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USING DIFFERENT LEVELS OF PHYTASE IN THE LAYING HEN DIETS AS AN ATTEMPT TO REDUCE THE ANTI-NUTRITIONAL EFFECTS OF PHYTATE

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ABSTRACT

A Factorial experimental design was carried out to evaluate the effect of adding two levels of enzymes mixture (control and 0.3kg phytase plus 0,5kg cocktail enzyme / ton diet) and substitute barley by corn in laying diet with the levels of 0, 25 and 50% on growth performance of growing local strain hens. Total number of 72 males and 216 females Anshass strain layers chicks, five weeks old were randomly distributed into 6 groups of (12 males and 36 females). Each group contained 4 replicates of (3 males and 9 females). The experiment was lasted for 25 weeks of age. Body weight gains, feed intake and feed conversion were weekly calculated from 5 to 19 weeks of age. Egg number and egg weight were daily recorded per replicate during the productive period (19 to 25 weeks of age) and egg mass was calculated. The obtained results indicated that, phytase and cocktail enzymes supplementation had no significant effect ($P \geq 0.05$) on live body weight, body gain, feed intake and feed conversion ratio at all studied ages. Using barley as a substitute of corn in layer diets at levels either 25% or 50% had significantly enhancement ($P \leq 0.05$) on feed intake at all experimental periods including the entire period (5-19 weeks of age) except the period 5-7 weeks of age. Phytase and cocktail enzymes supplementation had no significant effect ($P \geq 0.05$) on egg number and egg mass. However, using barley as a substitute of corn in diets at levels either 0 or 25% and 50% had significant effect ($P \leq 0.05$) on egg number and egg mass. Layers fed 50% dietary barley recorded the greatest ($P \geq 0.05$) values of egg number and egg mass compared with 25% dietary barley and control diet. No significant effect was detected between 25% dietary barley and control diet on egg number and egg mass. It could be concluded that using barley at levels of (0, 25, and 50%) as a substitute of corn in growing layer diet either with or without enzyme addition had no adverse effects on growth performance and egg production of local strain hens.

Key words: - laying hens, Anshass, barley, phytase enzyme, growth performance, egg production.

INTRODUCTION

The poultry industry in Egypt is confronted with a number of challenges, especially the pressures to produce high quality products to satisfy customer needs in a cost effective manner. In poultry productions, feed cost has always been one of the major issues, accounting for 70% of total production Cost (Zarei, *et al.,* 2011).

Barley is utilized to best advantage in poultry diets when consideration is given to the class of bird being fed and the desired level of performance. The β-glucans inherent to most barley scan create problems for young birds and birds raised on litter. The amount of barley in broiler diets can gradually be increased as the birds age advance. Feeding poultry on barley based diets, reduced variability in performance and improved growth can be obtained through the use of enzyme supplementation. During production peak period's barley should not be used as the sole grain components.

Exogenous enzyme has long been used in poultry industry to alleviate the anti-nutritional factors and improve the utilization of dietary energy and protein, thus leading to enhanced poultry performance (Ravindran, 2013). Due to the structural complexity in feedstuffs, it has been pointed out that the multiple enzyme preparations with the substrate-specific activities be regarded as the next generation of technology **(**Ravindran, 2013). Phytase enzyme has been added to poultry diets as exogenous phytase (Yao *et al.,* 2007). A high or low level of available P in a laying hen΄s diet may adversely affect the bird΄s performance and reduce the eggshell quality (Harms, 1982). The use of phytase in layer diets improves phosphorus phytate utilization and reduces the requirement for inorganic P. Gordon and Roland (1997) reported that hens consuming the low non phytate P (NPP) diet with supplementary phytase performed as well as the hens fed diets containing higher levels of NPP without supplementary phytase. However, the effects of phytase in layer diets are complicated by the intimate link between Ca and P metabolism (Scott *et al.,* 1999).

The aim of this study was to evaluate the effect of adding two levels of enzymes (control without enzyme and 0.3 kg phytase plus 0,5kg cocktail enzyme / ton diet) and substitute barley by corn with the levels of 0, 25 and 50% in local strains diet on growth performance of Anshass local strain.

