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EFFECT OF SOME ENZYME MIXTURES ON GROWTH PERFORMANCE, CARCASS CHARACTERISTICS AND ECONOMICAL EFFICIENCY OF BROILERS CHICKS

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ABSTRACT:

A total number of 192 unsexed 1-day old Arbor Acres broiler chicks were randomly distributed in 8 treatments in a factorial design distribution(2×4) in two feed forms (recommended vs low density diet as 2% crude protein and 100 Kcal ME/Kg) and four enzyme mixtures (un-supplemented, Nu3Lease, Kem Zyme® Plus Dry and Fra Zyme® Ms Dry at the level of 0.05% of each) to evaluate growth performance, carcass traits and economical efficiency. Each treatment contained 3 replicates of 8 birds each. Average live body weight and feed consumption were recorded at 3 and 6 weeks of age. Body weight gain and feed conversion ratio were calculated during starting (0-3 weeks), growing (4-6 weeks) and the whole experimental period (0-6 weeks). At the end of the sixth week of age 3 birds were randomly taken from each treatment and slaughtered to measure carcass traits. The results revealed that, birds fed recommended diet had the best final body weight (6 weeks), Birds fed recommended diet had significantly higher body weight gain and feed consumption during the growing and whole experimental periods. Adding Nu3lease enzyme mixture to broiler diets significantly increased body weight and body weight gain and improved feed conversion ratio during staring, growing and whole experimental periods. Also, birds fed diet supplemented with Nu3lease enzyme had significantly higher dressing and giblets percentage and lower abdominal fat percentage. The best economical efficiency was recorded in chicks fed recommended diet supplemented with Nu3lease enzyme mixture.

Key word: enzymes, performance, carcass characteristics, chicks

INTRODUCTION

In poultry nutrition, it is a solid fact that feeding cost is considered the most expensive item in the whole production process. Many attempts have been undertaken in order to improve the utilization of diet nutrients by adding dietary supplementation of several growth feed additives from different sources **(**Boulos, *et. al.,* 1992; El-Gendi, *et. al.,* 1994; Ibrahim, *et. al.,* 1998 and Abdel-Azeem, 2002). It is known that a high molecular weight component of non-starch polysaccharide dissolved in intestine led to an increase in the viscosity of gut contents. High viscosity of the gut contents leads to reduced growth rate, increased feed to gain ratio and sticky droppings. Enzymatic digestion of NSP improves performance and allows more efficient use of nutrients. Since, a compound feed is a mixture of different ingredients; a multi-enzyme system is preferred to that of a single enzyme preparation **(**Kadrivel, 2002). The NSPs are resistant of digestive enzymes to poultry and depress the performance of chicks. Degradation of NSPs by using either naturally derived exogenous enzymes or synthetic enzymes increases digestion and absorption of organic and inorganic components of feed. Some recent studies have confirmed that use of exogenous feed enzymes derived from biotechnological innovation break the structural barrier in the form of cell wall carbohydrates and various multi-enzyme mixtures have been employed in broiler diets and found beneficial. In the present study, an attempt has been made to evaluate the performance of broiler chick fed with diets supplemented with commercial enzymes.

The use of enzymes in the feed industry has a history of around 20 years. Enzymes are now widely used in poultry diets. There are many pre-reviewed publications indicating beneficial effects of enzymes in improving the nutritional values of wheat, corn, barley, oats, rye, and triticale and also productive performance of poultry.It is known that a reduction of intestinal viscosity is the most likely mechanism of action of these enzymes. Five principles and reasons for dietary enzyme usage; hydrolysis of phytic acid for the release of phosphorus, break down cell walls eliminating the encapsulating effect improving energy and amino acid availability, improving hind gut fermentation by solubilizing cell walls, hydrolyze carbohydrate-protein linkages improving amino acid availability, and eradication of anti-nutritive properties by enzymatic hydrolysis to prebiotic type components improving gut development and health in young birds for poultry,**(**Slominski, 2011).

