Addition of different level of zeolite powder on Japanese quail bird feed and its effects on carcass parameters

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Abstract

Study was carried out at the poultry farm of the animal resource Department - Collage of Agriculture - Tikrit University for the period from 14/11/2018 to 12/2/2019 and the main aim of this study was to improve importance of addition of different levels of zeolite on Japanese quail bird feed and its effect on the primary and secondary carcass parts. And in this study a 240 birds were used and these were divided into four treatments with three replicates for each treatment and each replicates contained 20 birds with percent of one male and three female. And the birds feed with 20% percentage of protein and 2800 kilo calorie of energy.

The treatments were divided as following:
First treatment (T1) control treatment without addition of zeolite
Second treatment (T2) second treatment addition of 2g/kg feed of zeolite powder
Third treatment (T3) third treatment addition of 3g/kg feed of zeolite powder
Fourth treatment (T4) fourth treatment addition of 4g/kg feed of zeolite powder

The results showed that addition of zeolite have significant effect (p<0.05) on live body weight, carcass weight and main carcass parts (chest, thigh, back, wings and neck) at the treatment with addition of 3g of zeolite powder in compare with other study treatments.

Keywords: zeolite powder, carcass parts, Japanese quail bird.

Introduction:
The contamination of feed with fungi and mycotoxins considered as a big problem which threat the developmental process of animal production in countries that have a weak or poor environment of feed storing (1).

So the farmers refuge to addition of many organic and inorganic matters in animal feed to decrease dangerous of toxins and one of these inorganic matters that use for this purpose is by addition of zeolite metals, the zeolite metal known as crystalized metal, have structure characterized by frame quadruple surface each one consisting of four atom of oxygen (SiO₄) surrounded by cations (sodium, calcium, potassium and barium) that formed open structure have open cavities as channels and wide cages. These cavities filled with water and the additional of cations able to replacement. The channels characterized by its big size that allow passing of hosted ion, and liquefied phase the water take off at the temperature mostly bellow 400 °C, and have a high affinity to liquefaction again. The zeolite metals contained many...
of liquefied silicate metals, that same in its chemical structure and presence in nature, and it's known as aluminum silicate, and sodium and calcium at basic discretion, and contained high percentage of water, the hardness of zeolite metal ranger between 3.5 to 5.5, and specific weight between 2 to 2.4 \(^{(2)}\).

The natural zeolite metal used to purified water and building be ancient romans from about 2700 years ago, and it's discovered at 1756 AD as crystals presence in basalt rock cavities by Sweden scientist Baron Axel Fredrik, that give the name of zeolite on this metal, and the name the zeolite derived from Latin words Zein and Lithos and that mean boiling rocks, that mean when heating this metal excrete water and appeared as boiling \(^{(3)}\).

The aqueous form (ammonium silicate) was formed in environment ranged between deep Ocean and shallow water in desert lacus that correlated with volcano emission and the zeolite metal characterized by many chemical and physical features make it use in many of agriculture, environmental and industry applications one of these features gas absorption high ability of ion exchange and mix between absorption and adsorption also zeolite can absorbed the ammonia and carbon dioxide and hydrogen sulfide and detoxification \(^{(4)}\).

The variety in livestock and select the animals that short generation considered the best choice to reducing the decrease of proteins for humans and the country development, the Japanese quail remain the best bird for increase the base of animal proteins in developing country, and it is increasing meat and egg production, that characterized by high quality because of fast growth and early sexual puberty \(^{(3)}\). So that the study aimed to study the effects of addition of different levels of zeolite powder and evaluate it's effects on parameters of carcasses parts and parameters of brown feather quail birds.

**Materials and methods**

The study was done in the Japanese quail hall related to animal production farm – Agriculture College – Tikrit University at the period from 14\11\2018 to 12\2\2019 and the main aim of this study was to improve the importance of addition of different levels of zeolite on Japanese quail bird feed and its effect on the primary and secondary carcass parts. In this study, 240 birds were used and these divided into four treatments with three replicates for each treatment and each replicates contained 20 birds with percent of one male and three female.

