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EVALUATION OF DIETARY INCLUSION GUAR KORMA MEAL WITH TWO ENZYMES SUPPLEMENTATION ON PERFORMANCE OF LOCAL STRAIN INSHAS CHICKS.

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ASBSTRACT

The current study was carried out to study the effect of using different levels of guar korma meal (GKM) with β-mannanase and protease enzymes in the diet of Inshas chicks on growth performance traits, nutrients digestibility and economic efficiency. Experimental diets were formulated to included 0.0, 2.5, 5.0, 7.5 and 10.0% guar korma meal. The experiment started with one day old Inshas chicks and lasted for 12 weeks. Two hundred and twenty five Inshas chicks were randomly divided into five groups (45 birds for treatment). Each treatment consisted of 3 replicate (15 birds/ replicate).

***Results indicate that** inclusion of (GKM) in chicks diet up to 7.5% supplemented with enzymes lead to insignificant (P>0.05) increase in final body weight and weight gain. While, inclusion at rate 10% lead to significant decrease in final body weight and weight gain (P<0.05) as compared to control treatment. Using guar korma meal up to 7.5% level slightly improved digestibility coefficients of organic matter, crude fiber, ether extract, nitrogen free extract, and nutritive value when compared to control with no significant difference (P>0.05). While, using (GKM) in feed at 10% lead to significant decrease in nutrient digestibility (P<0.05). Similarly, there were insignificant differences in empty carcass and dressing percentages when chicks fed with diet contain up to 7.5% (GKM) compared to the control group. While, the inclusion of (GKM) at rate 10% in diet significantly decrease (P<0.05) carcass and dressing compared to control. Also, the results indicate that use of (GKM) in diet reduced feed cost per chicks. However, the highest net revenue, economic efficiency and relative economic efficiency were obtained at inclusion rate 7.5% of guar meal in chick diet.*

***Conclusively,** it could be concluded from the present study that Guar Korma Meal can be used in growing Inshas chicks diets up to 7.5% in the diet with β- mannanase and protease enzymes to reduce fed costs without adverse effects on performance of chicks.*

Key words: Guar, β- Mannanase, protease, chicks, growth, digestibility, carcass traits, economic efficiency.

INTRODUCTION

With a growing population, feeding competition between human and animals is increasing. Because major ingredients used animal feeds, especially in poultry diets are now being used in human nutrition, there is a decreased availability of quality feed resources and poultry feeds are becoming costly. Guar korma meal is an easily available and economical feed ingredient and may be helpful in alleviating this problem.

Guar Korma Meal (GKM) is a relatively inexpensive high protein meal produced as a by-product of guar gum manufacture. The guar meal is the by-product of guar seed, which is obtained after the mechanical separation of endosperm from both hulls and germs of guar seed. It contains high protein 35-45%, which is high in lysine and methionine (Couch *et al*., 1966). Guar korma meal contains 13-18% residual galactomannan gum (Anderson and Warnick, 1964; Nagpal *et al*., 1971 & Lee *et al*., 2004). Beta-mannan, also referred to as *β*-galactomannan, is a polysaccharide with repeating units of mannose, with galactose or glucose, or both, often found attached to the *β*-mannan backbone. The solubility of *β*-mannan in water increases as the number of galactose molecules on the mannan backbone increases (Hsiao *et al.*, 2006). The high amino acid content of the guar korma meal makes it a useful protein source for broilers and layers (Mishra *et al.*, 2013). Approximately 88% of the nitrogen content in guar korma meal is true protein that makes it potentially useful as an ingredient for poultry feed (Verma and McNab, 1984; Lee *et al.*, 2003 a &b & Lee *et al.*, 2005). Nadeem *et al.* (2005) reported that amino acids availability ranged from 64 to 93% for guar korma meal residual guar gum. A highly viscous galactomannan polysaccharide is probably the primary factor responsible for the reported low effects (Verma and McNab, 1982). Some of the anti-nutritional agents (trypsin inhibitors, gum residue, saponins) present in guar meal limit its usage at high levels in broiler diets (Anderson and Warnick, 1964).

