Effect of Using Low-Energy Diets Enriched with Enzymes on Some Qualitative Traits of Broiler Chickens (ROSS 308(

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Abstract :
The experiment was conducted broiler chicken fields affiliated with the Animal Production Department - College of Agriculture - Tikrit University for a period of 34 days, during which low-energy feeds were used with the addition of an enzyme mixture to determine the extent of its effect on some qualitative characteristics of broiler chickens 144 birds of the type were used ROSS 308 . The chicks were randomly distributed into six treatments, each with six replicates, with four birds per replicate. This experiment studied including liver fat percentage, abdominal fat percentage, edible viscera percentage, and dressing percentage. The data obtained from the study, after statistical analysis, did not indicate any significant differences ($p \leq 0.05$) in the relative weights of some internal organs. There were no significant differences in the relative weight of the liver and gizzard between the experimental treatments, but we noted a significant superiority ($p \leq 0.05$) in the heart weight percentage for the second treatment compared to the third treatment . Regarding the relative weights of the immune organs, no significant differences were observed between the experimental treatments compared to the first and second control treatments with regard to the Fabricius gland, while the second treatment recorded a significant superiority ($p \leq 0.05$) in the spleen weight compared to the sixth treatment. Also, no significant differences were recorded between the experimental treatments compared to the control treatments in the relative weights of abdominal fat and the percentage of liver fat. Adding enzymes to broiler feed after reducing energy had no significant effect on the net weight percentage .

Keywords : Enzymes, broiler chickens, low energy feeds, quality characteristics.

-1Introduction -:

The continuous increase in global consumption of poultry products, most notably poultry meat, has made broiler production projects one of the most important economic pillars for many countries around the world [1] . When creating or formulating effective feeds, cost and nutritional quality must be considered to meet the needs of poultry [2] . Studies have confirmed that poultry nutrition , feed, represents 70–80% of production costs [3]. Energy is a major component of the cost of broiler feed [4]. The energy level of the feed is the starting point in feed formulation, and birds eat until their energy requirements are met [5]. The trend has become to use a wide range of plant sources, whether grain industry waste or grains unfit for human consumption, to reduce production costs [6]. Energy is one of the most important and expensive nutrients in broiler feeds and is required for optimal bird growth performance. Accordingly, several studies have been conducted to investigate the possibility of reducing energy by adding exogenous enzymes to feed [7]. The use of feed additives (enzymes) in low-nutrition poultry feeds has improved the digestibility coefficient and increased the utilization of these feeds, which in turn has increased the productive efficiency of the bird [8]. Enzymes play an essential role in the digestive process. Enzymes are produced by living organisms in cells or produced by

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microbes naturally present in the digestive system of these organisms [9]. Therefore, the use of exogenous enzymes as feed additives in the poultry industry has received significant attention due to their potential to improve performance and increase productivity of broiler chickens [10] . The studies have indicated that the goal of adding exogenous enzymes to broiler feed is to reduce the anti-nutritional effects of some of the ingredients in the feed. [11] . The study showed that broiler chickens benefit more from enzyme supplements at a younger age and that the activity of enzymes in releasing nutrients decreases with age in chickens[12 .[

-2Materials and working methods -:

The experiment was conducted in the poultry field of the Animal Production Department at the College of Agriculture, Tikrit University, for a period of 34 days (5 Weeks) at the age of one day and weighing 43 grams. The chicks were raised in batteries (cages) with a total of 144 ROSS 308 broiler birds. The chicks were randomly distributed into six treatments, each treatment with six replicates, with four birds per replicate. The treatments were as follows: Treatment 1 (T1) was a control treatment without any addition (negative control), Treatment 2 (T2) added the enzyme mixture without reducing energy (positive control), Treatment 3 (T3) reduced energy by 30 kcal/kg feed with the addition of the enzyme mixture, Treatment 4 (T4) reduced energy by 60 kcal/kg feed with the addition of the enzyme mixture, Treatment 5 (T5) reduced energy by 90 kcal/kg feed with the addition of the enzyme mixture, Treatment 6 (T6) reduced energy by 120 kcal/kg feed with the addition of the enzyme mixture. The amount of enzyme mixture added was 500 g/ton according to the manufacturer's recommendations .Feed(Tables1and2) was supplied according to the Rose Guide 2022 [13] In plastic feeders placed inside the batteries. Water was also provided in upturned plastic basins .