MATERIALS AND METHODS:

A total number of 288 Anshass local strain chicks, five weeks old were used in this study (72 of males and 216 of females). Chicks were obtained from El-Azab Takamouly project in Fayoum. Chicks were randomly distributed into 6 groups of (12 males and 36 females). Each group contained 4 replicates of (3 males and 9 females, each. All chicks were housed in two-tiers floor batteries located in an open house. The dimensions of the cage in each battery were (100 ×60 × 40cm) for length, width and height, respectively. The batteries were previously cleaned and disinfected. Average initial body weight of all treatments was almost similar (kg). The experiment was lasted for 25 weeks of age

Three diets within each of the grower and production diets were formulated to have recommended levels of both crude protein and metabolizable energy. The first grower and production diets were formulated to meet the nutrients requirements of laying hens according to NRC (1994) and were served as a control treatment. The second and third grower and production diets were formulated to have replacing corn by barley at the levels of (25 and 50%) with or without adding enzyme. The cocktail enzyme in this experiment contained: Endo1,3(4)-beta- glucanase (beta-glucanase 1175 units /g), Endo1,4-beta- glucanase (cellulase 2000 units/ g), alpha amylase 200 units/ g , bacillolysin (protease) 225 units/g, and endo – 1,4- beta xylanase (xylanase 10000 units/ g. The ingredients and proximate analyses of the dietary treatments for chickens fed from 5 to 8 and from 9 to 25weeks of age are presented in Tables (1) and (2).

The slight improvement in body weight and body gain as a result of adding enzymes may be due to that birds do not produce enzymes like cellulase, xylanase, required for the digestion of NSPs. Supplementation of NSPs degrading enzymes may not only reduce the antinutritive effects of NSPs, but also releases some nutrients, which could be utilized by the birds **(**Balamurugan and Chandrasekaran, 2009). However, the effects of exogenous enzymes can be variable and it depends on some factors such as the age of the bird and the quality and type of diet (Bedford, 2000; Acamovic, 2001). The use of exogenous enzymes to improve the digestibility of corn-soybean meal diets for broilers is less well documented. Neither corn nor soybean meal is regarded as viscous feedstuffs even though they do contain appreciable amounts of NSP’s. Corn contains approximately 0.9% soluble NSP and 6% insoluble NSP, whereas SBM contains approximately 6% soluble NSP and 18-21% insoluble NSP (Knudsen, 1997).

Table (1): The ingredients and proximate analyses of the dietary treatments for chickens fed from 5 to 8 weeks of age.

(%) Ingredients	Treatments Enzyme level					
	0%			300gm phytase + 500gm cocktail enzymes		
	0% Bar.	25% Bar.	50%Bar.	0% Bar.	25% Bar.	50% Bar.
Yellow corn	62	46.50	31	62	46.50	31
Barley	0	15.50	31	0	15.50	31
Soybean meal	20.8	20.8	20.8	20.8	20.8	20.8
layer conc., 49% CP	10	10	10	10	10	10
Limestone	6	6	6	6	6	6
Nacl(salt)	0.7	0.7	0.7	0.7	0.7	0.7
Premix**	0.5	0.5	0.5	0.5	0.5	0.5
Proximate analysis						
Metabolizable energy K cal/kg	2759.74	2649.69	2539.64	2759.74	2649.69	2539.64
Crude protein,	19.01	19.48	19.94	19.01	19.48	19.94
Calcium, %	2.68	2.68	2.68	2.68	2.68	2.68
Available phosphorus,	0.55	0.56	0.57	0.55	0.56	0.57
Methionine and cysteine	0.75	0.76	0.77	0.75	0.76	0.77
Lysine, %	0.94	0.96	0.98	0.94	0.96	0.98

** Each 1 kg Premix contained: Vit A 3350000 IU, Vit D3 760 000 IU, Vit E 6700 IU, Vit K3 335 mg, Vit B1 334 mg, Vit B2 1670 mg, Vit B6 500 mg, Vit B12 3.4 mg, Niacin 10 000 mg, Ca.D.Pantothenate 3 334 mg, Biotin 16.7 mg, Folic acid 334 mg, Trace minerals: Iron 13 350 mg, Copper 3 335 mg, Zinc 16 700 mg, Manganese 25 000 mg, Iodine 500 mg, Cobalt 84 mg, Selenium 100 mg, Additives: Ethoxyquine 600 mg, Carrier (ca co3) up to 1 kg.

