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UTILIZATION OF SUSTAINED FINISHER DIETS CONTAINED ALTERNATIVE PROTEIN SOURCES AND LEVELS ON PERFORMANCE AND CARCASS TRAITS OF BROILERS

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ABSTRACT: An experiment was conducted to study the effect of replacing soybean meal (SBM) with mix of corn gluten meal (CGM), sunflower meal (SFM) and distillers dried grains with solubles (DDGS) at (2.5, 5 and 7.5%, respectively) with different protein levels (21, 20 and 19%) at finisher diets on live performance and carcass traits of broilers. A total of 432 day old Cobb 500 chicks were randomly distributed into 6 treatments at (19-35) days of age, each with three replicates, each replicate contains 24 chicks. The six treatments were: 1) control 21% CP, 2) tested 21% CP, 3) control 20% CP, 4) tested 20% CP, 5) control 19% CP and 6) tested 19% CP. Control diets were based only on soybean meal (SBM) as a source of protein, while tested diets based on mix of (CGM, SFM and DDGS) beside SBM. At the end of experiment at 35 days of age, 5 broilers per treatment were slaughtered and evaluated for carcass traits. The results of this study have shown that feeding tested diets at 21 and 20% protein could be applied without any effect on performance or carcass traits when compared to the corresponding control diets. However, feeding 19% tested diet showed better performance than control 19% but with no significant difference between them. So, it can be concluded that mix of (CGM, DDGS and SFM) could be included up to 15% to replace soybean meal protein in broiler finisher diets at a CP level ranged between 19 and 21 %.

Keywords: Alternative ingredients - Performance - Finisher diets - Carcass traits.

INTRODUCTION

Scarcity of feed ingredients and their high costs for poultry feeding is the main obstacle to poultry industry development in many countries, especially Egypt. From the nutrition point of view, protein is one of the very important nutrients in poultry diets and plays an important part in maintenance and reparation of tissues as well as it promotes proper growth and development performance (Chinrasri, 2004). The non-availability of SBM at an economically viable price forces the use of alternate protein sources in poultry diets (Rao et al., 2006). Therefore, there is a movement within poultry industry to reduce its reliance on SBM as a protein source and replacing it with more sustainable alternatives (Hwangbo et al., 2009; and Tolimir et al., 2010). Coming up with alternative protein sources such as CGM, SFM and DDGS could improve broiler production and at the same time improve the economy of poultry production. In this respect, various studies revealed that using different protein sources in broiler diets has a positive effect on their performance and meat quality (Aftahi et al., 2006; and Kermanshahi and Rostami, 2006). Meanwhile, there is a possible range of alternative feed ingredients that has been identified and potential for partially or fully replace soybean protein in broiler diets (Leeson, 2012).

CGM is a by-product of the manufacture of corn starch (and other times ethanol) by the wet-milling process (RFA, 2008).As demonstrated by Waldroup (2000), CGM could be included in broiler diets up to 10% without impairing performance traits. However, Rose et al. (2003) found a significant increase in feed intake when broiler chicks were fed a diet containing 10% CGM. Along the same line, DDGS is a co-product that is produced during the production of corn-based ethanol (Rosentrater, 2006). It is an acceptablefeed ingredient used as an alternative to corn or soybean meal in poultry diets (Jung et al., 2012). Batal and Dale (2003) suggested that the maximum level of DDGS up to 6% in starter diets and 12% in grower-finisher diets with a beneficial effect on the productive performance. Results of Choi et al. (2008) revealed that the maximum level of DDGS was 15% in broiler diets with no adverse effect on performance traits. In this respect, Khalifah (2011) indicated that the best level of DDGS in broiler diets was 20% without any adverse effect on performance traits. In line with above mentioned ingredients, SFM has been extensively used in broiler diets as a good protein source (Pinheiro et al., 2002). Results of Furlan et al. (2001) asserted that up to 15% of sunflower meal can be included in broiler feeds with no adverse effect on performance. Also Oliveira et al. (2007) and Araujo et al. (2011) concluded that the dietary inclusion of 15% SFM improves productive performance, but does not affect carcass yield.

