Original Article

Effect of Dietary Supplementation of *Silybum marianum* and Artichoke (*Cynara scolymus* L.) on Japanese Quail's Carcass Characteristics, Oxidative Stability, and Quality of Breast Meat

Fatemeh Salehi[1], Razieh Partovi[1], Saeed Seifi[2*]

1. Department of Food Hygiene, Faculty of Veterinary Medicine, Amol University of Special Modern Technologies, Amol, Iran.
2. Department of Clinical Sciences, Faculty of Veterinary Medicine, Amol University of Special Modern Technologies, Amol, Iran.

Use your device to scan and read the article online

How to Cite This Article Salehi, F., Partovi, R., & Seifi, S. (2024). Effect of Dietary Supplementation of *Silybum marianum* and Artichoke (*Cynara scolymus L.*) on Japanese Quail's Carcass Characteristics, Oxidative Stability, and Quality of Breast Meat. *Iranian Journal of Veterinary Medicine, 18*(1), 87-96. http://dx.doi.org/10.32598/ijvm.18.1.1005318

http://dx.doi.org/10.32598/ijvm.18.1.1005318

ABSTRACT

Background: Herbs possess a large amount of antioxidants; thus, using them in the poultry diet can improve the quality of final products.

Objectives: This study investigated the effects of dietary supplementation of artichoke, *Silybum marianum*, and their mixture on Japanese quail's carcass characteristics, oxidative stability, and breast meat quality.

Methods: A total of 120 one-day-old Japanese quail were studied in a completely randomized design with 4 experimental treatments (0%, 1.5% artichoke, 1.5% *S. marianum*, 1.5% mixture of artichoke and *S. marianum*). Each treatment consisted of 3 replicates of 10 birds. At the end of the experiment (day 42), the carcass characteristics of the birds were recorded, and the physical characteristics, chemical composition, color, and oxidative stability of breast meat were evaluated.

Results: The results showed no significant difference among the experimental groups regarding pH, dry matter, ash, drip loss, and cooking loss. Dietary enrichment with artichoke and *S. marianum* caused a decrease in the mean body weight in the experimental treatments compared to the control group ($P<0.05$). Dietary supplementation with herbal powders increased the crude protein and fat content of breast meat, and group 4 (artichoke+*S. marianum*) had a higher mean than other groups ($P<0.05$). The hardness of breast meat in the treatment groups has decreased compared to the control group. Compared to the control group, the amount of lightness in the treatments has reduced, and redness and yellowness have increased. TBARS (thiobarbituric acid reactive substances) index showed a significant decrease in the investigated treatments compared to the control group ($P<0.05$).

Conclusion: Dietary supplementation of *S. marianum* and artichoke improved nutritional value and increased oxidative stability of breast meat in Japanese quail. However, they adversely affected birds' weight gain and feed consumption.

Keywords: Artichoke, Dietary enrichment, Meat quality, Oxidative stability, *Silybum marianum*

Article info:
Received: 05 Mar 2023
Accepted: 15 May 2023
Publish: 01 Jan 2024

*** Corresponding Author:**
Saeed Seifi
Address: *Department of Clinical Sciences, Faculty of Veterinary Medicine, Amol University of Special Modern Technologies, Amol, Iran.*
Phone: *+98 (11) 44271057*
E-mail: *s.seifi@ausmt.ac.ir*

Introduction

One of the main concerns of poultry meat producers is to optimize meat both qualitatively and quantitatively (Sabow et al., 2021). Several factors contribute to meat quality, including breeding, genetics, environment, slaughtering procedures, as well as age, sex, feeding, and density of birds. Poultry meat is highly nutritional and contains large amounts of protein, essential unsaturated fatty acids, and minerals. In addition, poultry meat fat contains more unsaturated fatty acids than other animals, making it prone to lipid oxidation (Amaral et al., 2018).

Poultry meat is a perishable product due to its carbohydrate, protein, lipid, and water content, so its preservation must follow specific standards to maintain its quality until final consumption (Cartoni Mancinelli et al., 2022). Today, consumers look for characteristics such as color, taste, juiciness, crispness, and proper appearance in meat (Amaral et al., 2018). Nowadays, changes in human lifestyle due to consuming prepared and fatty foods (fast foods) have increased metabolic and cardiovascular diseases. Therefore, special attention is paid to the research on reducing the amount of fat-cholesterol and significantly modifying the fatty acid composition of animal products such as meat (Cartoni Mancinelli et al., 2022).

