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Article

Protein Replacers in Poultry Diets

Galib A. Al-Kaissy[1], Hasan S.A. Jawad[2]*, Nihad Abdul-Lateef Ali[3] and Ihsan H. Al-Timimi[1]
[1]National University of Science and Technology, Thi qar, Iraq.
[2]Department of Animal Production, Faculty of Agricultural Engineering Sciences, University of Baghdad, Iraq
[3]Department of Animal Production, Faculty of Agriculture. Al-Qasim Green University, Iraq.
*Correspondence: hasan.s@coagri.uobaghdad.edu.iq , dr.hassan198366@yahoo.com , hassan198366@gmail.com
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Abstract

The experiment was conducted in a private poultry farm from 20/9/2021 to 24/10/2021. Four hundred eighty chickens of the Ross 308 strain were used; the chicks were randomly divided into 5 experimental groups. Several plant protein sources in Iraq were used as the major protein source instead of soya bean meal to cover the diet requirement for protein and calories. The following characteristics were studied: average live body weight gain, feed and CP utilization efficacy, and chemical and calculated physiological fuel value for boneless meat at 6 weeks of age.

Keywords: Protein, poultry diets, poultry industry

Introduction

The poultry industry has witnessed rapid and significant development in the ways and methods used to improve production and its quality. These methods and methods used today differ from those used only ten years ago, and every new day that passes witnesses a quantitative and qualitative development in various fields of the poultry industry. Poultry feeding is one of the pillars of this industry. It has witnessed broad and influential developments in improving production by setting accurate standards for manufacturing feeds and controlling them to meet birds' most accurate daily needs [1]. In addition to producing and providing many essential and auxiliary feed additives and public health supports in order to improve production and quality [2], The use of Yeast, including Saccharomyces cerevisiae, which is one of the types of non-pathogenic microorganisms used in the manufacture of probiotics, and usually the term live yeast culture is used as a definition of the dried yeast culture in the same medium in which it was grown. Here, it is required that the medium is among animal feed components. Adding Yeast to feed improves the efficiency of food conversion and body weight. Yeast has been used in poultry feeds on a commercial scale as a growth promoter if it is found that adding it leads to an improvement in body weight and weight gain and that the amount of improvement varies depending on the percentages of addition, nutritional status and environmental factors other .[3] found that adding Yeast leads to an improvement in body weight, weight gain and the immune response of birds, and many researchers also found that Yeast improves growth [4]. feeding constitutes the most significant part of the total costs of the poultry industry, so thinking began to find feed alternatives, especially protein sources, at the lowest costs without causing any adverse effects on the productive performance of the bird.

Soybeans and their extracts are essential sources of proteins in poultry diets, but they are costly [5]. Therefore, the researchers sought to find locally produced alternatives that can be partially or entirely replaced by [6]. ViciaFaba Var minor is one of the crops with a relatively high protein level of about (26%) and starch (30%). It is a good source of lysine, but some anti-nutrients and its low content of sulfur amino acids, methionine and cysteine limit its use in poultry diets [7]. The presence of anti-nutrients increases the viscosity of the excreta because these substances are not degraded by the digestive enzymes, which causes a delay in the intestinal functions of the digestive system 8. However, it can be a substitute for soybeans [9] after a procedure such as germination or chemical treatments to improve its nutritional value. Poultry occupies an essential and effective corner in covering part of the nutritional needs of humans, and thus, from the nutritional and economic point of view, it is one of the important sources of animal protein [10] and protein sources in the ration are of great importance. The most important of which is soybean meal because it contains a high percentage of protein as well as its high digestibility, but its high price led to the search for alternatives at lower prices, including the yellow corn gluten meal, which is of high nutritional value for ruminants that can be obtained after separating the starch from the corn grain to remain the meal of gluten Corn, which is rich in protein. Its crude protein content ranges between 41-64%, and its low lysine, arginine, and tryptophan [11] content. Corn gluten meal has all the characteristics of vital nutrition and is suitable for feeding broilers with its low percentages that require high energy and good protein content in rations [12] It also contains high levels of methionine, which is the primary determinant of many feed materials [13]. Corn gluten meal is a rich source of vitamins E and B complex and contains a low amount of phosphorous [14]. A number of researchers have used corn gluten in the diets of laying hens and broilers. [15] found that when they used Corn Gluten Meal, in proportions 0, 4, 8, 12, 16, and 20% in the laying hens (High Line) ratio, there were no significant differences between the experimental treatments in the productive traits. The feed consumption decreased when gluten was used by 20% in the ration without affecting the feed conversion ratio. [28] noticed when using liquid corn gluten in broiler diets at averages of 0, 2.5, 5, 7.5, and 10 % containing 25% protein, with a decrease in feed consumption. Whenever the addition amount exceeds 2.5%, the feed conversion ratio improves by the % when adding liquid corn gluten by 5%.

Materials and methods

This experiment was carried out at the poultry experiment station, faculty at Agriculture, AlKassim Green-, University of Babil.