Because of the information scarcity on the possibility of using mixture of different protein sources in broiler finisher diets, the aim of the current study was to evaluate the effect of CGM (2.5%), SFM (5%) and DDGS (7.5%) mixture in broiler finisher diets contained different levels of crude protein (21, 20 and 19%) with a constant metabolized energy (3100 kcal ME/kg) on performance and carcass traits of Cobb 500 broiler chicks.

MATERIALS AND METHODS

The experimental work was carried out at Ismailia/Misr Company poultry farms - Sarapium district, Ismailia in official collaboration with Poultry Production Department, Faculty of Agriculture, Alexandria University.

Dietary treatments

Diets were developed for super starter phase (0-8 days) with 23% crude protein (CP), starter phase (9-18 days) with 22% CP and at finisher phase (19-35 days). Birds were distributed into six treatments as follows: 1) control 21% CP, 2) tested 21% CP, 3) control 20% CP, 4) tested 20%

CP, 5) control 19% CP and 6) tested 19% CP. Control diets were based only on soybean meal (SBM) as a source of protein, while tested diets based on partial replacement of SBM with mix of (CGM, SFM and DDGS) at (2.5, 5 and 7.5%, respectively) beside SBM. Diets were formulated to contain 3000 kcal of ME/kg for super starter and starter diets and 3100 kcal of ME/kg for finisher diets whether control or tested. All diets were supplemented with complete vitamin, trace mineral premixes, phytase, mixed enzymes, probiotics, anti-mycotoxin and coccidiostat obtained from commercial sources. Composition and calculated analysis of the diets used in this experiment were shown in Table (1)

Birds, housing and management

A total of 432 day-old broiler chicks (Cobb 500 strain) were weighed and randomly assigned into 6 groups and three replicate per group with 24 birds per replicate. Chicks were raised in a temperature-controlled room with cleaned and fumigated ground floor under similar managerial and hygienic conditions. An ambient temperature program was maintained at 33°C at placement till 4 days of age, 32°C from 5 to 9 days of age, 29°C from 10 to 14 days of age, 27°C from 15 to 23 days of age, 25°C from 24 to 28 days of age, 23°C from 28 to 35 days of age and the relative humidity was around 60%. Diets of super starter phase were provided in the form of crumbles, whereas those of starter and finisher phases were in pellets form at 3 and 5 mm, respectively. Also, water and feed were provided for ad-libitum consumption.

Performance

At the end of each feeding phase**,** number and weight of birds present in each replicate were recorded as well as the weight of remaining feed. Number, age and weight of birds died during the trial were recorded in order to calculate the daily livability percentage. On the basis of measurements, body weights gain (BWG), feed conversion ratio (FCR), and production efficiency factor (PEF) were calculated and corrected for livability percentage. The equation of PEF was reported by Lemme et al. (2006) as follows: PEF= (final weight, kg*livability %)/(age, days* FCR)* 100.

Carcass traits

At the end of the trial (35 days), five broilers from each dietary treatment were subjected to a total feed withdrawal of 12h. and slaughtered in a commercial slaughter house. In that, broilers were hung by their feet in steel shackles by hand then they were slaughtered by cutting the jugular veins of the neck according to the Islamic religion instruction with a sharp knife. When complete bleeding was achieved, birds were scalded, defeathered, and manually eviscerated. Carcasses, breast, thigh, fillet, tender, thigh meat, abdominal fat, wings and skin were calculated as a percentage relative to live body weight.

Feed Cost and Cost Index

The economical feasibility of the dietary inclusion of alternative protein sources mixture was assessed first by calculating feed cost per kilogram of body weight gain (Yi), as proposed by Bellaver et al. (1985).

Yi = (Pi*Qi)/Wi

Where;

Yi: feed cost per kilogram of body weight gain in treatment

Pi: price per kilogram of feed used in treatment

Qi: feed intake amount in treatment

Wi: weight gain of treatment.

Then, the Economical Efficiency Index (EEI) and the Cost Index (IC) sorted by Fialho et al. (1992) were calculated.