Quail production has found a special place in the poultry industry recently. Features such as short life cycles, high disease resistance, no need for multiple vaccinations (Ramankevich et al., 2022), small size, low nutritional needs, and short incubation period have attracted farmers' attention for raising this bird. Quail meat is useful for all age groups because it contains many nutrients, including protein, vitamin B6, thiamin, niacin, pantothenic acid, and riboflavin. Breast meat of Japanese quail is a vital source of vital nutrients, including essential amino acids and unsaturated fatty acids. Factors such as rapid growth rate and high resistance to diseases have made this bird a suitable model for nutritional research (Shah et al., 2014).

Due to public concerns about the possible effects of drug residues and antibiotic resistance, a new strategy of feeding animals with bioactive components has been set off (Nateghi et al., 2013). A diet supplemented with natural substances such as medicinal plants with antioxidant properties is believed to help maintain meat quality and increase its shelf life. Many recent studies have shown that herbs and spices are valuable and safe additives to improve poultry health and growth rate (Sabow et al., 2021).

Artichoke (*Cynara scolymus* L.) is a member of the Asteraceae family, widely grown in the Mediterranean region. It has been used since ancient times as a medicine to treat liver problems and indigestion (Nateghi et al., 2013). This plant is rich in natural antioxidants and is of great value, containing compounds such as flavonoids (lutein and apigenin) and polyphenols (cynarin and chlorogenic acid). Polyphenolic compounds have antioxidants, anti-tumor, and anti-microbial properties (Abbasi & Samadi, 2014).

Silybum marianum also belongs to the Asteraceae family, a therapeutic herb with a 2000-year history of use. This plant grows widely in the northern and southern regions of Iran. The most important flavonoids in *S. marianum* fruit are silybin, silychristin, and silydianin, collectively called silymarin. About 1.5% to 3% of bioactive components in *S. marianum* is silymarin, which protects the liver from toxic agents and helps in its regeneration (Janocha et al., 2021). Also, silymarin has antioxidant and anti-inflammatory properties and reduces blood cholesterol (Hosseinian et al., 2021).

The present study was carried out to investigate the effect of dietary enrichment with artichoke and *S. marianum* alone and their mixture on Japanese quail's carcass characteristics, oxidative stability, and quality of breast meat.

Materials and Methods

Experimental design

A total of 120 unsexed 1-day-old Japanese quail chicks were purchased from a local hatchery. The experiment employed a completely randomized design with 4 treatments (0%, 1.5% artichoke, 1.5% *S. marianum*, 1.5% mixture of artichoke and *S. marianum*) and three replicates (10 birds each). The birds had free access to water and food along with the trial. A basal diet was formulated to meet the nutrient recommendations for quail (NRC, 1994). At the end of the experiment (day 42), 12 birds from each treatment (4 birds per replicate) were weighed and humanely sacrificed, and factors such as live weight, carcass weight, breast muscle weight, and thigh muscle weight were recorded. The breast muscle was placed in polyethylene bags within a refrigerator for further tests.

Physical characteristics of breast meat

To measure the pH value, 5 g of breast meat was homogenized with 25 mL of distilled water in a Stomaker, and after filtering, the pH of each sample was measured at room temperature with a pH meter (Jenway 3505, Staffordshire,

England) (Mehri et al., 2015). For the determination of drip loss, the weight loss of meat after 24 hours at 4°C was calculated as a percentage. To measure the cooking loss, a piece of breast meat was weighed and placed in a water bath (Memmert, WNB14, Germany) at a temperature of 75°C for 1 h. Then, the sample was cooled at room temperature for 30 minutes. The difference between the weight of meat before and after this process is described as cooking loss (Pastorelli et al., 2016).

Chemical composition of breast meat

Breast meat samples' moisture, ash, protein, and fat values were assessed according to the Association of Official Analytical Chemists (AOAC) standard methods (AOAC, 2000a; AOAC, 2000b; AOAC, 2000c & AOAC, 2000d).

Meat textural characteristics

Breast meat's texture characteristics were evaluated using a texture analyzer (Texture Pro CTV1.2 Build 9, Brookfield Engineering Laboratories, Inc., MA, USA). The samples with an approximate thickness of 1 cm and a diameter of 3 cm were compressed to 50% of their original thickness at room temperature. The force-time deformation curve was drawn using a 25 kg cell load and a speed of 2 mm/s (Partovi et al., 2019).

Evaluation of meat color

The color of the quail breast meat samples was measured by considering the parameters (a*, b*, L*) with a colorimeter (Konica Minolta, CR 400, Japan). The parameter a* showed (redness), b* (yellowness), and L* (lightness) (AOAC, 2000a; AOAC, 2000b; AOAC, 2000c & AOAC, 2000d).

Phenolic compounds

The cupric ion reduction method was used to determine the amount of phenolic compounds (Vlaicu et al., 2022). This method reduces Cu(II) to Cu(I). The samples were mixed with $CuCl_2$ solution and neocuproine reagent in ammonium acetate buffer. Then, it was incubated for 20 min at 50°C, and the absorbance was read at 450 nm.