Table (2): The ingredients and proximate analyses of the dietary treatments for chickens fed from 9 to 25 weeks of age.

(%) Ingredients	Treatments Enzyme levels					
	0%			300 gm phytase + 500gm cocktail enzymes		
	0% Bar.	25% Bar.	50%Bar.	0% Bar.	25% Bar.	50%Bar.
Yellow corn	70	52.50	35	70	52.50	35
Barley	0	17.50	35	0	17.50	35
Soybean meal	15.8	15.8	15.8	15.8	15.8	15.8
layer conc.,49% CP	7	7	7	7	7	7
Limestone	6	6	6	6	6	6
Nacl(salt)	0.7	0.7	0.7	0.7	0.7	0.7
Premix**	0.5	0.5	0.5	0.5	0.5	0.5
Proximate analysis						
Metabolizable energy K cal/kg	2850.57	2726.32	2602.07	2850.57	2726.32	2602.07
Crude protein,	15.98	16.50	17.03	15.98	16.50	17.03
Calcium, %	2.57	2.57	2.57	2.57	2.57	2.57
Available phosphorus,	0.47	0.48	0.49	0.47	0.48	0.49
Methionine and cysteine	0.63	0.65	0.66	0.63	0.65	0.66
Lysine, %	0.76	0.78	0.81	0.76	0.78	0.81

** Each 1 kg Premix contained: Vit A 3350000 IU, Vit D3 760 000 IU, Vit E 6700 IU, Vit K3 335 mg, Vit B1 334 mg, Vit B2 1670 mg, Vit B6 500 mg, Vit B12 3.4 mg, Niacin 10 000 mg, Ca.D.Pantothenate 3 334 mg, Biotin 16.7 mg, Folic acid 334 mg, Trace minerals: Iron 13 350 mg, Copper 3 335 mg, Zinc 16 700 mg, Manganese 25 000 mg, Iodine 500 mg, Cobalt 84 mg, Selenium 100 mg, Additives: Ethoxyquine 600 mg, Carrier (ca co3) up to 1 kg.

All groups were randomly allocated in batteries and kept under similar conditions of management. 12 hours daily lighting was provided until first egg of production, then the artificial light was used in the evening to complete 17 hours per day.

Pre – laying (Growing) period:

Body weight means of each replicate was measured at 5, 7, 9, 11, 13, 15, 17and 19 weeks of age. Body weight gains and feed intake were calculated during the periods (5-7, 7-9, 9-11, 11-13, 13-15, 15-17 and 17-19 weeks of age) . Feed conversion ratio was calculated as feed intake / weight gain (gm. feed/ gm. gain) at all experimental growing intervals (5-7, 7-9, 9-11, 11-13, 13-15, 15-17and 17- 19 weeks of age)

Laying period:

Egg number and egg weight were daily recorded per hen in each cage during the laying period (19 to 25 weeks of age). Egg mass was calculated for each group during the same experimental period as follows:

Egg mass (per hen / day, gm) = hen day egg production X egg weight, gm

The factorial experimental data were statistically analyzed by the two way analysis of variance using the General Linear Model (GLM) procedure of Statistical Analysis System (SAS, 1998). Significant differences among treatments were tested by Duncan's multiple range tests Duncan (1955).

The following statistical model was used.

$Y_{ijk} = M + D_i + E_j + DE_{ij} + e_{ijk}$

Where: Y_{ijk} = an observation measured. M = the overall mean. D_i = effect of barley (1, 2, 3) E_j = effect of enzymes (1, 2). DE_{ij} = effect of interaction ($D_i \times E_j$). E_{ijk} = experimental error.

