# Effect of adding marjoram and rosemary leaves powder to the diet of Japanese quail males on their meat quality

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## Abstract

The present study Was conducted in the quail field of the Agricultural Research Center - College of Agriculture - University of Basra to determine the effect of adding marjoram leaves and rosemary powder to the diets of Japanese male Breedat different ages of 70, 100 and 130 days. This study includes 10 treatments: T1 means basal feed without any addition (control), T2 means adding 5g of marjoram leaf powder per 1kg of feed from 1 day old until 21 days old, T3 means adding 5g of marjoram leaf powder per 1kg of feed from 22 days old until 42 days old, T4 means adding 5g of rosemary leaf powder per 1kg of feed from 1 day old until 21 days old, T5 means adding 5g of rosemary leaf powder from 22 days old until 42 days old, T6 means adding 2.5g of each of marjoram and rosemary leaf powder in 1kg of feed from 1 day old until 21 days old, T7 means adding 2.5g of each of marjoram and rosemary leaf powder in 1kg of feed from 21 days old until 42 days old, T8 means adding 5g of marjoram and rosemary leaf powder at a concentration of 1g from 1 day old One until the end of the experiment, T9 means adding 5 g of rosemary leaf powder per 1 kg of feed from one day old until the end of the experiment, and T10 means adding 2.5 g of each of marjoram and rosemary leaf powder to 1 kg of feed from one day old until the end of the experiment. Some qualitative and sensory tests were conducted on meat samples, and the study indicators showed a significant decrease ($p \leq 0.05$) in the percentage of loss during the cooking process when adding marjoram and rosemary leaf powder and their mixture compared to the control treatment, and an improvement in sensory attributes including (color, flavor, tenderness, juiciness, and overall acceptability) through raising the sensory evaluation scores of the judges compared to the control treatment.

**Keywords**: Japanese Quail, Rosemary, Marjoram, meat

## Introduction

The meat has a high value of Nutritional because it is considered as a main source of basic amino acid that is needed by Humans to build its tissues. Also, it is considered as a main source to B vitamin compound group and mineral elements

especially iron [1]. Considering meat chemical and Biological nature and being decayed due to oil oxidation and bacterial growth which both are considered the main influenced factors on the nutrition quality and vitality reduction. The oil oxidation leads to flavor and taste degeneracy for meat and its products, and all that lead to storage shortage [2]. The oxidant rancidity is considered the main reason for food decay such as meat and its products, and the resultant of unsaturated fatty acid dissolve and oxidant Cholesterol products that have a negative consequences on the consumer's health [3]. The bacterial contamination can cause health risks represented in the nutrition poising and perishing meat and followed by an economic loss consequences [4].

However, using many industrial preservatives widely in manufacturing meat products such as the industrial anti-Oxidants (BHT) that prevents Oxidation or Nitrate and Nitrite that has a certain role in preserving the meat's color and avoiding microorganisms' growth during meat preservation. But, regarding the health awareness grown among consumers for these additions that cause health risk consequences, the research was underwent in the last years for the vegetables origin for having anti-oxidant and antimicrobial effectiveness, and both sustained meat quality and the economic loss [5,6]. An examples of these additions: Marjoram plant, flavorings, colorings of multi-compounds of phenols and vitamins, amino acid and other food components that are available in vegetables, grains and seeds that could be used in food preservation because all are natural and considered as a human food [7,8 ,9]. In order to seize the meat deterioration status whether it was read or white meat, the medical plants and herbs can be used for their role in restoring prolongation and improving meat qualitative feature [10 ,11]. The research aims to determine the extent to which powdered marjoram and rosemary leaves (alone or together) contribute to improving the qualitative and sensory characteristics of Japanese quail meat at different ages compared to the control treatment (basic diets without additives).

## Material and Methods

### Birds management

The chicken has out inside the Battery cages (locally made), and they are consisted of three layers, and each layer is consisted of two cages The number of treatments is 10, distributed across 30 cages. Each treatment has 3 replicates, and each replicate contains 12 birds, The size of each cage is 45cm length, 70 cm width and 75cm high. Also, provided with plastic springs 4 Litters capacity. The feed were put in cylinder plastic feeding trough. The air fans were used to obtain a required ventilation. Both water and feed were available; no losses were recorded at the experiment.