Carotenoid content

The meat was homogenized by a homogenizer (Omni International, THP 115, USA) to determine the carotenoid level. This calculation was done based on the standard curve of β-carotene and at 470 nm using a spectrophotometer (PG Instruments Ltd, T80 UV-Vis, England). The concentration of carotenoid pigments was obtained using a standard curve calculated using a commercial carotene reagent (Partovi et al., 2020).

Vitamin E

To measure the amount of vitamin E, 10 mg of breast meat was homogenized in a homogenizer (Omni International, THP 115, USA). Then, the samples were exposed to iron (Fe^3) solution, 2,4,6-tripyridyl–s-triazine, and acetate buffer (pH=4). The standard curve was prepared with appropriate concentrations of vitamin E. The absorbance of the samples was read at 595 nm (Shah et al., 2014).

Lipid peroxidation

Two grams of breast muscle were mixed with 5 mL of 20% trichloroacetic acid solution in a blender for 2 minutes, then the container was washed with 5 mL of distilled water and added to the previous mixture. Finally, the whole mixture was filtered with Whatman No. 41 filter paper with a diameter of 9 cm. Five milliliters of filtered extract (breast muscle trichloroacetic acid extract) was mixed with 5 mL of 0.01 M thiobarbituric acid solution in a test tube and placed in a 100°C bath for 1 h to develop color. The resulting color was read at a wavelength of 532 nm (Amaral et al., 2018).

Statistical analysis

The Shapiro-Wilk test was performed to check the normality of the data, and Levene's test was performed to check the equality of variances. Parameters related to carcass characteristics, oxidative stability, and breast meat quality in Japanese quail were analyzed using a one-way ANOVA parametric test. If there was a significant difference between the means, Tukey's post hoc test was used to compare them. The results were expressed as the Mean±SD. Data analysis was done using SPSS software, version 26 (SPSS Inc., Chicago, IL, USA). A $P<0.05$ was considered significant in all analyses.

Results

Table 1 presents the effects of using artichoke and *S. marianum* and their mixture in a quail diet on final weight, breast, and thigh muscle weight. The difference between the average live weight in the control and other groups is statistically significant ($P<0.05$). Breast and thigh weight was significantly higher in the control group compared to other groups ($P<0.05$), but no significant difference was seen among the treatment groups.

Table 1. Effects of dietary supplementation with artichoke and *S. marianum* on carcass characteristics of Japanese quail

Variables	Mean±SD				P
	Group 1	Group 2	Group 3	Group 4	
Final weight (g)	199.88±1.50[a]	162.00±8.94[b]	164.80±6.26[b]	168.00±18.00[b]	0.001
Breast weight (g)	29.20±1.34[a]	21.80±1.78[b]	22.20±1.09[b]	23.20±1.78[b]	0.001
Thigh weight (g)	15.40±1.002[a]	12.00±1.41[b]	13.20±1.09[b]	13.20±2.28[b]	0.02

Note: Group 1: Control; Group 2: Artichoke (1.5%); Group 3: *S. marianum* (1.5%); Group 4: Artichoke+*S. marianum* (1.5%).

[a/b]Significant differences (P<0.05).

Table 2 indicates no significant difference among the studied groups regarding pH, dry matter, ash, drip loss, and cooking loss. The protein content of the treatment groups was significantly (P<0.05) higher than the control group, and the highest (20.08%) and the lowest (18.20%) contents were observed for T4 (group 4 treatment) and control, respectively. The breast meat fat content of the treatments was significantly (P<0.05) higher than the control group, and the highest amount of fat was found for T4 (9.90%). The hardness of breast meat in the treatment groups decreased compared to the control group, and a significant difference was observed between the control group and groups 3 and 4 (P<0.05). The L* value of the treatment groups was lower than that of the control, while the a* and b* values of the treatments were higher than those of the control.

As seen in Table 3, the use of artichoke and *S. marianum* in the diet caused a statistically significant difference between all groups in phenol and carotenoid levels (P<0.05), and the highest amount was seen in the *S. marianum* group. Vitamin E slightly increased in the treatment groups compared to the control group, however not significant (P>0.05). TBARS (thiobarbituric acid reactive substances) index showed a significant decrease in the treatments compared to the control group (P<0.05).