RESULTS AND DISCUSSION

Growth performance

Body weight and body weight gain

The effect of dietary enzyme, barley supplementation and their interaction on body weight(gm) and body gain of Anshass chicks are presented in Tables (3 and 4). The data revealed that, adding enzyme supplementation to growing diets had no significant effect ($P \geq 0.05$) on live body weight and body gain at all growing experimental periods. A slightly improvement in live body weight and body gain was recorded for birds fed dietary enzyme supplementation. In spite, of enzyme addition, birds fed 50% dietary barley had the best ($P \geq 0.05$) live body weight and body gain compared with other dietary treatments at the end of the growing period (19 weeks of age). Birds fed 50% barley diet without enzyme additions had the best ($P \geq 0.05$) body weight and body gain followed by birds fed control diet with enzyme compared with other dietary treatments.

Enzyme supplementation can change the nutritional status and improve growth performance of broiler chickens fed a wheat diet, but which are also closely related to the regulation of metabolism and functioning of the growth related endocrine system. Nutritional status is an important factor in the regulation of plasma hormones and intermediary metabolism in broiler chickens (Gao *et al.,* 2007; Buyse *et al.,* 2002; Swennen *et al.,* 2005).

In general, the present results are coincided with the results reported by NJ Lucky et al.,(2014) They found that final body weight of laying hens did not differ significantly (p>0.05) among different dietary levels 0, 0.05, 0.10, and 0.15% exogenous phytase. Also, Zeweil *et al.,* (2005) showed that Optizyme enzymes had no significant effect on weight gain of Japanese quail. Moreover, El- Deek *et al.,* (2009) found that body weight gain was not significantly affected by dietary corn glutin meal (CGM) with phytase supplementation in Hubbard broiler chicks. Also, Bahnas *et al.,* (2009) showed that Kenmzyme supplementation insignificantly affected body weight gain during the period from 10 to 38 days of age in Japanese quails.

The effect of dietary enzyme, barley supplementation and their interaction on feed intake (gm) of laying chicks are presented in Table (5) the data revealed that, adding enzyme supplementation to growing layer diets had no significant effect (P≥0.05) on feed intake at all experimental periods. A slightly improvement (P≥0.05) was noticed in feed intake for birds fed dietary enzyme during the periods 11-13, 15-17, 17-19 and 5-19 weeks of age, while unfavorably effect was noticed at other experimental periods. Using barley as a substitute of corn in layer diets at levels either 25% or 50% had significantly enhancement (P≤0.05) on feed intake at all experimental periods including the entire period (5-19 weeks of age) except the period 5-7 weeks of age. During the entire period (5-19 weeks of age), birds fed 25% barley diet presented the greatest (P≤0.05) values of feed intake followed by birds fed 50% barley compared with others fed control diet. Adding enzyme supplementation to layer diets contained different levels of barley had no significant effect (P≥0.05) on feed intake at all growing experimental periods. During the entire period (5-19 weeks of age), birds fed 25% barley diet with enzyme additions recorded the highest (P≥0.05) feed intake followed with birds fed 50% barley with enzyme additions compared with other dietary treatments.

These results agree with the results of, Rahman *et al.,* (2005), they showed that, addition of enzyme mixture to diets of broiler chicks did not alter feed intake. Also, Amina *et al.,* (2008) found that, feed intake was not affected when added 0.05% avizyme to diets of golden Montana male chicken.

Selle *et al.,* (2006c) found similar results when phytase was added to grower and finisher diets of broiler chicks.

Table.3. Effect of dietary enzyme, barley supplementation and their interaction on body weight (gm) of laying chicks

