



Influence of adding different levels of local dried Tarragon (*Artemisia dracunculus*) as a feed additive on production performance of broiler chicks.

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Article info	Abstract
Original: 26 December 2019 Revised: 25 March 2020 Accepted: 17 May 2020 Published online: 20 June 2020 Key Words: <i>broiler, tarragon, performance.</i>	A total of 240 (one-day-old) unsexed broiler chicks (Ross 308) were used. The experiment included four treatment groups, with four replications per treatment with 15 birds each. The experiment persisted 42 days, the chickens were provided with feed and water <i>ad libitum</i> . Experimental treatments were given basal diet only (T0), basal diet with adding 200 g dried local tarragon (T1), basal diet with adding 400 g dried local tarragon (T2) and basal diet with adding 600 g dried local tarragon (T3). The tarragon additive positively affects the values of daily feed intake, in overall period (1-42 day of age), 333.88g/bird/day was the best feed intake which was belonged to T3 treatment. Also, the tarragon additive affects positively protein and energy intake. No significant effects were obtained in body weight gain between the different treatments and within several age periods. Significant effects were recorded for the results of feed conversion ratio and both protein and energy conversion ratio in the age period (29-42 day) and in overall period (1-42 day) but did not affect body weight gain during the trial periods.

Introduction

Feed additives have been defined as ingredients carefully added to animal feed to accelerate their development, increasing both the quality and quantity of the products, without undesirably affecting the health of those animals [1]. The use of feed additives is an important approach for attractive livestock performance and health. Many organic and inorganic substances have been used as feed additives, for example, antibiotics have been added to afford antimicrobial effects and to increase the feed conversion rate [2]. The use of antibiotics as a vintage enhancing feed additive is forbidden because of their possible risks to human health [3]. *Artemisia dracunculus* L. (tarragon) is an aromatic plant belonging to the Asteraceae family. The plant and the essential oil obtained from its stems and leaves have been widely used in popular medicine [4]. Tarragon was used as a medicine treatment for increasing appetite, and its melted extract can increase the excretion of gastric fluid. The use of tarragon in the diets is not a form envisioned to cover antacid influences, but to prepare the basis for the development of conserving factors such as bicarbonate production, mucin secretion, and contraction property [5]. Dried tarragon leaves can act as blood cleanser, and have anti-headache /anti-dizziness property [6]. Tarragon leaves and its connected essential oils examined in broiler diets, and some useful results were detected in slaughter traits and growth performance [7]. *Artemisia dracunculus* also has important compounds ascribed to it, such as: metilkafikol, osimen, mirsen, kamfer, kamfen, anisacit, α -ve β -pinen, limonen, linalool, p-metoksisinamikaldehyde, flavonoide, kumarine and minerals [8]. Tarragon (*Artemesiadracunulus*), has stomachic, digestive stimulating, anti-microbial and anti-inflammatory properties. There are restricted researches about the use of tarragon in poultry feeding [9] and [10].

The aim of this study was to evaluate the effect of dried local tarragon, as feed additives on production performance of broiler chicks.

Materials and Methods

This study was carried out at the Poultry Farm of Animal Science Department, College of Agricultural Engineering Sciences, University of Sulaimani/Kurdistan Region of Iraq, from 17/10/2019 to 27/11/2019. A total of 240 (one-day-old) unsexed (Ross 308) broiler chickens were weighed and allotted into 4 groups randomly. Each treatment comprised 4 replicate pens with 15 birds each. All chickens had *ad libitum* access to water and feed and the diets were available as mash form. Diets were formulated to meet the chicken's recommended levels of Ross requirements. The chickens were fed the starter (from day one to fourteendayof age), grower (from fifteendayto twenty eightdayof age) and finisher (from twenty eightdayto forty twodayof age) diets throughout the whole experiment but received different amounts of (0, 200 , 400 , and 600) g of dried local tarragon.