Enzymes in animal feeds can be derived from microbial, plant and animal sources, but the majority are derived from bacterial and fungal fermentation with the latter acting as the source of many commercial

supplements (Classen and Bedford, 1991). Exogenous enzyme blends containing various combinations of amylase, protease, xylanase, glucanase, cellulase, mannanase, and pectinase have been assessed in broiler diets which contain high levels of soluble NSP and was found to improve nutrients digestibility and bird growth performance (Yu and Chung, 2004; Meng and Slominski, 2005[a];Meng et al.,2005[b]; Choct, 2006).

Therefore, the present study was carried out to study the results of 2 diets based on corn/soybean meal (served as recommended diet) or corn/soybean meal which having low levels of protein and energy (served as low density diet) and the effect of supplementing all diets with different sources of enzymes (Nu3Lease, Kem Zyme® Plus Dry and Fra Zyme® Ms Dry) on growth performance, carcass traits, and economical efficiency of commercial broiler chickens.

MATERIALS AND METHODS

A total number of 192 unsexed, one day old Arbor-acres broiler chicks were obtained from a Cairo Poultry Company, randomly were distributed into 8 experimental treatments groups of 24 birds each. Each group contained three replicates of 8 birds each. The birds were housed in an open house in cleaned and fumigated battery cages (1 x 0.6 x 0.4 meter as length, width and height). Feed and water were offered to the bird's *ad-libitum* during the experimental periods (0-6 weeks of age).

The experimental groups were fed on a basal diet and Low diet supplemented with or without enzyme mixtures as follow:- The 1st group was fed on recommended diet without enzyme (control), the 2nd group was fed on recommended diet supplemented with 0.05% Nu3Lease /kg diet, the 3rd group was fed on recommended diet supplemented with 0.05% Kem Zyme/kg diet, the 4th group was fed on recommended diet supplemented with 0.05% Fra Zyme/kg diet, the 5th group was fed on low diet density without enzyme (control), the 6th group was fed on low diet supplemented with 0.05% Nu3Lease /kg diet, the 7th group was fed on low diet supplemented with 0.05% Kem Zyme /kg diet and the 8th group was fed on low diet supplemented with 0.05% Fra Zyme/kg diet.

The recommended diet starter (23% CP and 2900 Kcal ME/Kg diet) and grower (20% CP and 3100 Kcal ME/Kg diet) were formulated to contain adequate levels of nutrients for growing broiler chicks as recommended by NRC, (1994) and low starter diet (21% CP and 2800 Kcal ME/Kg diet) and grower (18% CP and 3000 Kcal ME/Kg diet) as shown in (Table 2).

Chemical composition of enzyme mixtures used in this study is presented in Table (1)..

Table (1): Chemical composition of commercial enzyme mixtures used.

Kem zymePlus Dry	Nu3 Lease AX 500	Fra ZymeMSDry
- Alpha-Amylase400 Units/g	-Alpha-Amylase8000U	- Alpha-amylase2100 IU
- Endo1-4 beta-Xylanase(xylanase)20000 Units/g	- Endo1-4- Beta Xylanase (Bacillus Subtills) 320 U	- Xylanase (Trichoderma Reesi) 16000 BXU
- Endo1-4-beta-glucanase4000 Units/g	- Carrier:	- 1.3 (4) Beta-glucanase 2400 BU
- Endo1.3-(4) beta-glucanase2350 Units/g	calciumcarbonate up to1 g	- pectinase 210U
- Bacilloysin 450Units/g		- Mannanase3000 MNU
- Vegetable Oil1%		- Protease 600 U
-Carrier: Limestone up to 100%		- Carrier:Ceplolite up to1 g

**Dosage 500 gm /ton of diet of all enzyme mixtures.*

Table (2): Formulation and calculated proximate analysis of the experimental basal diets.