Treatments	Age / Week							
	5	7	9	11	13	15	17	19
A) Effect of enzyme								
Sig	NS	NS	NS	NS	NS	NS	NS	NS
Without enzyme	331.25	458.33	701.04	900	1051.36	1351.83	1645.49	1917.95
With enzyme	331.33	465	710.42	912.49	1067.70	1354.01	1671.19	1947.16
± SE	2.53	11.46	9.43	10.75	15.74	24.62	40.86	40.44
B) Effect of barley								
Sig	NS	NS	NS	NS	NS	NS	NS	NS
Control without barley	331.37	465	716.66	913.02	1062.5	1355.26	1682.5	1936.28
0.25% Barely	331.25	461.87	698.43	903.12	1055.20	1362.41	1655.034	1881.35
0.5% Barely	331.25	458.125	702.08	902.60	1060.89	1341.01	1637.49	1980.028
± SE	3.09	14.04	11.55	13.17	19.28	30.15	50.04	49.53
(A*B) Interaction								
Sig	NS	NS	NS	NS	NS	NS	NS	NS
Without enzyme control	331.25	448.75	703.12	905.21	1065.62	1376.14	1678.51	1906.66
Without enzyme 0.25%	331.25	458.12	678.12	890.62	1028.124	1323.769	1602.77	1843.26
Without enzyme 0.5%	331.25	468.12	721.87	904.16	1060.32	1355.58	1655.09	2003.90
With enzyme control	331.50	481.25	730.20	920.83	1059.37	1334.37	1686.4	1965.89
With enzyme 0.25%	331.25	465.62	718.75	915.62	1082.29	1401.04	1707.29	1919.43
With enzyme 0 .5%	331.25	448.12	682.29	901.04	1061.45	1326.61	1619.88	1956.14
± SE	4.38	19.86	16.34	18.62	27.27	42.64	70.78	70.04

NS: NOT Significant ($p \geq 0, 05$).

Table.4. Effect of dietary phytase, barley supplementation and their interaction on body gain (gm) of laying chicks

Treatments	Age / Week							
	5-7	7-9	11-9	13-11	15-13	17-15	19-17	5-19
Sig	NS	NS	NS	NS	NS	NS	NS	NS
A) Effect of enzyme								
Without enzyme	127.08	252.50	198.96	151.36	300.47	293.66	272.45	1596.48
With enzyme	133.66	254.16	202.083	155.21	286.30	317.18	275.96	1624.553
± SE	11.80	16.15	9.318	9.42	19.62	28.42	35.04	129.768
B) Effect of barley								
Sig	NS	NS	NS	NS	NS	NS	NS	NS
Control without barley	133.62	267.91	196.35	149.47	292.75	327.24	253.77	1621.11
.25% Barely0	130.62	247.81	204.68	152.08	307.19	292.62	226.31	1561.31
0.5% Barely	126.87	244.27	200.52	158.28	280.20	296.39	342.53	1649.06
± SE	14.45	19.78	11.41	11.53	24.03	34.81	42.91	158.92
(A*B)Interaction								
Sig	NS	NS	NS	NS	NS	NS	NS	NS
Without enzyme control	117.50	253.75	202.08	160.41	310.51	302.46	228.07	1574.78
Without enzyme 0.25%	126.87	235	212.5	137.5	295.64	279.008	240.48	1526.998
Without enzyme0.5%	136.87	268.75	182.29	156.15	295.26	299.50	348.81	1687.63
With enzyme control	149.75	282.08	190.62	138.54	274.99	352.03	279.48	1667.49
With enzyme 0.25%	134.37	260.63	196.88	166.66	318.75	306.25	212.15	1595.69
With enzyme0 .5%	116.878	219.79	218.75	160.42	265.15	293.28	336.26	1610.528
± SE	20.43	27.97	16.14	16.32	33.98	49.23	60.69	224.76

NS: NOT Significant ($p \geq 0, 05$).; Feed intake (gm)

The improvement in feed intake as a result of using dietary barley may be due to that the birds try to compensate the reduction in benefit nutrients by eating more diets in view of the fact that barley contains ß-glucan as the major anti-nutritional factor in the cell wall of the aleurone and endosperm layers. These non-starch polysaccharides (NSP) are ß-1, 4 or ß-1, 3 glucosidic linked and not hydrolyzed by digestive enzyme in birds (Trethewey, and Harris 2002).

Feed conversion ratio (gm feed intake/gm weight gain)

As presented in Table (6) the data revealed that, adding enzyme to growing layer diets had no significant effect (P≥0.05) on feed conversion at all experimental periods. While, it was noticed that birds fed dietary enzyme recorded a slightly improve (P≥0.05) in feed conversion compared with others fed un-supplemented diet during the entire period of the experiment (5-19 weeks of age). The insignificant (P≥0.05) effect on feed conversion ratio of birds fed dietary enzyme are related to insignificant enhancement in body gain and feed intake for these birds Tables(4&5). Using barley as a substitute of corn in layer diets at all levels had no significant effect (P≤0.05) on feed conversion at all experimental periods. Adding enzyme supplementation had no significant effect (P≥0.05) on feed conversion ratio at all experimental periods. During the entire period (5-19 weeks of age), birds fed control diet incorporated with enzyme additions recorded the best (P≥0.05) feed conversion ratio followed with birds fed control diet without enzyme additions compared with other dietary treatments.