Each pen-confined group was fed one of the following four diets (Table 1) for forty-two days, Treatments were:

- T0: base diet (control),
- T1: base diet + 200g of Tarragon,
- T2: base diet + 400g of Tarragon,
- T3: base diet + 600g of Tarragon

Table (1): Composition and nutrient levels of the base diets (starter, grower and finisher)

Ingredients	Starter (%)	Grower (%)	Finisher (%)
Meat and bone meal	2.5	0.55	0.4
Soybean meal (44% CP)	30	25	21.44
Wheat	59.23	65.71	69.1
Sunflower seed oil	4	5	5
Dicalcium phosphate	2.3	1.94	1.66
DL-methionine	0.2	0.07	0.8
Lysine HCl	0.27	0.22	0.2
Limestone	1.15	1.16	1.05
Salt	0.25	0.25	0.25
*Mineral and Vitamin Premix	0.1	0.1	0.1
<i>Calculated nutrient contents (%)</i>			
ME (kcal/kg)	2919	3056	3079
Crude protein	21.32	19.27	17.8
Crude fiber	3.15	3.5	3.7
Calcium	0.97	0.86	0.85
Available phosphorus	0.51	0.48	0.47
Lysine	1.45	1.30	1.22
Methionine	0.52	0.50	0.48
Methionine + cysteine	0.90	0.81	0.73

* Supplied per kg of diet: 10,000 IU vitamin A, 12 mg vitamin E, 2000 IU vitamin D, 36 mg niacin, 10 mg D-pantothenic acid, 3.61 mg riboflavin, 3.52 mg pyridoxine, 2.41 mg thiamine, 1.39 mg folic acid, 0.16 mg biotin and 0.03 mg vitamin B, 59 mg manganese, 41 mg zinc, 1281 mg iron, 7,9 mg copper, 0.31 mg iodine and 0.22 mg selenium.

Table (2): Tarragon herb, (*Artemisia dracunculus*), dried nutritional value per 100 g.

Principle	Nutrient Value	Percentage of RDA (%)
Protein	22.77 g	15
Fat	7.24 g	24
Fiber	7.4 g	19
Metabolizable energy	295 Kcal	15
CHO	50.22	38

RDA: Recommended Dietary Allowance
 USDA National nutrient data base, (2019)

Feed intake

To determine feed intake, specific amounts of ration were weighed and given to the birds for every room at the beginning of week. At the end of week, the rest of the ration from every room were weighed and deducted from the original ration, so weekly consumed diet can be yielded. Feed intake in one to fourteen days old, fifteen to twenty-eight days old and twenty-nine to forty-two days old and entire feed intake in one to forty-two days intervals old was calculated.

Protein and Energy intake

Specific amounts of ration were weighed and given to the birds for every pan at the beginning of week. At the end of week, the rest of the ration from every room were weighed and deducted from the original ration, the consumed diet multiplied by the percentage of protein in the ration by age stage to determine protein intake. To determine energy intake the same amount of consumed ration multiplied by the amount of metabolizable energy in the ration by age stage, so weekly protein and energy can be yielded, protein and energy intake in one to fourteen days old, fifteen to twenty-eight days old and twenty-nine to forty-two days old and entire protein and energy intake in one to forty-two days intervals old was calculated.

Body weight gain

At the beginning of the experiment, all of chicks were weighed. There was no significant among them, and the primary average weight of chicks in different rooms was almost equal. At the end of each week, every room's chicks were weighed, and deduced from their first week's weight. Therefore, weekly weight gain can be measured. The same method was applied to measure weight gain in the periods from one to fourteen days old, fifteen to twenty-eight days old and twenty-nine to forty-two days old and entire body weight gain in one to forty-two days old.

Feed conversion ratio

After measuring feed intake and body weight gain over a week, the following equation used to determine

$$\text{feed conversion ratio: } \frac{\text{Feed intake over a week}}{\text{week's beginning weight} - \text{week's ending weight}}$$

Conversion ratio analysis was calculated in one to fourteen days old, fifteen to twenty-eight days old and twenty-nine to forty-two days old and entire feed conversion ratio in one to forty-two days intervals old was calculated.

