SINAI Journal of Applied Sciences 10 (1) 2021 027-038

Available online at www.sinjas.journals.ekb.eg

SCREENED BY iThenticate Professional Plagiarism Prevention

SINAI Journal of Applied Sciences

Print ISSN 2314-6079
Online ISSN 2682-3527

ARU-EGYPT SJAS Trust Science | It Creates

GROWTH PERFORMANCE, CARCASS CHARACTERISTICS, ECONOMIC EFFICIENCY AND BLOOD BIOCHEMICAL OF BROILER CHICKS FED DIFFERENT LEVELS OF WILD MINT (*MENTHA LONGIFOLIA*) AND SAGE (*SALVIA OFFICINALIS*) PLANTS

Mai A. Hussain*; M.A. Abdel-Ghaffar; K.I. Said and A.M. Ali

Dept. Ani. and Poult. Prod., Fac. Environ. Agric. Sci., Arish University., Egypt

ARTICLE INFO

Article history:
Received: 24/03/2021
Revised: 06/03/2021
Accepted: 26/03/2021
Available online: 13/04/2021

Keywords:
Broiler,
Wild Mint,
Sage,
Performance and
Carcass

ABSTRACT

This study was conducted to determine the performance of broilers fed diets supplemented with dry wild mint (*Mentha longifolia*) and sage (*Salvia officinalis*) leaves and which are among the alternative growth promoters. A total number of 315 unsexed broilers seven-day old (Ross 308) were randomly allocated to seven treatments with three replicates. The dietary treatments consisted of the basal diet as control (T1), 10 (T2), 20 (T3) and 30 (T4) g/kg wild mint, 10 (T5), 20 (T6) and 30 (T7) g/kg sage added to the basal diet. The results showed birds fed on diet with 20 g/kg wild mint leaf powder significantly had (P≤0.05) the best body weight and FCR as compared to the group fed on 20 and 30 g/kg of sage without any significant effects compared with the other groups. Birds fed on control groups consumed higher (P≤0.05) feed intake compared with the other treatments. Supplemented broiler diets with 20 g/kg wild mint significantly increased slaughter, carcass, gizzard, liver, leg, giblet and total giblet weight compared with chicks fed on diet supplemented with either 20 or 30 g/kg sage without any significant with the rest group. Not significant affected were observed on heart, head, gut and lung weight due to the treatments. Birds fed in diet supplemented with 20 g/kg wild mint had the highest values of net revenue and economic efficiency compared with the control group**.** Blood biochemical parameters including serum protein, albumin, globulin, A/G ratio, and glucose concentrations were not statistically (P>0.05) influenced among all treatments.

INTRODUCTION

Antibiotics are mostly used at sub therapeutic level to improve the production performance of poultry birds. However, consistent use of antibiotic will not only lead to various health issues, could be a major contributors to higher feed cost **Durrani *et al.* (2008)**. The use of phytogenic as feed additives is gaining importance due to their antimicrobial and stimulatory effects on digestive system **(Jang *et al.*, 2004)**. Herbs, spices or their products including plant extracts, essential oils or the main components of the essential oils are among the alternative growth promoters that are already being used in research publication **(Ahmed *et al.*, 2016)**.

Habek mint (*Mentha longifolia*) – known as horse or wild mint - like many other members of this genus, is often used in domestic herbal remedy, being valued especially for its antiseptic properties and its beneficial effects on the digestion **(Foster and Duke, 1999)**.

Sage (*Salvia officinalis*) has high contents of antioxidant, which can help and protect the body's cells damage by the free radicals leading to impaired immunity and chronic disease **(Mohamed and Mustafa, 2019)**.

* **Corresponding author: E-mail address:** jakoupmai@gmail.com
https://doi.org/ 10.21608/SINJAS.2021.69360.1013

In broiler chicks many studies were conducted to evaluate the effect of wild mint and sage plants as feed additives and growth promoters causing safe improvements in growth performance and economic traits **(Al-Kassie 2010, Ameri *et al*., 2016**, **Asadi *et al*., 2017, Agha *et al*., 2019 and Rasouli *et al*., 2019).** So that the purpose of this study was to evaluate the effect of wild mint and sage in the broiler diet on their performance and carcass characteristics.

MATERIALS AND METHODS

The study was carried out at the Poultry Research Farm of the Department of Animal and Poultry Production, Faculty of Environmental Agricultural Sciences, Arish University, El Arish, North Sinai, Egypt.