The deleterious effects attributed to the trypsin inhibitors have been an issue of contradiction because it was reported that guar korma meal contained lower levels of trypsin inhibitor than processed SBM (Conner, 2002). Anti-nutritional components like guar gum (*β*-mannan), saponins and trypsin inhibitors limit the use of guar korma meal in broiler diets (Hussain *et al.*, 2012). However, residual gum in guar korma meal increases intestinal viscosity in chickens, which reduces growth and feed efficiency (Lee *et al.*, 2003a).

The anti-nutritional effects are more pronounced in young birds (Verma and McNab, 1982). The residual gum present in the hull fraction (and to a lesser extent in the germ) is thought to be the main cause of the antinutritional value of guar korma meal. Guar korma meal in poultry feed has been limited because of reported adverse effects, which include diarrhea, depressed growth rate, and increased mortality, when fed at relatively high levels (Verma and Mc-Nab, 1982). Patel and Mc Ginnis (1985) found that level 10% seems to be the maximum acceptable rate.

Supplementing the diet with the β-mannanase enzyme improved the negative effects of the galactomannan content of guar korma meal. β-mannanase hydrolyses the galactomannan complex of guar korma meal. As a result, the guar gum induced viscosity in digesta is reduced, which increases the digestibility of starch (Zangiabadi and Torki, 2010 & Ehsani and Torki, 2010) and improves the metabolizable energy of guar korma meal.

In this way, β - mannanase supplementation helps in achieving superior feed conversion and better growth performance in broilers fed guar korma meal (McNaughton *et al*., 1998 & Daskiran *et al*., 2004).

The inclusion of exogenous protease enzymes in poultry diet enhance protein and energy digestibility and thus improve the performance parameters (Fru-Nji *et al.,* 2011). The first introduction of exogenous protease enzyme in poultry feed was in the 1990s, with the aim to improve the energy and protein digestibility of both grain and oil seed (Olukosi *et al*., 2015). Several studies have documented increments in the digestibility of protein and amino acids of diets fed to broiler chickens with protease supplementation (Fru-Nji *et al*., 2011; Rada *et al*., 2013; Romero *et al*., 2013 & 2014 and Olukosi *et al*., 2015).

Therefore, the objectives of the present study were to investigate effects of dietary inclusion of guar meal with *β*-mannanase and protease enzymes on growth performance traits, nutrients digestibility coefficients and economical efficiency of Inshas chicks.

MATERIALS AND METHODS

The experiment was conducted at Poultry Research Station (Inshas), Animal Production Research Institute, Agriculture Research Center, Egypt. Two hundred and twenty five Inshas chicks as a local strain one day old were randomly devided into five equal experimental treatments (45 birds in each group) with three replicates (15 birds) in each treatments.

Diets and treatments:

Experimental diets were formulated to included T1(0.0),T2 (2.5),T3 (5.0), T4 (7.5) and T5 (10.0%) GKM replacement from SBM for the experimental treatments, T1(control), T2, T3, T4 and T5, respectively, all treatments were supplemented with mixture from B-mannose and protease enzymes (0.3 g/ kg diet from each enzyme). Hemicell-HT is B-mannose enzyme, which extracted from *Bacillus lentus* and obtained from Hemgen crop USA and contain 160 million units/ kg.

Table 1. Chemical analysis of guar korma meal and soybean meal (on DM basis)*

Items	Guar korma mean	Soybean meal (44%)
DM	92.90	88.5
OM	94.22	93.60
CP	49.22	44.00
CF	8.53	3.90
EE	5.10	1.90
Ash	5.63	6.49

*Salama *et al.*, 2015

A comparison of nutritional values of soybean meal and guar meal were conducted by Salama *et al.* (2015) as shown in (Table 1). Based in analysis of guar korma meal and soybean meal, experimental diet formulated to meet nutritional requirements of chicks according to the NRC (1994) and according to Feed Composition Table for Animal and Poultry Feedstuffs Used In Egypt (2001). The composition and calculated analysis of the experimental diets are shown in Table 2. All diets were formulated to be *isonitrogenous* (about 19% CP) and *isocaloric* (ME about 2828 Kcal/Kg diet).

