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PARTIAL REPLACEMENT OF SESAME SEEDS IN BROILER RATION TO ENHANCE THE PRODUCTIVE PERFORMANCE

Ali Redha Abid[1], Majed Muhsen Salman[2] and Salah Mahdi Gatea[3]

[1]College of Veterinary Medicine. University of Kerbala, Iraq.
[2]Agriculture College. University of Kufa, Iraq.
[3]College of Agriculture. University of Kerbala, Iraq.

Abstract

The experiment was carried out in the scientific research hall of the Animal Production Department/ College of Agriculture over the period from 13/8/2018 to 14/9/2018. Aim of the experiment was investigating the effect of sesame seeds in broiler rations (as a source of protein, energy, vitamins, and minerals) to enhance their productive performance. Rose broilers were randomly distributed into four experimental treatments, were fed with four rations with varying protein percentages (21, 20.2, 20.2 and 21%) with energy (3110, 3110, 3028 and 3000 Kcal/Kg diet, with replacement ratios of sesame seeds (0, 30, 25 and 20%) of the basic ration components for the experimental treatments (T_1, T_2, T_3 and T_4) respectively. respectively, over the experimental treatments until the age of marketing at 32 day.

Third treatment (T_3) differed significantly ($p>0.05$) in productive indicators over all the experiment period until the age of marketing upon Treatments (T_2 and T_4) with qualitative measurements such as daily feed intake, body weight, feed conversion, and mortality percentage, although, there were no differences between it and the control treatment (T_1).

Key words : Broiler Ration, Productive Performance, protein percentages

Introduction

The nutrition of livestock is viewed as one of the important elements of animal production for its directly proportional relation with the quality and quantity of productive performance. Animal products especially white meat are a main nutritive protein source for human consumption and they have a direct relation with the health of the consumer. Accordingly, livestock meals became the focus of researchers attention, poultry breeders always wish to find the best nutritive elements to enhance the performance of poultry especially broilers, what has a positive impact on the main components essential in muscle composition and building, and consequently on the health of the consumer.

One of the nutritive elements is sesame seeds which scientifically known as *Sesamum indicum*. The origin of sesame is not known, but it was cultivated since the old times in tropical and semi-tropical regions. It is thought that India and Ethiopia are the world's oldest producers of sesame. Then it came to be cultivated in south Europe and North Africa. It is an oil crop cultivated in many countries with hot, semi-hot, and moderate climate. Sesame seeds have a high ratio of oil that ranges 50-60%. It has a long shelf life because the oil contains an antioxidant called Sesamolin (Joshi *et al.,* 2005), it also contains Sesamin a natural insecticide (Sami, 2001). Sesame seeds are used in baking, candy making, and other food industries because they contain 25.2% proteins, 15% carbohydrates and 47% oil. Odorless and colorless oils are extracted from seeds and used in the manufacturing of soaps, lubricants, illumination, and insecticides.

The cake remaining after pressing or extraction makes an excellent livestock food for cattle and poultry for the high level of protein (37.5%), in addition to calcium and phosphor (Romani, 2000). The color of sesame seeds are varied, and range from white to scarlet, brown and black. There are 30 kinds of sesame seeds. Table 1 shows the chemical analysis of white sesame seeds of Turkish origin (available in local market).

Sesame seeds oil is composed of unsaturated fatty acids that don't precipitate in the veins of human or animals when using it in their diet, the percentage of these acids

Table 1: The chemical analysis of white sesame.

Ingredients	Percentage %
Protein	20.8
Carbohydrate	9.19
Fibers	14.2
Oil	41.5
Water	4.41
Ash	10.1

(Dashak and Fali,1993).

is 85% (Sadaghi *et al.,* 2009). Sesame seeds have amino acid composition similar to that of soybean meal (47.7% Crude Protein) with the exception of lower lysine percent (Mumputu and Buhr, 1995).

Sesame seeds and their byproducts (sesame oil, sesame juices, and sesame seeds cake) were used in various percentages in livestock meals (Malasi, 2013). Sesame seeds cakes were used as local product in Yemen as a meal for broilers instead of soya bean meals imported from abroad. Sesame meal has a low lysine amino acid and a high methionine composition, thus it is better to be added to soybean or soybean cakes with the ration of 1:2 to avoid the lack of the main nutritive elements especially amino acids (Attia *et al.,* 2003). Sesame seeds cakes totally replaced soybean cakes in broilers rations when studying the productivity of the poultry (Hussein, 1998). Sesame seeds and sesame seeds products were considered untraditional meals, and they were used in studying their influence on the productive performance of broilers (Hussein, 1991).