Table 2. Effect of experimental treatment on Japanese quail breast meat characteristics

Variables	Mean±SD				P
	Group 1	Group 2	Group 3	Group 4	
pH	6.30±0.36[a]	6.65±0.14[a]	6.52±0.14[a]	6.63±0.17[a]	0.08
Dry matter (%)	75.20±1.30[a]	75.50±0.60[a]	75.61±0.64[a]	74.99±3.52[a]	0.95
Ash (%)	1.52±0.32[a]	1.48±0.30[a]	1.68±0.14[a]	1.68±0.30[a]	0.56
Drip loss (%)	2.10±0.44[a]	2.23±0.57[a]	2.14±0.51[a]	2.31±0.30[a]	0.89
Cooking loss (%)	1.56±0.38[a]	1.90±0.55[a]	1.68±0.37[a]	2.55±0.84[a]	0.06
Crude protein (%)	18.20±0.05[b]	19.42±0.23[a]	19.64±0.11[a]	20.08±0.59[a]	0.001
Fat (%)	9.10±0.05[b]	9.69±0.12[a]	9.79±0.10[a]	9.90±0.11[a]	0.001
Hardness (N)	9.17±0.10[a]	8.93±0.15[a]	8.19±0.13[c]	8.55±0.34[b]	0.001
L*	64.73±0.17[a]	57.12±2.45[b]	58.60±0.53[b]	57.72±0.93[b]	0.001
a*	4.45±0.32[d]	6.12±0.22[a]	5.21±0.32[c]	5.69±0.13[b]	0.001
b*	12.40±0.16[d]	14.30±0.22[c]	16.07±0.19[b]	17.69±0.24[a]	0.001

Note: Group 1: Control; Group 2: Artichoke (1.5%); Group 3: *S. marianum* (1.5%); Group 4: Artichoke+*S. marianum* (1.5%).

[a,b,c,d]Significant differences (P<0.05).

Table 3. Effects of dietary supplementation with artichoke, *S. marianum* and artichoke+*S. marianum* on oxidative stability of Japanese quail breast meat

Variables	Mean±SD				P
	Group 1	Group 2	Group 3	Group 4	
Phenol (ppm)	77.85±1.52^{d}	866.16±10.01^{c}	1290.94±8.70^{a}	1163.30±55.38b	0.001
Carotenoid (ppm)	88.84±0.62^{d}	100.04±1.12^{c}	115.76±1.96^{a}	112.63±1.72^{b}	0.001
TBARS (mg MDA/kg)	0.33±0.01^{a}	0.18±0.01^{b}	0.17±0.01^{b}	0.18±0.02^{b}	0.001
Vitamin E (mg/100g)	0.58±0.02	0.63±0.03	0.63±0.03	0.62±0.02	0.06

TBARS: Thiobarbituric acid reactive substances.

Note: Group 1: Control; Group 2: Artichoke (1.5%); Group 3: *S. marianum* (1.5%); Group 4: Artichoke+*S. marianum* (1.5%).

^{a,b,c,d}Significant differences (P<0.05).

Discussion

The results indicate that artichoke and *S. marianum* powder have a negative impact on the growth of Japanese quail, which is in line with the results of Gharahveysi (2018), who reported that the use of *S. marianum* fruit in the diet causes weight loss in broiler chickens. Abbasi and Samadi (2014) noted that using artichoke does not affect the growth performance of Japanese quail. Melo and Harkes (2007) reported similar results when using artichokes in the diet. Schiavone et al. (2007) did not observe any effect of supplemental *S. marianum* on broiler chicken's weight gain and feed conversion ratio, which is consistent with the results of the present study. Similar to the current research results, Zaker-Esteghamati et al. (2021) stated that supplemental artichoke and *S. marianum* in broiler diets did not affect the performance.

However, some studies have reported that the supplementation of artichoke or *S. marianum* in the diet can improve performance (Janocha et al., 2021). The difference between various studies can be attributed to the conditions of the experiments and the type of substance used (powder or extract). The decrease in final weight in treatments 2, 3, and 4 can be caused by the reduction in feed consumption due to the change in the taste of the diet caused by the addition of artichoke and *S. marianum*. Moreover, another reason for reducing the final weight might be related to increased dietary fiber due to the use of artichoke or *S. marianum*. By increasing the amount of fiber in the diet, more of the consumed food is fermented, and as a result, the amount of energy required for growth and weight gain is reduced (Zdanowska-Sąsiadek et al., 2019).

The amount of pH, dry matter, ash, leachate loss, and loss from cooking breast meat was not affected by adding artichoke and *S. marianum* to the diet. Likewise, Samadi et al. (2016) reported that the dietary levels of artichoke leaf powder do not affect breast meat's pH and moisture content in Japanese quail. Abbasi and Samadi (2014) showed that using 1.5% and 3% levels of artichoke in Japanese quails did not affect the pH of breast and thigh meat, which is consistent with the present results. The amount of crude protein and fat in the treatment groups was significantly higher than that in the control group, and the highest amount was related to the mix of artichoke and *S. marianum*. Following a decrease in feed consumption, the feed passage rate through the digestive tract slows down, and the activity of pancreatic enzymes increases, thus increasing feed digestibility. This mechanism may increase the crude protein and fat in breast meat.

