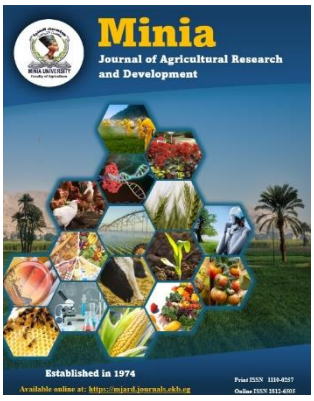
Minia J. of Agric. Res. & Develop., Minia Univ., Vol. 45 (4): 875 - 884, 2025

Minia Journal of Agricultural Research and Development
Journal homepage & Available online at:
https://mjard.journals.ekb.eg



Using of coriander seeds (Coriandrum Sativum L) as feed additives in broiler chick diets

Ahmed M. A. Osman[1], Mahmoud A. Toson[1], Emad A. Hassan[2] and Mahmoud M. A. Hassan[2]

[1] Department of animal and production poultry faculty of Agriculture in Minia university & [2] Central Lab. of Organic Agriculture, Agriculture Research Center

Received: 21 Oct. 2025 Accepted: 30 Oct. 2025

ABSTRACT

The current study set out to determine how broiler chicks' growth performance and economic efficiency would be affected by the addition of powdered coriander seeds as a natural feed supplement. One hundred eighty Arbor-Acres broiler chicks, all unsexed, were placed randomly to four groups, each with three replicates each replicate 15 birds. Chicks were fed adlibitum during expermintal periods on basal diet supplemented with powdered coriander seeds at 0, 1, 2, and 3% levels for C, T1, T2 and T3 groups, respectively. The results revealed the following: When compared to the control group, the birds fed the diets supplemented with 1, 2, and 3% level of powdered coriander seeds showed significantly ($p<0.05$) improvement in feed conversion ratio, which accompanied by parallel increases in body weight and gain. The economic efficiency of broiler chicks fed diets contained coriander seeds powder was significantly ($p<0.05$) better than those fed basal diets.

Keywords: coriander seeds, feed additive, growth performance, broiler chicks

INTRODUCTION

In the poultry production, dietary antibiotic growth enhancers were essential. However, because to public health concerned that animal products could be have antibiotic residues and the emergence of microbes resistant to antibiotics, the majority of these drugs have been outlawed in numerous nations. In chicken diets, herbs and spices are utilized as an alternate feeding method in place of antibiotic growth boosters. Medicinal herbs or phytobiotic as feed additives are natural and safe to use in poultry production when compared to chemical materials or antibiotics **(Maha *et al.*, 2016)**. Coriander is a medicinal herb belong to the family Apiaceae. Coriander seeds contain high nutritional values of proteins, oils, carbohydrates, fiber and wide range of minerals, trace elements and vitamins. Linalool makes up 57.57% of the

*** Corresponding author: Mahmoud A. Toson**
E-mail address: prof.mahmoudtoson55@gmail.com

essential oils found in coriander seeds, while geranyl acetate makes up 15.9%. Because coriander seeds include essential oils and other chemical substances that improve the feed's palatability and aroma for broiler chicks. Also, coriander seeds supplementation into chick diets resulted better digestion of nutrients through improvement in endogenous digestive enzymes secretion, eliminating harmful microorganisms in the digestive system and feed stuffs and increased the economical efficiency of broilers (**Srinivas *et al.*, 2022a** and **Farid *et al.*, 2024**). The results of using coriander seeds as feed additives in broiler chick diets vary depending on different factors, including the form of the herb (seed powder, essential oil, or alcoholic extract), supplemented levels, the bioactive molecules concentration in the herbs, and the breeding environment (whether or not heat stress is present). It is preferable to use intact coriander seeds as feed additives in broiler chick diets, due to its availability in local market, easy to mix with other feed ingredients and its contents of not only fat, but also other nutrients such as protein, minerals and vitamins. Hence, this investigation was undertaken to assess how coriander seed inclusion in broiler diets influences growth performance and economic efficiency.