These results agree with the results of Zeweil (1996), who indicated that Feed conversion was insignificantly improved with enzyme supplementation. Moreover, Viveros *et al.,* (2002) showed that phytase supplementation had no significant effect on feed conversion ratio at any studied age of broiler chicks. Also, Salem *et al.,* (2003) found that phytase supplementation had no significant effect on feed conversion of broiler chicks. In addition, Rahimian *et al.,* (2013) indicated that phytase had insignificant effect on feed conversion of broiler chicks from 0 to 49 days of age.

The effects of dietary enzyme, barley supplementation and their interaction on egg number, egg weight and egg mass (kg) ±SE of laying hens are presented in (Table 7). The data revealed that, adding enzyme to layer diets had no significant effect (P≥0.05) on egg number, egg weight and egg mass at all experimental periods. While, it was noticed that birds fed dietary enzyme recorded a slight improvement (P≥0.05) in egg number and egg mass compared with others fed un-supplemented diet during the productive period of the experiment (19-25 weeks of age). However, layers fed dietary enzyme recorded a slight decrease (P≥0.05) in egg weight compared with layers fed un-supplemented diet .The data revealed that, using barley as a substitute of corn in layer diets at levels 0, 25% and 50% had significant effect (P≥0.05) on egg number and egg mass. However, no significant effect was detected (P≤0.05) on egg weight as a result of substituting corn with barley in layer diet. Layers fed 50% barley diet recorded the greatest (P≥0.05) values of egg number and egg mass compared with 25% dietary barley and control diet. No significant effect was detected between 25% barley diets and control diet on egg number and egg mass. Adding enzymes to layer diet containing 50% barley recorded a slight enhancement (P≥0.05) in egg number and egg mass compared with other dietary treatments either with or without enzyme addition.

The slight improvement in egg number and egg mass as a result of adding enzymes may be due to that, the use of phytase in layer diets reduces the requirements for inorganic P **(**Gordon and Roland 1997; Carlos and Edwards 1998 and Um and Paik 1999). Different levels of exogenous phytase increased egg production in chicken at younger ages (Hughes *et al.*, 2008; Augspurger *et al.*, 2007; Wu *et al.,* 2006; Lim *et al.,* 2003 and Boling *et al.,* 2000). Researchers are scanty on relations between P availability and egg production of hens at older ages. The obtained results also, is supported by Francesch *et al.,* (2005) who reported that supplementation of microbial dietary phytase (0, 300 and 600Ukg-1) improved egg production, egg weight in laying hens.

The present result agree with Mohammed *et al.,* (2010) who reported that egg production, egg weight and egg mass increased when maize was replaced with enzyme supplemented barley. Mathlouthi *et al.*, (2002) found that supplemention xylanase improved (P < 0.05) the egg mass of layers fed diets containing 70% wheat and wheat-barley (49% wheat and 20% barley), but had no effect on diets containing both wheat-barley and wheat bran (48% wheat, 10% barley, and 10% wheat bran).

Panda *et al.*, (2005) reported that the addition of phytase to corn and soybean diets containing 0.12% NPP improved the egg production and egg shell quality of layers to the level of those fed diets containing 0.18 to 0.30% NPP. However, Rao *et al.,* (2003) reported that adding phytase to a diet with 3.25% Ca and 0.28% NPP did not improve the performance and retention of Ca and P in the bone and serum of White Leghorn layers, suggesting that 0.28% NPP is adequate for laying hens.

