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# The effect of adding different levels of local grass pea on some qualitative traits of Japanese quail eggs

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## Abstract:

This experiment was conducted in the poultry field of the research station at the College of Agriculture and the Marshes of Thi-Qar University, from 1/11/2021 to 1/4/2022, to determine the effect of replacement different levels of grass pea seeds instead of soybean meal in the diet, and their effect on the growth parameters of Japanese quail (*Coturnix coturnix*). A total of 216 Japanese quail birds of 45 days old were used, distributed randomly to four experimental treatments and three replicates (18 birds/replicate). The treatments were as follows: T1: control transaction; T2: The birds were fed a diet containing 20% soybean meal with 10% local grass pea seeds; T3: The birds were fed a diet containing 10% soybean with 20% local grass pea seeds; T4: The birds were fed a diet containing 30% local grass pea seeds. The results of the study indicated that the addition of 20% grass pea seeds powder led to a significant improvement on the qualitative traits of Japanese quail eggs (yolk and albumin height, relative weight of yolk, albumin and shell, shell thickness, yolk and albumin index and Hough unit), compared to the level of addition of 30% of crushed safflower seeds.

**Keywords: local grass pea, eggs qualitative, Japanese quail.**

## I. INTRODUCTION

The massive increase in population, will create competition in the poultry feed ingredients available for poultry feed, moreover, this increase in population will increase the demand for poultry products, as a result, the availability of feed ingredients for poultry feed will become more competitive. In addition, there was a growing trend to produce biofuels from feed, especially corn and wheat, to meet the demand all over the world, this poses a major threat to food security, especially in developing countries, the development that took place in the poultry industry, led to the use of fodder sources in large quantities, this prompted those working in the field of poultry to find alternative sources that are available and cheap. Nowadays, efforts are being made all over the world to use alternative sources of protein and energy, to replace either soybean meal, yellow corn or wheat in poultry diets, one of these sources is legumes (Alshelmani *et al*., 2016).

Many grains are used as food sources for humans and animals, including poultry, the most important of these grains is soybean, which is one of the most expensive sources of vegetable protein used as a meal in poultry diets, although it is poor in some amino acids such as methionine and cysteine (Juodka *et al*., 2022).

The sources of vegetable protein used for poultry, especially soybean meal, and as a result of the great demand for it, it led to alternative protein sources, such as canola seed meal, sunflower cake, cotton seed cake, and grass pea seeds, they were alternative protein sources in the diets of farm animals, especially poultry, that are cheap and available, supports the economic aspect of the poultry industry (El-Deek *et al*., 2020).

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Chowdhury *et al*. (2005) showed that feeding Shaver brown broilers on a diet containing grass pea seeds at a level of 100 g, led to a decrease in egg production and egg mass as a result of increasing the nutritional levels of the hartman.

The untreated grass pea seeds had no significant effect on the qualitative characteristics of 87-week-old white laghorn eggs when added to the diet at a rate of 8%, however, when its concentration was increased to 16% in the aegia, it led to a decrease in egg production with a significant decrease in both the relative weight of the eggshell and the thickness of the shell, with a significant decrease in the unit (Sahaf *et al*., 2018).

The current study aims to show the effect of adding different levels of local grass pea on some qualitative characteristics of Japanese quail eggs.

## II. MARERIALS AND METHODS

The study was conducted at the poultry station affiliated to the Department of Animal Production, College of Agriculture, Thi Qar University. The local quail birds were distributed after naturalization into four treatments, each treatment contains 54 birds with three replications for each treatment (18 birds per replicate), which includes 12 females and 6 males, and the treatments (Table 1) were:

T1: control transaction.

T2: The birds were fed on a diet containing 20% soybean meal with 10% local grass pea seeds.

T3: The birds were fed on a diet containing 10% soybean with 20% local grass pea seeds.

T4: The birds were fed a diet containing 30% local grass pea seeds.

Table (1) Basal diet ingredients and their chemical composition.

| Items | T1 | T2 | T3 | T4 |
|---|---|---|---|---|
| Maize | 39.00 | 39.00 | 39.00 | 39.00 |
| Wheat | 18.00 | 18.00 | 18.00 | 18.00 |
| Soybean meal (48%) | 30.00 | 20.00 | 10.00 | 0.00 |
| Protein concentrate (50%) | 8.00 | 8.00 | 8.00 | 8.00 |
| Premix (6%) | 0.30 | 0.30 | 0.30 | 0.30 |
| Limestone | 3.90 | 3.90 | 3.90 | 3.90 |
| Salt | 0.30 | 0.30 | 0.30 | 0.30 |
| Local grass pea seeds | 0.00 | 10.00 | 20.00 | 30.00 |
| Sunflower oil | 0.50 | 0.50 | 0.50 | 0.50 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 |
| Chemical analysis | | | | |
| Crude protein (%) | 23.05 | 21.35 | 19.65 | 17.95 |
| Metabolize energy (Kcal/ kg diet) | 2884.50 | 2914.39 | 2944.29 | 2974.18 |
| C/ P ratio | 1250.14 | 136.50 | 149.83 | 165.69 |
| Crude fiber (%) | 3.77 | 3.90 | 4.03 | 4.16 |
| Calcium (%) | 2.11 | 2.10 | 2.10 | 2.10 |