Protein and Energy conversion ratio

After measuring feed intake, and through it to determine the protein intake and the amount of metabolizable energy intake and gain weight over a week, the following equation used to determine protein conversion ratio and energy conversion ratio:

$$\text{Protein conversion ratio} = \frac{\text{protein intake over a week}}{\text{week's beginning weight} - \text{week's ending weight}}$$

$$\text{Metabolizable energy conversion ratio} = \frac{\text{metabolizable energy intake over a week}}{\text{week's beginning weight} - \text{week's ending weight}}$$

Protein and metabolizable energy conversion ratio analysis was calculated in one to fourteen days old, fifteen to twenty-eight days old and twenty-nine to forty-two days old and entire protein and metabolizable energy conversion ratio in one to forty-two days intervals old was calculated.

Methods of data analysis

All data collected during the experiment were analyzed using Excel software. Calculations for the parameters will perform for different treatments. Data were analyzed using XLSTAT 2019.3.2. [11]

Comparison of means is also conducting by using Fisher least significant differences (LSD), at the significance level of 0.05. The project statistical model is as follows:

$$X_{ij} = \mu + T_j + e_{ij}$$

X_{ij} : Observation of the i replicate in j treatment

μ : Mean of all the data

T_j : The effect of j experimental treatments

e_{ij} : The effect of experimental error

Results and Discussion

Dietary supplementation effects of different dried local tarragon levels on feed intake during the whole experimental periods are shown in table (3). The results of the experiment showed that adding 200,400 and 600 g of dried local tarragon caused no significant difference between the feed intake of different treatments in two age periods (1-14 and 15-28 days), however there were significant differences ($p \leq 0.05$) in the age period (29-42) and overall period (1-42 days). Birds fed with diets containing dried local tarragon supplements (T3) had significantly ($P \leq 0.05$) lower daily feed intake (g/bird/day) compared to the birds fed with the control diet during the two periods (from 29 to 42 and 1-42 days of age).

Table 3. The effects of different dried local tarragon levels on feed intake (g/bird/day) of broiler chickens (Mean \pm S.E.).

Treatments	Age periods (days)			
	1-14 Starter diet	15-28 Grower diet	29-42 Finisher diet	1-42
T_0	41.29 \pm 0.22 a	105.89 \pm 0.45 a	207.08 \pm 2.66 a	354.26 \pm 2.93 a
T_1	41.06 \pm 0.18 a	105.83 \pm 0.55 a	203.76 \pm 2.68 a	350.64 \pm 2.61 ab
T_2	41.31 \pm 0.25 a	102.33 \pm 1.78 a	197.50 \pm 4.29 ab	341.14 \pm 5.89 ab
T_3	41.31 \pm 0.42 a	101.61 \pm 2.15 a	190.96 \pm 5.98 b	333.88 \pm 8.39 b

The means with different superscripts in the same column for each section are significantly different ($p \leq 0.05$).

T_0 : base diet (control), T_1 : base diet + 200g of Tarragon, T_2 : base diet + 400g of Tarragon, T_3 : base diet + 600g of

The highest (354.26 g/bird/day) and lowest (333.86 g/bird/day) at 1-42 day of age period feed intake values were recorded in T_0 and T_3 groups, respectively. The results of experiment conducted by Hosseinzadeh and Moghaddam (2014) [10] showed that experimental dietaries not effect significantly ($P > 0.05$) on feed Intake, which experiment includes base diet (control), base diet plus 0.125% of Tarragon, base diet plus 0.25% of Tarragon, base diet plus 0.5% of Tarragon. In a study carried out by Tunc, *et. al.*, (2019) [12] on they observed that no significant difference among the groups and periods was observed for daily feed intake in an experimental groups which were given basal diet only (control treatment), basal diet plus 0.1% tarragon (T_1), basal diet plus 0.2% tarragon (T_2) and basal diet plus 0.5% tarragon (T_3).