Several plant Protein sources available in Iraq were used as the primary protein source in the experimental diets. The level of- these protein sources ranged from 14 to 28 % of diets used (Table 1). In diet 7, a mixture of protein sources (excluding soybean meal) was used, composing 39% of the ration. The diets were formatted to be approximately iso-nitrogenous and iso-caloric.

Five hundred, one–day–old (Arber-Acres) broilers were randomly divided into 32 groups of 15 birds each, four replicates for each at the eight diets.

The birds. Chicks were vaccinated against Newcastle disease with eye drops at hatch. At 30 days of age, they were revaccinated against Newcastle.

The birds received water and weighed feed ad libitum during the experiment period. Chicks were individually weighed each week while they were fasting. Feed consumption was also recorded weekly.

Eight rations were used in the present study, including a reference commercial broiler starter diet of an unknown formula. Vitamins and mineral mixtures were formulated for each diet separately to cover the nutritional. The amino acid content of most of the feedstuffs was calculated from [16], and the faba beans from [17].

At 6 weeks of age, all the birds were slaughtered, and 4 birds from each replicate were individually weighted to the nearest gram (after 12 hours of fastening), then slaughtered by cutting the threat and the jugular vein with a sharp knife near the fist vertebra, then slaughter weight was recorded. The birds were then plucked after scalding, and the plucked weight was obtained. The eviscerated weight was obtained after the removal of the head. Neck, viscera, Shank, spleen, gizzard, liver, heart and reproductive organs. The edible giblets with and without edible giblets percentages were calculated. Statistical analysis was carried out according to [18]. Body weight data was analyzed by the least squares method of [19]. The separation of means was carried out according to [20].

Items Ingredient	1 SBM	2 CSM	3 FB	4 CGM	5 RGM	6 Yeast	7 Mixed
Yellow corn	61.00	51.62	40.46	42.45	38.70	49.48	40.00
Alfalfa meal	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Soybean meal	21.00	-	-	-	-	6.00	-
Cotton seed meal	-	28.00	10.00	11.00	12.00	-	10.00
Yeast	-	-	7.00	2.00	7.00	14.00	6.00
Folia bean	-	-	22.00	-	-	-	7.00
Corn gluten meal	-	-	-	24.00	-	10.00	10.00
Rice germ meal	-	-	-	-	20.00	-	6.00
Fish meal	6.00	7.00	7.00	7.00	6.00	7.00	7.00
Blood meal	4.00	4.00	4.00	4.00	5.00	4.00	4.00
Meat meal	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Vit. Mixture*	0.23	0.18	0.31	0.47	0.30	0.15	0.35
Mineral mixture**	0.68	0.50	0.57	0.67	1.00	0.57	0.57
Animal fat	1.80	4.03	3.60	3.31	4.90	3.76	4.00
Methionine	0.05	0.03	0.06	0.01	0.01	0.04	0.08
Calculated feeding value and CP							
CP	23.01	23.03	23.04	22.99	22.98	23.03	23.02
ME K.cal/Kg diet	3086	3086	3086	3086	3086	3086	3082
C/P ratio	134.12	134.00	133.94	134.23	134.29	134.00	134.06
Methionine	0.43	0.44	0.41	0.38	0.37	0.44	0.39
Cysteine	0.41	0.51	0.43	0.43	0.37	0.39	0.41
TSCAA	0.48	0.59	0.48	0.81	0.74	0.83	0.80
Lysine	1.55	1.37	1.65	1.38	1.31	1.65	1.47

Table 1. Constitutions of the different rations and their calculated feeding values.

Results

Table (2) shows the feed, CP, and efficiency of feed utilization. At one week old, the difference in body weight of chicks raised on the different diets started to be significant ($p \leq 0.05$). When the experiment was terminated at 6 weeks of age, the birds receiving the SBM diet were significantly heavier than any other treatment group. However, those receiving diets with CSM and CGM were not as heavy.

	Diet						
Item	1 SBM	2 CSM2	3 FB	4 CGM	5 RGM	6 Yeast	7 Mixed
Final live weight(gm)	1963	1713	1814	1631	1708	1815	1828
Total gain (gm)	1868	1627	1716	1537	1620	1729	1741
Efficiency of feed utilization							
Average daily feed consumption/gm	51.90	45.20	47.70	42.69	45.00	48.02	48.40
Average daily gain (gm)	27.70	23.90	24.60	23.30	23.90	26.50	26.60
Kg. gain/Kg. feed	0.53	0.52	0.51	0.54	0.53	0.55	0.54
Kg. feed/Kg. gain	2.10	1.89	1.94	1.83	1.88	1.81	1.82
Efficiency of CP utilization							
Daily CP intake/gm	14.81	14.48	14.73	14.74	14.75	15.49	15.64
Kg. gain/Kg. CP	1.87	1.65	1.67	1.58	1.62	1.71	1.70

Table 2. Effect of different plant proteins on live weight, feed efficiency and CP utilization.

When the experiment was terminated at 6 weeks of age, the birds receiving the SBM were significantly heavier than any other treatment group.