MATERIALS AND METHODS

The experimental period was conducted from October 14 to November 24, 2022, at the Animal and Poultry Production Farm, Faculty of Agriculture, Minia University. The economic calculations and data analyses were performed after the completion of the experimental period to evaluate the impact of powdered coriander seeds as a feed additive on the economic efficiency and growth performance of broiler chicks.

Experimental birds and housing:

A total of 180 Arbor-acress broiler chicks, including 180 unsexed one-day-olds, were randomly divided into four groups, each group consisted three replicates **each replicate 15 birds**. All chicks were housed in floor pen (an open house previously cleaned and disinfected). The dimension of each pen was 1.25 x 1.25 m for length and width respectively. At 3 and 6 weeks of age, the chicks in each replicate were weighed to the closest gram. In order to quantify body weight gain during the periods (from 1–21, 22–42, and 1-42 days of age), the initial body weight was subtracted from the end body weight (gm/bird) within each period.

Experimental diets:

In accordance with **NRC (1994),** table (1), one starter and one grower basal diet were developed to satisfy the nutritional needs of broiler chicks. The amount of coriander seed powder added to the starter and growth basal diets was 0, 1, 2, and 3%, respectively. Coriander seeds were bought from Minia Governorate's local market in Egypt. The coriander seeds were ground in electric mill to obtain a fine powder and then it was added to starter and grower basal diets as feed additives. Feed and water were full access for birds during the whole experimental period. Amounts of feed consumed in each replicate at starting, growing and whole experimental period were recorded. Averages feed consumption (gm/bird) during each period were calculated as follow: Feed consumption for each replicate (gm) divided by the number of survived chicks in the same replicate.

Feed conversion ratio:

Feed conversion was estimated as following:

$$\text{Feed conversion ratio} = \frac{\text{Average feed consumption / survived chicks in each period}}{\text{Average body weight gain (gm) / survived chicks in each period}}$$

Hygiene:

Hitchner B1 was used to vaccinate the chicks against New-castle disease at 7 days of age, while Lasota was used at 18 and 28 days. Also, chicks were subcutaneous injected with vaccine in the middle region of the back of the neck against New-castle disease and Avian Influenza at10 days of age. Additionally, at 12 and 23 days of age, the chicks received vaccinations against Gumboro disease.

Cost of diets and economic return:

At the time of preparation of this study (2025), the cost of one kilogram of feed for various diets, the cost of feed/kg gain, and the cost of feed/bird were determined using the local market's one-kilogram live body weight and feed ingredient prices. The absolute economical efficiency of birds in each treatment was estimated as the revenue per bird as follow: Bird-cost of feed/bird-selling price in comparison to the control treatment's economical efficiency, the relative economical efficiency was computed.

Statistical analysis:

The Statistical Analysis System's General Linear Model (GLM) technique was used to analysis the data **(SAS, 2006).** Duncan's multiple range test was used to distinguish significant changes among treatments **(Duncan, 1955).** The statistical model was employed as follow:

$$Y_{ij} = \mu + T_i + E_{ij}$$

Where:

Y_{ij} = The experimental observations.

μ = The overall means.

T_i = The effect of dietary treatment.

E_{ij} = The experimental error.

RESULTS AND DISCUSSION

Body weight and body weight gain:

