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EFFECT OF CORIANDER SEEDS EXTRACT ON SOME BIOCHEMICAL PARAMETERS AND BODY WEIGHT GAIN OF JAPANESE QUAILS

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ABSTRACT

This study evaluated the effects of administering coriander seed extract to Japanese quails at various concentrations on weight gain, liver enzymes such as ALT and AST, and male sex hormones. Forty male quails were randomly divided into four groups. The groups were distributed as follows: the control group received regular feed and water without any addition, the second group received a 10% concentration of the seed extract with drinking water, the third group received a 20% concentration of the seed extract with drinking water, and the fourth group received a 40% concentration of the seed extract with drinking water. The experimental period was extended to four weeks. The results showed a significant increase in weight in the 10%, 20%, and 40% treated groups compared to the control group. ALT levels significantly decreased in the 10% and 20% treated groups compared to the control group, while the 40% coriander seed extract-treated group showed a significant increase in ALT and AST levels compared to the other treated groups. The levels of SSH, ICSH, and testosterone hormones didn't show a significant difference in the 10% extract-treated group, while their levels decreased significantly at the 20% and 40% doses compared to the control group and the 10% supplemented group. The study concluded that a 10% concentration of coriander seed extract was the best in terms of inducing weight gain while maintaining liver health and sex hormone levels, whereas higher concentrations had negative effects on liver function and sex hormone levels.

Keywords: Body weight, Biochemical properties, Coriander seed powder, Hormones, Quail.

INTRODUCTION

One of the ancient plants used in medicine is coriander, which has therapeutic characteristics and cooking uses (Ali and Malik, 2021). About 80% of the medicinal benefits of plants are attributed to the plant extracts or their constituent components, which act as antioxidants, antibiotics, antifungal agents, and growth promoters (Bashir and Safdar, 2020; Asghar, 2024; Mahleyuddin *et al.*, 2021; Al-Abdaly *et al.*, 2023) are commonly used in animal diets.

Additionally, these plants stimulate the digestive system by increasing digestive enzyme production, enhancing liver

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function, promoting bile formation, and activating its secretion (Sun *et al.*, 2020; Murti *et al.*, 2023). Medicinal plants and essential oil extracts have proven effective in scientific applications (Abdallah *et al.*, 2019; Pan *et al.*, 2022). Consequently, there is an increasing trend towards incorporating medicinal plants into animal diets through oil or water extracts and food additives to enhance human nutrition patterns and improve animal productivity and health status (Pan *et al.*, 2022; Al-Hayani, 2023).

Coriander is primarily known for its role as a flavoring agent and antimicrobial in human nutrition (Kačániová *et al.*, 2020; Hajlaoui *et al.*, 2021). The importance of coriander seeds lies in their beneficial substances and diverse chemical components, making them a valuable source of volatile oils with natural and aromatic compounds. Additionally, their high nutritional value and content of essential elements, such as minerals, vitamins, and antioxidants, make them suitable for nutritional studies. Several studies present findings on the effects of giving coriander to animals (Hajlaoui *et al.*, 2021; Pan *et al.*, 2022).

The study examined the impact of different concentrations of coriander seed extract on weight gain, liver enzymes (ALT and AST), and male sex hormones in Japanese quails.

MATERIALS AND METHODS

Preparation of Coriander Seed Powder Extract

We purchased dried coriander seeds from Mosul markets and ground them into powder using an electric grinder. We mixed 100 grams of coriander powder with 500 ml of water (20%) and soaked it for 24 hours at room temperature (37°C). The mixture was then heated for 30 minutes in a water bath at 65°C. The extract was filtered, concentrated, and stored at 4°C for use in the experiment. Quantities were adjusted as needed. (Nehme et al., 2021).

Experimental birds:

40 male Coturnix quails, aged 55-65 days and weighing 150-200 grams, were divided into four groups. The birds were purchased from local markets and housed in custom-made wooden cages.

The birds were housed in an environment with temperatures between 25 and 28°C and a lighting schedule of 15 hours of light and 9 hours of darkness. They were given a one-week acclimation period to adjust to their surroundings. Clean water was provided through specially designed drinkers for easy access.