Trial management:

Chicks kept under the same management system and hygienic conditions and provided with fresh water and diets, *ad-libtum* over the experimental period. The experimental period lasted for 12 weeks. Average initial weight of chicks at start ranged from 29.33 to 30.38 gm. Chicks fed assigned diet from day one throughout the experiment.

Growth performance traits:

Live body weight (LBW) and feed intake (FI) were recorded weekly, then body weight gain (BWG) , feed conversion ratio (FCR).

Growth parameters used:

Growth and feed efficiency parameters were calculated according to the following equation:

WG (g) = Mean chick final weight, wt (g) – Mean initial weight, wt (g).

ADG (g/ day) = Final chick, wt (g) – Initial chick, wt (g)/ Number of (days).

FCR = Total feed consumed (g) / Total weight gain (g)

Chemical analyses:

The chemical composition of dietary treatments and excreta were done according to the methods of AOAC (1990). Three males of each treatment were used, during the last week of experiment to determine the digestibility of nutrients dry matter (DM), organic matter (OM), crude protein (CP), crude fiber (CF), ether extract (EE) and nitrogen free extract (NFE), as shown in Table 2.

Table 2: Composition and calculated analysis of experimental diets.

Items	T1	T2	T3	T4	T5
Ingredients					
Yellow corn	59.90	59.60	59.75	59.55	57.94
Corn Gluten, 60%	4.00	4.00	4.00	4.00	4.00
Soybean Meal, 44%	24.34	21.74	18.69	16.34	13.50
Guar Korma Meal, 49%	0.00	2.50	5.00	7.50	10.00
Wheat Bran	8.00	8.40	8.80	9.85	10.80
Dical. Phos.	1.53	1.53	1.53	1.53	1.53
Lime stone	1.52	1.52	1.52	1.52	1.52
Salt	0.37	0.37	0.37	0.37	0.37
Premix*	0.30	0.30	0.30	0.30	0.30
DL-Methionine	0.04	0.04	0.04	0.04	0.04
Total	**100**	**100**	**100**	**100**	**100**
Calculated analysis:					
Crude Protein (CP %)	19.02	19.12	19.05	19.28	19.32
ME kcal/kg.	2802	2818	2839	2839	2846
Crude fiber (CF %)	4.11	4.21	4.29	4.45	4.59
Ether extract (EE %)	3.05	3.09	3.14	3.18	3.22
Calcium, %	1.03	1.02	1.02	1.01	1.01
Avail. Phosphorus, %	0.43	0.43	0.43	0.43	0.42
Total phosphorus, %	0.68	0.68	0.68	0.68	0.68
Lysine, %	0.95	0.95	0.94	0.94	0.94
Methionine, %	0.40	0.41	0.41	0.41	0.41
Met + Cys., %	0.74	0.73	0.73	0.73	0.73
Sodium, %	0.16	0.16	0.16	0.16	0.16

* Each 3kg contains : Vit A 12000000 IU , Vit D_3 2000000 IU , Vit E10g , Vit K_3 2g , Vit B_1 1g, Vit B_2 5g, Vit B_6 1.5g , Vit B_{12} 10mg, Nicotinic acid 30g, Pantothenic acid 10g, Folic acid 1g, Biotin 50mg, Choline chloride 250g, Iron30g, Copper 10g, Zinc 50g, Manganese 60g, Iodine 1g , Selenium 0.1g Cobalt0.1g and carrier ($caco_3$) up to 3kg

HPEnzy. = Hemicell and Protease Enzymes.

**According to Feed Composition Table for Animal and Poultry Feedstuffs Used In Egypt (2001).

For carcass measurements, 3 birds from each treatment were randomly slaughtered to determine liver, gizzard, heart and giblets weight in (gm) and then carcass and dressing percentages were calculated.
Carcass (%)= (Carcass weight (g) x 100) /(Pre-slaughter live weight (g)
Dressing (%)= (Carcass wt+ Giblets, wt)(g)x100)/(Pre-slaughter live weight (g)

Cost and return calculations: economic analysis:

The economical and the relative economical efficiency (REE) were calculated in relation to local market prices at time of the experiment. Total price for feeds was calculated according to the price of different ingredients available in Arab Republic of Egypt (ARE).