EEI = (MCe/CTei)*100

CI = (CTei/MCe)*100

Where;

MCe: is the lowest feed cost per kilogram of weight gain observed among treatments

CTei: cost of treatment.

Statistical analysis

A completely randomized design was applied to execute this experiment. According to SPSS, 17 (2008), biological data of weight gain, feed intake and feed/gain ratio, and other data were subjected to statistical analysis by analysis of variance and the means were separated if they were significantly different using Duncan Multiple range test (Duncan, 1955).

The statistical model used was as follows:

$Y_{ijk} = \mu + D_i + e_{ij}$

Where:

Yijk = Observed value of the dependent variable.

μ = Overall mean.

D = the effect of diets

e_{ij} = The experimental random error.

RESULTS

Performance

Data of growth performance traits are presented in Tables (2 and 3). It is clearly shows that body weight of all experimental broiler chicks at 18 days old ranged from 537 g and 563.33 g with no significant difference among groups of studied dietary treatments. This created a suitable condition to appraise the effect of studied dietary treatments. With feeding experimental diets up to age of 35 days, no significant difference was detected in body weight among chicks fed the control or tested diets with alternate mixture at levels of 21 and 20% CP. Meanwhile, there is a tendency to decrease values of body weight with feeding tested diets under the same levels of protein. The opposite was true with dietary protein level of 19%, where chicks of tested dietary treatment had higher weight but without significant difference. Along the same line, similar trend was detected with values of BWG through the growth period of (19-35 days). In that, BWG was decreased as feeding tested dietary treatment and decreasing levels of protein up to 20% but with no significant different with the control diets. Also, chicks fed control diet with 19% protein had lower BWG which recorded 1054.40 g compared with those fed tested diet at 19% protein which recorded 1105.00 g but without significant difference.

Concerning the amount of feed intake during finisher period it is obvious that the highest amount of feed was recorded by broiler chicks fed tested diet at 21% protein, 2171.81 g, whereas the least amount was consumed by birds received the control diet of 19% protein followed by those of the tested dietary treatment of 19% protein. However, no significant difference was found among control and tested dietary treatments groups of 21 and 20% protein. Also, it is worthily noted that chicks of dietary treatment contained the studied mixture of (CGM, SFM and DDGS) with 19% protein consumed more feed than those of the corresponding control diet. Based on the above mention results, changes in average FCR during studied period shows that chicks fed the control diet at 21% protein recorded significantly the best FCR compared to those of the other studied dietary treatments, meanwhile, no significant difference was attained with chicks received tested diets of 21% and those of control and tested diets contained 20 or 19% protein. It is worth noted that feeding control diet of 21% protein give the best score in this respect. Regarding to the livability percentage throughout the finisher period, it appeared that no significant differences among all studied dietary treatment whether control or tested were found. Meanwhile, the highest percentage was recorded by chicks received the tested diet of 19% protein being 95.65%, whereas the least value was attained with those fed control diets of 19% protein, being 93%. Concerned results of PEF at the end of the trial, no significant difference was found between birds fed dietary treatments of 21 and 20% protein whether control or tested diets. Meanwhile, there is a tendency to decrease PEF with using low levels of dietary protein and incorporating CGM, SFM and DDGS mixture into diets, the opposite was true with chicks fed 19% protein where PEF of tested diet recorded higher value than those of control ones but without significant difference.