-1-2Qualitative characteristics-:

Four birds were selected from each treatment, two males and two females, for a total of 24 Birds were weighed before slaughter and the data was recorded. The birds were then numbered with plastic numbers on their legs. After that, the birds were slaughtered and cleaned by removing feathers and inedible parts. The carcass was weighed, as well as the weight of the edible internal organs (liver, heart, gizzard), as well as the weight of the abdominal fat, the Fabricius gland, and the spleen for each bird, using an accurate scale to extract the required relative weights ..

– 2-2Enzyme mixture:

The enzyme mixture contains beta-xylanase, protease, beta-glucanase , alpha-amylase, cellulase, and pectinase.(Bregan Co(.

- 3 – 2Statistical analysis- :

The experimental data were statistically analyzed using a completely randomized design (CRD) To study the effect of the treatments studied during the experiment on the different characteristics, and the significant differences between the averages were compared using Duncan's multiple range test to find the significant differences between them [14] and the ready statistical program SAS [15] was used in the statistical analysis according to the following mathematical model :

$$Yij = M + Ti + eij$$

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Table (1)Broiler feed ingredients, and calculated chemical composition

Feed materials	Relationships					
	Control T1	Control T2	T3	T4	T5	T6
Yellow corn (%)	62.14	62.14	62.76	57.76	55.46	55.61
Soybean meal (48%)	32.25	32.25	32.15	31.8	31.6	31.45
barley	--	--	--	5.3	8	8.5
*Premix(%)	2.5	2.5	2.5	2.5	2.5	2.5
Oilsunflower(%)	1.17	1.17	0.65	0.7	0.5	0
phosphatebilateralCalcium (%)	0.35	0.35	0.35	0.35	0.35	0.35
Limestone (%)	1.15	1.15	1.15	1.15	1.15	1.15
d l-Methionine (%)	0.14	0.14	0.14	0.14	0.14	0.14
Table salt (%)	0.3	0.3	0.3	0.3	0.3	0.3
the total	100	100	100	100	100	100
**Calculated chemical composition						
Represented energy (kcal/kg feed)	3050	3050	3022	2990	2961	2931
Crude protein (%)	21.5	21.5	21.5	21.5	21.5	21.5
Crude fiber (%)	2.3	2.3	2.3	2.5	2.6	2.6
Lysine (%)	1.24	1.24	1.24	1.24	1.24	1.24
Methionine (%)	0.83	0.83	0.83	0.82	0.82	0.82
Methionine + Cysteine (%)	0.93	0.93	0.93	0.93	0.93	0.93
Calcium (%)	0.76	0.76	0.76	0.76	0.76	0.76
Phosphorus (%)	0.42	0.42	0.42	0.43	0.43	0.43

*Premix (%) \ Calcium 6.36%; Phosphorus 8.07%; Magnesium 0.34%; Sodium 4.83%; Chloride 7.89%; Potassium 0.02%; Sulfur 3.57%; Crude Protein 29.89%; Crude Fat 0.62%; Ash 47.68%; Crude Fiber 0.26%; Lysine 10.23%; Methionine 15.01%; Threonine 7.86% .

**Calculated chemical composition According to[16.[

Table (2)Broiler feed ingredients(Final)With calculated chemical composition

Feed materials	Relationships					
	Control T1	Control T2	T3	T4	T5	T6
Yellow corn (%)	67.86	67.86	68.41	68.31	64	59.69
Soybean meal (48%)	27.05	27.05	27	26.8	26.5	26.22
barley	0	0	0	0.8	5.41	10
*Premix(%)	2.5	2.5	2.5	2.5	2.5	2.5
Oilsunflower(%)	1	1	0.5	0	0	0
phosphatebilateralCalcium (%)	0.1	0.1	0.1	0.1	0.1	0
Limestone (%)	1.07	1.07	1.07	1.07	1 .07	1.17
d l-Methionine (%)	0.12	0.12	0.12	0.12	0.12	0.12
Table salt (%)	0.3	0.3	0.3	0.3	0.3	0.3
the total	100	100	100	100	100	100