### Nutrition

During the first three weeks, the birds were fed with feed includes 22.94 % of raw protein and 2948 kg/calorie, growth feed from the age of 22 to 42 days includes 21.61 % of raw protein and 2916 kg/calorie. The Feed was provided from feed plant at the college of Agriculture in Basra University. The birds were feed from the age of 42

days till the end of the experiment on the productive feed, that has included %20.03% of raw protein and 2904 kg/calorie .

**Treatments**

Ten experimental treatments were used, and distributed as hereunder:

1-The first Treatment (control).

2-The second treatment is by adding 5 g of Marjoram leaves powder at the age of 1 day till 21 days.

3- The third treatment is by adding 5 g of Marjoram leaves powder at the age of 22 days till 42 days.

4- The fourth treatment is by adding 5 g of Rosemary leaves powder at the age of 1 day till 21 days.

5- The fifth treatment is by adding 5 g of Rosemary leaves powder at the age of 21 day till 42 days.

6-The sixth treatment is by adding 2.5 g of each of Marjoram and Rosemary leaves powder at the age of 1 day till 21 days.

7- The seventh treatment is by adding 2.5 g of each of Marjoram and Rosemary leaves powder at the age of 22 days till 42 days.

8- The eight treatment is by adding 5 g of Marjoram leaves powder at the age of 1 till the end of the experiment.

9- The ninth treatment is by adding 5 g of Rosemary leaves powder at the age of 1 till the end of the experiment.

10- The tenth treatment is by adding 2.5 g of each of Marjoram and Rosemary leaves powder at the age of 1 day till the end of the experiment.

**Marjoram and Rosemary**

The Marjoram and Rosemary leaves powder were used after buying them from the local markets at wasit province. The chemical analysis was measured at the Seas science center in Basra University.

**The percentage of weight loss water loss**

Losses from meat samples during the cooking process of stored (frozen) meat were estimated for each period according to [10] at the Meat Science Laboratory, College of Agriculture, University of Basrah. Two samples were taken from each treatment, each weighing 5 g from a leg cut, and each was placed in a tightly sealed plastic bag. They were then cooked in a water bath at 70°C for 90 minutes. The liquid was then drained and stored in a refrigerator at 4°C for 24 hours. The samples were weighed after draining the liquid from their surfaces using filter paper, taking into account the loss percentages as shown below:

-Weight of sample before cooking

-Weight of sample after cooking

-Losses water loss= (%)

-Weight of sample before cooking.

**Sensory Testing**

Method [12] was followed at the Meat Science Laboratory, College of Agriculture, University of Basrah. The meat from each treatment was cut into small

pieces, approximately 3 $cm^3$ in size, from a leg cut, and then grilled in an electric oven at 200°C for 30 minutes. Sensory evaluation was conducted by a panel of experienced judges in the Animal Production Department to assess the samples in terms of color, freshness, flavor, juiciness, and overall acceptability based on the application's baseline scores.

**Statistical analysis**

The data were subjected to one-way analysis of variance (ANOVA) and a completely randomized design (CRD) was used to study the effect of different treatments on the studied traits, and the significant differences between the means were compared using Duncan's multiple range test. SPSS [13].

**Results and Discussion**

Table (1) refers to the influence and periods of addition of Marjoram and Rosemary leaves powder and their combination to the feed regarding color to the femur's meat sample of the cooked male carcasses during the three periods. Considering the table, there is a moral effect ($p \leq 0.05$) on this According to, whereas the color evaluation of the meat was risen in the addition coefficients to the Marjoram and Rosemary leaves powder and their combination comparing to the control coefficient. The color evaluation value of meat samples at the tenth coefficient was higher around 7.60, 7.70,8.18 consecutively for the three periods. While the evaluation degree in control coefficient was less value around 6.60, 6.80, 7.10 for the three periods consecutively due to the high sensory evaluation degree to the meat's color feature in the addition coefficients. But the natural anti-oxidant of the Marjoram a Rosemary was effective to provide protection to the meat membrane, and consequently the meat Myoglobin color will be late in formation through the meat color protection from oxidants [14].