Ingredients	Starter diets (0-3w)		Grower diets (4-6w)	
	Rec. diet %	Low diet %	Rec. diet %	Low diet %
Yellow corn	55.25	56.50	61.20	69.60
Soybean meal	33.65	26.60	25.70	19.20
Concentrates*	10.00	10.00	10.00	10.00
Wheat bran	0.00	6.40	0.00	0.90
Calcium dibasic phosphate	0.00	0.15	0.00	0.00
Limestone	0.00	0.00	0.00	0.00
Methionine	0.00	0.05	0.00	0.00
Lysine	0.00	0.00	0.00	0.00
Premix**	0.30	0.30	0.30	0.30
Oil	0.80	0.00	2.80	0.00
Total	100.00	100.00	100.00	100.0
Calculated chemical analysis:				
Crude protein (%)	23.00	21.00	20.01	18.00
M. E. (Kcal/Kg diet)	2901.76	2800.97	3099.71	3001.46
Calcium (%)	0.96	0.97	0.94	0.92
Phosphorus (%)	0.50	0.52	0.48	0.47
Lysine (%)	1.28	1.14	1.08	0.94
Methionine + Cysteine (%)	0.90	0.90	0.82	0.77

**Concentrates: Crude protein 35%, Crude fiber1.85%, Fat 3.2%,.Calcium 8.5%, Available phosphorus 3.6%, Methionine + Cysteine 2.67%, Lysine 2.34% , Energy 2300 kcal/kg.*

***Premixes:- contributed the following nutrients per kilogram of complete feed: vitamin A, 2,300 IU; vitamin D3,400 IU; vitamin E, 1.8 mg; vitamin B12, 3.5 mg; riboflavin, 1.4 mg; pantothenic acid, 2 mg; nicotinic acid, 7mg; pyridoxine, 0.25 mg; folic acid, 0.15 mg; menadione, 0.3 mg; thiamin, 0.15 mg; manganese oxide, 35 mg; ferrous sulfate 35 mg; zinc oxide, 30 mg; copper sulfate, 60 mg; cobalt carbonate, 5 mg; potassium iodine, 0.6 mg; selenium vanadate, 0.09 mg. Based on NRC (1994) feed composition table.*

The live body weight and feed consumption of each replicate were recorded at 0, 3rd and 6th week of age in nearest gram. Body weight gain and feed conversion ratio (gm feed/ gm weight gain) were calculated during starting (0-3 weeks), growing (4-6 weeks) and the whole experimental period (0-6 weeks).

At the end of the experiment (6 weeks of age), representative samples of birds (3 birds from each treatment) were randomly taken, starved for about 12 hours, then individually weighed. Birds of all treatment groups were slaughtered and after complete bleeding, the birds were scalded and feathers were plucked. Carcasses were removed, heads and shanks were separated, Then the carcass were chilled in tap water for about 10 minutes. Eviscerated carcasses were individually weighed and dressing percentage was calculated (weight of carcass + Spleen + giblets + abdominal fat / pre slaughter weight × 100). Giblets and abdominal fat Percentage were expressed to carcass weight.

Data were statistically performed according the following model.

$$Yijk = \mu + Di + Zj + (DZ)ij + Eijk$$

Where:

Yijk = Experiment al observations.

μ = The overall mean.

Di= The effect of diet density

Zj = The effect of enzyme mixtures

DZ_{ik} = The effect of interaction between diet density and enzyme sources

Eijk = The experimental error.

RESULTS AND DISCUSSION

Effect of treatments on growth:

Body weight and body weight gain:

The effect of diet density, enzymes mixture and their interactions on body weight and body weight gain of growing chicks is presented in Table (3). The data revealed that, the heaviest ($P \leq 0.01$) body weight was recorded for birds fed recommended diet compared with low density diet at the end of the experiment (6 weeks of age). During all experimented periods except from 0 -3 weeks of age body weight gain was increased ($P \leq 0.01$) for birds fed recommended diet compared with low density diet. These results agree with Abd El-Samee, (2002), Abd El-Gawad, *et. al.*, (2004) and Kamran, *et. al.*, (2008), they concluded that broiler chicks fed on diets containing recommended crude protein recorded higher ($P<0.05$) body weight than those fed on low crude protein density during growing and finishing periods. Also, Venäläinen, *et. al.*, (2006) found that, dietary ME of 2868.00 kcal/kg. diet increased ($p<0.05$) growth of broiler chicks compared to 2629.00kcal/kg. diet.