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**Calculated chemical composition						
Represented energy (kcal/kg feed)	3100	3100	3072	3040	3010	2980
Crude protein (%)	19.5	19.5	19.5	19.5	19.5	19.5
Crude fiber (%)	2.3	2.3	2.29	2.3	2.5	2.63
Lysine (%)	1.12	1.12	1.12	1.12	1.12	1.12
Methionine (%)	0.79	0.79	0.79	0.79	0.79	0.78
Methionine + Cysteine (%)	0.86	0.86	0.86	0.86	0.86	0.86
Calcium (%)	0.66	0.66	0.66	0.66	0.66	0.67
Phosphorus (%)	0.36	0.36	0.37	0.37	0.37	0.36

*Premix(%) \ Calcium 6.36%; Phosphorus 8.07%; Magnesium 0.34%; Sodium 4.83%; Chloride 7.89%; Potassium 0.02%; Sulfur 3.57%; Crude Protein 29.89%; Crude Fat 0.62%; Ash 47.68%; Crude Fiber 0.26%; Lysine 10.23%; Methionine 15.01%; Threonine 7.86% .

**Calculated chemical composition According to [16.[

-3Results-:

-1-3Relative weight of the gland of Fabricius, spleen, and liver -:

It is shown from Table No. (3) which indicates the effect of using low-energy feeds with the addition of enzymes on the relative weight of the Fabricius gland, spleen and liver of broiler chickens (Ross 308) There were no significant differences between the experimental treatments compared to the first and second control treatments for each of my attribute Relative weight of the Fabricius gland and liver . While a significant superiority was observed ($p \leq 0.05$) The relative weight of the spleen was in favor of the second treatment compared to the sixth treatment, and there were no significant differences between the other treatments compared to the first control treatment .

Table (3) The effect of using low-energy diets enriched enzymes on the relative weight of the Fabricius gland, spleen and liver of broiler chickens (Ross 308 .(

Values represent (mean + standard error(

Transactions	Fabricius gland	spleen	liver
T 1	0.16 ± 0.03	0.20 ± 0.01**ab**	3.17 ± 0.17
T 2	0.18 ± 0.01	0.26 ± 0.04**a**	3.19 ± 0.11
T 3	0.14 ± 0.01	0.18 ± 0.01**ab**	3.13 ± 0.21
T 4	0.15 ± 0.02	0.22 ± 0.04**ab**	3.06 ± 0.20
T 5	0.16 ± 0.03	0.21 ± 0.02**ab**	2.92 ± 0.15
T 6	0.13 ± 0.01	0.17 ± 0.02**b**	3.03 ± 0.18
Morale level	N.S	*	N.S

*

Different letters within the same column indicate significant differences between the treatments at a probability level of ($p \leq 0.05$ (

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NS / No significant differences between transactions in the same column.
** T1 = negative control treatment without enzyme mixture addition, T2 = positive control treatment with enzyme mixture addition, T3 = energy reduction of 30 kcal/kg feed with enzyme mixture addition, T4 = energy reduction of 60 kcal/kg feed with enzyme mixture addition, T5 = energy reduction of 90 kcal/kg feed with enzyme mixture addition, T6 = energy reduction of 120 kcal/kg feed with enzyme mixture addition .

- 2 - 3Liver fat percentage and Relative weight of the heart and the gizzard -:

Table No. (4) To demonstrate the effect of using low-energy feeds with the addition of enzymes in Liver fat percentage the relative weight of the heart and gizzard of broiler chickens (Ross 308),As it becomes clear there were no significant differences between the experimental treatments compared to the first and second control treatments. For the description Liver fat percentage , and note from the table there is a moral superiority ($p \leq 0.05$) For the relative weight of the heart for the second treatment compared to the third treatment . It is also noted from the same table that there were no significant differences between the treatments compared to the first and second control treatments for the relative weight of the gizzard .

Table (4) The effect of using low-energy diets enriched with enzymes on the percentage of fatty liver and relative weight of the heart and gizzard of a chicken (Ross 308.(
Values represent (mean + standard error(

Transactions	Liver fat percentage	Relative weight of the Heart	Relative weight of the Gizzard
T 1	15.51 ± 0.09	0.83 ± 0.06**ab**	3.19 ± 0.36
T 2	15.41 ± 0.11	0.94 ± 0.04**a**	3.09 ± 0.08
T 3	14.56 ± 1.02	0.72 ± 0.04**b**	2.91 ± 0.11
T 4	16.29 ± 0.50	0.75 ± 0.02**ab**	3.39 ± 0.23
T 5	15.46 ± 0.87	0.76 ± 0.04**ab**	3.47 ± 0.12
T 6	15.44 ± 0.38	0.88 ± 0.11**ab**	3.19 ± 0.12
level Morale	**N.S**	*****	**N.S**