Carcass traits

Data concerning carcass traits of broiler chicks at 35 days of age are expressed as average of carcass, breast, thigh, wings, skin, abdominal fat, breast fillet, tender and thigh meat (percentage of live body weight) are summarized in (Table 4 and 5). No significant difference was observed among experimental groups regarding to the carcass, breast, thigh and abdominal fat. Meanwhile, feeding tested dietary treatment of 21% protein recorded higher percentage of carcass and lower percentage of abdominal fat being 75.90 and 0.97 %, respectively, whereas the opposite was seen with using tested diet of 19% protein being 73.82 and 1.09%, respectively. On the other hand, chicks fed control diet contained 19% protein had significantly the highest percentage of wings being 7.81%. This difference was disappeared with using the other dietary treatments. However, this trend was found with parameter of tender as shown in Table (5). As for skin and fillet percentage, no significant difference was detected among the experimental groups. Regarding to thigh meat percentage, no significant difference was found among chicks fed dietary treatments of 21 and 19% protein with or without studied mixture. Also, thigh meat of chicks received the control diet of 19% protein was statistically similar to those of the other studied dietary treatments of 21 and 20% protein. However, the highest percentage was recorded with chicks of tested dietary treatment of 21% protein and the lowest was recorded by chicks of tested diet of 19% protein.

Feed cost and cost index

Observing data (Table 6), it is obvious that there is a tendency to increase feed cost per weight gain as decreasing inclusion level of protein whether control or tested diets. However, tested diets of 21% protein scored less feed cost per kg gain being 4.75 L.E compared with the other dietary treatments. Assuming the feed cost per kg gain of broilers fed diet of 21% protein with mixture of CGM, SFM and DDGS as the lowest cost equal 100, it is clearly shown that feeding this type of diet gave lower cost by 1.25% than the control diet at the same level.

DISCUSSION

Results of this study indicate that incorporating 15% of the studied mixture (2.5% CGM, 5% SFM and 7.5% DDGS) as replacing for SBM into broiler Cobb 500 diets contained 21 and 20% protein with a constant metabolized energy (3100 kcal/kg) during finisher phase (19-35 days) can reduce growth performance numerically but not significant when compared to control diets. Such reduction in this respect may be due to non-starch polysaccharides (NSP) in the tested diets which causing some digestion problems for broiler chicks and reduce the absorption and availability of important nutrients (Annison and Choct, 1991; and Mostafa, 2009). However, this result was attained with the amount of feed consumed, livability, PEF and carcass yield. Based on the amount of feed intake and BWG, there is a tendency to impair feed conversion ratio significantly ($p \leq 0.05$) difference. Along the same line, Kamran et al. (2008) reported that an adverse effect was recorded for the productive performance of broilers but carcass traits were unaffected as feeding low protein diets with constant ME:CP ratio during period of (1-33 days of age). Also, Warren and Emmert (2000) suggested that using mixture of different ingredients with reduced protein content have no effect on body weight and feed

intake of broilers. The opposite was true with dietary treatment of 19% protein, where an increase in all studied traits was recorded by chicks received the same level of protein with the tested diet. Such improvement in growth traits may be due to increasing feed intake by about 6.1% over the control. Meanwhile, no significance was seen in score of FCR. This result means that broilers had the ability to regulate the feed consumed based on the capacity limitation of the gastro-intestine for chicks (Scott, 2002). In addition, the increment in feed intake of tested diet of 19% protein may be due to the dietary inclusion of oil in SFM which may have improved digestibility of nutrients (Tavernari et al., 2008; and Araujo et al., 2011). As demonstrated by
Oliveira et al. (2007), dietary inclusion of 15% SFM improved performance traits, but did not affect carcass yield. Also, Kim et al. (2012) reported that fish or meat meal could be replaced by CGM in broiler diets without any adverse effect on their performance and carcass traits. In line with the previous findings, Min et al. (2012) found that inclusion of 30% DDGS had no adverse effect on gain, feed intake and FCR as well as breast meat yield. Results of economical efficiency show that experimental diet of 21% protein with CGM, SFM and DDGS mixture scored less feed cost per kg gain being 4.75 L.E. So, it could be concluded that incorporating mixture of corn gluten meal, sunflower meal and distillers dried grains with solubles into finisher diets had no adverse effect on the productive performance and carcass traits. In addition, a sustainable feeding program for finisher diets containing different alternative protein sources and levels could be applied to replace the traditional one.