The effects of different levels of dried local tarragon on body weight gain during the whole experimental periods are presented in table (4), the dietary supplementation of the dried local tarragon had no significant effect on body weight gain between the treatments in different age periods, which is varied between (213.45) in T_0 to (226.48) in T_2 . Khaligh, *et al.*, (2015) [13] announced that dietary treatments had no significant effect on average body weight gain at the end of the experiment ($P > 0.05$), when birds fed 0.4% tarragon (*Artemisia dracunculus*) leaves or with 0.2% tarragon leaves plus 0.2% peppermint leaves.

Table 4. The effects of different dried local tarragon levels on body weight gain (g/bird/day) of broiler chickens (Mean \pm S.E.).

Treatments	Age stages (days)			
	1-14	15-28	29-42	1-42
T_0	32.55 \pm 0.45 a	78.39 \pm 3.18 a	102.50 \pm 10.29 a	213.45 \pm 6.69 a
T_1	32.48 \pm 1.86 a	81.96 \pm 0.75 a	106.70 \pm 9.48 a	221.14 \pm 7.56 a
T_2	32.55 \pm 0.74 a	80.80 \pm 2.38 a	113.13 \pm 7.95 a	226.48 \pm 6.81 a
T_3	30.13 \pm 0.42 a	81.52 \pm 3.04 a	104.29 \pm 4.24 a	215.93 \pm 6.87 a

The means with different superscripts in the same column for each section are significantly different ($p \leq 0.05$).

T_0 : base diet (control), T_1 : base diet + 200g of Tarragon, T_2 : base diet + 400g of Tarragon, T_3 : base diet + 600g of Tarragon.

The feed conversion ratio of different treatments and age periods are summarized in table (5). No significant difference was found in feed conversion ratio in the age periods (1-14, 15-28 and 29-42 days), however there are significant differences ($P \leq 0.05$) between T_0 and T_2 , T_3 in the overall age period (1-42 days), in this period of age the best feed conversion ratio is recorded in T_2 which was (1.51) in otherwise (1.66) is the lowest feed conversion ratio in T_0 . Study on broiler chicks carried out by Ciftci *et al.*, 2005 [14] showed that adding Tarragon at 100 and 200 g/ kg had no significant difference in performance parameters compared with control treatment, while at 400 g/ kg diet improved average daily weight gain significantly.

Table 5. The effects of different dried local tarragon levels on feed conversion ratio (g feed intake/g body weight gain) of broiler chickens (Mean \pm S.E.).

Treatments	Age stages (days)			
	1-14 Starter diet	15-28 Grower diet	29-42 Finisher diet	1-42
T_0	1.27 \pm 0.01 a	1.36 \pm 0.06 a	2.07 \pm 0.16 a	1.66 \pm 0.04 a
T_1	1.28 \pm 0.08 a	1.29 \pm 0.02 a	1.96 \pm 0.18 a	1.59 \pm 0.06 ab
T_2	1.27 \pm 0.03 a	1.27 \pm 0.05 a	1.78 \pm 0.10 a	1.51 \pm 0.02 b
T_3	1.37 \pm 0.03 a	1.25 \pm 0.03 a	1.83 \pm 0.04 a	1.55 \pm 0.02 b

The means with different superscripts in the same column for each section are significantly different ($p \leq 0.05$).

T_0 : base diet (control), T_1 : base diet + 200g of Tarragon, T_2 : base diet + 400g of Tarragon, T_3 : base diet + 600g of Tarragon.

Researchers have reported that adding tarragon increasing length of intestine and can also improve absorption level in the intestine that can result in increased growth [15]. In the present study, broiler chickens fed with higher levels of dried local tarragon gained little weight when compared with other groups, and this led to the increase of feed conversion ratio of the birds. 0.5 % Tarragon can increase feed conversion ratio intake and decrease the performance of broiler chickens when compared with lower levels of Tarragon. It is possible that in the process of drying Tarragon, all its useful combination was destroyed [16] and has lost its effectiveness. No significant difference was found in feed conversion ratio ($P > 0.05$) when birds fed 0.4% tarragon (*Artemisia dracunculus*) leaves or with 0.2% tarragon leaves plus 0.2% peppermint leaves (PplusT, 5 pens) [13] and [10]. No significant difference among the groups and periods was observed for the feed conversion rate in the experimental groups which were given basal diet only (control), basal diet plus 0.1% tarragon (T_1), basal diet plus 0.2% tarragon (T_2) and basal diet plus 0.5% tarragon (T_3), [12].