The aim of study was to evaluate of sesame seeds as a dietary replacement on productive performance of broilers.

Materials and Methods

This experiment was done in the Scientific Research hall of the Animal Production Department/College of Agriculture in Kufa University over the period from 13/8/2016 to 14/9/2016. One day aged and a sexualized, 120 of Rose broilers randomly distributed into four treatments (30 broiler/treatment)- a three replicates for every treatment (10 broilers for each replicate).

Broilers placed in 1.5m × 1.5m wired pens, ground was covered with clean sawdust. Feed and water were provided *ad libitum*. Birds were exposed to constant 23h/day lighting program. Treatment (T_1) was the control, while T_2, T_3 and T_3 were the experimental treatments. Broilers were provided with the rations as indicated in table 2 where the percentages of protein in the rations were (21, 20.2, 20.2 and 21) for the four treatments (T_1, T_2, T_3 and T_4) respectively.

Table 2: The percentages of rations components provided to the experimental treatments.

Nutrient	T_1	T_2	T_3	T_4
Wheat	27.3	18	18	18
Yellow Corn	44.8	30	30	30
Sesame Seeds	0.0	30	25	20
Plant Oil	3.5	0.0	0.0	0.0
Soybean Meal	23.4	18	20	25
Calcium	0.5	2	3	3
Salt	0.5	0.0	0.0	0.0
Nigella sativa	0.0	2	4	4
Chemical Analysis				
Crude Protein	21	20.2	20.2	21
M.E Kcal/kg	3110	3110	3028	3000

*Protein and energy were calculated according to NRC,(1994) Tables.

The studied characteristics are following: (according to Al-Zubaidy, 1986)

Weight Gain

The weight gain is calculated according as follows:

The weight gain (gm) = Weight of the living body at the end of the week (gm) – Weight of the living body at the beginning of the week (gm).

Feed Intake

The weekly food intake for every replicate is calculated according to the formula:

Food intake average (gm) = The quantity of food offered to the birds at the beginning of the week – the quantity of food left at the end of the week.

Feed conversion ratio

The feed conversion ratio is calculated according to the formula :

Feed Conversion Ratio =quantity of feed intake (gm)/ weight gain(gm)

Mortality percentage

The number of mortal broilers were recorded weekly for every treatment, and then the mortality percentage was calculated according to the following formula:

Mortality Percentage = Number of mortal broilers / total number of broilers×100

Statistical Analysis

The results of the experiment were analyzed according to CRD (Completely Randomized Design) to study the effects of various treatments as per the studied characteristics and comparing the differences among the average results according to Duncan's multiple range test (Duncan, 1955) pursuant to the following statistical model:

$Yij = m + ti + eij$

Yij = the jth observation at tracking treatment i

m = overall mean effect

ti = true effect of the ith treatment

eij = error term assumed to be normally distributed with mean 0 and variance e σ^2.

Results and Discussion

Feed Intake

Table 3 shows the average feed intake (grams/ broiler) during the rearing weeks (four weeks). During the first week, there were no significant differences between treatment (T_1) and treatment (T_3) in the average feed intake (158 and 156.5 gram /broiler) for each treatment respectively. Likewise, there were no significant differences noticed between them in the average feed intake by the end of the experiment, whereas both (T_1 and T_3) differed significantly ($p>0.05$) from the other two experimental treatments (T_2 and T_4) in the average feed intake (116.25 and 114.2 grams/broiler) respectively. Treatment (T_3) continued to differ significantly ($p>0.05$) as compared to treatments (T_2 and T_4) in the average feed intake all over the experiment period (four weeks) as well as in the average of the total daily feed intake by the end of the experiment (1507.75, 1988.2 and 1760.4 gram/broiler) for treatments (T_2, T_3 and T_4) respectively.

The significant difference ($p>0.05$) of treatment (T_3) over treatments (T_2 and T_4) in the average feed intake over the four-week-experiment period is may be due to the smell, flavor, and taste of the delicious sesame seeds. These results agree with those of Yasine, (1990) who showed that many world countries use sesame seeds and sesame cakes in feeding poultry for their appealing taste and smell. Mashhadani, (2006) manifested that significant differences ($p>0.05$) were noticed in the average feed intake among the experiment treatments when replacing ratios of sesame seeds cakes in broilers rations while these significant differences were not noticed in the control treatment. Furthermore, Baghel and Netke, (1987) asserted the increase of feed intake consumption when replacing sesame seeds in rations of broilers between (2-4 weeks) of age for experiment treatments without significant differences with the control treatment. Sesame seeds also have an effect of lowering the level of blood glucose for containing vinyl compounds (oil solvent Para hydroxide vinyl propane and mono unsaturated fatty acids Omega 6 and 9) which are characterized as compounds that lower the level of glucose in blood which makes the bird feels hungry and thus needs to consume more offered feed (Ogunlesi *et al.,* 2010). The fibers found in sesame seeds slows down the work of the intestine causing a lowering the absorption of glucose and cholesterol in the intestine that lowers the level of glucose in blood (Kochhar and Naji, 2005). Shitto *et al.,* (2007) creating a mechanical feeling of not being satiated, thus the broilers increase their consumption of rations.

