The Eurasia Proceedings of Science, Technology, Engineering & Mathematics (EPSTEM)
ISSN: 2602-3199

The Eurasia Proceedings of Science, Technology, Engineering and Mathematics (EPSTEM), 2025

Volume 34, Pages 102-106

ICBASET 2025: International Conference on Basic Sciences, Engineering and Technology

# Effect of Using ß-Pentosanase Enzyme in Feed on Broilers Performance

**Achour Mennani**
Mohamed Boudiaf University

**Sadam Houcin Lahmar**
University of Batna

**Abstract**: The aim of this study was to determine the effect of using the ß-pentosanase enzyme on the zootechnical performance of broiler chickens. The study was carried out on 165-day-old broiler chicks, divided into 5 batches of 33 chicks each (Batch 1: control without incorporation; Batches 2, 3, 4 and 5: with enzyme incorporation (at a dose of 25g enzyme/100kg feed) during the start-up, growth, finishing and rearing phases respectively). Data analysis showed that incorporation of the ß-pentosanase enzyme had a very highly significant influence ($P<0.001$) on weight at 21 days and 42 days, highly significant ($P<0.01$) on weight at 47 days and significant on weight at 56 days of age. This incorporation had a very highly significant influence ($P<0.001$) on weight gain between (0 and 21) days, highly significant ($P<0.01$) on weight gain between (22 and 42) days, significant ($P<0.05$) on weight gain between (43 and 47) days and non-significant ($P>0.05$) on weight gain between (48 and 56) days and with a remarkable improvement in feed conversion. We conclude from this study that the incorporation of the ß-pentosanase enzyme into broiler feed had a significant positive effect on broiler zootechnical performance, notably average weights and daily weight gain in the first two growth phases, with a notable improvement in feed conversion. However, this incorporation had no effect on the above-mentioned zootechnical parameters during the last growth phase (between 48 and 56 days).

**Keywords:** ß-pentosanase enzyme, Broiler chicken, Zootechnical performance

## Introduction

Advances in nutrition are partly responsible for the progress of the poultry industry. Today, the mastery of feeding techniques is the most important means of reducing production costs and improving the quality of products, better adapted to agricultural conditions, it also makes it possible to correct certain depressive effects caused by the environment. In farmed poultry, more than in any other animal production, well-established nutrition enables animals to externalize their production performance. Poultry feed currently covers almost all nutritional requirements. In this sector, deficiencies are rare and generally due to absorption problems, or to human errors such as feed formulation, or farmers' demands on the incorporation rates of certain raw materials in feed. Thus, the quality of the raw materials and their incorporation rates are always the most important aspect on which the quality and characteristics of the feed depend (Larbier & Leclercq, 1992)

Currently, the use of enzymes in different types of poultry feed is well established worldwide, with the aim of improving the nutritional efficiency of poultry feeds. The possibility of using exogenous enzymes in monogastric feeds, mainly for poultry, has provided nutritionists with an important tool for improving feed digestibility and reducing feed costs (Zakaria et al., 2010). This translates into better animal performance, improved litter quality and better bird health, which in turn has a positive effect on reducing production costs (Saleh et al., 2005; Cowieson & Ravindran, 2008a, 2008b).

- This is an Open Access article distributed under the terms of the Creative Commons Attribution-Noncommercial 4.0 Unported License, permitting all non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

- Selection and peer-review under responsibility of the Organizing Committee of the Conference

*© 2025 Published by ISRES Publishing: www.isres.org*

In this context, we propose this work, which aims to test the effect of incorporating the enzyme ß-pentosanase into broiler feed, and also to assess the effect of this incorporation on broiler performance during the different growth phases.

## Materials and Methods

### Animal Material

A total of 165-day-old chicks of Arbor Acres strain, with a mean initial weight of 37.01 ± 3.08g, were identified and weighed to be randomly distributed over the 5 batches and reared separately for a duration of 56 days under the same breeding conditions. The distribution of the chicks was done in such a way as to have an experimental setup consisting of five groups according to the rate of incorporation of pentosanase enzyme (with a dose of 25g enzyme/100kg feed) into the food during the different growth phases (Table 1 and Table 2).

Table 1. Food formula according to the different phases of growth

| Raw materials (%) | Starting (0-21 days) | Growth (22-42 days) | Finishing (0-21 days) |
|---|---|---|---|
| Corn | 60.9 | 62 ,9 | 68,9 |
| Soybean meal | 29 | 27 | 21 |
| CMV | 1 | 1 | 1 |
| Phosphate | 1 | 1 | 1 |
| Wheat bran | 8 | 8 | 8 |
| Limestone | 1 | 1 | 1 |
| Salt (NaCl) | 0,1 | 0,1 | 0,1 |

Table 2. Incorporation rate of ß-pentosanase enzyme (with a dose of 25g enzyme/100kg feed) in the different feed

| variables | Control batch | Batch I | Batch II | Batch III | Batch IV |
|---|---|---|---|---|---|
| Starting (0-21 days) | - | + | - | - | + |
| Growth (22-42 days) | - | - | + | - | + |
| Finishing (0-21 days) | - | - | - | + | + |

### Variables Analyzed

The variables analyzed are: Weights at 21, 42 and 56 days (W21, W42 and W56) and average daily gain: ADG (0-21) d, ADG (22-42) d, ADG (43-56) d.