This is expected since it knows that the SBM protein is the best

Protein for poultry feed from the standpoint of protein and amino acid availability.

These results indicate that the CGM is the least adequate plant protein source for broiler ration. This might be due to the lower amino acid abilities of the CGM. The lower body weight of the birds receiving the CGM might either be due to

lower amino acid availability or to the effect of gossypol. Data also showed that the FB, RGM, Yeast and mixed plant protein sources can be used adequately in broilers if the ration is formulated correctly.

Diet		Moisture %	Crude protein Nx6.25	Ether extract %	Ash %	Calculated fuel value Kcal/Kg	
		Front part				Fresh	DM
1	SBM	71.94	22.69	4.20	1.17	1285.43	4561.50
2	CSM	71.33	28.89	4.64	1.14	1333.39	4647.58
3	FB	72.27	23.09	3.44	1.20	1233.10	4438.80
4	CGM	71.98	22.19	4.44	1.17	1286.98	4629.42
5	RGM	71.66	21.76	5.06	1.20	1325.64	4732.74
6	Yeast	72.20	23.55	3.67	1.12	1272.26	4478.21
7	Mixed	72.14	22.32	4.41	1.13	1289.86	4595.15
Hind part							
1	SBM	73.75	20.85	4.28	1.12	1219.28	4630.76
2	CSM	73.01	20.79	5.14	1.06	1249.28	4791.85
3	FB	73.82	20.72	4.39	1.07	1231.70	4765.96
4	CGM	74.19	20.20	4.55	1.06	1216.90	4713.01
5	RGM	73.33	20.51	5.07	1.09	1277.08	4793.84
6	Yeast	73.62	20.62	4.70	1.06	1247.70	4733.31
7	Mixed	73.34	20.50	5.08	1.05	1277.14	4794.07

Table 3. Chemical composition and calculated physiological fuel value for boneless meat at six weeks of age.

	Diet						
Item	1 SBM	2 CSM2	3 FB	4 CGM	5 RGM	6 Yeast	7 Mixed
Live weight in gm.	1963	1713	1814	1631	1708	1815	1828
Weight after slaughter in GM	1897	1667	1755	1585	1644	1760	1771
Plucked weight in gm	1804	1617	1700	1534	1585	1698	1711
Eviscerated weight in	1358	1273	1324	1180	1201	1328	1335

gm							
Edible giblets in gm	230	216	228	215	234	229	225
Total edible parts in gm	327	316	296	291	298	302	300
As a percentage of live weight							
Blood percentage	3.36	2.54	3.25	2.82	3.74	3.03	3.12
Feather percentage	4.90	2.99	3.13	3.22	3.59	3.52	3.38
Eviscerated percentage with edible giblets	83.95	86.92	85.55	85.34	84.01	85.78	85.34
Eviscerated percentage without edible giblets	82.78						

Table 4. Carcass quality and dressing percentage of six-week-old broilers raised on different diets.

Discussion

The daily feed consumption of the birds raised on the different diets increased gradually with advancing age. Birds receiving the CGM diets consumed less feed than the rest of the groups during the first five weeks of age. This may be due to the bulkiness of the diet, less palatability, or an imbalance in the actual calorie/protein ratio. The low feed intake is mostly the cause of the retarded growth. The result also proved that the birds fed the CSM and CGM diets had the lowest protein intake. This is due to their low feed consumption; [27] also reported similar results. Feed consumption also can be altered by the palatability of the diet. However, there is no reason to believe that the CSM or CGM were not as palatable as the rest of the diet.

[21] reported that in chickens, energy intake is directly related to protein intake. If the protein intake of CSM and CGM is altered through low amino acid availability, energy will be reduced through reduced feed intake. Feed efficiency is an important factor.

In determining the profitability of growing broiler besides body weight. Birds require less feed from adequately balanced diets to produce a unit of live weight. The best feed efficiency is usually obtained when the birds are young. The efficiency of feed utilization decreased gradually with advancing age. Usually, there is a high correlation between feed efficiency and growth rate. Also, a high correlation was reported between ME and body weight [22].

The chemical composition of birds raised on the different rations is presented in Table (3). The various front and hind parts analysis indicated no significant difference between treatments. However, the fat content of the front parts of birds

raised in the CP feed was significantly ($p \leq 0.05$) lower than the rest of the groups. This would indicate that all the rations used, with the different plant protein sources, did not have any practical effect on the chemical composition of the debone carcasses [23]. Also, the blood percentage on the different diets was not statistically significant (Table 4). This would indicate, as expected, no influence of the plant protein sources on the blood percentage. Also, the same results with the feather percentage and eviscerated percentage (with and without giblets). These results agree with those reported by [24], [25], and [26].

Conclusion

The result showed that adding CGM is the least adequate plant protein source for poultry rations. Also, a high correlation was reported between ME and body weight and feed efficiency with growth rate. In addition, it indicates that all rations used with the different plant protein sources did not have any practical effect on the chemical composition of the debone carcasses.

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