The results in table (6 and 7) indicate that there are no significant differences between the treatments in protein and energy intake in the two age periods (1-14 and 15-28 days), while the results in overall the study from (1-42) days of age showed that protein and energy intake in control group differ significantly ($P \leq 0.05$) with T1, T2 and T3 treatments, the highest protein intake (g/bird/day) recorded in control treatment which was (65.416), in contrast the lowest protein intake (g/bird/day) recorded in T3, it was (62.379), the highest energy intake (Kcal/bird/day) recorded in control treatment which was (1081.71), in contrast the lowest protein intake (Kcal/bird/day) recorded in T3, it was (1019.08). The results of an experiment collected by Hosseinzadeh and Moghaddam (2014) [10] showed that experimental dietaries not effect significantly ($P > 0.05$) on protein and energy intake of different treatments, the treatments contains base diet (control), base diet and 0.125% of Tarragon, base diet and 0.25% of Tarragon, base diet and 0.5% of Tarragon. In a study carried out by Tunc, *et. al.*, (2019) [12] they observed that no significant difference among the groups and periods was observed for daily protein and energy intake in an experimental group which were given basal diet only (control group), basal diet and 0.1% tarragon, basal diet and 0.2% tarragon and basal diet and 0.5% tarragon.

Table 6. The effects of different dried local tarragon levels on protein intake (g/bird/day) of broiler chickens (Mean \pm S.E.).

Treatments	Age stages (days)			
	1-14 Starter diet	15-28 Grower diet	29-42 Finisher diet	1-42
T ₀	8.80 \pm 0.05 a	20.41 \pm 0.09 a	36.86 \pm 0.47 a	66.07 \pm 0.52 a
T ₁	8.75 \pm 0.04 a	20.39 \pm 0.11 a	36.27 \pm 0.48 a	65.42 \pm 0.47 ab
T ₂	8.81 \pm 0.05 a	19.72 \pm 0.34 a	35.16 \pm 0.76 ab	63.68 \pm 1.07 ab
T ₃	8.81 \pm 0.09 a	19.58 \pm 0.42 a	33.99 \pm 1.07 b	62.38 \pm 1.54 b

The means with different superscripts in the same column for each section are significantly different ($p \leq 0.05$)

Table 7. The effects of different dried local tarragon levels on energy intake (Kcal /bird/day) of broiler chickens (Mean \pm S.E.).

Treatments	Age stages (days)			
	1-14 Starter diet	15-28 Grower diet	29-42 Finisher diet	1-42
T ₀	120.51 \pm 6.42 a	323.60 \pm 13.60 a	637.60 \pm 81.84 a	1081.71 \pm 90.26 a
T ₁	119.86 \pm 5.25 a	323.41 \pm 16.90 a	627.37 \pm 82.41 a	1070.63 \pm 80.08 ab
T ₂	120.58 \pm 7.18 a	312.71 \pm 54.28 a	608.11 \pm 131.95 ab	1041.40 \pm 180.96 ab
T ₃	120.60 \pm 12.12 a	310.53 \pm 65.82 a	587.95 \pm 184.21 b	1019.08 \pm 257.38 b

The means with different superscripts in the same column for each section are significantly different ($p \leq 0.05$).

In the current study, the best protein conversion ratio, which shown in table (8), in the whole of experiment period were related to T3 which fed diet containing 600 g of tarragon with protein conversion ratio of (0.282), while the best energy conversion ratio, which shown in table (9), was recorded in T2 which fed diet containing 400 g of tarragon with energy conversion ratio of (13.03). It seems that dried local tarragon improves the average protein and energy conversion ratio (g protein intake/g body weight

gain)(Kcal energy intake/g body weight gain) respectively by speeding up the digestion and shortening the transit time through the gastrointestinal tract. Improvement in feed conversion ratio may be due to a reduction in the number of pathogenic bacteria and an increase in the number of beneficial bacteria in the gut. This leads to a reduction in the incidence of diarrhea, reducing the competition with the host for nutrients, increasing access to energy and protein, and increasing functions of the immune system [17].