According to the data in tables (2) and (3), adding powdered coriander seeds to broiler chick diets at 1%, 2%, and 3% had a significant ($p<0.01$) impact on body weight and weight gain during the starting (1-3 weeks of age), growing (4-6 weeks of age), and whole (1-6 weeks of age) experimental periods. Broiler chicks fed diets supplemented with powdered coriander seeds at doses of 1%, 2%, and 3% observed significantly ($p<0.05$) heavier body weight and higher weight gain compared to the control group during the previous mentioned periods. In comparison to the control, the broiler chicks' body weight and weight gain gradually improved ($p<0.05$) as the amount of coriander seed supplementation rose from 1% to 3%.Throughout the whole trial period (1-6 weeks of age), the inclusion of coriander seed powder at levels of 1%, 2%, and 3% resulted in superior body weights of 3.74%, 5.79%, and 6.87%, respectively, compared to those fed the control group. Additionally, for the entire study period (from 1 to 42 days of age), birds fed diets supplemented with 1%, 2%, and 3% powdered coriander seeds gained approximately 3.81%, 5.91%, and 7.01% more body weight than those fed the control group ($p<0.05$).The better feed conversion ratio (Table 5) and the negligible ($p>0.05$) increase in feed consumption (Table 4) compared to the control group were the primary causes of the broiler chicks' superior body weight and body weight increases when fed diets supplemented with powdered coriander seeds. **Rashid *et al.* (2014)** reported that broiler chicks fed diets supplemented with 1% and 1.5% powdered coriander seeds had heavier ($p<0.05$) live body weight and body weight gain than the control group. Additionally, **Ayman *et al.* (2019)** fed broiler diets containing 0, 0.1, 0.2, and 0.4% coriander seed powder from day one to day forty-two. They discovered that, in comparison to the control group, the broiler chicks fed the 0.4% coriander seed powder diet had the highest final body weight and total weight gain ($p<0.05$), followed by those fed the 0.2% or 0.1% coriander

seed powder diets. Furthermore, when compared to the control group, **Hanaa *et al.* (2022)** discovered that adding coriander extract to broiler chick diets significantly ($p<0.05$) increased body weight at the beginning (from 0–3 weeks), end (from 4-6 weeks), and whole period (from 0–6 weeks). Additionally, they stated that the presence of phenolic and antioxidant compounds in coriander extract, which improved growth performance, may be responsible for this impact. Additionally, **Revati *et al.* (2023)** offered broiler chicks diets supplemented with 0.5%, 1%, and 1.5% powdered coriander seeds and showed that utilizing coriander seed powder significantly ($p<0.05$) body weight and weight gain. Herbal feed additives could be improving feed's flavour and palatability by stimulating the digestive process with their active ingredients, which in turn improves productivity (**Windisch *et al.*, 2008; Brenes** and **Roura, 2010**). Additionally, coriander essential oils are great appetite stimulants and encourage the proper secretion of stomach enzymes and certain digestive secretions, according to **Rajeshwari and Andallu (2011)**. Consequently, this improves growth performance and feed conversion ratio by promoting digestion. Furthermore, herbs and spice extracts contain antibacterial and appetite-stimulating qualities, according to **Jamroz *et al.*, (2003)**. Furthermore, linalool chemicals included in coriander seed powder increase the activity of digestive enzymes, which improves nutrient absorption and feed intake. This can raise the feed conversion ratio and improve growth performance (**Cabuk *et al.*, 2003**).

Feed consumption:

Addition coriander seeds powder into broiler chick diets at levels of 1%, 2% and 3% had insignificant ($p>0.05$) increased on feed consumption at starting (for 1-3 weeks of age), growing (for 4-6 weeks of age) and entire (for 1-6 weeks of age) experimental periods (Table 4). During the entire trial period (1-6 weeks of age), broiler chicks fed diets containing 1%, 2%, and 3% powdered coriander seeds, respectively, showed an insignificant ($p>0.05$) increase in feed consumption of roughly 0.68%, 1.20%, and 2.07% in comparison to the control group. These findings are agreed with those of **Rashid *et al.* (2014),** who found no discernible impact on feed consumption by feeding powdered coriander seeds to broiler chicks. Additionally, **Hanaa *et al.* (2022)** discovered that adding coriander extract to broiler chick diets had no discernible effect on feed consumption during the starting and finishing phases. Additionally, they stated that the inclusion of coriander seeds may have improved feed consumption because of the essential oils and linalool, which is its principal constituent. According to **Cabuk *et al.* (2003),** linalool stimulates the animal digestive system and has an appetising impact in diets. According to **Lee *et al.* (2003),** the lack of impacts of coriander seeds on feed consumption can be related to the experiment's ambient conditions as well as the make-up of the basal diet. Because there is less substrate available for bacterial growth, feeds with easily digestible components limit the growth of bacteria in the intestinal tract and lessen the antibacterial effect of plant extract. This is also seen when birds are raised in environments with stringent health control or little immune challenge. However, **Revati *et al.* (2023)** discovered that adding 0.5%, 1%, and 1.5% of powdered coriander seeds to broiler chick diets increased feed consumption ($p<0.05$). According to a number of researchers (**Attia and Harthi, 2015; Attia *et al.*, 2017; 2018**), the variations in the