Birds fed dietary Nu3Lease enzyme mixture recorded the best ($P \leq 0.05$ and $P \leq 0.01$) body weight at 3 and 6 weeks of age compared with other treatments Also, body weight gain was increased ($P \leq 0.05$, $P \leq 0.01$ and $P \leq 0.01$) as a result of addition of Nu3Lease enzyme mixture to broiler chicks during all periods (0-3, 4-6 and 0-6 weeks) respectively compared with other enzyme mixtures addition. The present results are in agreement, Anuradha and Roy, (2015), they found that, adding xylanase enzyme on broiler diets in de-oiled rice bran

recorded significantly ($p<0.05$) higher body weight gain when compared to control group. Also, Amoni, *et, al.*, (2011), revealed that addition of xylam enzyme which contain (alpha-amylase 8000 units/g and endo 1-4 α xylanase 1260 units/g) at the level of 0.5 kg to broiler chicks diet significantly increased the body weight gain.

The data of the interaction between dietary density and enzymes mixtures revealed that there was no significant ($P\geq0.05$) difference in body weight and body weight gain at all interactions. However, numerically improvement in body weight and body weight gain were noticed for birds fed control diet and supplemented with Nu3Lease enzyme mixture followed by birds fed control diet and contained Kem Zyme at the end of the experiment (6 weeks of age).

Table (3) Effect of diet density, enzyme mixtures and their interaction on body weight and body weight gain (g/bird) of growing chicks.

Treatments	Body weight (gm)		Body weight gain (gm)		
	3 wk	6 wk	0 -3 wk	4 - 6 wk	0 – 6 wk
Diet density:	NS	**	NS	**	**
Rec.	724.17	2580.16[a]	675.96	1855.99[a]	2531.95[a]
Low.	723.42	2451.93[b]	675.25	1728.51[b]	2403.77[b]
±SE	11.42	29.28	11.39	26.18	29.29
Enzyme mixtures:	*	**	*	**	**
Control	718.67[b]	2441.87[b]	670.50[b]	1723.21[b]	2393.71[b]
Nu3Lease	768.83[a]	2692.30[a]	720.67[a]	1923.46[a]	2644.12[a]
Kem Zyme	705.17[b]	2477.81[b]	657.00[b]	1772.64[b]	2429.64[b]
Fra Zyme	702.50[b]	2452.19[b]	654.25[b]	1749.69[b]	2403.94[b]
±SE	16.15	41.41	16.10	37.01	41.42
Diet*Enzymes:	NS	NS	NS	NS	NS
Rec.*Control	719.50	2490.47	671.33	1770.92	2442.25
Rec.* Nu3Lease	775.83	2805.00	727.67	2029.17	2756.83
Rec.*Kem Zyme	699.83	2552.08	651.67	1852.25	2503.92
Rec.* Fra Zyme	701.50	2473.12	653.17	1771.62	2424.79
Low*Control	717.83	2393.33	669.67	1675.50	2345.17
Low* Nu3Lease	761.83	2579.59	713.67	1817.75	2531.41
Low* Kem Zyme	710.50	2403.54	662.33	1693.04	2355.37
Low* Fra Zyme	703.50	2431.25	655.33	1727.75	2383.08
±SE	22.84	58.59	22.78	52.35	58.58

[a-b] Values under the same column with different superscripts are significantly different ($p<0.05$).