Weight Gain

Table 4 showed the effect of adding sesame seeds on the average weekly and total weight gain. The table showed that treatment (T_3) recorded significant weight gain ($p>0.05$) as compared to treatments (T_2 and T_4) over the four weeks rearing period as it reached (99.8, 184.7, 326.5 and 609.2), (140.7, 292.3, 548 and 846.9), and (100.1, 165.8, 289.9 and 492.8) grams/bird for treatments (T_2, T_3 and T_4) respectively. However, treatment (T_3) and the control treatment (T_1) didn't differ significantly ($p>0.05$) as per the average weight gain which recorded (149.5, 293.5, 550 and 847.6) gram/bird for treatment (T_1) during the rearing period.

The above table showed a significant increase in the average total weight gain ($p>0.05$) of treatments (T_1 and T_3) on treatments (T_2 and T_4) by the end of the four weeks rearing period as they measured (1840.6 and 1827.7gm/bird) respectively, but did not show any significant difference between them.

The increased weight gain of the experimental treatments broilers is due to their consumption of rations that include substances that provide them with their nutritive needs (protein, energy, vitamins, and minerals) that necessary for the development of their body organs and muscles provided by these rations components

Table 3: The effect of sesame seeds on the average feed intake(gm/broiler).

Age / Treatments	Week 1	Week 2	Week 3	Week 4	Total Feed Intake
T_1	158.0±4.1 a	365.0±2.3 a	570.0± 2.0a	943.0± 1.8a	2036.0± 2.5a
T_2	116.2±6.2 b	287.5± 4.1b	422.0± 4.1b	682.0± 3.3 b	1507.7± 4.4b
T_3	156.5±3.5 a	358.7± 3.0a	535.0± 2.1a	938.0± 1.1 a	1988.2± 2.4 a
T_4	114.2± 7.4 cb	314.2± 5.7 c	489.0± 3.1 c	843.0± 2.0 c	1760.4± 4.7 c

*The values represent the arithmetic mean± the margin of error. *The various letters in every column means the existences of significant differences ($p>0.05$) between the treatments.

Table 4: The effect of sesame seed on the average weight gain (gram /bird).

Age / Treatments	Week 1	Week 2	Week 3	Week 4	Total Feed Intake
T_1	149.5±0.5 a	293.5± 0.5 a	550±0.2 a	847.6±0.6 a	1840.6±0.1 a
T_2	99.8±1.1ab	184.7±1.3 b	326.5 ±0.7 b	609.2±1.2 b	1220.6±0.5 b
T_3	140.7±0.4 a	292.3±2.2 a	548.0±0.6 a	846.9±0.8 a	1827.9±0.2 a
T_4	109.1±1.7cb	165.8±2.5c	289.9±1.4 c	492.8±1.4 c	1057.6±1.3 c

*The values represent the arithmetic mean ± the margin of error. *The various letters in every column means the existences of significant differences (p>0.05) between the treatments.

Table 5: The effect of adding sesame seeds on feed conversion ratio of the experimental treatments.

Age / Treatments	Week 1	Week 2	Week 3	Week 4	Total Feed Intake
T_1	1.05±0.1 a	1.24±0.3 a	1.03±0.1 a	1.11±0.8 a	1.10±0.5 a
T_2	1.16±0.2 b	1.55±0.1 b	1.29±0.1 b	1.11±0.3 b	1.23±0.4 b
T_3	1.11±0.5 a	1.22±0.1 a	0.97±0.1 a	1.10±0.1 a	1.08±0.4 a
T_4	1.14±0.4 cb	1.89±0.7 c	1.66±0.1 c	1.69±0.2 c	1.66±0.7 c

*The values represent the arithmetic mean ± the margin of error. *The various letters in every column means the existences of significant differences (p>0.05) between the treatments.

especially sesame seeds and *Nigella sativa* as untraditional ration components partially replaced in the ration. These results are in agreement, with those reported by Hussein, (1991) when studying the productive characteristics of broilers (weight gain) fed with rations of sesame cakes totally replacing soybeans cakes and fortified with lysine and methionine amino acids and which showed significant increase (p>0.05) in average weight gain (gram/bird) over the other experimental treatments understudy. No significant difference in average weight gain (gram/bird) was noticed among the chickens in other experimental treatments where sesame seeds were used in birds rations in the development and sexual maturity stages (Hussein, 1998).