On the other hand, Mahdavi *et al.,* (2005) reported absence of significant (P>0.05) difference in egg mass as barley was supplemented with probiotic substituted maize up to 100%

Table.5. Effect of dietary phytase, barley supplementation and their interaction on feed intake (GM) of laying chicks

Treatments	Age / Week							
	5-7	7-9	9-11	11-13	13-15	15-17	17-19	5-19
A) Effect of enzyme								
Sig	NS	NS	NS	NS	NS	NS	NS	NS
Without enzyme	389.37	763.54	956.71	941.319	950.340	992.36	998.95	5992.589
With enzyme	386.25	789.93	948.26	972.56	980.62	1013.19	1023.26	6114.07
± SE	8.64	11.26	8.65	16.68	15.16	11.00	8.20	79.59
B) Effect of barley								
Sig	NS	*	*	*	*	*	*	*
Control without barley	380.31	754.68[b]	907.29[b]	920.83[b]	902.02[b]	961.45[b]	970.83[b]	5797.41[b]
0.25% Barely	392.81	803.12[a]	974.47[a]	959.89[ab]	1007.81[a]	1038.54[a]	1040.62[a]	6217.26[a]
0.5% Barely	390.31	772.39[ab]	975.69[a]	990.10[a]	986.61[a]	1008.33[a]	1021.87[a]	6145.3[a]
± SE	10.58	13.79	10.603116	20.43	18.57512	13.47473	10.04847	97.50144
(A*B)Interaction								
Sig	NS	NS	NS	NS	NS	NS	NS	NS
Without enzyme control	380.62	739.58	908.33	878.12	901.75	947.91	953.12	5709.43
Without enzyme 0.25%	384.37	782.29	969.79	948.95	991.66	1035.41	1039.58	6152.05
Without enzyme0.5%	403.12	768.75	992.02	996.87	957.60	993.75	1004.16	6116.27
With enzyme control	380	769.79	906.25	963.54	902.29	975	988.54	5885.41
With enzyme 0.25%	401.250	823.95	979.16	970.83	1023.95	1041.66	1041.66	6282.46
With enzyme0 .5%	377.50	776.04	959.37	983.33	1015.62	1022.91	1039.58	6174.35
± SE	14.96	19.51	14.99	28.90	26.26	19.05	14.21	137.88

NS: NOT Significant (p ≥ 0, 05).

Table.6. Effect of dietary phytase, barley supplementation and their interaction on feed conversion (GM) of laying chicks

Treatments	Age / Week							
	5-7	7-9	11-9	13-11	15-13	17-15	19-17	5-19
A) Effect of enzyme								
Sig	NS	NS	NS	NS	NS	NS	NS	NS
Without enzyme	3.34	3.15	4.93	6.69	3.36	4.58	4.43	30.48
With enzyme	3.08	3.27	4.81	6.38	3.49	3.43	4.16	28.62
± SE	0.29	0.22	0.25	0.51	0.21	1.00	0.48	2.96
B) Effect of barley								
Sig	NS	NS	NS	NS	NS	NS	NS	NS
Control without barley	2.99	2.89	4.68	6.69	3.17	3.09	4.51	28.02
0.25% Barely	3.30	3.28	4.82	6.55	3.48	3.59	4.86	29.88
0.5% Barely	3.35	3.44	5.10	6.36	3.63	5.32	3.50	30.7
± SE	0.35	0.27	0.31	0.62	0.26	1.23	0.59	3.63
(A*B)Interaction								
Sig	NS	NS	NS	NS	NS	NS	NS	NS
Without enzyme control	3.37	2.99	4.51	6.39	2.97	3.19	5.30	28.72
Without enzyme 0.25%	3.27	3.38	4.60	7.18	3.74	3.78	4.752	30.702
Without enzyme0.5%	3.38	3.07	5.67	6.51	3.37	6.76	3.22	31.98
With enzyme control	2.60	2.80	4.85	6.99	3.36	3.00	3.73	27.33
With enzyme 0.25%	3.33	3.19	5.05	5.93	3.21	3.41	4.97	29.09
With enzyme0 .5%	3.32	3.81	4.53	6.21	3.89	3.87	3.78	29.41
± SE	0.50	0.38	0.44	0.88	0.37	1.74	0.83	5.14

NS: NOT Significant ($p \geq 0, 05$); Productive period

Table.7. Effect of dietary phytase, barley supplementation and their interaction on egg production (kg) of laying hens