A total number 315 unsexed seven day-old broiler chicks (Ross 308) are having nearly equal live weights (33 g) were purchased from a local hatchery and randomly assigned to seven treatments with three replicates of 15 birds based on a completely randomized design. The dietary treatments consisted of the basal diet as control (T1), 10 (T2), 20 (T3) and 30 (T4) g/kg wild mint, 10 (T5), 20 (T6) and 30 (T7) g/kg sage. Fresh wild mint and sage leaves were purchased, sun-shade dried and then grounded to obtain powder. Tables 1 and 2 lists the basal diet formulated to meet or exceed the nutrient requirements of broilers provided by **Ross Broiler Manual (2002)**. All birds received feed and water *ad libitum*. Body weight and feed consumption were recorded weekly. Average live body weight gain and feed conversion ratio were calculated.

At 42 days of age, three birds from each treatment having live body weight around the average of treatment were selected and slaughtered to obtain the carcass; giblets (gizzard, liver and heart). Blood samples were taken from the jugular vein of the birds, at the same time of slaughtering. Blood serum were individually separated by centrifugation at 3000 rpm for 10 minutes and stored in vials at -20^{o}C for later analysis. Frozen serum were thawed and assayed to determine, on individual bases, some biochemical parameters by using Atomic Absorption Spectrophotometer and suitable commercial diagnostic kits following the same steps as described by manufactures. Serum total protein (g/dl), albumin (mg/dl), globulin (mg/dl) and glucose (Glu, mg/dl) were determined.

The prevailing market prices of ingredients and medicinal plants used during the period of the study were used for the economic appraisal of the feeds. Economic efficiency is defined as the net revenue per unit feed cost calculated from input output analysis as described by **Mohanty *et al.* (2020).**

The economic efficiency was calculated by the following:

Feed cost = number of kg feed per chick × price of kg feed.

Selling revenue = body weight gain per chick × price of kg for live body weight.

Net revenue = difference between selling revenue and feed cost.

E.EF (Economic efficiency) = (net revenue/ feed cost) × 100.

R.E.E (Relative economic efficiency), assuming control treatment = 100%.

The obtained data was statistically analyzed using the general linear model procedure described in SAS User's Guide (**SAS, 2004)**. Differences among means were tested using Duncan's multiple range test **(Duncan, 1955)**.

$$Y_{ij} = \mu + \alpha_i + e_{ij}$$

Y_{ij}=individual observation, μ=overall mean, α_i=effect of treatment and e_{ij} represents the random error.

Table 1. Composition and calculated analysis of starter diets (7-21 days of age)

Ingredients %	Starter period						
	T1 Cont.	T2	T3	T4	T5	T6	T7
Yellow corn (grains) %	58.68	58.58	58.48	58.38	58.58	58.48	58.38
Soybean meal (48%)	31	31	31	31	31	31	31
Corn gluten meal (60%)	4.37	4.37	4.37	4.37	4.37	4.37	4.37
Soybean oil	1.85	1.85	1.85	1.85	1.85	1.85	1.85
Monocalcium phosphate	1.83	1.83	1.83	1.83	1.83	1.83	1.83
Limestone (Calcium Carbonate)	1.57	1.57	1.57	1.57	1.57	1.57	1.57
Dl-Methionine	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Lysine	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Premix*	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Salt (Nacl)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Wild mint	0	0.1	0.2	0.3	0	0	0
Sage	0	0	0	0	0.1	0.2	0.3
Total	100	100	100	100	100	100	100
Calculated Analysis							
Metabolizable energy **(ME Kcal/kg diet)	3059	3058	3057	3056	3059	3059	3058
Crude protein (%)	22.8	22.85	22.87	22.88	22.84	22.85	22.85
Calcium (%)	1	1	1	1	1	1	1
Available phosphorus (%)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Methionine (%)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lysine (%)	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Methionine +Cystine (%)	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Crude fiber	2.55	2.55	2.55	2.55	2.55	2.55	2.55

Chemical Analysis

Items	DM	OM	CP	EE	CF	NFE	ASH	Energy (kcal/k)
Control (T1)	85.9	95.2	19.1	3.99	2.79	55.22	4.8	2990
Wild mint 10 g. (T2)	87.6	95	21.6	4.14	2.81	54.05	5.0	3053
Wild mint 20 g. (T3)	87.0	95	21.2	3.15	3.15	54.5	5.0	2974
Wild mint 30 g. (T4)	86.5	94.8	20.9	3.24	2.43	54.73	5.2	2979
Sage 10 g. (T5)	86.0	95.1	20.8	3.24	2.8	54.26	4.9	2958
Sage 20 g. (T6)	86.2	95	20.9	3.37	2.24	54.69	5.0	2988
Sage 30 g. (T7)	86.1	95	20.2	3.57	2.58	54.75	5.0	2980

* Each 3 kg of Premix contains the following, 14000000 UI Vit. A, 4000000 UI Vit. D3, 80000 mg Vit. E, 3000 mg Vit. K3, 4000 mg Vit. B1, 6500 mg Vit. B2, 5000 mg Vit. B6, 20 mg Vit. B12, 50000 mg niacin, 200 mg biotin, 2000 mg folic acid, 15000 mg pantothenic acid, 80000 mg zinc, 100000 mg manganese, 10000 mg copper, 50000 mg iron, 1000 mg iodine, 200 mg cobalt, 300 mg Selenium whereas, calcium carbonate taken as a carrier.