A higher shear force characterized the breast meat of the control group compared to the other groups. The lowest (P<0.05) shear force was found for the breasts of birds receiving the mixture of artichoke and *S. marianum*. These results support the findings of a previous study (Zdanowska-Sąsiadek et al., 2019), which reported that applying vegetable and herb mixtures improved meat physiochemical characteristics. Tenderness is one of the most essential properties of meat quality. Due to stress, muscle fibers are shrinking, which can directly affect the increase in meat hardness. Using herbs with strong antioxidant properties may reduce the effects of stress and improve meat tenderness (Shah et al., 2014).

All the color indexes of the treatment groups were significantly different from the control (P<0.05). The L* value of the treatment groups was lower than the control

group, while the a* and b* values were higher than the control group. The color of meat is one of the crucial factors in customer satisfaction with food products (Partovi et al., 2021). Various factors such as genotype, age, rearing conditions, and diet affect meat color. The change in meat color is due to the oxidation of red oxymyoglobin to metmyoglobin, which causes a brown color in the meat. Natural antioxidants increase redness and delay metmyoglobin formation, thereby preventing meat discoloration. Janocha et al. (2021) reported that the use of *S. marianum* seeds in feeding broiler chickens decreased the L*index and increased the a* and b* indexes in meat, similar to the results of the present study (Janocha et al., 2021).

The highest amount of phenol and carotenoid was seen in the *S. marianum* group, and all treatment groups showed a significant increase compared to the control group. Essential oils that contain phenolic compounds prevent oxidation by deactivating fat-free radicals and proxy radicals and increasing the reductive power. Polyphenols, having antioxidant properties, increase the shelf life of meat. Hajipour Dehbalayi et al. (2014) showed that thyme and oregano prevented the oxidation of meat fat due to their antioxidant properties. Also, Starcevic et al. (2015) stated that phenolic compounds reduce lipid oxidation. The positive effects depend on the phenolic compound used. Natural phenolic compounds range from simple molecules such as phenolic acids to highly polymerized compounds such as tannins and proanthocyanidins. Nabi et al. (2020) conducted studies on the effect of carotenoids in the poultry industry. They showed that carotenoids are another group of natural plant compounds with antioxidant properties, and birds cannot synthesize carotenoids in their bodies, so these pigments must be obtained through diet. Also, the use of carotenoid supplements in the diet of birds improves the performance and quality of their eggs and meat.

A study by Rajput et al. (2014) on the effects of carotenoids in the meat of broiler chickens under coccidiosis stress shows that these compounds can reduce the activity of free radicals produced by oxidative stress caused by coccidiosis. Results of the present study showed that dietary enrichment with artichoke and *S. marianum* increases the amount of vitamin E in breast meat, but this increase was not significant. Vitamin E is one of the soluble antioxidants in the cell membrane that prevents the oxidation of membrane phospholipids. Oxidation of meat reduces sensitivity to hydrolysis and reduces water storage between myofibrils. Senobar Kelati et al. (2012) showed that adding vitamin E to the diet increased this vitamin in meat and tissues, and vitamin E, which acts as an antioxidant in eliminating free radicals, caused oxidative stability and increased the duration of meat preservation and quality. Abbasi and Samadi (2014) reported that artichoke leaf powder does not improve oxidative stability, but vitamin E reduces oxidative degradation and increases oxidative stability.

Results showed that the TBARS index decreased significantly in all treatment groups compared to the control group. Malondialdehyde is the end product of lipid oxidation. According to the study by Samadi et al. (2016) on the effects of artichoke powder on the quality of Japanese quail breast and thigh meat, the amount of malondialdehyde, pH, water holding capacity, and moisture content of breast meat in Japanese quail was influenced by the dietary levels of artichoke powder and vitamin E. Still, the amount of malondialdehyde in thigh meat was significantly reduced. Hajipour Dehbalayi et al. (2014) conducted a study on the effect of thyme and oregano essential oil on the quality of Japanese quail meat. They concluded that these plants' essential oil positively affects the quality of quail meat and reduces the thiobarbituric acid index. Senobar Kelati et al. (2012) showed that the amount of malondialdehyde decreased significantly with the increase of vitamin E levels in the Japanese quail diet.

Conclusion

Dietary supplementation of artichoke and *S. marianum* improved breast meat's quantitative and qualitative characteristics in Japanese quail. Both plants improved the oxidative stability of breast meat in Japanese quail, and *S. marianum* was significantly better than artichoke in this regard.

Ethical Considerations

Compliance with ethical guidelines

The experimental protocol was approved by the Animal Care Committee of Amol University of Special Modern Technologies (Code: Ir.ausmt.rec.1400.16).