Weight gain means the increase of digestion averages and metabolism because sesame seeds contain oleic Acid an unsaturated fatty acid that blocks the absorption of cholesterol in the intestines and expels it with the wastes because of an increase of bile secretion to complete additional digestions that support the weight gain (Chen *et al.,* 2005). Darraji *et al.,* (2010) further said that replacing sesame seeds in rations of Japanese quails led to better productive performance (egg quality) what manifests the practical value of adding sesame seeds in rations.

Feed conversion ratio

Table 5 shows a significant differences of T_3 (p>0.05) in feed conversion ratio which recorded (1.16, 1.55, 1.29 and 1.11), (1.11, 1.22, 0.97 and 1.10), and (1.14, 1.89, 1.66 and 1.69) for experimental treatments (T_2, T_3 and T_4) respectively, over the four week and during the total rearin 0g period in which the average feed conversion ratio recorded (1.23, 1.08 and 1.66) for treatments (T_2, T_3 and T_4) respectively. That is due to the cumulative effect of consuming rations and weight gain.

The above table didn't show any significant differences (p>0.05) between the control treatment (T_1) and treatment (T_3) as for average feed conversion ratio which read (1.10 and 1.08) respectively.

Sesame seeds contain Zinc and vitamin B which are necessary for metabolism (Dawson *et al.,* 1992) as well as vitamin C (Glenville, 2008) which is essential for promoting the pancreas to secrets insulin (Shittu and Addesite, 2008). Sesame seeds also contain vitamin E (Shittu *et al.,* 2009) which along with vitamin C is an antioxidants, These vitamins play an important role in fighting free radicals and enhancing the competence of the productive performance of broilers. Sesame seeds also provide the important elements such as magnesium, copper, and calcium to complete the function of the β-Cells in the pancreas to secrets insulin that lowers the level of glucose in blood (Rao *et al.,* 2002). This role regulates the vital and supportive performance for building the skeleton and muscles that characterized the birds which fed on rations fortified with sesame seeds to go in harmony with the significant indicator of feed conversion in the treatments to be similar to the feed conversion of the control treatment.

These results agree with those of Qattan *et al.,* (2008) who showed that the active sesame seeds compounds Lignans including Sesamol, Sesamolin, and α-Tochopherol have a great effect on lowering the level of lipoprotein LDL-C and fighting the oxidation of fats for containing a high level of vitamin C which works along

with the o7 the r vitamins in sesame seeds (vitamins A, E, and B) as fighting oxidative and free radical damage that ruins and reduces cells and tissues (Shittu *et al.,* 2007). This is betters the health of the poultry thus, increases its feed intake what satisfies the primary and essential needs of metabolism resulting in an increase in weight gain and a decrease in mortality percentage all over the rearing period with the best feed conversion.

Mortality Percentage

The poultry were not subject to mortality percentages above the normal levels due to the good management and healthy program that harmonize with the geographical environment of the rearing hall and protect against the diseases and epidemics that spread during the rearing period. So this characteristic understudy did not have an effect on the total production performance as it was within the normal range (1.5%).

Conclusion

1. We can use sesame seeds in broiler rations as an alternative for a considerable ratio of soybeans (as a protein source) to get the same level of productive performance of the poultry as the protein of sesame seeds is characterized by a great vital value.
2. We can replace sesame seeds in broiler rations as a source of energy with the ration adopted in the experience (does not exceed 25%) instead of using plant oils or animal fats which have negative side effects on the health of the bird on the first place and on the health of the consumer as per the accumulative effect that concurs with the continuous consumption of broiler products.
3. A helping factor in replacing sesame seeds in broiler rations is the seeds' delicious taste besides their being rich in minerals, calcium, phosphor, and zinc which are essential in building the skeleton and muscles of the bird's body.
4. Sesame seeds contain antioxidant substances which are natural preservatives such as Sesamolin and poisonous substances which repel insects known as Sesamin. Such substances limit or prevent the usage of chemical substances as ration additives which have negative effect on the health of the bird and the consumer and which increases the costs of manufacturing and producing the rations.
5. The good price and availability of sesame seeds in our production environment around the year saves financial costs which is favorable to the breeders and producers what leaves a positive effect on the purchase power parity and the income of the consumer and increases the chance of competence with the imported products of white meat in general.

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