Regarding the diet used in the research, the quails were fed a diet tailored specifically for quail nutrition. The Poultry Company Limited in Mosul supplied this diet. Was consistently provided according to set schedules for all categories. Throughout the study duration, the birds had access to both feed and water. The feed composition adhered to components, protein content, and energy levels following guidelines set by the (National Research Council, 1994).

Administration of Coriander Seeds Powder Extract

Quails were provided with an aqueous solution of coriander seed powder extract in their drinking water at concentrations of 10%, 20%, and 40% for four weeks, with the water being refreshed daily.

Experimental Design

The birds were randomly divided into four groups, each consisting of 10 birds. This random allocation ensured an even distribution of birds across all groups. This study lasted for four weeks.

1. Group 1 (Control): Birds received feed and water without any supplements.
2. Group 2: Birds were given drinking water containing 10% coriander seed extract.
3. Group 3: Birds were given drinking water containing 20% coriander seed extract.
4. Group 4: Birds received drinking water with 40% coriander seed extract.

After the trial, the birds were weighed based on their groups, and their average weights were recorded. Subsequently, the birds were humanely euthanized by severing a vein to collect blood samples for biochemical analysis.

Biochemical Analyses:
The ALT enzyme activity in serum was assessed using measurement strips from the Reflotron device produced by Roche. The ALT enzyme activity was quantified in units per liter (IU/L), providing insights into liver function.

The level of activity of Aspartate Aminotransferase (AST) was also measured using test strips from the Reflotron device. The enzyme activity was quantified in units per liter (IU/L).

Hormone determination:
The levels of hormones, including Sperm-Stimulating Hormone (SSH), Interstitial Cell-Stimulating Hormone (ICSH), and Testosterone, were tested in blood serum of quails using the VIDAS system developed by Nassa in the United States.

Statistical Analysis:
The results of the biochemical measurements were analyzed using a completely randomized design in a simple experimental process. Duncan's test was used at a specific level ($P<0.05$). Additionally, the Analysis of Variance (ANOVA) was performed to extract the Least Significant Difference (LSD).

RESULTS

Table (1) shows a significant increase in weight in the 10%, 20%, and 40% treated groups compared to the control group.

Table 1: The influence of different concentrations of coriander extract on the weight gain (g) of male quail.

Groups	Bw (g)
Control	187.81± 10.43
10%	247.51±12.39*
20%	260.52±20.31*
40%	255.89±0.24*

Each group consists of 10 birds and is presented as mean ± standard error, * differs from the control group at $P \leq 0.05$.

Table 2 indicates that the concentration of ALT enzyme significantly decreased in the groups treated with 10% and 20% compared to the control group, while the group treated with 40% coriander seed extract showed a significant increase in ALT and AST levels compared to the other groups.

Table 2: The influence of different concentrations of coriander extract on ALT and AST levels in the serum of Japanese quails.

Groups	ALT U/L	AST U/L
Control	49.81± 0.43	86.64 ±0 ± 0.5
10%	45.51±0.39*	88.30± 0.24
20%	40.52±0.31*	85.69 ± 0.36
40%	60.89±0.24*ab	98.44 ± 0.4*ab

Each group consists of 10 animals and is presented as mean ± standard error, * differs from the control group. The letters ab expresses the significant differences between the 10% and 20% groups, at $P \leq 0.05$.

The results indicated that the levels of SSH and ICSH hormones did not show a significant difference in the group treated with 10% extract. However, the levels of these hormones significantly decreased at the 20% and 40% doses compared to the control group and the 10% group, while the dose of 40% different from all other groups (Table 3).

Table 3: The impact of coriander extract on the concentrations of sex hormones in the blood serum of male quails.

Groups	SSH IU/ml	ICSH IU/ml	U\ML testosterone
Control	1.16 ± 0.03	1.07 ± 0.06	2.16 ± 0.11
10%	1.13±0.04	0.9±0.14	2.13±0.04
20%	0.50 ± 0.09*a	0.06 ±0.09 *	0.5 ±0.09*a
40%	0.41±0.10 *ab	0.21 ± 0.06 *ab	0.31± 0.09 *ab

Each group consists of 10 birds and is presented as mean ± standard error, * differs from the control group, The letters ab express the significant differences from the 10% and 20% groups, at P≤0.05.