Funding

This research was financially supported by the Amol University of Special Modern Technologies.

Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflicts of interest.

Acknowledgments

The authors would like to thank the Amol University of special Modern Technologies for the support.

References

Abbasi, F., & Samadi, F. (2014). Effect of different levels of artichoke (Cynara scolymus L.) leaf powder on the performance and meat quality of Japanese quail. *Poultry Science Journal, 2*(2), 95-111. [DOI:10.22069/PSJ.2014.1959]

Amaral, A. B., da Silva, M. V., & da Silva Lannes, S. C. (2018). Lipid oxidation in meat: Mechanisms and protective factors - a review. *Food Science and Technology, 38*(1), 1-15. [DOI:10.1590/fst.32518]

AOAC. (2000a). *Official methods of analysis.* Gaithersburg: The Association of Official Analytical Chemists. [Link]

AOAC. (2000b). Official Method No. 960.39 - AOAC methods for fat determination. Gaithersburg: The Association of Official Analytical Chemists.

AOAC. (2000c). *Official method No. 942.05 - AOAC methods for ash determination official methods of analysis.* Gaithersburg: The Association of Official Analytical Chemists.

AOAC. (2000d). *Official Method No. 981.10 - AOAC methods for protein determination.* Gaithersburg: The Association of Official Analytical Chemists.

Cartoni Mancinelli, A., Mattioli, S., Twining, C., Dal Bosco, A., Donoghue, A. M., & Arsi, K., et al. (2022). Poultry meat and eggs as an alternative source of n-3 long-chain polyunsaturated fatty acids for human nutrition. *Nutrients, 14*(9), 1969. [DOI:10.3390/nu14091969] [PMID] [PMCID]

Gharahveysi, S. H. (2018). [Effects of milk thistle powder on performance, blood parameters and liver enzymes of broiler chickens (Persian)]. *Animal Production, 19*(4), 879-889. [DOI:10.22059/jap.2018.225325.623153]

Hajipour dehbalaei, S. H., Afsharmanesh, M., & Sami, M. (2014). [The effect of essential oils of thyme, oregano and their mixture on the quality of quail meat in comparison with the antibiotic virginiamycin (Persian)]. *Food Hygiene, 5*(4), 45-54. [Link]

Hosseinian, S. A., Abdi Hacheso, B., Nazifi, S., Hashemi Hazaveh, S. A., Hashemi Tabar, S. H., & Rezapoor, R. (2021). Cardioprotective and hepatoprotective activity of silymarin in broiler chickens fed on mash and pellet diets. *Iranian Journal of Veterinary Medicine, 15*(1), 104-121. [Link]

Janocha, A., Milczarek, A., & Pietrusiak, D. (2021). Impact of milk thistle (Silybum marianum [L.] Gaertn.) seeds in broiler chicken diets on rearing results, carcass composition, and meat quality. *Animals: An Open Access Journal from MDPI, 11*(6), 1550. [PMID] [PMCID]

Mehri, M., Sabaghi, V., & Bagherzade-kasmani, F. (2015). Mentha piperita (peppermint) in growing Japanese quails' diet: Serum biochemistry, meat quality, humoral immunity. *Animal Feed Science and Technology, 206*, 57-66. [DOI:10.1016/j.anifeedsci.2015.05.022]

Melo, J., & Harkes, R. (2008). Productive evaluation of broiler chickens consuming artichoke extract (Cynara scolymus L.) during the first three weeks of life. Retrieved: [Link]

Nabi, F., Arain, M. A., Rajput, N., Alagawany, M., Soomro, J., & Umer, M., et al. (2020). Health benefits of carotenoids and potential application in poultry industry: A review. *Journal of Animal Physiology and Animal Nutrition, 104*(6), 1809-1818. [DOI:10.1111/jpn.13375] [PMID]

Nateghi, R, Samadi, F., Ganji., F., & Zerehdaran, S. (2013). Hepatoprotective effects of Cynara scolymus L. extract on CCL_4 induced liver injury in broiler chickens. *International Journal of Agri Science, 3*(9), 678-688. [Link]

Partovi, R., Seifi, S., Pabast, M., & Babaei, A. (2019). Effects of dietary supplementation with nanocurcumin on quality and safety of meat from broiler chicken infected with Eimeria species. *Journal of Food Safety, 39*(6), e12703. [DOI:10.1111/jfs.12703]

Partovi, R., Seifi, S., Pabast, M., Mohajer, A., & Sadighara, P. (2020). Effect of dietary supplementation of nanocurcumin on oxidant stability of broiler chicken breast meat infected with Eimeria species. *Veterinary Research Forum, 11*(2), 159-163. [PMID]