1- The price was calculated (at time of experiment) due to the local market the price of one Kg of enzyme (120 LE) and one ton of Guar korma meal (1900 LE) and price of one Kg live weight was 25 LE.
2- Net revenue= Total revenue/chick- Total feed cost
3- Economic efficiency= Net revenue/ Total feed coast
4- Relative economic efficiency of treatment = Economic efficiency of treatments other than the control / Economic efficiency of the control group.

Statistical analysis:

Data obtained were statistically analyzed by the SAS program (SAS, 1996) using one-way analysis of variance (included 5 treatments). Duncan's Post Hoc Multiple Comparisons Test was performed to evaluate the differences among treatments means (Duncan, 1955).

RESULTS AND DISCUSSION

Growth performance traits:

The effects of GKM replacement with Hemicell and Protease Enzymes supplement in checks diets on averages body weight, weight gains, feed intake and feed conversion values of the growing Inshas chicks are shown in Table 3, treatment group (T5) was significantly ($P \leq 0.05$) lower in final body weight (980.67g) as compared with other treatments and control, while there were no significant differences among T1, T2, T3 and T4. Also, feed intake and weight gain were in the same trend as final body weight. There were no differences among T1, T2, T3 and T4 in feed conversion, while T5 were significantly lower values than other treatment groups.

Table 3: Effect of GKM replacement with Hemicell and Protease Enzymes supplement on Productive performance of local checks.

Items	Treatment groups					MSE
	T1	T2	T3	T4	T5	
Initial body weight (g)	30.37	30.38	30.01	29.35	29.33	0.345
Final body weight (g)	996.65 [a]	1002.00 [a]	1001.30 [a]	1001.33 [a]	980.67 [b]	2.887
Feed intake (g)	2757.78 [b]	2779.03 [b]	2772.18 [b]	2786.58 [b]	2892.07 [a]	11.056
Weight gain (g)	966.28 [a]	971.76 [a]	971.29 [a]	971.98 [a]	951.34 [b]	2.926
Feed conversion	2.853 [b]	2.857 [b]	2.857 [b]	2.867 [b]	3.037 [a]	0.007

[a, b….] Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$)

The treatments received GKM in levels 2.5, 5.0 and 7.5% with HP Enz additive were better in final body weight, weight gain and feed conversion than the treatment received GKM in level 10.0% with HP Enz. Similarly, Salma *et al*. (2015) and Mishra *el al*., (2013), reported that High levels of GKM had negative effect on performance. Lee *et al.* (2005) reported that guar meal can be used at up to 5% with β-mannanase enzyme in broilers. Furthermore, Gharaeil *et al.* (2012) found that birds received 9 % guar meal in the diets had a significantly lower ($P< 0.05$) weight gain, during starter and total periods and they also, had significantly ($P<0.05$) lower body weight in day 42.

The improvement in performance due to enzyme addition in treatments contain 2.5, 5.0 and 7.5% GKM may be due to the hydrolyzing effect of enzyme on GKM (Gharaei *et al*., 2012), or *β*-mannanase improving the digestibility of starch (Ehsani and Torki, 2010). The inclusion of exogenous protease enzymes enhancing protein and energy digestibility and thus improve the performance parameters of chickens (Fru-Nji *et al.,* 2011).

Nutrients digestibility

The effects of the experimental diets on digestion coefficients and nutritive values of the growing chicks are shown in (Table 4). The obtained results shows significant (P<0.05) difference in digestibility coefficients of

Table 4: Effect of GKM replacement with Hemicell and Protease Enzymes supplementation on nutrients digestibility traits.