results could be caused by a variety of experimental conditions, including the form of the herb (essential oils, alcoholic extract or seed powder), the potion of supplements, the abundance of bioactive phytochemicals in the herbs and the housing conditions (whether or not it is under heat stress).

Table (1) Ingredients and calculated chemical analysis of starter and grower experimental diets.

Ingredient	Starter diets (1-3wks)	Grower diets (4-6wks)
Yellow corn%	56.69	68.01
Soybean meal (44 %cp)	31.53	17.14
Mono calcium phosphate%	1.30	0.90
Limestone%	1.82	1.75
Lysine %	0.02	0.10
Methionine%	0.09	0.00
Sunflower oil%	00	0.10
Common Salt%	0.25	0.25
Premix*	0.30	0.30
Total%	100	100
Chemical analysis (calculated)		
Crude protein %	23.01	20.00
Lysine %	1.10	0.90
Methionine + Cystine%	0.90	0.78
Calcium %	1.00	0.93
Available phosphors %	0.45	0.38
ME kcal/kg	2904	3100

*Each 0.3 kg of Premix contained:12000.000 IU vitamin A acetate; 10.000 mg vitamin E acetate; 2000.000 IU vitamin D3; 2000 mg vitamin K3; 4000 mg vitamin B2; 100 mg vitamin B1; 1500 mg vitamin B6; 10.000 mg pantothenic acid; 10 mg vitamin B12; 20.000 mg Nicotinic acid; 50 mg Biotin; 500.000 mg chorine; 1000 mg Folic acid; 10.000 mg Copper; 300.00 mg Iron; 1000 mg Iodine; 55.000 mg Manganese; 100 mg Selenium, and 55.000 mg Zinc.

Table (2): Body weight development of broiler chicks as affected by coriander seed supplementation.

Age (days)	21 days	42 days	1 – 42 days
Treatments	**	***	***
Control	700.00^{c}	1998.67^{c}	1998.67^{c}
Coriander 1%	717.67^{b}	2073.33^{b}	2073.33^{b}
Coriander 2%	721.67^{ab}	2114.33^{a}	2114.33^{a}
Coriander 3%	728.67^{a}	2136.00^{a}	2136.00^{a}
SE	2.87	9.59	9.59

Significant differences ($p < 0.05$) exist between means that have different letters within the same column. SE is the standard error. *** Highly significant at ($p < 0.001$).

Table (3) Body weight gain development of broiler chicks as affected by coriander seed supplementation.

Age (days)	21 days	42 days	1 – 42 days
Treatments	**	***	***
Control	658.00^{c}	1298.67^{c}	1956.67^{c}
Coriander 1%	675.67^{b}	1355.67^{b}	2031.33^{b}
Coriander 2%	679.67^{ab}	1392.67^{a}	2072.33^{a}
Coriander 3%	686.67^{a}	1407.33^{a}	2094.00^{a}
SE	2.87	7.58	9.59

Significant differences ($p < 0.05$) exist between means that have different letters within the same column. SE is the standard error. *** Highly significant at ($p < 0.001$).