Regarding the sensory evaluation value of flavor to the meat samples in the different experimental coefficients and the table, there is a moral effect ($p \leq 0.05$) on this feature. Whereas the evaluation degree of the meat's flavor was risen in the addition coefficients of the Marjoram and Rosemary leaves powder and their combination comparing to the control coefficient in the three periods. While the evaluation degree of flavor in control coefficient was less value (7.00, 7.24, 7.40) consecutively due to the color feature improvement in flavor in the light of the addition of Marjoram and Rosemary plants and the role of effective materials in it, and fatty anti-oxidation which reflects on this feature. The results were correspondent what Baker's referred to [15], that the meat treatment with vegetables extractions lead to flavor improvement .

Table (2) refers to the influence and periods of addition of Marjoram and Rosemary leaves powder and their combination to the feed regarding tenderness to the femur's meat sample of the cooked male carcasses during the three periods. Considering the table, there is a moral effect ($p \leq 0.05$) on this feature, whereas the tenderness evaluation of the meat was risen in the addition coefficients to the Marjoram and Rosemary leaves powder and their combination comparing to the

control coefficient. The tenderness evaluation value of meat samples at the tenth coefficient was higher around 7.60, 7.70,8.18 consecutively for the three periods. While the evaluation degree in control treatment was less value around 6.60, 6.80, 7.10 for the three periods consecutively due to the tenderness improvement at the treated meat samples with Alcoholic and water extractions of Marjoram plant, and this plant also contains many of the Alkaloids that can rise the pH that will help keeping the water and increase tenderness [16].

**Table (1):** Effect of adding marjoram and rosemary powder to the feed on some sensory evaluation traits of Japanese male quail at ages of 70, 100 and 130 days

| Treatments | Color at 70 days | Color at 100 days | Color at 130 days | Flavor at 30 days | Flavor at 100 days | Flavor at 130 days |
|---|---|---|---|---|---|---|
| **T1** | 7.10 ± 0.100 c | 6.80 ± 0.200 c | 6.60 ± 0.242 c | 7.40 ± 0.244 b | 7.24 ± 0.231 c | 7.00 ± 0.223 d |
| **T2** | 7.80 ± 0.202 ab | 7.40 ± 0.244 abc | 7.00 ± 0.316 abc | 8.00 ± 0.316 ab | 7.88 ± 0.287 abc | 7.64 ± 0.244 abc |
| **T3** | 7.40 ± 0.244 bc | 6.96 ± 0.040 bc | 6.96 ± 0.285 abc | 7.60 ± 0.244 ab | 7.44 ± 0.222 bc | 7.20 ± 0.200 cd |
| **T4** | 7.60 ± 0.244 abc | 7.40 ± 0.244 abc | 7.20 ± 0.200 abc | 7.80 ± 0.200 ab | 7.64 ± 0.160 abc | 7.40 ± 0.100 abcd |
| **T5** | 7.40 ± 0.240 bc | 6.84 ± 0.102 c | 6.70 ± 0.200 bc | 7.60 ± 0.244 ab | 7.44 ± 0.222 bc | 7.24 ± 0.166 bcd |
| **T6** | 7.80 ± 0.200 ab | 7.40 ± 0.244 abc | 7.10 ± 0.100 abc | 8.00 ± 0.316 ab | 7.88 ± 0.287 abc | 7.64 ± 0.244 abc |
| **T7** | 7.90 ± 0.100 ab | 7.70 ± 0.202 a | 7.60 ± 0.244 a | 7.80 ± 0.200 ab | 7.64 ± 0.160 abc | 7.40 ± 0.100 abcd |
| **T8** | 8.10 ± 0.104 a | 7.60 ± 0.244 ab | 7.40 ± 0.244 ab | 8.30 ± 0.300 a | 8.08 ± 0.233 ab | 7.84 ± 0.235 ab |
| **T9** | 7.80 ± 0.200 ab | 7.40 ± 0.242 abc | 7.20 ± 0.202 abc | 8.00 ± 0.006 ab | 7.84 ± 0.040 abc | 7.60 ± 0.100 abcd |
| **T10** | 8.18 ± 0.111 a | 7.70 ± 0.200 a | 7.60 ± 0.242 a | 8.40 ± 0.244 a | 8.24 ± 0.231 a | 8.00 ± 0.223 a |
| **Significance Level** | * | * | * | * | * | * |