Items	**Treatment groups**					**MSE**
	T1	**T2**	**T3**	**T4**	**T5**	
DM	74.87 [b]	76.05 [a]	76.15 [a]	76.09 [a]	73.21 [c]	0.115
OM	80.87 [a]	81.15 [a]	81.13 [a]	81.16 [a]	79.40 [b]	0.303
CP	83.81 [b]	85.13 [a]	85.19 [a]	85.21 [a]	82.51 [c]	0.283
CF	27.75 [b]	28.05 [ab]	28.28 [ab]	28.48 [a]	23.07 [c]	0.189
EE	75.56 [b]	75.98 [a]	76.12 [a]	76.09 [a]	72.09 [c]	0.110
NEF	80.70 [b]	81.89 [a]	81.91 [a]	81.78 [a]	79.82 [c]	0.278

[a, b….] Means within each row with similar letter(s) are not significantly different ($P \leq 0.05$).

organic matter, crude fiber, ether extract, NFE and nutritive values of TDN and DE between the control and treatment T2, T3 and T4, while T5 was significantly (P<0.05) the lowest values. Lee *et al.* (2009) attributed the impaired digestibility in high level GKM diet due to preventing effect of correct mixing and their contact with digestive secretions because of GKM increases intestinal viscosity due to the residual gum in GKM. Furthermore, Edward *et al.* (1988) attributed the negative effect of high level of GKM due to depressed the digestibility of starch and deprive the birds of the available energy. Other explanation of growth depression in broiler chicken due to the increases in intestinal viscosity due to the high content of galactomanan in diet contain high level of GKM, which suppress nutrient digestibility and cause growth depression (Almirall *el al.*, 1995). While, the improvements in 2.5, 5.0 and 7.5% GKM treatments with enzyme supplement may be due to that enzyme reduced viscosity, which increases the digestibility of starch (Zangiabadi and Torki, 2010 & Ehsani and Torki, 2010).

Carcass characteristics:

The results of slaughter trail of local strain chick fed diet contain GKM with enzyme supplement are shown in Table 5. The current study results showed no significant differences (P>0.05) in carcass between T2, T3 and T4 and the control, while there were significant difference between T5 and other experimental treatments. The lowest carcass value was 64.3 recorded in T5. There were no significant differences (P>0.05) in liver, gizzard and heart weights percentages among treatment groups. However, giblet weight percentages did not affected with inclusion GKM in diet.

Table 5: Effect of GKM replacement with Hemicell and Protease Enzymes supplementation on slaughter traits (%).

Items	**Treatment groups**					**MSE**
	T1	**T2**	**T3**	**T4**	**T5**	
Carcass wt (%)	65.02 [a]	65.13 [a]	65.09 [a]	64.98 [a]	64.30 [b]	0.151
Giblets wt (%):	14.58	14.44	14.46	14.22	14.08	0.153
Liver wt (%)	7.05	7.10	7.13	6.98	6.88	0.162
Gizzard wt (%)	6.23	6.13	6.09	5.95	6.01	0.114
Heart wt (%)	1.30	1.21	1.24	1.29	1.19	0.041
Dressing wt(%)	79.42 [a]	79.89 [a]	79.34 [a]	78.03 [b]	77.35 [b]	0.274

[a, b….] Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$). wt = Weight

Data showed significant differences ($P \leq 0.05$) in dressing weight among all experimental treatment groups, while there were no differences among T1, T2 and T3 group. Both T4 and T5 groups were recorded the lowest value (78.03 and 77.35%, respectively). The obtained results agree with findings of Karman *et al*. (2002) and Mishra *el al*. (2013), which reported that enzyme supplementation to the diets improved the percentage of dressing weight. On the other hand Rada *et al.* (2013) reported that supplementation of protease to low protein diet in broiler chicken feed, lead to improve carcass weight and carcass yield, but with no significant effect.

Economic efficiency:

The effect of feeding GKM with enzyme supplement on economic profile is mentioned in Table 6. The obtained results indicate that the lowest feed cost per chick and per kilogram weight gain in T4. Also, the present results showed that lowest economic performance indicators (economic efficiency and relative economic efficiency) were in T2 and T5 groups.

Generally, it can be noticed that inclusion of GKM treated with HPEnz up to 7.5% in Inshas chicks feed on feed reduce production costs and achieve the best economic return over other treatments. Similar results reported by Salma *et al*., (2015), they reported that the addition of GKM as a partial replacement for SBM in poultry diet is useful economic strategy for decreasing feed cost. Similar result reported by Fru-Nji *et al*., (2011), who stated that inclusion of protease to chicks diet reduce production costs for the farmer due to increasing the efficiency of feed utilization by the animals.