DISCUSSION

The ability of coriander seeds to enhance the weight of bird groups treated with concentrations of 10%, 20%, and 40% of coriander seed powder extract, compared to the control group, can be imputed to various agents supported by scientific studies. The research suggests that the active components found in coriander seeds affect improving body weight. These components trigger the release of juices, which aid in digestion, boosts appetite, and enhance feed conversion efficiency, ultimately leading to weight gain. Additionally, coriander seeds possess antioxidant properties that help prevent the proliferation of bacteria and microorganisms in the body (Ciocarlan and Zarboc, 2015).

Moreover, the nutritional makeup of coriander seeds, including carbohydrates, fats, and linalool compounds, has been found to enhance the processes in animals. This leads to feed conversion efficiency, subsequently influencing body weight (Latha *et al.,* 2015, Alabdaly, 2021). The aromatic oils present in coriander seeds are thought to boost appetite and aid digestion, improving absorption in the digestive system by promoting fat storage (Sriti *et al.,* 2012). Coriander seeds also contain fatty acids like linoleic acid that are crucial for stimulating hormone secretion from glands, like the pituitary gland (Latha *et al.,* 2015). These substances help trigger the production of growth hormones for cell growth and division. Additionally, elements found in coriander seeds can boost metabolism and insulin secretion from beta cells impacting how carbohydrates, proteins, and fats are metabolized potentially leading to weight gain or glycogen storage (Kansal *et al.,* 2011)

Overall, the diverse effects of coriander seeds on digestion, appetite regulation, metabolism, and hormone secretion contribute to the weight gain observed in birds fed with coriander seed powder. These findings underscore the benefits of incorporating coriander seeds into animal diets at different levels.

Additionally, it seems that incorporating 10% or 20% coriander seed powder extract may have an impact on reducing ALT levels compared to a control group. This suggests that these doses could offer liver protection effects or, at least, not harm liver function. One possible explanation is that coriander seeds contain polyphenols, glycosides, and vitamin C, which collectively act as potent antioxidants. These compounds play a role in protecting liver cells from damage caused by oxidative stress. By enhancing antioxidant activity, coriander seeds contribute to improved liver function and increased activity of antioxidant enzymes. This, in turn, prevents free radicals from depleting the oxygen content associated with unsaturated fatty acids in cell membranes. Consequently, intracellular enzymes are preserved, preventing their release into the bloodstream and maintaining normal levels of liver enzymes in blood serum (Seghatoleslam *et al.,* 2016). Another potential mechanism regarding the

role of coriander seeds in controlling blood glucose concentrations within normal limits. Insulin influenced by coriander seeds helps to lower blood glucose levels by enhancing the liver's sugar absorption and reducing sugar secretion from the liver into the blood. Additionally, insulin promotes fat synthesis and the utilization of energy from fats. As a result, the potential damage from elevated blood sugar levels to the liver is reduced, leading to a decrease in ALT enzyme levels in the blood. This explanation aligns with the regulation of blood glucose levels and its effect on liver enzyme levels (Shavandi *et al.,* 2012). However, increasing the dose to 40%, ALT and AST levels rose significantly. This elevation suggests that the high dose may have adverse effects on the liver, leading to increased ALT and AST enzyme levels in the blood, indicative of liver damage (Seghatoleslam *et al.,* 2016). This could be explained by several mechanisms, including direct toxicity, oxidative stress, negative metabolic reactions, inflammatory response, effects on cell membranes, and inhibition of protective enzymes. These effects collectively contribute to elevated AST and ALT levels, indicating liver damage (Shavandi *et al.,* 2012). Therefore, low doses of coriander seed powder extract (10% and 20%) may be beneficial or non-harmful to the liver. Conversely, the high dose (40%) results in a significant increase in AST and ALT levels, indicating potential adverse effects on the liver at this high dose.