Partovi, R., Seifi, S., Alian, S., & Nikpay, A. (2021). Appraisal of dietary prebiotic supplementation on meat properties and carcass characteristics of broiler chickens after experimental infection with eimeria species. *Iranian Journal of Veterinary Medicine, 15*(3), 346-357. [Link]

Pastorelli, G., Rossi, R., Ratti, S., & Corino, C. (2016). Plant extracts in heavy pig feeding: Effects on quality of meat and Cremona salami. *Animal Production Science, 56*(7), 1199-1207. [Link]

Rajput, N., Ali, S., Naeem, M., Khan, M. A., & Wang, T. (2014). The effect of dietary supplementation with the natural carotenoids curcumin and lutein on pigmentation, oxidative stability and quality of meat from broiler chickens affected by a coccidiosis challenge. *British Poultry Science, 55*(4), 501-509. [DOI:10.1080/00071668.2014.925537] [PMID]

Ramankevich, A., Wengerska, K., Rokicka, K., Drabik, K., Kasperek, K., & Ziemiańska, A., et al. (2022). Environmental enrichment as part of the improvement of the welfare of Japanese quails. *Animals, 12*(15), 1963. [DOI:10.3390/ani12151963] [PMID] [PMCID]

Sabow, A., Abdulla, N., & Ahmed, B. (2021). The carcass and meat quality characteristics of Japanese quail fed a diet supplemented with powdered Lactuca seriola leaves. *Potravinarstvo Slovak Journal of Food Sciences, 15*, 521-527. [Link]

Samadi, F., Abbasi, F., & Samadi, S. (2016). [Effect of dietary levels of Artichoke leaf powder on meat quality of thigh and breast and fatty acids profile of breast meat in Japanese quail (Persian)]. *Iranian Journal of Animal Sciences, 47*(1), 103-111. [DOI:10.22059/IJAS.2016.61661]

Senobar Kalati, H., Shams Sharq, M., Dastar, B., & Zerehdaran, S. (2012). [Effect of different levels of organic selenium and vitamin E on performance and meat quality in Japanese quail (Persian)]. *Iranian Journal of Animal Science Research, 4*(1), 8-16. [DOI:10.22067/IJASR.V4I1.13907]

Schiavone, A., Righi, F., Quarantelli, A., Bruni, R., Serventi, P., & Fusari, A. (2007). Use of Silybum marianum fruit extract in broiler chicken nutrition: influence on performance and meat quality. *Journal of Animal Physiology and Animal Nutrition, 91*(5-6), 256-62. [DOI:10.1111/j.1439-0396.2007.00701.x] [PMID]

Shah, M. A., Bosco, S. J., & Mir, S. A. (2014). Plant extracts as natural antioxidants in meat and meat products. *Meat Science, 98*(1), 21–33. [PMID]

Starčević, K., Krstulović, L., Brozić, D., Maurić, M., Stojević, Z., & Mikulec, Ž., et al. (2015). Production performance, meat composition and oxidative susceptibility in broiler chicken fed with different phenolic compounds. *Journal of the Science of Food and Agriculture, 95*(6), 1172-1178. [DOI:10.1002/jsfa.6805] [PMID]

Subcommittee on Poultry Nutrition. (1994). Nutrient Requirements of Poultry. Washington: National Research Council of the National Academies (NRC). [Link]

Vlaicu, P. A., Untea, A. E., Turcu, R. P., Saracila, M., Panaite, T. D., & Cornescu, G. M. (2022). Nutritional composition and bioactive compounds of basil, thyme and sage plant additives and their functionality on broiler thigh meat quality. *Foods, 11*(8), 1105. [DOI:10.3390/foods11081105] [PMID] [PMCID]

Zaker-Esteghamati, H., Seidavi, A., & Bouyeh, M. (2021). The effects of Cynara scolymus and Silybum marianum on growth, carcass and organ characteristics, immunity, blood constitutes, liver enzymes, jejunum morphology, and fatty acid profile of breast meat in broilers. *Food Science & Nutrition, 9*(12), 6692–6706. [PMID] [PMCID]

Zdanowska- Sąsiadek, Z., Lipi'nska-Palka, P., Damaziak, K., Michalczuk, M., Grzybek, W., & Kruzi'nska, B., et al. (2019). Antioxidant effects of phytogenic herbal-vegetable mixtures additives used in chicken feed on breast meat quality. *Animal Science Papers and Reports, 36*(4), 393-408. [Link]

مطالعه پژوهشی

تأثیر افزودن جیره‌ای گیاه خارمریم و آرتیشو بر ویژگی‌های لاشه، ثبات اکسیداتیو و کیفیت گوشت سینه بلدرچین ژاپنی

فاطمه صالحی[1]، راضیه پرتوی[1]، *سعید سیفی[2]

۱. گروه بهداشت مواد غذایی، دانشکده دامپزشکی، دانشگاه تخصصی فناوری‌های نوین آمل، آمل، ایران.
۲. گروه علوم درمانگاهی، دانشکده دامپزشکی، دانشگاه تخصصی فناوری‌های نوین آمل، آمل، ایران.