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Tabel (1): Composition and calculated analysis of diets used in the experiment

Ingredients	Super starter phase	Starter phase	Finisher phase					
	Control 23%	Control 22%	Control 21%	Test 21%	Control 20%	Test 20%	Control 19%	Test 19%
Yellow corn	54.66	57.78	60.50	54.99	63.50	58.64	66.80	61.49
Soybean meal, (48% CP)	38.40	35.98	33.30	22.60	30.80	20.00	28.00	17.35
Corn gluten meal, (62%CP)	-	-	-	2.50	-	2.50	-	2.50
DDGS, (31% CP)	-	-	-	7.50	-	7.50	-	7.50
Sunflower meal, (28% CP)	-	-	-	5.00	-	5.00	-	5.00
Soy oil	2.60	2.15	2.90	3.60	2.40	3.25	1.90	2.90
L-lysine HCL (98%)	-	-	-	0.050	-	0.15	-	0.25
DL-methionine (98%)	0.20	0.25	0.15	0.10	0.15	0.10	0.20	0.15
Limestone	2.20	2.20	1.75	1.75	1.75	1.75	1.75	1.75
Di- calcium phosphate	0.85	0.80	0.20	0.200	0.20	0.20	0.15	0.20
NaCl	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Vitamin premix[1]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Mineral premix[2]	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Coccidiostat[3]	0.20	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Mixed enzymes[4]	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
Anti-mycotoxin[5]	0.10	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Phytase[6]	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Probiotic[7]	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060
Total	100	100	100	100	100	100	100	100
Calculated analysis :								
ME, (kcal/kg)	3000	3000	3100	3100	3100	3100	3100	3100
Crude protein, (%)	23	22	21	21	20	20	19	19
Fat, (%)	2.60	2.67	2.75	3.4	2.85	3.48	2.94	3.57
Fiber, (%)	2.49	2.47	2.45	3.97	2.44	3.95	2.43	3.94
Calcium, (%)	1.10	1.10	0.77	0.76	0.77	0.76	0.75	0.75
Available Phosphorus, (%)	0.50	0.53	0.38	0.38	0.40	0.40	0.39	0.42
Total Lysine, (%)	1.30	1.28	1.05	1.05	1.13	1.20	1.01	1.04
Methionine, (%)	0.57	0.59	0.45	0.51	0.48	0.49	0.49	0.50
Cysteine, (%)	0.33	0.35	0.28	0.32	0.28	0.30	0.28	0.31
Meti+cyst, (%)	0.90	0.94	0.73	0.83	0.76	0.79	0.77	0.81
Arginine, (%)	1.33	1.35	1.07	1.00	1.06	1.02	1.03	1.04

[1]Vitamin premix provides per kg of diet: Vit. A: 12000000 IU, Vit. E: 400000 mg, Vit. Bl: 2000 mg. Vit. B2: 160000 mg, Vit. B6: 5000 mg, Vit, B12: 12 mg, Niacin: 45000 mg, Pantothenic acid: 12000 mg, Vit. K: 3000 mg, Vit. D3: 3000000 IU, Biotin: 70 mg and Folic acid: 2000 mg.

[2] Trace mineral premix provides per 2 kg of diet: Choline: 3600000 mg, Copper: 10000 mg, Iodine: 1000 mg, Iron: 30000 mg, Manganese: 100000 mg, Zinc: 600000 mg, selenium: 400 mg, and cobalt: 100 mg.[3]Diclazuril 500 mg ,Atozuril® (ATcopharma).[4] Combo® Enzyme Blend consists of : Cellulase 75,000 CU units/kg, Fungal amylase 30,000 SKB units/kg, Fungal protease 1,000,000 HUT units/kg, Neutral protease 100,000 PC units/kg, Alkaline protease 1.2 Anson units/kg, Xylanase 20,000 XU units/kg, Beta-glucanase 20,000 BG units/kg, Hemicellulase 20,000 HCU units/kg and Lipase 75,000 FIP units/kg.

[5]Mycofix® Select 3, feed additives that protect broiler health by deactivation of mycotoxins.[6] Axtra® PHY 10000 TPT, 6-phytase 10000 FTU/g.[7]Enviva® Pro 202 GT, Bacillus subtilis 2.5E CFU/gm.