Medicinal plants effect the performance of broilers in different aspects. In these plants there are effective substances such as Cinnamaldehyde and Capsaicin. These substances can have stimulating effects on increasing the secretions of digestive latexes from organs such as the pancreas and liver. Sufficient secretion of these latexes leads to better digestion, absorption and metabolism of nutrients. The result would be reflected as improvement in the performance efficiency [5].

Table 8. The effects of different dried local tarragon levels on protein conversion ratio (g protein intake/g body weight gain) of broiler chickens (Mean ± S.E.).

Treatments	Age stages (days)			
	1-14 Starter diet	15-28 Grower diet	29-42 Finisher diet	1-42
T ₀	0.27 ± 0.01 a	0.26 ± 0.01 a	0.37 ± 0.03 a	0.31 ± 0.01 a
T ₁	0.27 ± 0.02 a	0.249 ± 0.01 a	0.35 ± 0.03 a	0.30 ± 0.01 ab
T ₂	0.29 ± 0.01 a	0.24 ± 0.01 a	0.33 ± 0.02 a	0.29 ± 0.01 ab
T ₃	0.27 ± 0.01 a	0.25 ± 0.01 a	0.31 ± 0.01 a	0.28 ± 0.01 b

The means with different superscripts in the same column for each section are significantly different (p≤ 0.05).

Table 9. The effects of different dried local tarragon levels on energy conversion ratio (Kcal/g body weight gain) of broiler chickens (Mean ± S.E.).

Treatment s	Age stages (days)			
	1-14 Starter diet	15-28 Grower diet	29-42 Finisher diet	1-42
T ₀	3.70 ± 0.395 a	4.15 ± 1.941 a	6.37 ± 5.009 a	14.23 ± 2.758 a
T ₁	3.73 ± 2.413 a	3.95 ± 0.549 a	6.02 ± 5.436 a	13.70 ± 4.087 ab
T ₂	3.71 ± 0.978 a	3.88 ± 1.645 a	5.44 ± 2.984 a	13.03 ± 1.776 b
T ₃	4.01 ± 0.835 a	3.82 ± 0.894 a	5.65 ± 1.158 a	13.47 ± 1.567 ab

The means with different superscripts in the same column for each section are significantly different (p≤ 0.05).

Various outcomes have been accounted for during the utilization of various homegrown medication inductions (oil extricate, water-powered or natural concentrates, and mixture) on the presentation of poultry [18]. These distinctions can be the consequence of assorted variety in compelling mixes accessible in the referenced deductions, physiological state of the bird’s body, and furthermore rapid in transmitting stomach related material in poultry’s digestive system. Concentrate on broiler chicks demonstrated that including *Artemisia dracunculus* (tarragon) extricate at 100 and 200 mg/kg had no huge contrast in execution parameters contrasted and control treatment, while a similar concentrate at 400 mg/kg diet improved

normal day by day weight gain essentially [14]. Cross et al., (2007) [18] assessed the constructive outcome of (*Achilleamillefolium*) herb on broiler chicks' performance, while yarrow separate had no noteworthy impact on performance. The distinction between *Achilleamillefolium* herb and extraction can be expected to the chemzointerpensysco structures that are found in herb yet can't be found in extract. Scientists have revealed that expanding the length of the digestive tract can likewise improve the absorption level in the digestive system that can bring about expanded growth [19].

Conclusion

In the present study, broiler chickens fed with higher levels of dried local tarragon gained more body weight when compared with other groups, and this led to increase feed conversion ratio of the birds. Adding 600 g of dried local tarragon can increase feed conversion ratio of broiler chickens when compared with lower levels of dried local tarragon. It is possible that in the process of drying tarragon, all its useful combination was destroyed [16] and has lost its effectiveness.

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