The experimental treatments T1 control treatment, T2 adding the Marjoram leaves powder 5 g for each one kg of feed from 1 day age to the age of 21 days. T3 adding the Rosemary leaves powder of 5 g for each one kg of feed from the age of 22 days till 42 days, T4 adding the Rosemary leaves powder of 5 g for each kg of feed to the period from 1 day age till 21 days, T5 adding the Marjoram leaves powder of 5 g to each one kg of feed in the age of 22 days till 42 days, T6 adding 2.5 g of each of Marjoram and Rosemary leaves powder each 1 kg of feed to the age of 1 day till 21 days, T7 adding 2.5 g of each of Marjoram and Rosemary leaves powder each 1 kg of feed to the age of 22 days till 42 days, T8 adding the Marjoram leaves powder of 5 g for each 1 kg of feed at the age of 1 day till the end of the experiment, T9 adding the Rosemary leaves powder of 5 g for each 1 kg of feed at the age of 1 day till the end of the experiment, T10 adding 5 g of each of Marjoram and Rosemary leaves powder each 1 kg of feed at the age of 1 day till the end of the experiment.

*This sign means the existence of moral differences between the experiments morally (p≤ 0.05)
-The value at each treatment represents the medium , Math_+ standard error.
The different letter within the column represent of moral difference existence.

Table (2) refers to the influence and periods of addition rates of Marjoram and Rosemary leaves powder and their combination to the feed regarding juiciness to the femur's meat sample of the cooked male carcasses during the three periods. Considering the table, there is a moral effect (p≤ 0.05) on this feature, whereas the juiciness evaluation of the meat was risen in the addition treatment to the Marjoram and Rosemary leaves powder and their combination comparing to the control treatment. The color evaluation value of meat samples at the tenth treatment was higher around 7.86, 8.02, 8.20 consecutively for the three periods. While the juiciness evaluation degree was less value ( 6.80, 6.90, 7.20) for the three periods consecutively due to the high degree of sensory evaluation to Juiciness at the treated meat samples of treated additions and the great correlation between tenderness and juiciness, therefore the evaluation degrees were high [17]. Also, the influence of effective materials at the Marjoram and Rosemary plants such as Alkaloids that can rise the Ph that will help keeping the water and increase Juiciness [11,15].

**Table (2):** Effect of adding marjoram and rosemary powder to the feed on some sensory evaluation characteristics of Japanese quail males at 70, 100, and 130 days of age

| Treatments | tenderness at 70 days | tenderness at 100 days | tenderness at 130 days | Juiciness at 30 days | Juiciness at 100 days | Juiciness at 130 days |
|---|---|---|---|---|---|---|
| T1 | 7.40 ± 0.244 b | 7.28 ± 0.171 b | 7.12 ± 0.159 b | 7.20 ± 0.200 c | 6.90 ± 0.200 c | 6.80 ± 0.200 c |
| T2 | 8.00 ± 0.316 ab | 7.82 ± 0.324 ab | 7.62 ± 0.324 ab | 7.80 ± 0.202 abc | 7.62 ± 0.166 ab | 7.46 ± 0.128 ab |
| T3 | 7.80 ± 0.200 ab | 7.42 ± 0.243 b | 7.26 ± 0.229 b | 7.40 ± 0.244 bc | 7.10 ± 0.244 bc | 7.00 ± 0.223 bc |
| T4 | 7.80 ± 0.202 ab | 7.62 ± 0.165 ab | 7.46 ± 0.128 ab | 7.80 ± 0.200 abc | 7.62 ± 0.165 ab | 7.46 ± 0.128 ab |
| T5 | 7.60 ± 0.244 ab | 7.42 ± 0.171 b | 7.26 ± 0.150 b | 7.40 ± 0.244 bc | 7.22 ± 0.267 bc | 7.06 ± 0.261 bc |
| T6 | 8.10 ± 0.240 ab | 7.82 ± 0.274 ab | 7.66 ± 0.246 ab | 7.80 ± 0.202 abc | 7.62 ± 0.165 ab | 7.42 ± 0.165 ab |
| T7 | 7.90 ± 0.100 ab | 7.62 ± 0.165 ab | 7.46 ± 0.128 ab | 7.80 ± 0.200 abc | 7.62 ± 0.166 ab | 7.46 ± 0.128 ab |
| T8 | 8.10 ± 0.104 ab | 7.92 ± 0.096 ab | 7.72 ± 0.096 ab | 7.90 ± 0.100 ab | 7.72 ± 0.146 ab | 7.52 ± 0.146 ab |
| T9 | 7.90 ± 0.100 ab | 7.82 ± 0.073 ab | 7.66 ± 0.102 ab | 7.90 ± 0.100 ab | 7.72 ± 0.145 ab | 7.56 ± 0.169 ab |
| T10 | 8.20 ± 0.254 a | 8.16 ± 0.227 a | 8.00 ± 0.223 a | 8.20 ± 0.200 a | 8.02 ± 0.182 a | 7.86 ± 0.186 a |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Significance Level** | * | * | * | * | * | * |