Table 6. Effect of using GKM with Hemicell and protease supplementation on economic performance

Items	Treatment groups				
	T1	**T2**	**T3**	**T4**	**T5**
Net weight gain (kg)	0.966	0.972	0.971	0.972	0.951
Revenue/ chick (EGP)	24.16	24.29	24.28	24.3	23.78
Feed cost/chick (EGP)	6.91	7.02	6.83	6.79	6.84
Net revenue/chicks (EGP)	10.76	10.81	10.99	11.07	10.34
Economic efficiency	2.49	2.46	2.55	2.58	2.48
Relative economic efficiency, %	100	98.59	102.37	103.42	99.39

Conclusively **,** the current study result indicate that inclusion of guar korma meal with enzyme supplementation up to 7.5% in Inshas chicks diet, caused to reduces production cost and improve growth performance traits, digestibility coefficients, dressing percentage and achieve better economic performance.

REFERENCES

Almirall, M., Francesch, M., Perez-Vendrell, A.M., Brufan, J. and Esteve-Garcia, E. (1995). The differences in intestina viscosity produced by barley and β-glucanase alter digesta enzyme activities and ileal nutrient digestabilities more in broiler chicks than in cocks. *Journal of Nutr.*, 125: 947-955

Anderson, J.O. and Warnick, R.E. (1964). Value of enzyme supplements in rations containing certain legume seed meals or gums. *Poultry Sci.*, 43: 1091-1097.

AOAC (1990). *Official Methods of Analysis*, 15^{th} ed. Association of Official Analytical Chemists, INC. Arlington, Virginia 22201 USA.

Conner, S. (2002). *Characterization Of Guar Meal For Use In Poultry Rations*. Ph.D. Dissertation. Texas A&M University, College Station, TX.

Couch, J.R., Creger, C.R. and Bakshi, Y.K. (1966). Trypsin inhibitor in guar meal. *Proc. Soc. Exp. Biol. Med.*,123: 263-265.

Daskiran, M., Teeter, R.G., Fodge, D.W. and Hsiao, H.Y. (2004). An evaluation of endo-β-D-mannanase (Hemicell) effects on broiler performance and energy use in diets varying in β-mannan content. *Poultry Sci*., 83: 662–668.

Duncan, D. B. (1955). Multiple range and multiple F test test. *Biometrics*, 11:1-42.

Edward, C.A., Johnson, I.T. and Read, N.W. (1988). Do viscous polysaccharides siow absorption by inhibitin diffusion or convection. *European J. of Clinical Nutr*., 42:306-312.

Ehsani, M. and Torki, M. (2010) Effects of dietary inclusion of guar meal supplemented by β-mannanase on performance of laying hens, egg quality **,**characteristics and diacritical counts of white blood cells. American J. of Animal and Veterinary Sciences, 5 (4): 237–243.

Feed Composition Table for Animal and Poultry Feedstuffs Used In Egypt (2001). *Technical Bulletin*. No.1, Central Lab for Feed and Food, Ministry of Agriculture, Egypt.

Fru-Nji, F., Kluenter, A.M., Fischer, M., Pontoppidan, K. (2011) A feed serine protease improves broiler performance and energy digestibility. *Journal of Poultry Science,* 48: 239-246.

Gharaei, M.A., Dastar, B., Nameghi, A.H., Taber, G.H. and Shargh, M.S. (2012). Effects of guar meal with and without β-mannanase enzymes on performance and immune response of broiler chicks. *Int. Res. J. Appl. Basic Sci.*, 3(s): 2785-2793.

Hassan, S.M., Rehman, A.U. and Khalid, M.F. (2012). Feeding value of guar meal and the application of enzymes in improving nutritive value for broilers. *World's Poultry Science Journal*, 68 (02): pp 253-268

Hsiao, H.Y., Anerson, D.M. and Date, N.M. (2006). Level of *β*-mannan in soybean meal. *Poultry Sci.*, 85: 1430-1432.