Table (4) Feed consumption development of broiler chicks as affected by coriander seed supplementation

Age (days)	21 days	42 days	1 – 42 days
Treatments	**NS**	**NS**	**NS**
Control	1025.67^{b}	3009.33^{b}	4035.00^{b}
Coriander 1%	1031.33^{ab}	3031.00^{ab}	4062.33^{ab}
Coriander 2%	1032.67^{ab}	3050.67^{ab}	4083.33^{ab}
Coriander 3%	1038.33^{a}	3080.33^{a}	4118.67^{a}
SE	2.74	16.51	19.13

Means heaving different letter (s) within each column are significantly different ($p<0.05$).
Ns = Not significant, SE = standard error

Feed conversion ratio:

Fortification with of 1%, 2%, and 3% coriander seeds to broiler chick diets showed a highly significant ($p<0.01$) impact on feed conversion ratios at various age intervals (Table 5). When broiler chick diets were supplemented with powdered coriander seeds, the feed conversion ratio increased ($p<0.05$) during the beginning (for 1 to 3 weeks of age), growing (for 4 to 6 weeks of age) and full (for 1 to 6 weeks of age) experimental periods in comparison to the control dietary treatment. When 1% coriander seed powder was added to the diet during the initial period (for 1 to 3 weeks of age), the feed conversion ratio of the broiler chicks improved ($p<0.05$); however, there was no further improvement in the feed conversion ratio with increasing the level of coriander seed powder in the diet. However, the feed conversion ratio improved gradually up to the level of 2% coriander seed supplementation during the growing (22-42 days of age) and entire (1-42) experimental periods. However, there was no further improvement in feed conversion ratio beyond the level of 1%. As coriander seed powder was added to broiler chick diets at levels of 1%, 2%, and 3%, respectively, the feed conversion ratio improved by approximately 3.10%, 4.67%, and 4.83% during the course of the trial as compared to the control treatment. The benefits of adding powdered coriander seeds to broiler chick diets include increased appetite and feed consumption, improved nutrient digestibility from improved endogenous digestive enzyme secretion, modulation of immune responses and the multifunctional

bioactivities antibacterial, antiviral, antioxidant, and antihelminthic of coriander seed powder.

These findings concur with those of **Gujral *et al.* (2005),** who found that adding 2% powdered coriander seeds to broiler chicks' diets enhanced their feed conversion ratio ($p<0.05$) when compared to other dietary regimens. Additionally, **Al-Tememy *et al.* (2011)** found that the feed conversion ratio of broiler chicks fed a diet supplemented with 2% coriander seeds was substantially ($p<0.05$) which outperformed the other treatments containing 0%, 1%, and 3% coriander seeds. Furthermore, **Naeemasa *et al.* (2015)** found that adding powdered coriander seeds to broiler chicks' diets at 1.5%, 2.0%, and 2.5% improved feed conversion ratios. Additionally, **Revati *et al.* (2023)** demonstrated that adding 0.5%, 1.0%, and 1.5% coriander seed powder to broiler chick diets increased feed conversion ratios ($p<0.05$). They stated that the antibacterial, digestive-stimulating, and appetite-enhancing properties of coriander may be responsible for these changes.

Table (5) Feed conversion ratio development of broiler chicks as affected by coriander seed supplementation:

Age (days)	21 days	42 days	1 – 42 days
Treatments	**	***	***
Control	1.559[a]	2.317[a]	2.062[a]
Coriander 1%	1.526[b]	2.236[b]	2.000[b]
Coriander 2%	1.519[b]	2.190[c]	1.970[c]
Coriander 3%	1.512[b]	2.189[c]	1.967[c]
SE	0.004	0.003	0.002

Significant differences ($p < 0.05$) exist between means that have different letters within the same column. SE is the standard error, *** Highly significant at ($p < 0.001$).

Economical efficiency:

The addition of powdered coriander seeds to the diets of broiler chicks had a highly significant ($p<0.01$) impact on the absolute (L.E.), relative net revenue (%), selling price/bird (L.E.), and total feed cost/bird (L.E.) (Table 6). As the amount of coriander seed powder supplemented into the broiler chicks' diets grew, the total feed cost (L.E.) per bird climbed gradually ($p<0.05$). Additionally, when the amount of coriander seed powder in the diets was increased from 1% to 2%, the selling price per bird increased ($p<0.05$); however, there was no subsequent increase in selling price per bird above the 2% coriander seed powder supplementation level. Additionally, the trend of net revenue and the selling price (L.E.)/bird were comparable. When compared to the control dietary treatment, birds fed diets enriched with 1%, 2%, and 3% coriander seed powder had greater ($p<0.05$) relative net revenue by roughly 5.0%, 7.23%, and 7.54%, respectively. Based on these findings, it can be said that adding 1%, 2%, and 3% powdered

coriander seeds to the diets of broiler chicks gradually raised ($p<0.05$) the cost of feed per bird while gradually increasing ($p<0.05$) the absolute and relative net revenue.