The experimental treatments T1: control treatment, T2 adding the Marjoram leaves powder 5 g for each one kg of feed from 1 day age to the age of 21 days. T3 adding the Rosemary leaves powder of 5 g for each 1 kg of feed from the age of 22 days till 42 days, T4 adding the Rosemary leaves powder of 5 g for each 1 kg of feed to the period from 1 day age till 21 days, T5 adding the Marjoram leaves powder of 5 g to each one kg of feed in the age of 22 days till 42 days, T6 adding 2.5 g of each of Marjoram and Rosemary leaves powder each 1 kg of feed at the age of 1 day till 21 days, T7 adding 2.5 g of each of Marjoram and Rosemary leaves powder each 1 kg of feed to the age of 22 days till 42 days, T8 adding the Marjoram leaves powder of 5 g for each 1 kg of feed at the age of 1 day till the end of the experiment, T9 adding the Rosemary leaves powder of 5 g for each 1 kg of feed at the age of 1 day till the end of the experiment, T10 adding 2.5 g of each of Marjoram and Rosemary leaves powder to each 1 kg of feed at the age of 1 day till the end of the experiment.

*This sign means the existence of moral differences between the treatments on the morality level ($p \leq 0.05$)

-The value at each treatment represents the medium Math_+ standard error.

-The different letters within the column represent of moral different existence.

Table (3) refers to the influence of rates and periods of addition rates of Marjoram and Rosemary leaves powder and their combination to the feed in the water loss feature to the cooked femur's meat samples during the three periods. Considering the table, there is moral effect ($p \leq 0.05$) on this feature, whereas the evaluation degree of water loss was decreased in the treatment addition of the Marjoram and Rosemary leaves powder and their combination Compared to the to the control treatment. The total of water loss at the meat samples in the tenth treatment less in value (52.72, 51.22, 48.43) respectively for three periods, while the water loss amount in the control treatment was higher (60.40, 57.57, 55.10) consecutively for three periods due to the water loss water loss in the addition treatments of Marjoram and Rosemary leaves powder and their combination and their effect on the meat's proteins and increasing the spots the keeping water.

Table (3) refers to the influence of rates and periods of addition rates of Marjoram and Rosemary leaves powder and their combination to the feed in the general acceptance feature to the cooked femur's meat samples during the three periods. Considering the table, there is moral effect ($p \leq 0.05$) on this according to, whereas the evaluation degree of the general acceptance was high in the treatment addition of the Marjoram and Rosemary leaves powder and their combination comparing to the to the control treatment. The total of the general acceptance at the meat samples in the tenth treatment high in value (6.30, 8.16, 8.40) consecutively for three periods, while the general acceptance degree in the control treatment was higher (7.60, 6.80,7.20) consecutively for three periods. The general acceptance feature is considered the final result to the features of color, flavor, tenderness and Juiciness [9,11].