### Statistical Analysis

The variables were subjected to a descriptive analysis and an analysis of variance by the least squares using the general univariate linear model, this analysis was carried out with the software SPSS (26). The general linear model was used to test the effect of incorporation of ß-pentosanase enzyme on the different variables; the significance and homogeneity between different averages were achieved by the application of S.N.K test.

## Results and Discussion

### Effect of Incorporation of ß-pentosanase Enzyme on The Different Weights

The results shown in Table 3 indicate clearly that the incorporation of the ß-pentosanase enzyme into the concentrated broiler feed had a highly significant influence ($P < 0.01$) on hen weight at 21, 42 and 56 days. The best weights at 21 days of age were attributed to individuals from batches IV and III, with average weights of 762.68g and 730.58g respectively. These 2 batches (IV and III) received ß-pentosanase enzyme in the concentrated feed during this growth phase, which explains the positive effect of incorporating ß-pentosanase enzyme into the feed.

The control batch and batch II (not receiving the enzyme in the feed) had lower 21-day weights than the other batches in this study, at 671.68g and 699.33 respectively. Regarding the weight of chickens at 42 days, a very significant superiority was recorded in batch IV, which received the incorporation of the ß-pentosanase enzyme in the feed during the start-up and growth phases. This continuous incorporation contributed to the achievement of this very remarkable growth performance.

The weight recorded for individuals in this batch was 2440.99g. The control batch (without incorporation) recorded the lowest weight compared with the other batches, with an average of 2141.59g. A weight value at 56 days of age of 3731.14g was recorded for individuals in batch IV, which still gives this batch superiority, as it receives incorporation of the enzyme into the feed during all phases of growth (from 0 to 56 days). This superiority is explained by the energy content of the feed resulting from the direct effect of the enzyme action. This high energy value improves chicken growth (Peric et al., 2011).

Furthermore, the positive effect of incorporating the enzyme ß-pentosanase into the concentrated feed on poultry weights found in this study is strongly identical to the results found by Brene et al (1993) and mentioned that a crude enzyme preparation can be used for feed production, this enzyme complex improved the performance of the to varying degrees when added to different cereals. The response to enzyme treatment was influenced by the amount of enzyme added and by the type of cereal making up the feed. The maximum response was noted for cereal-based diets such as barley and oats, and this was the case in our study where the diet was also cereal-based, which is corn.

Table 3. Effect of incorporation of pentosanase enzyme on the different weights

| Batchs | $W_{21}$ (g) | $W_{42}$ (g) | $W_{56}$ (g) |
|---|---|---|---|
| Control batch | 671,68$^{b}$ | 2107,37$^{b}$ | 2977,11$^{b}$ |
| Batch I | 722,45$^{a}$ | 2141,59$^{b}$ | 3086,59$^{b}$ |
| Batch II | 699,33$^{b}$ | 2218,33$^{b}$ | 3255,26$^{ab}$ |
| Batch III | 730 ,58$^{a}$ | 2248,63$^{b}$ | 3306,86$^{ab}$ |
| Batch IV | 762,68$^{a}$ | 2440,99$^{a}$ | 3731,14$^{a}$ |
| Average | 718,46 | 2234,42 | 3280,10 |
| Significant | P<0,01 | P<0,01 | P<0,01 |

*Means affected by different letters in the same column differ significantly at the threshold of (P<0.05).*

**Effect of Incorporation of ß-pentosanase Enzyme on Average Daily Gain (ADG)**

Concerning the average daily gain variable and according to the results summarized in Table 4, the incorporation of the ß-pentosanase enzyme into the concentrated broiler feed had a significant influence (P <0.05) on the average daily gain ADG(0-21d) and ADG(43-56d) and had a highly significant effect on the average daily gain ADG(22-42d). The best weight gains in the 0-21 day growth phase were achieved by batch IV followed by batch I, both of which received enzyme incorporation during this phase and had average ADG(0-21d) of 34.51g/d and 32.66 g/d respectively.

During the 22–42-day phase, the best performance was achieved by batch IV and batch II, which were fed an enzyme-treated concentrate feed during the growth phase, resulting in a remarkable improvement in ADG(22-42d). Batches IV and II scored ADG (22-42d) values of 83.91 g/d and 75.95 g/d , and the lowest ADG(22-42d) performances were recorded by the control batch and batch I, with ADG(22-42d) averages of 71.78 g/d and 70.95 g/d respectively. This difference is clearly explained by the positive effect of incorporating the ß-pentosanase enzyme into the feed on ADG improvement (22-42d). The last growth phase was also characterized by a remarkable superiority of the ADG value (22-42d) of batch IV compared with the other experimental batches. This batch recorded a ADG value (22-42d) of 81.87 g/d, while the lowest value was recorded by the control batch which never received the incorporation of ß-pentosanase enzyme in the concentrated feed, i.e. an average ADG (22-42d) of 55.55 g/d.