A significant decrease in concentrations of male sex hormones, including luteinizing hormone, follicle-stimulating hormone and testosterone, in male broiler chickens treated with coriander seed powder at concentrations of 20% and 40%, can be attributed to several factors. First, coriander seeds are known to contain several unsaturated fatty acids, and these fatty acids may play a role in hormonal regulation and contribute to significant changes in hormone levels (Sreelatha and Inbavailli, 2012). Additionally, variation in results may be influenced by factors such as dose and administration method, type of animals studied, and duration of the experiment. In this study, daily treatment of broiler chickens with coriander seed powder for 30 days led to a decrease in testosterone, ICSH, and SSH hormones in the blood at concentrations of 20% and 40% of the extract. Another potential explanation for the significant hormonal changes is the effect of coriander seed powder on cholesterol reduction (Cristian *et al.,* 2013). Cholesterol plays a role in producing steroid hormones like testosterone. The potential cholesterol-lowering effects of coriander seeds might affect the availability of cholesterol for testosterone production, leading to a decrease in testosterone levels (Rahimi *et al.,* 2013).

Leydig cells are essential for testosterone production, a hormone vital for testes development, growth, and proper functioning. Studying the alterations in Leydig cells and how they could affect testosterone production highlights the significance of exploring the mechanisms influenced by coriander seeds about reproductive functions (Venkatesh *et al.,* 2002). The changes observed in Leydig cells suggest a decline in their ability to produce testosterone after being treated with coriander seed powder (Venkatesh *et al.,* 2002; Rajeshwari and Andallu, 2011). The reasons behind the changes in Leydig cells may be complex and linked to how coriander seeds affect structures and functions that impact testosterone synthesis (Peethambaran *et al.,* 2012; Kuszak *et al.,* 2016). Additionally, the presence of camphor oil in coriander seeds might also play a role in these changes. Camphor oil is known for its effects.

CONCLUSION

The overall results from the present study showed that administering coriander seed extract at levels of 10% and 20%

concentrations resulted in weight gain among quails, while the higher concentration of 40% had negative effects on liver health and male sex hormones.

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تأثير مستخلص مسحوق بذور الكزبرة على بعض القياسات البيوكيميائية والزيادة في وزن الجسم في السمان الياباني

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هدفت الدراسة إلى تحديد تأثيرات إعطاء مستخلص بذور الكزبرة للسمان بتركيزات مختلفة لتحديد التأثيرات البيولوجية والكيميائية المحتملة على زيادة الوزن، وإنزيمات الكبد مثل ALT وAST، والهرمونات الجنسية الذكرية. تم تقسيم أربعين ذكر سمان عشوائيًا إلى أربع مجموعات. تم توزيع المجموعات كما يلي: المجموعة الضابطة تلقت طعاماً وماءً منتظمين بدون أي إضافة، المجموعة الثانية تلقت مستخلص البذور بتركيز ١٠٪ مع ماء الشرب، المجموعة الثالثة تلقت مستخلص البذور بتركيز ٢٠٪ مع ماء الشرب، والمجموعة الرابعة تلقت مستخلص البذور بتركيز ٤٠٪ مع ماء الشرب. استمرت فترة العلاج لمدة ٤ أسابيع .أظهرت النتائج زيادة ملحوظة في الوزن في المجموعات التي تلقت ١٠٪ و٢٠٪ و٤٠٪ مقارنة بالمجموعة الضابطة. كما انخفضت مستويات ALT بشكل كبير في المجموعتين اللتين تلقتا ١٠٪ و٢٠٪ مقارنة بالمجموعة الضابطة، بينما أظهرت المجموعة التي تلقت ٤٠٪ من مستخلص بذور الكزبرة زيادة كبيرة في مستويات ALT و AST مقارنة بالمجاميع الأخرى. أما بالنسبة لمستويات هرمونات SSH و ICSH والتستوستيرون، فلم تظهر اختلافات كبيرة في مجموعة الـ١٠٪، بينما انخفضت مستوياتها بشكل كبير في الجرعات ٢٠٪ و٤٠٪ مقارنة بالمجموعة الضابطة ومجموعة الـ١٠٪. خلصت الدراسة إلى أن تركيز ١٠٪ من مستخلص بذور الكزبرة كان الأفضل من حيث زيادة الوزن مع الحفاظ على صحة الكبد ومستويات الهرمونات الجنسية، في حين أن التركيزات الأعلى كان لها تأثيرات سلبية على وظيفة الكبد ومستويات الهرمونات الجنسية.

الكلمات المفتاحية: وزن الجسم، الخصائص البيوكيميائية، مسحوق بذور الكزبرة، الهرمونات، السمان