**Table (3):** Effect of adding marjoram and rosemary powder to the feed on some sensory evaluation characteristics of Japanese quail males at 70, 100, and 130 days of age

| Treatments | Water loss at 70 days | Water loss at 100 days | Water loss at 130 days | General Acceptance at 30 days | General Acceptance at 100 days | General Acceptance at 130 days |
|---|---|---|---|---|---|---|
| T1 | 55.10 ± 1.497 a | 57.57 ± 1.001 a | 60.40 ± 2.107 a | 7.20 ± 0.339 b | 6.80 ± 0.200 c | 6.30 ± 0.122 c |
| T2 | 49.96 ± 1.241 b | 52.42 ± 0.434 b | 55.25 ± 2.279 b | 7.86 ± 0.331 ab | 7.80 ± 0.202 ab | 7.40 ± 0.100 ab |
| T3 | 49.49 ± 1.254 b | 51.29 ± 0.519 b | 54.80 ± 1.161 b | 7.50 ± 0.316 ab | 7.20 ± 0.374 bc | 6.60 ± 0.400 bc |
| T4 | 49.99 ± 0.487 b | 52.45 ± 0.548 b | 55.60 ± 3.045 b | 7.60 ± 0.244 ab | 7.40 ± 0.244 abc | 7.00 ± 0.223 abc |
| T5 | 50.24 ± 1.246 b | 51.37 ± 0.545 b | 54.21 ± 1.788 b | 7.60 ± 0.240 ab | 7.20 ± 0.202 bc | 6.80 ± 0.200 abc |
| T6 | 49.97 ± 0.505 b | 52.43 ± 0.590 b | 54.27 ± 2.032 b | 7.80 ± 0.374 ab | 7.60 ± 0.242 abc | 7.20 ± 0.202 abc |
| T7 | 49.61 ± 1.007 b | 52.07 ± 0.893 b | 53.91 ± 2.514 b | 7.70 ± 0.200 ab | 7.60 ± 0.244 abc | 7.10 ± 0.244 ab |
| T8 | 48.73 ± 0.729 b | 51.19 ± 0.746 b | 52.36 ± 3.285 b | 8.10 ± 0.100 ab | 8.00 ± 0.316 ab | 7.50 ± 0.316 a |
| T9 | 48.61 ± 1.001 b | 51.08 ± 0.888 b | 52.58 ± 3.044 b | 7.70 ± 0.200 ab | 7.60 ± 0.244 abc | 7.00 ± 0.316 abc |
| T10 | 48.43 ± 1.070 b | 51.22 ± 1.280 b | 52.72 ± 3.501 b | 8.40 ± 0.291 a | 8.16 ± 0.213 a | 7.60 ± 0.240 a |
| Significance Level | * | * | * | * | * | * |

*This sign means the existence of moral differences between the treatments on the morality level ($p \leq 0.05$)
-The value at each treatment represents the medium Math_+ standard error.
-The different letters within the column represent of moral different existence.

The experimental treatments T1: control treatment, T2 adding the Marjoram leaves powder 5 g for each one kg of feed from 1 day age to the age of 21 days. T3 adding the Rosemary leaves powder of 5 g for each 1 kg of feed from the age of 22 days till 42 days, T4 adding the Rosemary leaves powder of 5 g for each kg of feed to the period from 1 day age till 21 days, T5 adding the Marjoram leaves powder of 5 g to each 1 kg of feed from the age of 22 days till 42 days, T6 adding 2.5 g of each of Marjoram and Rosemary leaves powder each 1 kg of feed to the age of 1 day till 21 days, T7 adding 2.5 g of each of Marjoram and Rosemary leaves powder each 1 kg of feed to the age of 22 days till 24 days, T8 adding the Marjoram leaves powder of 5 g for each 1 kg of feed at the age of 1 day till the end of the experiment, T9 adding the Rosemary leaves powder of 5 g for each 1 kg of feed at the age of 1 day till the

end of the experiment, T10 adding 2.5 g of each of Marjoram and Rosemary leaves powder each 1 kg of feed at the age of 1 day till the end of the experiment.

The addition of marjoram and rosemary, either alone or in combination, improved the qualitative characteristics of Japanese male quail meat by significantly reducing cooking losses compared to the control group and improving the sensory characteristics of the meat, including color, flavor, tenderness, juiciness, and overall acceptability - as evidenced by the higher sensory evaluation scores given by the committee members. Improved meat quality.

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