Table (2): Body weight and body weight gain of broiler chicks fed finisher diets contained alternative protein sources at levels (21, 20 and 19%p)

Treatments	Body weight (g)				Body weight gain (g)	
	Body weight18 days		Body weight 35 days		Finisher phase (19-35) days	
	Mean	SE	Mean	SE	Mean	SE
Control 21%CP	563.33	11.51	1888.75[a]	23.99	1325.42[a]	33.18
Tested 21% CP	561.25	11.31	1840.67[a]	25.81	1279.42[a]	29.14
Control 20%CP	537.00	5.83	1825.24[a]	18.72	1288.24[a]	21.23
Tested 20% CP	543.33	4.18	1779.58[a]	30.11	1236.25[a]	31.43
Control 19%CP	546.25	10.65	1600.64[b]	42.60	1054.39[b]	46.37
Tested 19% CP	552.50	9.55	1657.50[b]	63.31	1105.00[b]	63.73
Test of significant						
Treats	NS		**		**	

** p<0.01 NS: not significant

(a, b) Means with no common superscripts are significantly different for each parameter

Table (3): Feed intake (g), feed conversion ratio (kg feed/kg gain), livability and production efficiency factor of broiler chicks fed finisher diets contained alternative protein sources at levels (21, 20 and 19%p)

Treatments	Feed intake (g)		Feed conversion ratio (feed/gain)		Livability (%)		Production efficiency factor (%)	
	Finisher phase (19-35) days		Finisher phase (19-35) Days		Finisher phase (19-35 Days)		Total phase (1-35 Days)	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Control 21%CP	2111.68[a]	35.60	1.60[b]	0.06	95.31	2.04	345.65[a]	13.60
Tested 21% CP	2171.81[a]	18.66	1.70[a]	0.05	95.06	2.18	320.54[ab]	13.21
Control 20%CP	2169.88[a]	5.19	1.69[a]	0.03	94.67	1.33	313.56[abc]	7.35
Tested 20% CP	2163.54[a]	22.29	1.75[a]	0.04	95.59	1.81	302.55[abc]	15.25
Control 19%CP	1824.69[c]	13.01	1.74[a]	0.07	93.02	0.24	269.93[c]	14.45
Tested 19% CP	1936.24[b]	16.48	1.77[a]	0.10	95.65	1.80	284.78b[c]	18.24
Test of significant								
Treats	**		*		NS		**	

NS: not significant * p<0.05** p<0.01

(a, b) Means with no common superscripts are significantly different foreach parameter

Table (4): Percentage of carcass, breast, thigh, abdominal fat and wings of broiler chicks fed finisher diets contained alternative protein sources at levels (21, 20 and 19%p)

Treatments	Carcass		Breast		Thigh		Abdominal fat		Wings	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Control 21% CP	75.13	0.40	35.86	0.39	29.07	0.93	0.98	0.01	7.12[b]	0.12
Tested 21% CP	75.90	0.20	34.57	0.85	28.93	0.78	0.97	0.03	6.95[b]	0.04
Control 20% CP	75.58	0.52	33.43	1.17	29.31	0.19	0.97	0.03	7.11[b]	0.13
Tested 20% CP	75.21	0.52	35.00	0.29	28.19	0.48	0.99	0.02	6.87[b]	0.18
Control 19% CP	75.72	0.66	35.12	0.65	28.56	0.37	1.02	0.04	7.81[a]	0.18
Tested 19% CP	73.82	0.54	34.79	0.43	27.07	0.94	1.09	0.04	6.94[b]	0.26
Test of significant										
Treats	NS		NS		NS		NS		**	

NS: not significant ** p<0.01

(a, b) Means with no common superscripts are significantly different for each parameter

Table (5): Percentage of fillet, tender, thigh meat and skin of broiler chicks fed finisher diets contained alternative protein sources at levels (21, 20 and 19%p)