The positive effect of incorporating ß-pentosanase enzyme into concentrated feed on improving broiler ADG found in our study is strongly similar to the results obtained by Yanti et al (2024), who reported that broiler weight gain increased with the addition of doses of multienzymes with an incorporation of 0.19 g/kg to 0.33 g/kg feed. The observed increase in chicken weight can be explained by the positive effect of enzyme supplementation in the feed.

Table 4. Effect of incorporation of pentosanase enzyme on average daily gain (ADG)

| Batchs | $ADG_{0-21d)}$ | $ADG_{(22-42d)}$ | $ADG(_{43-56d)}$ |
|---|---|---|---|
| Control batch | $30,24^{b}$ | $71,78^{b}$ | $55,55^{c}$ |
| Batch I | $32,66^{a}$ | $70,95^{b}$ | $60,12^{c}$ |
| Batch II | $31,55^{b}$ | $75,95^{ab}$ | $68,26^{b}$ |
| Batch III | $32\ ,98^{a}$ | $75,85^{ab}$ | $63,46^{bc}$ |
| Batch IV | $34,51^{a}$ | $83,91^{a}$ | $81,87^{a}$ |
| Average | 32,44 | 75,80 | 66,21 |
| Significant | P<0,05 | P<0,01 | P<0,05 |

*Means affected by different letters in the same column differ significantly at the threshold of (P<0.05).*

## Conclusion

Our results in this study show that the incorporation of "pentosanase enzyme" with a dose of 25g enzyme/100kg of feed into concentrated broiler feed has a significant effect on the average daily weight and gain of broiler chicken. So, it is advisable to incorporate "pentosanase enzyme" into the concentrated broiler feed with a dose of 25g enzyme/100kg of feed to improve its zootechnical performance including live weight and average daily gain.

## Scientific Ethics Declaration

* The authors declare that the scientific ethical and legal responsibility of this article published in EPSTEM Journal belongs to the authors.

## Conflict of Interest

* The authors declare that they have no conflicts of interest

## Funding

* This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

## Acknowledgements or Notes

* This article was presented as a poster presentation at the International Conference on Basic Sciences, Engineering and Technology (www.icbaset.net) held in Trabzon/Türkiye on May 01-04, 2025.

## References

Yanti, A. F., Mahfudhoh, N. L., Sajidan, & Budiharjo, A. (2024). Biotechnology application of single enzyme and multienzyme in feed, and its effect on growth performance and carcass persentage in broiler. *BIO Web of Conferences, 127*, 01006.

Brenes, A., Guenter, W., Marquardt, R. R., & Rotter, B. A. (1993). Effect of β-glucanase/pentosanase enzyme supplementation on the performance of chickens and laying hens fed wheat, barley, naked oats and rye diets. *Canadian Journal of Animal Science, 73*(4), 941–951.

Cowieson, A. J., & Ravindran, V. (2008a). Effect of exogenous enzymes in maize-based diets varying in nutrient density for young broilers: Growth performance and digestibility of energy, minerals and amino acids. *British Poultry Science, 49*(1), 37–44.

Cowieson, A. J., & Ravindran, V. (2008b). Sensitivity of broiler starters to three doses of an enzyme cocktail in maize-based diets. *British Poultry Science, 49*(3), 340–346.

Larbier, M., & Leclercq, B. (1992). *Poultry nutrition and feeding* (p.355). In Qua (Ed.).

Saleh, F., M. Tahir, A. Ohtsuka and K. Hayashi, 2005. A mixture of pure cellulase, hemicellulase and pectinase improves broiler performance. *British Poultry Science, 46*, 602-606.

Zakaria, H. A. H., A.R. Jalal, M., & Abu Ishmai, M. A. (2010). The influence of supplemental multi-enzyme feed additive on the performance, carcass characteristics and meat quality traits of broiler chickens. *International Journal of Poultry Science, 9*(2), 126–133.

## Author(s) Information

**Achour Mennani**
Department of Agronomy, Faculty of Sciences, Mohamed Boudiaf University M'sila
M'sila28000, Algeria
Contact e-mail:*Achour.mennani@univ-msila.dz*

**Sadam Houcin Lahmar**
Department of Agronomy, Agronomic and Veterinary institute, University of Batna,
Batna 05000, Algeria

**To cite this article:**

Mennani, A., & Lahmar, S.H. (2025). Effect of using ß-pentosanase enzyme in feed on broilers performance. *The Eurasia Proceedings of Science, Technology, Engineering and Mathematics (EPSTEM), 34,* 102-106.