Kamran, M., Pasha, T. N.; Mahmud, A. and Ali, Z. (2002). Effect of commercial enzyme (Natugrain) supplementation on the nutritive value and inclusion rate of guar meal in broiler rations. *Inter. J. of Poultry Sci.*, 1 (6): 167–173.

. **Lee, J.T., Bailey C.A. and Cartwright, A.L. (2003a).** Guar meal germ and hull fractions differently affect growth performance and intestinal viscosity of broiler chickens. *Poultry Sci*., 82: 1589-1595.

Lee, J.T., Bailey C.A. and Cartwright, A.L. (2003b). Beta-mannanase ameliorates viscosity-associated depression of growth in broiler chickens fed guar meal and hull fractions. *Poultry Sci*., 82: 1925-1931.

Lee, J.T., Conner, A.S., Haq, A.U., Cartwright, A. and Bailey, C. (2004). Quantitative measurement of negligible trypsin inhibitor activity and nutrient analysis of guar meal fractions. *J. Agric. Food Chem*., 52: 6492-6495.

Lee, J. T., Conner, A. S., Cartwright, A. L. and Bailey, C. A. (2005). Effects of guar meal by-Product with and without ß-mannanase Hemicell on Broiler Performance. *Poultry Sci.*, 84: 1261–1267.

Lee, J.T., Bailey, C.A., Cartwright, A.L. (2009). *In vitro* viscosity as a function of guar meal and beta-mannanase content of feeds. *Int. J. Poultry Sci.*, 8 (8): 715-719

McNaughton, J.L., Hsiao, H., Anderson, D. and Fodge, D.W. (1998). Corn/soy/fat diets for broilers, β-mannanase and improved feed conversion. *Poultry Sci.*, 77(Suppl. 1):153.

Mishra, A.; Sarkar, S. K.; Ray S. and Haldar, S. (2013). Effects of partial replacement of soybean meal with roasted guar korma and supplementation of mannanase on performance and carcass traitsof commercial broiler chickens. *Available at www .veterinaryworld .org/ Vol.6/Sept-2013/21.pdf*

Nadeem, M. A.; Gilani, A.H.; Khan, A.G. and Mahr-Un-Nisa. (2005). Amino Acids Availability of Poultry Feedstuffs in Pakistan. *Int. J. Agri. Biol.*, 7(6): 985-989**.**

Nagra, S. S. and R. S. Virk, (1986). Feeding value of toasted guar meal and mustard cake for meat type chicken. *Ind. J. Res. Punjab Agri. Univ*., 23: 122-126.

NRC (1994). *National Research Council.* Nutrient Requirements of Domestic Animals Nutrien Requirements of Poultry**,** 9th. Nat. Acad. Sci., Washington, DC., USA.

Olukosi, O.A., Beeson, L.A., Englyst, K. and Romero, L.F. (2015). Effects of exogenous proteases without or with carbohydrases on nutrient digestibility and disappearance of non-starch polysaccharides in broiler chickens. *Poultry Science*, 94: 2662–2669.

Patel, M. B. and McGinnis, J., (1985). The effect of autoclaving and enzyme supplementation of guar meal on the performance of chicks and laying hens. *Poultry Sci.*, 64: 1148–1156

Rada, V., Foltyn, M., Lichovníková, M. and Musilová, A. (2013). Effects of protease supplementation of low protein broiler diets on growth parameters and carcass characteristic. *Men., del., Net.*, 268-272.

Romero, L. F., Parsons, C.M., Utterback, P.L., Plumstead, P.W. and Ravindran, V. (2013). Comparative effects of dietary carbohydrases without or with protease on the ileal digestibility of energy and amino acids and AMEn in young broilers. *Anim. Feed Sci. Technol.*, 181:35–44.

Romero, L. F., Sands, J.S., Indrakumar, S.E., Plumstead, P.W., Dalsgaard, S. and Ravindran, V. (2014). Contribution of protein, starch, and fat to the apparent ileal digestible energy of corn- and wheat-based broiler diets in response to exogenous xylanase and amylase without or with protease. *Poultry Sci.*, 93: 1–13.