Treatments	Fillet		Tender		Thigh meat		Skin	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Control 21%CP	17.80	0.33	2.91[b]	0.27	14.49[a]	0.23	5.40	0.26
Tested 21% CP	17.03	0.28	2.87[b]	0.11	14.63[a]	0.45	5.44	0.39
Control 20%CP	17.21	0.59	3.21[b]	0.08	14.23[a]	0.19	6.20	0.56
Tested 20% CP	16.01	0.29	3.14[b]	0.09	14.27[a]	0.22	5.52	0.20
Control 19%CP	16.68	0.58	3.76[a]	0.15	13.87[ab]	0.24	5.05	0.12
Tested 19% CP	16.50	0.56	3.20[b]	0.13	13.19[b]	0.28	5.02	0.27
Test of significant								
Treats	NS		**		**		NS	

NS: not significant ** p<0.01

(a, b) Means with no common superscripts are significantly different for each parameter

Table (6): feed cost per kilogram of body weight gain (FC), economical efficiency index (EFI) and cost index (CI) of Cobb broilers fed starter diets wit 22%p and diets containing alternative protein sources at levels (21, 20 and 19%p) at (19-35) day of age

Treatments	Feed cost (L.E/kg BW)*	Economic efficiency index, (%)**	Cost index, (%)***
Control 21% CP	4.81	98.75	101.25
Tested 21% CP	4.75	100	100
Control 20% CP	4.91	96.74	103.36
Tested 20% CP	4.91	96.74	103.36
Control 19% CP	4.87	97.53	102.47
Tested 19% CP	4.95	95.95	104.05

*Feed cost= (price per kilogram of feed used in treatment *feed intake in treatment)/ weight gain of treatment.

** Economical efficiency= (lowest feed cost per kilogram of weight gain among treatment/ cost of treatment)*100.

***cost index= (cost of treatment/ lowest feed cost per kilogram of weight gain among treatment)*100.

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Alternative ingredients - Performance - Finisher diets - Carcass traits.

الملخص العربى

الإستفادة من إستدامة العلف الناهى المحتوى على مصادر بديلة من البروتين ومختلف فى نسب البروتين على الأداء الإنتاجى وصفات الذبيحة لدجاج اللحم

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أجريت هذه التجربة لدراسة تأثير استبدال كسب فول الصويا بخليط من كسب جلوتين الذرة، كسب عباد الشمس و النواتج العرضية لتقطير الحبوب بنسب 2,5 و 5 و 7,5% على التوالى فى وجود مستويات مختلفة من البروتين 21 ، 20 و 19% فى العلف الناهى على الأداء الإنتاجى وصفات الذبيحة لدجاج اللحم. تم استخدام 432 كتكوت (كاب 500) عمر يوم وزعت عشوائياً على 6 معاملات فى الفترة من (19-35 يوم) وكانت كل معاملة تحتوى على ثلاث مكررات وكل مكررة تحتوى على 24 كتكوت وكانت المعاملات كما يلى : 1) كنترول 21% بروتين، 2) مختبرة 21% بروتين، 3) كنترول 20% بروتين، 4) مختبرة 20% بروتين، 5) كنترول 19% بروتين و 6) مختبرة 19% بروتين وكانت علائق الكنترول قائمة على كسب فول الصويا كمصدر وحيد للبروتين بينما العلائق المختبرة قائمة على الخلط بين المصادر البديلة. وفى نهاية فترة التجربة عند 35 يوم تم ذبح 5 كتاكيت من كل معاملة لتقييم صفات الذبيحة. أظهرت نتائج هذه الدراسة أن استخدام الأعلاف المختبرة بنسبة 21 و20% لم يكن لها أى تأثير معنوى على الأداء الإنتاجى و صفات الذبيحة عند مقارنتها بالكنترول، بينما سجلت المعاملة 19% مختبرة أداء أفضل من الكنترول لكن بصورة غير معنوية.

لذلك، فإنه يمكن استخدام خليط من كسب جلوتين الذرة، كسب عباد الشمس و النواتج العرضية لتقطير الحبوب بنسبة تصل إلى 15% بصورة مستدامة فى العلف الناهى لسلالة الكاب محل كسب فول الصويا كمصدر للبروتين عند مستوى بروتين خام يتراوح بين 19 ، 21%.