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| | | | | |
|---|---|---|---|---|
| Available phosphorus (%) | 0.37 | 0.37 | 0.37 | 0.37 |
| Lysine (%) | 1.28 | 1.42 | 1.56 | 1.70 |
| Methionine (%) | 0.48 | 0.48 | 0.48 | 0.49 |
| Methionine+ Cysteine (%) | 0.94 | 0.81 | 0.69 | 0.56 |

• Protein concentrate: Produced by the Dutch Brocon Company, it contains 50% crude protein and 2500 (kcal/kg) representative energy, 6.5% calcium, 3% available phosphorous, 3.70% methionine, 0.66% cysteine, 3.85% lysine, 3.5 fibers. Raw, 12.4% methionine and cysteine.

• Premix produced by the Iraqi Laymix Company in Erbil Governorate. It contains 6% crude protein and 4331.57 kcal / kg represented energy, 1.50% lysine, 5.90% methionine, 5.00% methionine and cysteine, 24.05% calcium, 10.20% phosphorous available.

• The chemical composition of the feed materials included in the composition of the rations was calculated according to the recommendations (NRC, 1994).

The birds were placed in locally manufactured wooden wire cages, consists of three floors, and each floor measures 120×60×40 cm, with the use of sawdust as a bed, water and fodder were freely available. The cages were placed inside a closed room with dimensions of 40×10 meters, after fumigation with paraformaldehyde gas, clean the manholes, troughs and used equipment before starting the experiment. It provided the appropriate environmental conditions for raising quails, such as heat, ventilation and lighting. The vacuum was used for the purpose of obtaining the required ventilation. No fatalities were recorded during the duration of the experiment at this stage.

Use the local grass pea seeds, obtained from local markets, after it was crushed using a special grinder, it became crushed ready to be added in the feed material for the duration of the experiment.

**Egg collection:**

Eggs were collected from the replicates for the purpose of studying the characteristics below, as ten eggs were taken from each replicate weekly starting from the first week and continued throughout the duration of the experiment.

**Egg qualitative traits:**

The height of the yolk and albumin, yolk, albumin and shell with the membranes weight, the shell with the membranes thickness, the index of yolk and the albumin, and Hough unit.

**Statistical analysis:**

Complete Random Design (CRD) was used to study the effect of different treatments on the studied traits, significant differences between means were compared with Duncan (1955) multiple range test under significance level of 0.05 and 0.01. The program SPSS (2012) was used in the statistical analysis.

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## III. RESULTS AND DISCUSSIONS

Table (2) indicates the effect of adding different levels of local grass pea to the feed on the height of the yolk and albumin, and the relative weight of each of the yolk, albumin and shell of Japanese quail eggs, it was noted that there is a significant effect of adding the powder of hyacinth seeds to Japanese quail diets on the qualitative characteristics of Japanese quail eggs, the addition of grass pea seed powder, whether 10% (T2) or 20% (T3), did not significantly affect the height of the yolk, albumin and the relative weight of the shell compared to the control treatment. The three treatments (T1, T2 and T3) were significantly (P≤0.05) superior compared to treatment T4. The height of the yolk was 11.26, 11.21, 11.21 and 10.77 mm, the albumin was 5.92, 5.84, 5.85 and 5.55 mm and the relative weight of the shell was 13.82, 13.60, 13.71 and 13.06% for the treatments T1, T2, T3 and T4, respectively.

Regarding the relative weight of each of the yolk and albumin, no significant differences were observed between all the experimental treatments in the treatments of adding grass pea seed powder compared to the control treatment. The relative weight of the yolk was 37.84, 36.59, 37.02, 36.02%, the relative weight of albumin was 48.31, 49.79, 49.25 and 50.89% for treatments T1, T2, T3 and T4, respectively.