*NS= Not significant($P\geq0.05$), ±SE= standard error *= ($P<0.05$) and**= ($P<0.01$).*

Feed consumption (gm/bird/period):

The effects of diet density, enzymes mixtures and their interactions on feed intake of growing broiler chicks is shown in Table (4).The data revealed that, feed consumption of birds fed recommended diet during growing (4-6 weeks) and the whole experimental period (0-6 weeks) were significantly($P\leq0.01$ and $P\leq0.05$)

higher compared with low density diet. These results agree with the finding of Abd El- Fattah, (2002); Venäläinen, et. al, (2006) and Maha Abd EL-Latif (2015), They found that feed consumption of birds fed high crude protein and energy levels was significantly increased compared to that of birds fed low density diet during starting and growing periods. Also, El- Mandy and El-Afif (2002); Shaldam, (2003) and Abd El- Gawad, *et. al.,* (2004) found that decreasing crude protein level in broiler diet significantly decreased (P<0.05) feed consumption at 3 and 6 weeks of age. However, Abd El-Raheem, (2001) found that feed intake was insignificantly decreased by the decrease in dietary protein and energy levels during starting and growing periods.

Birds fed dietary enzyme mixtures had no significant (P≥0.05) difference in feed consumption at all experimental periods. The effect of the interaction between diet density and enzyme mixtures on feed consumption was not significant (P≥0.05) at all experimental periods.

In agreement with these results, Cowieson and Ravindran, (2008) and Amerah, *et. al.,* (2016) stated that supplementing corn-SBM-based broiler diets with an enzyme product containing xylanase, amylase and protease did not affect feed consumption of broiler chicks**.**

Table 4: Effect of diet density, enzyme mixtures and their interaction on feed intake (g/bird) of growing chicks.

Treatments	Age (weeks)		
	0-3wk	4-6wk	0-6wk
Diet density:	NS	**	*
Rec.	1173.67	3495.45[a]	4669.14[a]
Low.	1181.09	3284.59[b]	4465.67[b]
±SE	10.77	53.51	60.25
Enzyme mixtures:	NS	NS	NS
Control	1184.50	3359.99	4544.47
Nu3Lease	1161.06	3356.60	4517.67
Kem Zyme	1182.19	3459.86	4642.05
Fra Zyme	1181.80	3383.63	4565.43
±SE	15.27	75.68	85.21
Diet*Enzymes:	NS	NS	NS
Rec.*Control	1169.77	3443.20	4612.97
Rec.* Nu3Lease	1153.62	3538.33	4691.95
Rec.* Kem Zyme	1188.92	3552.34	4741.27
Rec.* Fra Zyme	1182.43	3447.94	4630.37
Low*Control	1199.22	3276.77	4475.99
Low* Nu3Lease	1168.50	3174.88	4343.38
Low* Kem Zyme	1175.47	3367.37	4542.84
Low* Fra Zyme	1181.17	3319.31	4500.48
±SE	21.53	107.03	120.50

[a-b] Values under the same column with different superscripts are significantly different (p<0.05).

*NS= Not significant (P≥0.05), ±SE = standard error *= (P<0.05) and**= (P<0.01).*

Feed conversion ratio:

The effects of diet density, enzymes mixtures and their interactions on feed conversion of growing broiler chicks are shown in Table (5). The data revealed that, there were no significantly differences in feed conversion ratio between recommended and low density diet ($P \leq 0.05$) during all experimental periods. These results agree with the finding of Bunchasak, *et. al.,* (1997) who found that feed conversion ratio of broiler chicks was not significantly affected by crude protein and energy levels during starting and growing periods. In contrast Venäläinen, *et. al.,* (2006), found that high dietary ME significantly improved feed conversion of broiler chicks compared to birds fed low dietary ME.

Addition Nu3lease enzyme mixture to broiler diets significantly ($P \leq 0.01$) improved feed conversion ratio during all experimental periods compared with birds fed diets supplemented with other enzyme mixtures. Similar results were obtained by Habib, (2016) who indicated that addition of enzyme to the diet significantly improved ($p<0.01$) the feed conversion ratio of broiler chicks received 0.5 kg of Xylam which contain (alpha-amylase 8000 units/g and endo 1-4 α xylanase 1260 units/g) in their diets. Also, Lazaro, *et. al.,* (2004) suggested that supplementation of feed with β-glucanase and xylanase improved feed conversion of broiler chicks**.**

The data of the interaction between dietary density and enzyme mixtures revealed that there was no significant ($P \geq 0.05$) difference in feed conversion ratio at all experimental periods. Nagvi, and Nadeem (2004) found that broiler chicks fed the intermediate dietary energy level (3000 kcal/kg) with Kem Zyme plus exhibited better feed conversion ratio as compared to those of birds fed the same dietary ME level without Kem Zyme, but comparable to those of the control broiler chickens given the control diet (3200 kcal/ kg).