*****

Different letters within the same column indicate significant differences between the treatments at a probability level of ($p \leq 0.05$ (

NS / No significant differences between transactions in the same column.
** T1 = negative control treatment without enzyme mixture addition, T2 = positive control treatment with enzyme mixture addition, T3 = energy reduction of 30 kcal/kg feed with enzyme mixture addition, T4 = energy reduction of 60 kcal/kg feed with enzyme mixture addition, T5 = energy reduction of 90 kcal/kg feed with enzyme mixture addition, T6 = energy reduction of 120 kcal/kg feed with enzyme mixture addition .

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-3-3Dressing percentage and abdominal fat ratio- :

Table No. (5) To demonstrate the effect of using low-energy feeds with the addition of enzymes in dressing percentage and abdominal fat percentage For broiler chicken (Ross 308), and the results show that the phenomenon in the table There are no significant differences between the experimental treatments compared to the first and second control treatments in the net percentage trait. It is also noted from the same table that there are no significant differences between the treatments compared to the first and second control treatments for the trait of abdominal fat .

Table (5) The effect of using low-energy diets enriched with enzymes on the dressing percentage and abdominal fat in broiler chickens . Ross (308.(
Values represent (mean + standard error(

Transactions	Dressing percentage	Abdominal fat
T 1	74.17 ± 0.52	0.79 ± 0.06
T 2	73.55 ± 0.52	0.98 ± 0.08
T 3	73.10 ± 0.49	0.72 ± 0.08
T 4	72.23 ± 1.50	0.96 ± 0.24
T 5	73.52 ± 0.84	0.98 ± 0.11
T 6	74.17 ± 0.81	0.84 ± 0.14
level Morale	**N.S**	**N.S**

*Different letters within the same column indicate significant differences between the treatments at a probability level of ($p \leq 0.05$ (

NS / No significant differences between transactions in the same column.

** T1 = negative control treatment without enzyme mixture addition, T2 = positive control treatment with enzyme mixture addition, T3 = energy reduction of 30 kcal/kg feed with enzyme mixture addition, T4 = energy reduction of 60 kcal/kg feed with enzyme mixture addition, T5 = energy reduction of 90 kcal/kg feed with enzyme mixture addition, T6 = energy reduction of 120 kcal/kg feed with enzyme mixture addition .

-4Discussion- :

By reviewing the results shown in the tables of qualitative characteristics of broiler chickens that were fed low-energy diets with the addition of enzymes, we note from Table No. (3) Concerning the results of the statistical analysis of the relative weight characteristics of the Fabricius gland, spleen and liver . A significant superiority was observed ($p \leq 0.05$) The relative weight of the spleen was in favor of the second treatment compared to the sixth treatment These results agree with what was mentioned. [17] That adding enzyme supplements to broiler feed slightly increased the relative weights of the spleen, explaining the reason for this as being that the added enzymes worked to accelerate the growth of the immune organs in the bird's body by improving the process of digestion and absorption of nutrients. As for the results he obtained [18] It was shown that feeding low-energy diets supplemented with enzymes did not significantly affect the relative weights of the liver, heart, gizzard and spleen .

Table No. (4) to private data by weights Relative to the heart and gizzard and the percentage of liver fat, and through results The

table shows a significant superiority ($p \leq 0.05$) For the second treatment over the third treatment in the relative weight of the heart, and there were no significant differences between the remaining treatments when compared to the first treatment. The reason for the differences in the relative weights of the heart between birds may be attributed to genetic reasons or due to the artificial selection methods followed by broiler breed production companies, which led to accelerating the growth of modern breeds in a shorter period compared to the parents, which leads to reducing the relative weight of the heart[19 .[

Conclusions:

We note from the results of the experiment that reducing energy in broiler feeds with the addition of enzymes did not affect either of the following :Net weight, abdominal fat, liver fat, and relative weight of gizzard, gland of Fabricius, and liver .while The relative weight of the spleen decreased when the energy intake was reduced by 120 kcal/kg compared to the positive control treatment. The experiment achieved its objectives in determining the optimal level of energy reduction by adding the enzyme mixture to the feed. Reducing energy by 90 kcal/kg with the addition of the enzyme mixture gave the best results the natural weights of the internal organs are maintained, resulting in the bird staying healthy despite the reduced energy from the food .

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