Table (2) Effect of adding different levels of local grass pea to feed on yolk and albumin height, and the relative weight of yolk, albumin and shell of Japanese quail eggs (mean ± standard error).

| Treatments | Yolk height (mm) | Albumin height (mm) | Yolk relative weight (%) | Albumin relative weight (%) | Shell relative weight (%) |
|---|---|---|---|---|---|
| **T1** | 0.04±11.26 a | 0.02±5.92 a | 0.33±37.84 | 0.27±48.31 | ٠,٠٨±١٣,٨٢ a |
| **T2** | 0.01±11.21 a | 0.02±5.84 a | 0.16±36.59 | ٠,٢٤±49.79 | ٠,١٥±١٣,٦٠ a |
| **T3** | 0.03±11.21 a | 0.01±5.85 a | 0.25±37.02 | ٠,٤٥±49.25 | ٠,٢١±١٣,٧١ a |
| **T4** | 0.09±10.77 b | 0.06±5.55 b | 0.30±36.02 | ٠,٢١±50.89 | ٠,٠٩±١٣,٠٦ b |
| **Sig.** | * | * | N.S | N.S | * |

Table (3) shows the effect of adding different levels of local grass pea to the forage on the thickness of the shell, the yolk index, the albumin index and the Hough unit, the addition of safflower seed powder at different levels had a significant effect on the mentioned characteristics. It was noticed that there was a significant increase (P≤0.05) in the thickness of the shell with the two treatments T1 and T3, they were 0.246 and 0.240 mm compared to the T2 . treatment, which amounted to 0.226 mm was significantly superior (P≤0.05) at the expense of the fourth treatment, which amounted to 0.213 mm.

As for the yolk index, no significant differences were observed between all the treatments and it reached 0.441, 0.440, 0.439 and 0.438 for treatments T1, T2, T3 and T4, respectively.

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While we notice that the treatments T1, T2 and T3 did not differ significantly between them in the attribute of the albumin index, and these treatments were significantly (P≤0.05) outperformed by the treatment T4, it was 0.094, 0.092, 0.093 and 0.087 for treatments T1, T2, T3 and T4, respectively.

While for Hough unit, it was noted that treatment T4 decreased significantly (P≤0.05) compared to the control treatment, no significant differences were observed between treatments T1, T2 and T3 on the one hand, and treatments T2, T3 and T4 on the other hand, it was 97.37, 97.06, 97.10 and 96.50 for treatments T1, T2, T3 and T4, respectively.

Table (3) Effect of adding different levels of local grass pea to feed on yolk and albumin height, and the relative weight of yolk, albumin and shell of Japanese quail eggs (mean ± standard error).

| Treatments | Shell thickness (mm) | Yolk index | Albumin index | Hough unit |
|---|---|---|---|---|
| **T1** | ٠,٠٠٦±٠,٢٤٦ a | ٠,٠٠١٤±٠,٤٤١ | 0.0005±0.094 a | 0.13±97.37 a |
| **T2** | ٠,٠٠٣±٠,٢٢٦ b | ٠,٠٠٠٥±٠,٤٤٠ | 0.0003±0.092 a | 0.16±97.06 ab |
| **T3** | ٠,٠٠١±٠,٢٤٠ a | ٠,٠٠١٨±٠,٤٣٩ | 0.0003±0.093 a | 0.18±97.10 ab |
| **T4** | ٠,٠٠٣±٠,٢١٣ c | ٠,٠٠٤٠±٠,٤٣٨ | 0.0008±0.087 b | 0.27±96.50 b |
| **Sig.** | * | N.S | * | * |

The results obtained were that the addition of untreated grass pea seeds powder in the Japanese quail diet, whether 10 or 20%, that did not differ significantly with the control treatment, it did not significantly affect the qualitative characteristics of quail eggs compared to the control treatment. The improvement may be attributed to the internal quality characteristics of the eggs produced from Japanese quail, it may be due to the high level of unsaturated fatty acids in the grass pea seed powder and the formation of essential fatty acids as a result of its disengagement with phytic acid, which, in turn, was reflected in order to make the most of the nutrients entering, which raises its level in the body, which stimulates the body to secrete female sex hormones, leads to an improvement in some of the internal quality characteristics of the eggs produced (Al-Ani and Al-Nuaimi, 2009).

The improvement in the internal quality characteristics of the eggs produced and the superiority in the productive qualities, reflects the good nutrition of birds and the maximum benefit from the nutrients included in the bird's food, raising the level of unsaturated fatty acids, stimulates the secretion of female sex hormones, which in turn leads to an improvement in the relative weight of egg albumin and Hough unit (Khalil, 2019).

Studies have indicated that the components of the vegetable diet were characterized by their high content of fiber and anti-fowl food factors that cause the viscosity of the contents of the intestines, they prevent the formation of complexes that reduce the activity of digestive enzymes and increase the absorption of nutrients such as sugars, essential amino acids and fatty acids, leads to an increase in the formation of yolk in the liver, which were lipoproteins, leads to an increase in the

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weight of the yolk in the liver and this is positively reflected on the weight of the egg (Lazaro *et al*., 2003; Wen *et al*., 2012).

As for the decrease in the qualitative characteristics in the T4 treatment (adding the grass pea at a concentration of 30% to the diet), it may be due to the effect of the saponins, which are considered inhibitory compounds found in the seeds of grass pea, it has a negative effect on red blood cells in vitro (Invitro), despite its effect in lowering blood cholesterol in addition to its anti-cancer behavior (Peary and Peavy, 2019).

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