CARCASS CHARACTERISTICS:

The effects of diet density, enzyme mixtures i.e., Nu3Lease, Kem Zyme and Fra Zyme at the level of 0.5% for each addition and their interaction on body weights and some carcass traits for broiler at the end of the experiment (6 weeks of age) are presented in Table (6).

The data revealed that, there were no significantly differences between recommended and low-density diet ($P \geq 0.05$) in pre-slaughter weight, dressing percentage, giblets and abdominal fat percentages of broiler chicks. The present results agree with the finding of Maha Abd EL-Latif (2015), who found that abdominal fat, giblets percentages of broiler chicks were not significantly affected by diet density treatments. Also, Abd El-Fattah, (2002) showed that, dressing and abdominal fat percentages were not significantly affected by diet density, while the imbalanced diet increased ($P<0.5$) giblets percentage in broiler chicks at 6-week-old. Moreover, Abd El-Samee, (2002) reported that, averages of dressed carcass and giblets

percentages showed no significant differences by feeding different levels of CP in broiler chick diet. On the other hand, El-Husseiny, *et. al.,* (2002) found that, dressed percentage of birds fed 3000 kcal ME/Kg. diet was significantly higher than those fed 2800 or 3200 kcal ME/Kg. diet, while decreasing ME level significantly decreased abdominal fat.

Table 5: Effect of diet density with different sources of enzyme addition on feed conversion ratio of growing chicks.

Treatments	Age (weeks)		
	0-3 wk	4-6 wk	0-6 wk
Diet density:	NS	NS	NS
Rec.	1.74	1.89	1.85
Low.	1.75	1.90	1.86
±SE	0.023	0.021	0.015
Enzyme mixtures:	**	**	**
Control	1.77[a]	1.99 [a]	1.94 [a]
Nu3Lease	1.61[b]	1.74[b]	1.70[b]
Kem Zyme	1.80 [a]	1.95 [a]	1.91 [a]
Fra Zyme	1.80 [a]	1.93 [a]	1.90 [a]
±SE	0.032	0.030	0.021
Diet*Enzymes:	NS	NS	NS
Rec.*Control	1.75	1.94	1.89
Rec.* Nu3Lease	1.58	1.74	1.70
Rec.* Kem Zyme	1.82	1.92	1.89
Rec.* Fra Zyme	1.81	1.95	1.91
Low*Control	1.79	1.95	1.91
Low* Nu3Lease	1.64	1.75	1.71
Low* Kem Zyme	1.77	1.99	1.93
Low* Fra Zyme	1.80	1.92	1.89
±SE	0.045	0.043	0.030

[a-b] Values under the same column with different superscripts are significantly different ($p<0.05$).
NS= Not significant ($P\geq0.05$), ±SE = standard error **= ($P<0.01$).

The effect of enzyme mixtures did not significantly affect ($P\geq0.05$) pre-slaughter weight of broiler chicks, while birds fed dietary Nu3Lease enzyme mixture recorded the best proportions of dressing, giblet and abdominal fat compared with other enzyme mixtures. The data of addition of enzyme mixtures agree with, Selle, *et. al.,* (2003) they found that, diets incorporated with xylanase (5,600 EXU/kg) and phytase (500 FTU/kg) increased carcass weight by 3.9% (1,752 to 1,821 g/bird), without influencing yield fed to broiler chicks from 1-42 days. Moreover, Habib, (2016) indicated that addition of enzyme to the diet recorded significantly ($p< 0.05$) high percentage in carcass dressing received 1kg of Xylam in their diets when fed broiler (Ross 308) added commercial Xylam enzyme which contain (alpha-amylase 8000 units/g and endo 1-4 α xylanase 1260 units/g)

diets at levels of (zero, 0.5kg, 0.75kg, and 1 kg).