The expense of adding coriander seeds to broiler chick diets was the primary cause of the rise ($p<0.05$) in feed cost per bird. However, the improvements in the absolute and relative net revenue by coriander seeds supplementation were due to the higher selling price/bird resulted from the superiority ($p<0.05$) in body weight gain in coriander seeds treatments compared to the control dietary treatment. These findings coincide with those of **Farag (2013),** who found that adding 0.6% coriander seed powder to broiler diet increased economic efficiency by almost 27.06% better than the control group ($p<0.05$).

Table (6) Effect of coriander seeds on economical efficiency of broiler chicks.

The economical efficiency was calculated according to the prevailing prices in the local market (2025), The price of coriander seeds was 42 L.E/kg. Ns= Not significant SE = standard error

Treatments	Control	Coriander seeds			SE	Sig.
		1%	2%	3%		
Total feed consumption (gm)	4035.00^{b}	4062.33^{ab}	4083.33^{ab}	4118.67^{a}	19.13	**ns**
Total feed cost/ bird (LE)	73.59^{d}	75.05^{c}	76.38^{b}	77.97^{a}	0.354	**
Body weight (gm)	1998.67^{c}	2073.33^{b}	2114.33^{a}	2136.00^{a}	9.59	**
Selling price /bird (L.E)	175.88^{c}	182.45^{b}	186.06^{a}	187.97^{a}	0.844	**
Absolute net revenue	102.29^{c}	107.40^{b}	109.68^{a}	110.0^{a}	0.509	**
Relative net revenue	100^{c}	105.00^{b}	107.23^{a}	107.54^{a}	0.497	**

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الملخص العربي

إستخدام بذور الكزبره كإضافات غذائىه في علائق بدارى اللحم

أ.د أحمد محمد أحمد عثمان[١] – أ.د محمود عباس طوسون[١] – أ.د عماد عبد القادر حسن[٢] – محمود مصطفى على حسن[٢]

(١) قسم الإنتاج الحيواني – كلية الزراعة – جامعة المنيا
(٢) المعمل المركزي للزراعة العضوية – مركز البحوث الزراعية

كان الهدف من هذه الدراسه هو تقدير تأثير إضافة مسحوق بذور الكزبره كإضافات غذائية طبيعيه في علائق بدارى اللحم على كفاءتها الإنتاجية والاقتصاديه.

إستخدم في هذه الدراسه ١٨٠ كتكوت تسمين إربورايكرز عمر يوم وزعت عشوائيا إلى أربع مجموعات بكل مجموعه ٣ مكررات.

غذيت الكتاكيت لحد الشبع على علىقه البادىء (من عمر ١ - ٢١ يوم) وعلى عليقه النامي (من عمر ٢٢ - ٤٢ يوم) المضاف أو الغير مضاف اليها مسحوق بذرة الكزبره بمعدل ٠%، ١%، ٢%، ٣% على الترتيب.

أوضحت النتائج ما يلي:

سجلت الطيور المغذاه على مسحوق بذرة الكزبره بمعدلات ١%، ٢%، ٣% على الترتيب وزن جسم أعلى (٥%) وكذلك معدل الزياده في وزن الجسم (٥%) ومعدل تحويل غذائي أفضل (٥%) مقارنة بالطيور المغذاه على عليقة المقارنه.

إزدادت كمية العليقه المستهلكه بدرجه غير جوهريه بإضافة مسحوق بذور الكزبره إلى علائق بدارى اللحم.

إضافة مسحوق بذور الكزبره إلى علائق بدارى اللحم أدى إلى تحسن جوهري (٥%) في الكفاءه الإقتصاديه مقارنة بالطيور المغذاه على عليقة الأساس.