Salma, H. A-H., Basyony, M.M. and Hasan, A.A. (2015). Effects of partial replacement of soybean meal with different levels of guar korma meal on growth performance, carcass traits and blood metabolism of broiler chickens. *Asian J. of Poultry Sci*., 9(3)**,** ISSN 1819-3609 / DOI: 10.3923/ajpsaj.2015.

SAS, (1996). SAS, procedure Guid: Version b. 12Ed. "SAS Institute" Ink., Cary, NC, USA.

Thakur, R. S. and Pradhan, K. (1975). A note on inclusion of guar meal (*Gyamopsis tetragonoloba*) in broiler rations. *Ind. J. Anim. Sci*., 45: 98-102.

Verma, S.V.S. and Mc-Nab, J.M. (1982). Guar meal in diets for broiler chickens. *Br. Poultry Sci.*, 23: 95-105

Verma, S.V.S. and Mc-Nab, J.M. (1984). Performance of hens fed guar meal containing diets with or without supplemental cholesterol. *Ind. J. Poultry Sci.*, 19: 245–250.

Zangiabadi, H.R. and Torki, M. (2010) The effect of a β-mannanase-based enzyme on growth performance and humoral immune response of broiler chickens fed diets containing graded levels of whole dates. *Tropical Animal Health and Production*, 42: 1209–1217.

تقييم أحتواء العلائق على كسب الجوار مع أضافة أنزيمين وأثر ذلك على أداء الدجاج المحلى (أنشاص)

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تهدف هذه الدراسة لتقييم أحتواء علائق الدجاج المحلى (انشاص) على كسب الجوار كبديل لكسب فول الصويا مع أضافة نوعين من الانزيمات (β mannanase & protease) وتأثير هذه المعاملات على الاداء الانتاجى وكفاءة الهضم ومواصفات الذبيحة وحساب الكفاءة الاقتصادية لهذه الاضافات. أستمرت التجربة لمدة ٣ شهور وغذيت الدواجن على عليقة الكنترول (T1)بدون احلال وبدون انزيمات بينما كانت معدلات الاحلال بالعلائق التجريبية هى(T2) ٢,٥ ، (T3) ٥,٠ ، (T4)٧,٥ ، (T5)١٠,٠ % كسب جوار بدلا من كسب الصويا مع أضافة أنزيمى (β mannanase & protease) بمعدل ٣٠٠جم من كل أنزيم للطن لكل المعاملات بالتساوى.

اوضحت النتائج الاتي :

١ـ يمكن أستبدال كسب فول الصويا فى علائق الدجاج المحلى بكسب الجوار بمستويات تصل الى ٧,٥% مع أضافة أنزيمى(β mannanase and protease) بدون أى تأثيرات سلبية على معدلات الاداء للدجاج الخاضع للتجارب.

٢ـ أمداد العلائق بالانزيمين أدى الى المحافظة على الاداء الانتاجي للكتاكيت من حيث الوزن الحى وكفاءة تحويل الغذاء ومعامل الهضم دون تأثيرات على مواصفات الذبيحة عندما كانت نسبة الاحلال ٢,٥ ، ٥,٠ ، ٧,٥ %
(اى المعاملات T2-T3-T4علي التوالي)

٣ـ أحتواءالعلائق على ١٠ % كسب الجوار بديلاً عن كسب فول الصويا مع أضافة ومخلوط الانزيمين أدى الى أنخفاض معنوى فى الوزن الحى وكفاءة تحويل الغذاء ومعامل الهضم للدجاج الخاضع للتجربة (T5).

٤ـ أظهرت دراسة الكفاءة الاقتصادية لاستخدام تلك العلائق نجاح استبدال كسب الصويا بكسب الجوار فى وجود الانزيمين فى تحقيق عائد اقتصادى مقارنة بالكنترول فى ما عدى المعاملة الخامسة المحتوية على ١٠% كسب جوار(المضاف اليه الانزيمات) التى أدت الى خسائر أقتصادية.

التوصية: