Effect of adding different levels of Soybean Peptides on productive performance of Quail.

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Abstract

The experiment was conducted conducted in the poultry farm of the College of Agriculture, Department of Animal Production, Tikrit University. to study the effect of adding biologically active soybean peptides to quail feed (Coturnix coturnix) on several production traits during the growth and egg production stages. In first part (72) quail birds were used and raised until they reached 42 days of age, after which they began egg production. They were randomly distributed into four treatments, with three replicates in each treatment and five birds in each replicate. The birds were fed a basal diet supplemented with soybean peptide powder. T1 was the control treatment (without any addition), T2 (1 g peptides/kg feed), T3 (2 g peptides/kg feed), and T4 (3 g peptides/kg feed). The results showed that both live body weight and carcass weight significantly increased in all soybean peptide supplementation treatments (P≤0.05), while the dressing percentage did not record any significant differences. As for the weight of the internal parts , the weight of the heart and gizzard recorded a significant superiority, while the weight of the liver, intestines, and testes did not show any significant effect. As for the productive traits in the egg production stage, the fourth treatment (3 g peptides / kg feed) was significantly improvement (P≤0.05) in the egg weight, egg mass, egg production, feed consumption rate and feed conversion ratio compared to other treatments .

Key words: Soybean Peptide, egg, quail

Introduction

The increase in the world's population over the past years has increased human need for protein. This has led to the industrial breeding of livestock and poultry, which are considered high sources of protein. Their meat can be consumed by humans. Poultry production is considered the fastest-growing source of protein in all countries of the world, including quail, due to its distinctive characteristics, such as rapid growth, early sexual maturity, short intergenerational intervals, high breeding density per unit area, lower susceptibility to some poultry diseases, a rapid return on investment in such projects, and a high capacity for food conversion efficiency ,(1). The quail was domesticated in the Arab region and from there spread to the rest of the world (2) . Quail is one of the smallest domestic

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birds and has a market among consumers, contributing to the diversity of meat production. The largest countries producing quail meat are the United States, Italy, and Spain (3) . Quail meat is a healthy food that is beneficial to the body because it contains essential amino acids and polyunsaturated fatty acids, minerals and vitamins, and is low in cholesterol and fats. All of these features increase the nutritional value of the meat (4) . Since nutrition constitutes a high percentage of the poultry projects costs which about , 60-70%, due to the high prices of protein used in the feed, which is considered important for the good growth of the birds, in addition to other grains used in the feed, modern feeds and food additives are manufactured at reasonable prices in order to meet their nutritional needs. However, there is a need for more research to determine whether these feeds contain the nutritional elements that meet the needs of birds. Or there is a need for other nutritional additives to enhance various body functions (5) . Antibiotics used in poultry feed, which are considered growth promoters, have become banned in many developed countries, because bacterial strains resistant to antibiotics have emerged, and also the accumulation of residues of these antibiotics in food products is the reason that limits the use of these antibiotics as growth promoters (6) . Therefore, the trend has begun to find new nutritional additives that are of plant origin as an alternative, environmentally friendly growth promoter that works to improve the productive performance of birds, as adding peptides is considered one of the proposed alternatives in bird nutrition. In recent years, there has been great interest in the role of peptides in poultry nutrition. These peptides extracted from animal or plant protein sources, which provide biological functions and vital properties that are of high nutritional value, are called bioactive peptides (7) . Plant protein sources, especially soybeans, often contain Anti-nutritional and growth-inhibiting factors reduce their use as protein sources in poultry feed (8) . However, soybeans have been processed through manufacturing processes using enzymatic or microbial hydrolysis, which not only ferments proteins but also helps remove inhibitory and anti-nutritional factors in protein components. Multiple studies have reported that peptides produced from the enzymatic hydrolysis of proteins and added to poultry feed have achieved good and effective results in terms of feed utilization efficiency and feed conversion efficiency, as well as improved digestion and absorption in the intestine (9) . These features have been a major incentive for researchers to use biologically active peptides to enhance immunity in birds and improve the digestion of nutrients in poultry feed (10) . Biologically active peptides consist of 2–100 amino acids and are extracted from a variety of living sources, including microbes, insects, invertebrates, plants, amphibians, birds, fish, and mammals (11). Bioactive peptides are defined as short chains of amino acids, usually consisting of 2-20 essential amino acids, with specific biological properties that affect vital

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processes in living organisms. These peptides can be part of the protein or exist in a free form, and can be obtained through enzymatic, chemical, or bacterial fermentation (12) . Bioactive peptides can also be defined as protein fragments composed of amino acids extracted from soybean proteins, which can be released and activated by enzymatic, chemical, or bacterial degradation, after which they interact to become biologically active to regulate physiological activities in the body (13). The research aims to study the effect of adding soybean peptides on the productive performance of quail Coturnix coturnix during the growth and egg production stages.

Materials and Methods

This study was conducted at the poultry farm of the, of Animal Production Department, College of Agriculture Tikrit University. The first part of the experiment (growth stage) used 72 quails, obtained from a private hatchery in Nineveh Governorate . Upon reaching two weeks of age, the birds were randomly distributed into four treatments in cages measuring 50 x 40 x 50 cm, prepared for this purpose. Each treatment included three replicates, each cage(replicate) containing six birds. ,

The first treatment (T1) was the control treatment, without the addition of soybean peptides.

The second treatment (T2), The third treatment (T3), The fourth treatment (T4) were used soybean peptides in the amount (1,2and 3) g/kg of diet .

Feed and water were provided to the birds ad libitum. Soybean peptides were mixed manually for each treatment according to the proportions added to them with a small amount of feed and then with a larger amount in order to completely homogenize the quantity with the feed. This process was carried out every week. The feed was purchased ready-made from the local market (Middle East Feed Production Factory) to feed the birds. The feed provided to the birds provided the nutritional elements shown in Table (1) which was used until the end of age of the study . The soybean bioactive peptide used was produced by Vanavaran Novin Joestar in Tehran, Iran, and the peptides were in the form of a yellow powder. Six weeks after the start of the experiment, three birds from each treatment were slaughtered. They were weighed before and after the butchering process to measure live body weight and carcass weight to calculate the dressing percentage. The weights of the testes, heart, liver, gizzard, and intestines were also calculated. For the egg production stage, Second part ofexperment 60 female quail were used, divided into four treatments, with three replicates in each treatment, each replicated containing five female quail. The same peptide concentrations were given to the (growth) stage. Were used ror the egg production stage 42 days of age and above, the growth diet was replaced with the production diet manufactured in the poultry field feed laboratory of the College of Agriculture, Tikrit University (Table (2.(

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Hen Day Production (PDH%), weekly feed consumption of birds, average egg mass, average egg weight and feed conversion ratio for egg production were calculated. Statistical analysis of the results of the two experiments was carried out using a completely randomized design (CRD), and the General Linear Model method was used within the statistical program SAS .(14) to study the effect of factors, and Duncan's test(15) was carried out.

Table (1) shows the chemical composition of growth feed for quails.

Me (kcal /kg feed)	2950
Crude protein(%)	23
Crude fat(%)	5.2
Crude fiber (%	3.2
lysine	1.31
Methionine%	0.45
Methionine + cysteine (%)	0.85
Available phosphorus (%)	0.44
Sodium	0.16
Calcium	0.85
CL (%)	0.20
Potassium (%)	0.74
Calcium: phosphorus	2:03:
Ash	7.1
Moisture	11

Table (2) shows the proportions and chemical composition of the egg production feed for quails.

Feed Ingredients	**%**
Yellow Corn	59.05
Soybean Meal (44%)	29.55
*Premix	2.5
Sunflower Oil	0.25
Dicalcium Phosphite	0.350
Limestone	8
Table Salt	0.3

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Total	100
Calculated Chemical Composition**	
Metabolizable Energy (kcal/kg Feed)	2800
Crude Protein (%)	20
Lysine (%)	1.16
Methionine (%)	0.43
Methionine + Cysteine (%)	0.74
Calcium (%)	3.2
Available Phosphorus (%)	0.42

*

Each kg of premix contains 4,000 IU Vitamin D3, 200,000 IU Vitamin A, 10 mg B1, 25 mg B6, 100 mg B2, 30 mg B12, 100 mg Biotin, 120 mg Manganese, 100 mg Copper, 100 mg Iron, 800 mg Zinc, 30 mg Vitamin K, 3 mg Cobalt, 15 mg Iodine, 5,000 mg Choline Chloride, 600 mg Nicotinic Acid, 150 mg Pantothenic Acid, and 10 mg Folic Acid.

**Chemical analysis of feed ingredients according to NRC (16.(

Results and discussion

Table (3) shows the effect of adding soybean peptides to quail feed on body weight, carcass weight, and dressing percentage at six weeks of the experiment. Results showed a significant difference ($P \leq 0.05$) in live and carcass weight. The second, third, and fourth peptide supplementation treatments, at levels of 1, 2, and 3 g peptides/kg feed, significantly increase in contrast with the control treatment (without supplementation). However, no significant differences were recorded in dressing percentage across all experimental treatments. The reason for the improved carcass weight was attributed to the important role of soybean peptides, as they activate the enzyme tyrosine, which in turn digests and breaks down proteins, facilitating the absorption and full utilization of nutrients in the intestine. This leads to the growth and development of body tissues (17) . The significant superiority of carcass weight in quails fed a diet supplemented with soybean peptides at varying levels may be attributed to its association with body weight. Therefore, this increase is normal, as there is a direct correlation between carcass weight and live body weight , The improved carcass weight is also due to the important role of soybean peptides, as they activate the enzyme tyrosine, which in turn digests and breaks down proteins, facilitating the absorption and full

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utilization of nutrients in the intestine. This leads to the growth and development of body tissues (17.(

Table 3. Effect of adding soybean peptides on live weight carcass weight and dressing percentage of quail (mean ± standard error(

Treatment	Parameters		
	Live Weight (g)	Carcass Weight (g)	Dressing %
T1 Control	173.32± 2.84 b	112.34± 3.48 b	64.64± 1.33
T2 1g (SBP) /kg diet	193.00± 5.56 a	126.00± 5.03 a	65.31± 0.88
T3 2g (SBP) /kg diet	195.64± 1.45 a	125.31± 1.20 a	64.00± 0.00
T4 3g (SBP) /kg diet	193.00± 3.78 a	124.63± 0.88 a	64.65± 1.66
P-value (0≤0.05	*	*	NS

Different letters within each column indicate a significant difference in level (P≤0.05(

The results of the statistical analysis shown in Table (4) showed that there was no significant difference in the weight of the intestine, liver and testicles, while the heart weight recorded a significant superiority for the fourth treatment (3 g peptides/kg feed) at the level (P≤0.05) over the second and third treatments (1 and 2 g peptides/kg feed). As for the gizzard weight, the third treatment significantly outperformed the second treatment, while the third treatment did not

record any significant difference with the first and fourth treatments. These results are in agreement with (18) when they obtained a significant difference in the gizzard weight when adding soybean peptides and vitamin E to broiler feed. Contrary to our results,(19) did not record any significant effect in their experiment on the weight of the heart and gizzard when using cottonseed peptides in broiler feed.

Table (5) shows that there are significant differences when adding soybean peptides to quail feed in some production traits in the egg production stage, as the results of the statistical analysis of the egg weight trait showed that there is a significant difference between the experimental treatments, as the fourth treatment (3 g peptides/kg feed) was

significantly superior at the level (P≤0.05) to the first treatment (without addition) and the second (1 g peptides/kg feed), while the fourth treatment did not record any significant difference with the third treatment (2 g peptides/kg feed). As for the egg production rate, the addition treatments were significantly superior at the level (P≤0.05) to the control treatment. While the third and fourth treatments significantly outperformed the control treatment in terms of egg mass, the fourth treatment outperformed all other experimental treatments in terms of weekly feed consumption. The control treatment significantly improved its feed conversion ratio (P≤0.05) compared to the third and fourth treatments. The reason for the improved feed conversion ratio during the egg production stage is likely that the addition of peptides prevents the oxidation of fatty substances in the feed and increases the bioavailability of food. This, in turn, increases the nutritional requirements for egg production and increases the efficiency of absorption of essential nutrients and the entry of balanced amino acids into the portal vein via intestinal transport, unlike free amino acids (20). The reason for the increased egg production rate may be that this trait is linked to the availability of essential amino acids and their utilization

The significant superiority in egg production percentage may be due to the high content of soybean peptides, which contain essential amino acids necessary for growth and egg production. Due to their high biological activity as an antioxidant in feed, they work to prevent lipid oxidation and protect lipoproteins. This results in the availability of these substances, resulting in faster maturation of ovarian follicles compared to birds fed peptide-free feeds (control treatments). This is because the liver is the site of lipoprotein synthesis in laying hens (21 .(

The significant improvement in egg mass in treatments supplemented with soybean peptides is due to increased egg weight and egg production, as both traits are directly proportional to egg mass. This is due to the peptides' high content of essential amino acids and increased protein metabolism to meet the hens' egg production requirements. This is also due to the balanced amino acids in the feed and improved feed conversion ratio (20.(

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Table 4. Effect of adding soybean peptides on the weight of internal parts (g) of quail

Treatments	Parameters				
	Intestine(g)	Liver(g)	Heart (g)	Gizzard(g)	Testicles(g)
T1 Control	10.00± 1.00	3.73± 0.36	1.81± 0.02 **ab**	4.69± 0.16 **ab**	5.03± 0.54
T2 1g (SBP) /kg diet	9.34± 0.88	3.49± 0.39	1.59± 0.07 **c**	4.31± 0.46 **b**	4.73± 0.07
T3 2g (SBP) /kg diet	10.32± 1.45	3.82± 0.17	1.71± 0.04 **bc**	5.32± 0.03 **a**	5.17± 0.64
T4 3g (SBP) /kg diet	9.30± 0.33	3.64± 0.59	1.94± 0.02 **a**	4.72± 0.14 **ab**	5.28± 0.78
P-value (0≤0.05	NS	NS	*	NS	NS

Different letters within each column indicate a significant difference in level (P≤0.05.(

Table 5. Effect of soybean peptide supplementation on egg production traits in quail

Treatments	Parameters				
	Egg Weight	Egg Production	Egg Mass	Feed Consumption	Feed Conversion Ratio
T1 Control	11.65± 0.43 **b**	66.25± 1.77 **b**	7.71± 0.27 **b**	163.75± 1.18 **c**	21.28± 0.86 a
T2 1g (SBP) /kg diet	11.92± 0.33 **b**	82.00± 5.05 **a**	9.80± 0.84 **ab**	173.63± 1.64 **b**	18.00± 0.86 ab
T3 2g (SBP) /kg diet	12.70± 0.46 **a**	81.09± 3.37 **a**	10.28± 0.16 **a**	175.91± 2.34 **b**	17.11± 0.09 b
T4 3g (SBP) /kg diet	13.35± 0.16 **a**	84.41± 0.71 **a**	11.27± 0.16 **a**	185.64± 3.84 **a**	16.47± 0.35 b
P-value (0≤0.05		*	*	*	*

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.Different letters within each column indicate a significant difference in level (P≤0.05.(

Conclusion

:We conclude from this study that adding different levels of soybean peptide powder to the feed during quail care for a period that included two stages (fattening and egg production) gave very positive results in the productive performance traits, and when the percentage increased, the results were better.

References

[1]
Singh, S. K. 2008. Studies on the effect of floor space on growth, production and reproduction traits of Japanese quail (coturnix coturnix japonica) under different systems of management M.V.Sc thesis, B. A. U.,Ranchi(Jharkhand . .(

[2]Marsh, A. F., . 1976. Quail manual. 3rd. ed. Marsh from publication. U. S. A. (cited from Al-Obaidi 1999 .(

[3]Ikhlas ,B. N. Huda, and I. Noryati . 2011. "Chemical composition and physicochemical properties of meatballs prepared from mechanically deboned quail meat using various types of flour," International Journal of Poultry Science, vol. 10, no. 1, pp. 30–37

[4] Tavaniello,S. 2013. Effect of cross-breed of meat and egg line on productive performance and meat quality in Japanese quail (Coturnix japonica) from different generations .

[5] Hasted, T. L., Sharif, S., Boerlin, P., and Diarra, M. S. (2021). Immune stimulatory potential of fruits and their extracts in poultry. Frontiers in Immunology, 12, 1634

[6] Muhammad, J., Khan S., Su J. Q., Hesham A. E. L., Ditta A., Nawab J., and Ali A. (2020). Antibiotics in poultry manure and their associated health issues: A systematic review. Journal of Soils and Sediments 20 (1),486-497.

[7]Bhandari, D., S. Rafiq, Y. Gat, P. Gat, R. Waghmare, and V. Kumar. 2020. A review on bioactive peptides: Physiological functions, bioavailability and safety. International Journal of Peptide Research and Therapeutics, 26, 139-150 .

[8]McCalla, J., T. Waugh, and E. Lohry .2010. Protein hydrolysates/peptides in animal nutrition. Protein Hydrolysates in Biotechnology, 179-190.

[9] Abdollahi MR., F. Zaefarian, Y. Gu, W. Xiao, J. Jia, and V. Ravindran . 2017. Influence of soybean bioactive peptides on growth performance, nutrient utilisation, digestive tract development and intestinal histology in broilers. Journal of Applied Animal Nutrition, 5:1–7 .

ISSN 2072-3857

[10] Osho, S. O., W. W. Xiao, and O. Adeola . 2019. Response of broiler chickens to dietary soybean bioactive peptide and coccidia challenge.PoultryScience,98(11),5669-5678 .

[11] Jenssen, H., P. Hamill, and R. E. W. Hancock . 2006. Peptide antimicrobial agents. Clinical Microbiology Reviews, 19(3), 491–511 .

[12] Bravo, F. I., E. Calvo, R. A. , López-Villalba, C. Torres-Fuentes, B. Muguerza, A. García-Ruiz, and D. Morales . 2023. Valorization of chicken slaughterhouse byproducts to obtain antihypertensive peptides. Nutrients, 15(2), 457 .

[13] Gregory, G., A. P. F. Correa, F. F. Veras, and A. Brandelli . 2016 Bioactive peptides in buffalo whey hydrolysates. In XXV Food Science and Technology Brazilian Congress (CBCTA) and the 10th CIGR Section IV International Technical Symposium, held between 24th–27 th October .

[14] SAS. (2004). SAS Users Guide: Statistics Version 6th ed., SAS Institute Inc. , Cary, NC

[15]Duncan, D. B. (1955). Multiple range and multiple F test Biometrics. 11: 1 – 42.

[16]NRC National Research Council. (1994). Nutrient requirement of poultry, 9th ed, National Accad. press . Washington, DC NAS, pp. 155 .

[17]Nie, C., W. Zhang, W. Ge, Y. Wang, Y. Liu, and J. Liu .2015. Effects of fermented cottonseed meal on the growth performance, apparent digestibility, carcass traits, and meat composition in yellow-feathered broilers. Turkish Journal of Veterinary and Animal Sciences, 39(3): 350-356 .

[18] Saadoon,W.H.and R.J. Abbas. 2023. Physiological, immunological and microbial effects of soybean bioactive peptides and vitamin E supplementing to broiler diet. Animal Production Department, College of Agriculture, University of Basrah, Basrah, Iraq. Acta Scientiarum. Animal Sciences, v. 46, e68305, 2024 .

[19] Landy, N., and F. Kheiri . 2021. Evaluation of cottonseed bioactive peptides supplementation on performance, egg quality, and total antioxidant activity of serum in laying hens. Bulletin of the National Research Centre, 45: 1-7 .

[20]Hou , Y., Z. Wu , Z. Dai , G. Wang and G. Wu . 2017. Protein hydrolysates in animal nutrition: Industrial production, bioactive peptides, and functional significance. Journal of Animal Science and Biotechnology, 8(24): 1-13 .

[22] Klasing , K.C. 1998. Lipids. In: Comparative Avian Nutrition. CAB International. Wallingford. Oxon OX108 DE. UK. pp: 171-200.

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