0/88 | 0/88 | 0/88 | 1 | 0/89 | 1/01 | 0/84 | 0/84 | | |
| 0/84 | 1/01 | 0/84 | 1/01 | 1/29 | 1/29 | 0/85 | 1/02 | 0/86 | 1/02 | 1/33 | 1/33 | 0/76 | 0/94 | 0/77 | 0/94 | 1/2 | 1/2 | | |
| 0/18 | 0/2 | 0/18 | 0/2 | 0/19 | 0/19 | 0/23 | 0/25 | 0/24 | 0/25 | 0/26 | 0/26 | 0/31 | 0/33 | 0/31 | 0/33 | 0/31 | 0/31 | | |
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| 0/03 | 0/03 | 0/03 | 0/03 | 0/01 | 0/01 | 0/05 | 0/05 | 0/06 | 0/05 | 0/04 | 0/04 | 0/1 | 0/1 | 0/1 | 0/11 | 0/07 | 0/07 | | |

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|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|---------|
| 3050 | 3050 | 3050 | 3050 | 3050 | 3050 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 2950 | 2950 | 2950 | 2950 | 2950 | 2950 | kcal/kg |
| 17/15 | 17/15 | 17/15 | 17/15 | 17/15 | 17/15 | 18/75 | 18/75 | 18/75 | 18/75 | 18/75 | 18/75 | 21/2 | 21/2 | 21/2 | 21/2 | 21/2 | 21/2 | % |
| 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 3/5 | 3/5 | 3/5 | 3/5 | 3/5 | 3/5 | % |
| 0/76 | 0/76 | 0/76 | 0/76 | 0/76 | 0/76 | 0/84 | 0/84 | 0/84 | 0/84 | 0/84 | 0/84 | 0/92 | 0/92 | 0/92 | 0/92 | 0/92 | 0/92 | % |
| 0/28 | 0/28 | 0/28 | 0/28 | 0/28 | 0/28 | 0/33 | 0/33 | 0/33 | 0/33 | 0/33 | 0/33 | 0/41 | 0/41 | 0/41 | 0/41 | 0/41 | 0/41 | % |
| 7/1 | 7/1 | 7/1 | 7/1 | 7/1 | 7/1 | 6/7 | 6/7 | 6/7 | 6/7 | 6/7 | 6/7 | 6/3 | 6/3 | 6/3 | 6/3 | 6/3 | 6/3 | % |

ZYβ- 7 6 2 () GP82β-Glucanase 7 6 2 9 8 3 .1

() Glucanase

. %0/15 B K, E, D₃ A (%0/25) (%0/25) .2

250/000 mg 200 mg 1/000 mg 10/000 mg 100/000 mg 50/000 mg 100/000 mg : .3

10/000 mg B₂ 6/600 mg B₁ 1/800 mg K₃ 2/000 mg E 18/000 IU D₃ 2/000/000 IU A 9/000/000 IU : .4

250/000 mg 100 mg B₁₂ 15 mg B₉ 1/000 mg B₆ 300 mg B₅ 30/000 mg B₃

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|---------------------|----------------------|-------|-------|---------------------|---------------------|--------------------|--------------------|---------------------|---------------------|----|--------|
| 16/23 ^{ab} | 15/59 ^{ab} | 27/9 | 28/19 | 27 ^a | 28/31 ^{ab} | 5/29 ^a | 4/05 ^a | 69/8 ^a | 71/1 ^a | 0 | |
| 17/55 ^{cd} | 18/16 ^{cd} | 26/99 | 27/52 | 24/73 ^{bc} | 26/32 ^c | 4/03 ^{bc} | 3/14 ^c | 67/9 ^c | 69/1 ^c | 40 | |
| 17/62 ^d | 19/05 ^d | 26/41 | 26/97 | 24/11 ^c | 26/07 ^c | 3/76 ^c | 3/03 ^c | 67/3 ^c | 68/5 ^c | 60 | |
| 15/21 ^{ab} | 15/12 ^{ab} | 27/62 | 28/74 | 27/89 ^a | 28/75 ^a | 5/11 ^a | 4/04 ^a | 70/7 ^a | 71/8 ^a | 0 | |
| 16/31 ^{ab} | 16/58 ^{abc} | 27/53 | 27/98 | 26/69 ^a | 28/22 ^{ab} | 4/85 ^a | 3/86 ^{ab} | 69/4 ^a | 70/3 ^{ab} | 40 | |
| 16/63 ^{bc} | 16/91 ^c | 27/29 | 27/87 | 26/24 ^b | 27/5 ^b | 4/32 ^b | 3/46 ^b | 69/1 ^{ab} | 70/2 ^b | 60 | |
| 15/01 ^a | 14/74 ^{ab} | 27/77 | 28/71 | 27/87 ^a | 28/7 ^a | 5/19 ^a | 4/48 ^a | 70/2 ^a | 72/8 ^a | 0 | |
| 16/27 ^{ab} | 15/76 ^{ab} | 27/3 | 27/99 | 26/8 ^{ab} | 27/54 ^{ab} | 4/83 ^{ab} | 3/77 ^{ab} | 69/3 ^{ab} | 70/4 ^a | 40 | |
| 17/09 ^c | 16/95 ^c | 27/21 | 27/73 | 25/71 ^b | 27/46 ^{bc} | 4/04 ^{bc} | 3/37 ^{bc} | 68/6 ^{bc} | 70/3 ^{Ab} | 60 | |
| 0/24 | 0/23 | 0/37 | 0/35 | 0/36 | 0/34 | 0/24 | 0/23 | 0/27 | 0/25 | | SEM |
| | | | | | | | | | | | (E) |
| 15/42 ^a | 16/09 ^a | 26/97 | 27/65 | 27/02 ^a | 27/45 ^a | 5/08 ^a | 3/97 ^a | 69/15 ^{ab} | 71/64 ^a | | |
| 16/2 ^a | 15/49 ^a | 27/6 | 28/05 | 27/07 ^a | 27/22 ^a | 4/62 ^{ab} | 3/58 ^{ab} | 70/47 ^a | 71/04 ^a | | |
| 17/01 ^b | 18/04 ^b | 26/43 | 26/97 | 25/42 ^b | 25/03 ^b | 4/13 ^b | 3/42 ^b | 68/81 ^b | 68/77 ^b | | () |
| | | | | | | | | | | | (HB) |
| 15/36 ^a | 15/64 ^a | 27/36 | 28/91 | 15/42 ^a | 27/42 ^a | 4/97 ^a | 3/99 ^a | 70/15 ^a | 71/86 ^a | 0 | |
| 16/02 ^{ab} | 16/22 ^{ab} | 27/25 | 28/71 | 16/2 ^a | 16/2 ^a | 4/9 ^a | 3/72 ^{ab} | 69/77 ^{ab} | 70/42 ^{ab} | 40 | |
| 16/82 ^b | 17/2 ^b | 27/16 | 27/48 | 17/01 ^b | 17/01 ^b | 4/26 ^b | 3/25 ^b | 68/51 ^b | 69/18 ^b | 60 | |
| | | | | | | | | | | | (S) |
| 16/5 | | 27/3 | | 27/5 ^a | | 3/5 ^b | | 70/4 ^a | | | |
| 16/4 | | 27/8 | | 26/5 ^b | | 4/6 ^a | | 69/4 ^b | | | |
| ** | | NS | | * | | ** | | * | | | E |
| NS | | NS | | * | | NS | | * | | | HB |
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