The data of the interaction between diet density and enzyme mixtures revealed that there was no significant (P≥0.05) difference in pre-slaughter weight. Similarly the interaction between diet density and enzyme mixtures recorded the same trend for all the proportions of the dressing, giblet and abdominal fat.

The improvements in some carcass trait weights andits proportions as a result of feeding birds on dietary Nu3Lease are harmony with data of body weight and body gain (Table 3)

Table (6): Effect of diet density, enzyme mixtures and their interaction on some carcass characteristic of growing broiler chicks.

Treatments	LBW	Dressing %	Giblet %	Abdominal fat %
Diet density:	NS	NS	NS	NS
Rec.	2704.58	76.62	5.44	1.42
Low.	2577.92	76.90	5.55	1.64
±SE	63.26	0.41	0.13	0.09
Enzyme mixtures:	NS	**	**	**
Control	2634.17	76.45^{b}	4.94^{c}	1.80^{a}
Nu3Lease	2700.83	79.11^{a}	6.00^{a}	1.12^{b}
Kem Zyme	2520.00	75.37^{b}	5.31^{bc}	1.86^{a}
Fra Zyme	2710.00	76.12^{b}	5.71^{ab}	1.34^{b}
±SE	89.47	0.58	0.18	0.13
Diet*Enzymes	NS	NS	NS	NS
Rec.*Control	2585.00	76.65	4.83	1.66
Rec.* Nu3Lease	2706.67	79.07	5.99	1.02
Rec.*Kem Zyme	2581.67	74.90	5.29	1.70
Rec.* Fra Zyme	2945.00	75.88	5.63	1.30
Low*Control	2683.33	76.26	5.06	1.95
Low* Nu3Lease	2695.00	79.15	6.01	1.24
Low* Kem Zyme	2458.33	75.85	5.33	2.01
Low* Fra Zyme	2475.00	76.35	5.79	1.38
±SE	126.53	0.81	0.26	0.19

$^{a-b}$ Values under the same column have different superscripts are significantly different (p<0.05).

*NS= Not significant, ±SE = standard error **= (P<0.01).*

enzyme mixture compared with other dietary treatments. This improvement may be due to the enhancement in body weight, body weight gain and feed conversion ratio for birds fed dietary Nu3Lease mixture compared with other enzymes (Tables 3 and 5). Moreover, it could be noticed that adding all enzyme mixtures to low density diet of broiler chicks did not

ECONOMICAL EFFICIENCY.

The effects of dietary treatments on the economical efficiency of growing broiler chicks are shown in Table (7). The data showed that the greatest values of net revenue, economical efficiency and relative economical efficiency are recorded for birds fed recommended or low diets that contained Nu3Lease

than the recommended diet. enhance the economical efficiency

Table (7): Effect of dietary treatments on economical efficiency of the experimental diets (L.E in 2017).

Items	Treatments							
	Recommended				Low			
	No enzyme	Nu3 Lease	Kem Zyme	Fra Zyme	No enzyme	Nu3 Lease	Kem Zyme	Fra Zyme
Cost of one kg diet	4.00	4.00	4.00	4.00	3.76	3.76	3.76	3.76
Cost of one kg enzyme	0.00	64.00	70.00	66.00	0.00	64.00	70.00	66.00
Cost ofenzyme addition	0.00	0.32	0.35	0.33	0.00	0.32	0.35	0.33
Price /kg feed, L.E. (a)	4.00	4.32	4.35	4.33	3.76	4.08	4.11	4.09
Feed/gain ratio(b)	1.89	1.70	1.89	1.91	1.91	1.71	1.93	1.89
Feed cost of 1kg weight gain (a*b)	7.56	7.34	8.22	8.27	7.17	6.98	7.93	7.73
market price /kg (c)LE	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
Net revenue{c-(a*b)}	16.44	16.66	15.78	15.73	16.83	17.02	16.07	16.27
Economical efficiency	2.17	2.27	1.92	1.90	2.34	2.44	2.03	2.10
Relative economical efficiency %	100.00	104.29	84.62	99.10	100.00	104.05	83.02	103.91