Treatments	Productive period (19- 25 weeks)		
	Egg number	Egg weight (kg)	egg mass (kg)
A) Effect of enzyme			
Sig	NS	NS	NS
Without enzyme	45.33	0.031	1.38
With enzyme	46.50	0.030	1.42
± SE	5.32	0.0004	0.15
B) Effect of barley			
Sig	*	NS	*
Control without barley	39.00 [b]	0.0311	1.20 [b]
0.25% Barely	33.00 [b]	0.0316	1.04 [b]
0.5% Barely	65.75 [a]	0.0301	1.96 [a]
± SE	6.52	0.0005	0.19
(A*B)Interaction			
Sig	NS	NS	NS
Without enzyme control	51	0.03	1.55
Without enzyme 0.25%	33	0.03	1.05
Without enzyme0.5%	52	0.03	1.53
With enzyme control	27	0.03	0.84
With enzyme 0.25%	33.	0.03	1.03
With enzyme0 .5%	79.50	0.03	2.40
± SE	9.22	0.0007	0.27

NS: NOT Significant (p ≥ 0, 05).

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استخدام مستويات مختلفة من الفيتيز فى علائق الدجاج البياض كمحاوله لتثبيط مثبطات النمو للفيتات

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تم تصميم تجربه عامليه لتقييم تأثير إضافة مستويين من خليط الانزيمات (الكنترول و 0.3 كجم فيتيز و0.5 كجم كوكتيل انزيم / طن عليقه) مع استبدال الشعير بالذرة في عليقه الدجاج البياض بمستويات 0، 25 و 50٪ كبديل الذرة لبيان تأثيره على أداء النمو فى دجاج السلالات المحلية. تم استخدام إجمالي عدد 72 ذكور و 216 أناث من سلاله دجاج بياض أنشاس عند خمسة أسابيع من العمر وتم التوزيع عشوائيا إلى 6 مجموعات كل مجموعه تحتوى على 4 مكررات تشمل (12 ذكور و 36 إناث). واستمرت التجربة حتى 25 أسبوعا من العمر. تم حساب الزياده فى وزن الجسم، المأكول من العليقه ومعدل التحويل الغذائى اسبوعيا من 5 إلى 19 أسبوعا من العمر. تم تسجيل عدد البيض ووزن البيض يوميا لكل مكرره خلال الفترة الإنتاجية (19–25 أسبوعا من العمر) وتم حساب كتلة البيض. أشارت النتائج إلى أن انزيم الفيتيز والكوكتيل انزيم لم يكن لها تأثير معنوي ($P \geq 0.05$)على وزن الجسم الحي، والزياده فى وزن الجسم، والمأكول من العليقه ومعدل التحويل الغذائى في جميع الأعمار. استخدام الشعير كبديل للذرة في العليقه عند مستويات إما 25٪ أو 50٪ قد حسنت معنويا ($P \leq 0.05$)فى المأكول من العليقه في جميع الفترات التجريبية بما في ذلك الفترة (5–19 أسبوعا من العمر)ماعدا الفتره من5–7 أسبوع من العمر. انزيم الفيتيز وكوكتيل انزيم المكملات لم يكن لها تأثير كبير ($P \geq 0.05$)على عدد البيض وكتلة البيض. ومع ذلك، فإن استخدام الشعير كبديل من الذرة في الوجبات الغذائية عند مستويات إما 0 أو 25٪ و 50٪ كان له تأثير معنوي ($P \leq 0.05$) على عدد البيض وكتله البيض. الدجاج الذى تغذى على 50٪ من الشعير سجلت أفضل قيم ($P \geq 0.05$) غير معنويه لعدد البيض وكتله البيض مقارنة مع التى تغذت على العليقه الكنترول والعليقه 25% شعير. لم يظهر أي تأثير معنوي بين العلائق 25٪ شعير والعليقه الكنترول على عدد البيض وكتلة البيض. يمكن استنتاج أن استخدام الشعير بمستويات (0، 25، 50٪) كبديل للذرة نمو الدجاج البياض إما مع أو بدون إضافة إنزيم لم يكن له أي آثار سلبية على أداء النمو وإنتاج البيض من الدجاج السلالة المحلية.