Take the birds from each treatment (three female and three male) randomly, after record of live weight slaughtered and let to bleeding for two minutes then scald with scolder with 54 \(^\circ\)C temperature for one minutes then remove the feather and viscera manually then cut into main parts; chest, thighs, neck, back and wings.

**Nutrition and feed**:

The birds feeding with provender contain 20% proteins and metabolite energy 2800 kilo calories \(^{(5)}\).

**Nutrition treatment**

First treatment (T1) control treatment without addition of zeolite
Second treatment (T2) second treatment addition of 2g \(\text{kg feed}\) of zeolite powder
Third treatment (T3) third treatment addition of 3g \(\text{kg feed}\) of zeolite powder
Fourth treatment (T4) fourth treatment addition of 4g \(\text{kg feed}\) of zeolite powder
The zeolite powder (zeogreen) with 100% purity as powder that used supplemented by Agriculture Green Zeolite Company.

Body weight (g): the measurement done once weekly by using digital balance with two decimals.

Carcass weight (g): the weighting done once after inedible parts removed by using digital balance with two decimals.

The carcass washed with water singularly to measure the dressing percentage measured according to the body weight:

\[
\text{Dressing percentage} = \frac{\text{carcass weight (g) after inedible parts removed}}{\text{live body weight}} \times 100
\]

**Carcass parts weight:**
After removal of viscera, the carcasses weighted and the cut parts also weighted for each carcass singularly \(^6\).

**Statistical analysis:**
The experiment done according to complete random design and the data Analyzed by using ready statistical program SAS \(^7\) and the means compared by using Duncan test with multiple ranges \(^8\) at level of significant 0.05 to identify the significant differences between means according to mathematical equation:

\[
Y_{ij} = \mu + T_i + e_{ij}
\]

Whereas:
- \(y_{ij}\) = value of view \(j\) returned to treatment \(i\)
- \(\mu\) = general mean of parameter
- \(T_i\) = effect of treatment \(I\) (that the study include effect of treatments was mentioned)
- \(e_{ij}\) = random error that distribute naturally with mean equal to zero and variance equal to \(\sigma^2e\).

**Results and discussion**
Noticed from the results of study in table (1) presence of highly significant effect on parameter of live body weight and carcass weight at significant level \((p<0.05)\) which predominated the birds that preserved in a different percentage of zeolite in its feed as compared with control treatment that showed significant increase in body weight reached 222.58 g in treatment three \((3\text{g zeolite})\) while treatment one \((\text{control treatment})\) showed the lowest mean reached 155.99 g and the value of body weight of both treatment \((2\text{ and } 4)\text{ g zeolite}\) 196.51 and 190.23 respectively. And these results agree with data that reached by \(^9\) \(^10\) in their studies on some of carcass parameters and the primary and secondary carcass parts of Japanese quail bird.

The reasons of these results is due to zeolite powder work on stimulation of microorganism that present in small intestine by decrease absorption of toxins in intestine also remove of ions mainly nickel, lead, carbon and ammonia by passing them throw pores of zeolite and execrated them with feces then work on increase efficiency of nutritional matter \(^11\) \(^1\).

Also the results at the same table mentioned showed a significant differences between treatments of zeolite addition at a different percentage \((2, 3 \text{ and } 4)\ %\) in compare with control group in parameter of Dressing percentage that concealed important parameter in poultry industry and necessary to study it in Japanese quail bird to evaluate the Dressing weight from percentage of carcass to total weight or empty weight. Treatment three predominant on all study treatment and its value reached \((1)\) and the elevation in Dressing percentage returned to addition treatments in compare with control group due to elevation of Japanese quail bird in means of carcass weight because of increase body weight mean in compare with control group that the Dressing percentage have positive correlation and high in bird with parameter of body weight and these results agree with data that reached by each of \(^12\) \(^13\) \(^14\) \(^15\) in their studies on some parameter carcass parts of Japanese quail bird. While these results disagree with data that reached by \(^16\) that the value of dressing percentage japanese quail bird was highest than of value this results.