Use your device to scan and read the article online

How to Cite This Article Salehi, F., Partovi, R., & Seifi, S. (2024). Effect of Dietary Supplementation of *Silybum marianum* and Artichoke (*Cynara scolymus L.*) on Japanese Quail's Carcass Characteristics, Oxidative Stability, and Quality of Breast Meat. *Iranian Journal of Veterinary Medicine, 18*(1), 87-96. http://dx.doi.org/10.32598/ijvm.18.1.1005318

http://dx.doi.org/10.32598/ijvm.18.1.1005318

چکیده

زمینه مطالعه: گیاهان دارویی منبع مهمی از آنتی‌اکسیدان‌ها هستند و استفاده از آن‌ها در جیره طیور می‌تواند به بهبود ویژگی‌های محصول نهایی کمک کند.

هدف: این پژوهش به منظور بررسی اثر افزودن جیره‌ای گیاه آرتیشو، خارمریم و مخلوط آرتیشو و خارمریم بر ویژگی‌های لاشه، ثبات اکسیداتیو و کیفیت گوشت سینه بلدرچین ژاپنی انجام شد.

روش کار: تعداد ۱۲۰ قطعه بلدرچین ژاپنی یک‌روزه در قالب طرح کاملاً تصادفی با ۴ تیمار آزمایشی (سطوح صفر، ۱/۵ درصد آرتیشو، ۱/۵ درصد خارمریم و ۱/۵ درصد مخلوط آرتیشو و خارمریم) و سه تکرار (تعداد ۱۰ قطعه بلدرچین در هر تکرار) مورد مطالعه قرار گرفتند. در پایان آزمایش (روز ۴۲)، ۱۲ پرنده از هر تیمار (۴ پرنده از هر تکرار) وزن‌کشی و کشتار شدند و خصوصیات فیزیکی، شیمیایی، رنگ و ثبات اکسیداتیو مورد ارزیابی قرار گرفت.

نتایج: نتایج حاصل از این آزمایش نشان داد که ازنظر متغیرهای pH، ماده خشک، خاکستر، افت شیرابه و افت حاصل از پخت، اختلاف معناداری بین گروه‌های موردمطالعه دیده نشد. وزن سینه در تمام تیمارها نسبت به گروه کنترل کمتر بوده است (P<۰/۰۵). ازنظر میزان پروتئین و چربی، اختلاف معناداری بین گروه کنترل و تمام تیمارها وجود داشت و گروه آرتیشو+خارمریم میانگین بیشتری نسبت به سایر گروه‌ها داشت (P<۰/۰۵). میزان سختی گوشت سینه در گروه‌های تیمار نسبت به گروه کنترل کاهش یافته بود. میزان روشنایی در تیمارها در مقایسه با گروه کنترل کاهش و میزان قرمزی و زردی افزایش یافته بود. غنی‌سازی جیره با آرتیشو و خار مریم موجب ایجاد اختلاف آماری معنادار بین تمام گروه‌ها ازنظر میزان فنول و کاروتنوئید شد و در گروه خارمریم بیشترین میزان دیده شد. شاخص TBARS در تیمارهای موردبررسی نسبت به گروه کنترل کاهش معنادار نشان داد (P<۰/۰۵).

نتیجه‌گیری نهایی: غنی‌سازی جیره با گیاه خارمریم و آرتیشو موجب بهبود ارزش تغذیه‌ای و افزایش ثبات اکسیداتیو گوشت سینه بلدرچین ژاپنی شد. اگرچه آن‌ها اثرات نامطلوبی بر وزن‌گیری و مصرف خوراک پرندگان داشتند.

کلیدواژه‌ها: آرتیشو، غنی‌سازی جیره، کیفیت گوشت، ثبات اکسیداتیو، خار مریم

تاریخ دریافت: ۱۴ اسفند ۱۴۰۱
تاریخ پذیرش: ۲۵ اردیبهشت ۱۴۰۲
تاریخ انتشار: ۱۱ دی ۱۴۰۲

* **نویسنده مسئول:**
سعید سیفی
نشانی: آمل، دانشگاه تخصصی فناوریهای نوین آمل، دانشکده دامپزشکی، گروه علوم درمانگاهی.
تلفن: ۴۴۲۷۱۰۵۷ (۱۱) ۹۸+
رایانامه: s.seifi@ausmt.ac.ir

This Page Intentionally Left Blank