These results are in agreement with the finding ofHabib, (2016), who found that adding commercial Xylam enzyme which contain alpha-amylase 8000 units/g and end 1-4 α xylanase 1260 units/g in broiler chick diets resulted in economic benefits.Moreover, Dozier, *et. al.,* (2006) demonstrated that no economic benefit was realized by increasing dietary Apparent metabolizable energy beyond 3220 kcal/kg with changing diet and meat prices of broiler chicks. In addition, Rabie. *et. al.,* (2010) fed broiler chicks on starter and grower diet with 22% and 19% CP within each three levels of ME (3100, 2900 and 2700 kcal/ kg diet) and reported decreasing metabolizable energy in both starter and grower diets from 3100 to 2700 kcal/kg positively affected efficiency of energy utilization, but it had no significant effect on live economic efficiency.

On the other hand, Saleh, *et. al.,* (2018) reported that enzyme complexes in conjunction with a low-energy diet is associated with economic benefits in the poultry industry.

CONCLUSION.

From this study, It could be concluded that, adding different enzyme mixtures to recommended or low density diet may improve growth performance and some carcass traits. Moreover, recommended or low diets contained Nu3Lease enzyme mixture recorded the best economical efficiency compared with others diets.

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تأثير بعض مخاليط الانزيمات على الاداء الانتاجي وصفات الذبيحة والكفاءة الاقتصادية لكتاكيت التسمين

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تم استخدام 192 كتكوت أربور ايكرز غير مجنسة عمر يوم وزعت عشوائيا على 8 مجموعات في تجربة عاملية 4x2 (عليقة متزنة والأخرى منخفضة من البروتين الخام 2 % والطاقة 100 كيلو كالوري/كجم من العليقة المتزنة) مع اضافة او عدم اضافة ثلاث انواع من مخاليط الانزيمات (نيوتري ليز – كيم زايم – فرا زيم) بنسبة 0.05% لكل مخلوط انزيمات وذلك على أداء النمو، وصفات الذبيحة والكفاءة الاقتصادية في بداري التسمين. احتوت كل معاملة على 24 كتكوت فى ثلاث مكررات كل مكررة 8 كتاكيت.

تم تسجيل وزن الكتاكيت واستهلاك العلف في كل مكررة في عمر 3 و6 أسابيع وتم حساب الزيادة فى وزن الجسم ومعدل التحويل الغذائى خلال فترة البادئ (0–3 اسبوع) والنامي (4–6 اسبوع) واستمرت التجربة لمدة 6 اسابيع. في نهاية التجربة (الأسبوع السادس من العمر) تم اختيار 3 طيور عشوائيا من كل مجموعة وتم ذبحها لقياس صفات الذبيحة.

واتضح من النتائج ما يلي:

- أظهرت الطيور التي تغذت على العليقة المتزنة أفضل وزن جسم حي عند عمر 6 أسابيع وأعلى زيادة في الوزن واستهلاك العلف خلال فترة النمو والفترة الكلية للتجربة.
- سجلت الطيور التي تغذت على عليقة مضاف اليها مخلوط إنزيم نيوتري ليز أعلى وزن جسم واعلي زيادة في وزن الجسم وأفضل معدل تحويل غذائي خلال فترة البادي والنامي وفترة التجربة الكلية.
- سجلت الطيور التي تغذت على العليقة المضاف اليها النيوترى ليز أعلى نسبة تصافي والأجزاء الداخلية المأكولة وأقل نسبة دهن البطن مقارنة بالمعاملات الأخرى.
- –كان أفضل عائد اقتصادي في الطيور التي تغذت على العليقة الكنترول والمضاف اليها مخلوط انزيمات النيوترى ليز.