The results of statistical analysis appeared in table (1) to predominant significant increase in main carcass parts weight of zeolite addition \((T_3)\) on other addition treatment and control treatment on parameter of chest part and that noticed by \(^17\) \(^18\). Also the results showed predominant highly significant increase in parameter on wings, back and thigh also in liver in treatment three \((3\text{g zeolite})\) in compare with other treatment. And the cause of that is due to presence of a positive correlating coefficient and highly significant between body weights and liver weight parameter that the liver conceded the main axis of metabolism in the body \(^15\). And these results disagree with what reached by \(^19\) that fined the mean of liver weight of Japanese quail bird 2.37 and 2.44 g respectively and the reason of that is due to body weight of this treatment higher than other addition treatment. That the addition treatment work on improvement of digestion coefficient and increase mean of nutrient matter utilization

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\(^{6}\) After removal of viscera, the carcasses weighted and the cut parts also weighted for each carcass singularly.

\(^{7}\) The experiment done according to complete random design and the data Analyzed by using ready statistical program SAS.

\(^{8}\) The means are compared by using Duncan test with multiple ranges.

\(^{9}\) \(^10\) Data reached by studies on some carcass parameters and the primary and secondary carcass parts of Japanese quail bird.

\(^{11}\) Zeolite powder work on stimulation of microorganism in small intestine.

\(^{12}\) \(^13\) \(^14\) \(^15\) Data reached by studies on some parameter carcass parts of Japanese quail bird.

\(^{16}\) Data reached by study on dressing percentage of Japanese quail bird.

\(^{17}\) \(^18\) Significant increase in parameter on wings, back and thigh also in liver in treatment three.

\(^{19}\) Data reached by study on mean of liver weight of Japanese quail bird.
of bird by its role in closing receptors present on the surface of mycotoxins that lead to prevent attachment to intestinal epithelial cells and formation of unabsorbable complex \(^{(1)}\).

Appeared from weight of uneatable parts don't showed any significant difference in head weight parameters and these results is due to this percentage decrease significantly with age bird due to increase bulk size of Japanese quail bird with age and this reflex on increase bird body weight and carcass weight that gave low percentage to uneatable parts to carcass weight or percentage of carcass \(^{(20)}\).

From results of the present study we can conclude that the addition of different level of zeolite powder on feed of Japanese quail bird work on increase efficiency of digestive system and improve digestion coefficient of nutrient material then increase bird utilization of it and increase mean of body weight and carcass weight also increase weight of main carcass parts of Japanese quail bird.

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Table (1) showed effect of addition of zeolite powder on carcass parameters of quail bird (mean ± S.E)

- Treatment one: feed not contain zeolite (control treatment).
- Treatment two: feed contain zeolite (2g \ kg feed).
- Treatment three: feed contain zeolite (3g \ kg feed).
- Treatment four: feed contain zeolite (4g \ kg feed).

| Carcass parameter     | Treatment 1 g \ kg feed | Treatment 2 g \ kg feed | Treatment 3 g \ kg feed | Treatment 4 g \ kg feed |
|-----------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Body weight (gram)    | 155.99± 5.44c           | 196.51± 0.82b           | 225.58 ± 0.47a          | 190.23± 3.29b           |
| Carcass weight (gram) | 120.85± 2.46c           | 149.25± 2.49b           | 187.74± 2.61a           | 143.90± 1.77b           |
| Wing weight (gram)    | 6.85± 0.30b             | 7.67± 0.92b             | 10.25± 0.11a            | 8.58± 0.46ab            |
| Back weight (gram)    | 21.56± 1.13c            | 26.65± 1.02bc           | 0.69±34.52a             | 29.22± 2.65ab           |
| Thigh weight (gram)   | 22.57± 0.59c            | 25.24± 1.07b            | 28.94± 0.26a            | 26.22± 0.85b            |
| Chest weight (gram)   | 32.81± 0.65d            | 34.49± 0.45c            | 42.69±3.42 a            | 36.16± 0.47b            |
| Neck weight (gram)    | 5.12± 0.51b             | 4.86± 0.27b             | 7.96± 0.33a             | 5.64± 0.29b             |
| Liver weight (gram)   | 4.95± 0.28 b            | 5.73± 0.19b             | 6.19± 0.33 a            | 4.97± 0.48b             |
| Head weight (gram)    | 7.97± 0.62 a            | 7.98± 0.63a             | 8.08± 0.15 a            | 8.25± 0.51a             |