** Metabolizable energy: calculated according to **Ellis (1981)**

Table 2. Composition and calculated analysis of grower diets (22-42 days of age)

Ingredients %	grower period						
	T1 Contr.	T2	T3	T4	T5	T6	T7
Yellow corn (grains) %	67	66.9	66.8	66.7	66.9	66.8	66.7
Soybean meal (48%)	25.94	25.94	25.94	25.94	25.94	25.94	25.94
Corn gluten meal (60%)	1	1	1	1	1	1	1
Soybean oil	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Monocalcium phosphate	1.88	1.88	1.88	1.88	1.88	1.88	1.88
Limestone (Calcium Carbonate)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Dl-Methionine	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Lysine	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Premix*	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Salt (Nacl)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Wild mint	0	0.1	0.2	0.3	0	0	0
Sage	0	0	0	0	0.1	0.2	0.3
Total	100	100	100	100	100	100	100
Calculated Analysis							
Metabolizable energy **(ME Kcal/kg diet)	3057	3056	3055	3053	3056	3056	3056
Crude protein (%)	19.1	19.13	19.15	19.16	19.12	19.13	19.13
Calcium (%)	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Available phosphorus (%)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Methionine (%)	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Lysine (%)	1	1	1	1	1	1	1
Methionine +Cystine (%)	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Crude fiber	2.5	2.5	2.5	2.5	2.5	2.5	2.5

Chemical Analysis

Items	DM	OM	CP	EE	CF	NFE	ASH	Energy (kcal/k)
Control (T1)	85.5	95.3	20.1	3.17	2.69	54.84	4.7	2947
Wild mint 10 g. (T2)	87.5	95.1	18.8	3.27	2.47	58.06	4.9	3022
Wild mint 20 g. (T3)	87.1	94.8	20.6	3.01	2.22	56.07	5.2	2996
Wild mint 30 g. (T4)	87	94.3	19.1	3.11	2.94	56.15	5.7	2952
Sage 10 g. (T5)	87.1	95	19.3	3.08	2.06	57.66	5.0	3010
Sage 20 g. (T6)	86.8	94.8	19.00	3.21	2.44	56.95	5.2	2985
Sage 30 g. (T7)	87.4	94.3	19.7	3.2	3.16	55.64	5.7	2963

* Each 3 kg of Premix contains the following, 14000000 UI Vit. A, 4000000 UI Vit. D3, 80000 mg Vit. E, 3000 mg Vit. K3, 4000 mg Vit. B1, 6500 mg Vit. B2, 5000 mg Vit. B6, 20 mg Vit. B12, 50000 mg niacin, 200 mg biotin, 2000 mg folic acid, 15000 mg pantothenic acid, 80000 mg zinc, 100000 mg manganese, 10000 mg copper, 50000 mg iron, 1000 mg iodine, 200 mg cobalt, 300 mg Selenium whereas, calcium carbonate taken as a carrier.

** Metabolizable energy: calculated according to **Ellis (1981)**

RESULTS AND DISCUSSION

Growth Performance

Data in Table 3 presented the effect of medicinal plants during the experimental period from 7-42 day on body weight gain (g), feed Intake (g) and feed conversion ratio (g. feed/g. gain). The results indicated that the weight gain was significantly higher (P≤0.05) in T3 birds (2383.87 g), as compared to T1 (2281.33 g), T2 (2278.33 g), T4 (2278.33) and T5 (2216.53 g). The lowest body weight gain (g) values were in group T6 (2000.10 g) and T7 (1973.67 g) compared with the rest group. The birds from T3 had the highest body weight (2556.43g), which was significantly higher (p≤0.05) than T1 (2456.37g), T2 (2456.37 g), T4 (2394.40g) and T5 (2357.33 g). At this age, the lowest body weights of the experimental birds under T6 (2173.83 g) and T7 (2155.00 g) without any significantly between them as compared the rest of the treatment groups.

Birds fed in basal diet significantly (P≤0.05) had the highest feed intake by the T1 birds (4436.60 g) with respect to other experimental groups. For feed conversion ratio the results indicated that the T2 and T3 (1.46 and 1.40) birds were found to be significantly superior compared to T6 birds (1.71). The performance of the birds under T1 (1.66), T4 (1.49), T5 (1.52) and T6 (1.65) birds did not vary statistically due to the treatments. The positive effect of the peppermint on improving growth performance was due to its role in improving feed efficiency and decreasing the gastrointestinal disorders. In addition, **Sefidcon *et al*., (1996)** demonstrated that peppermint reinforced the stomach and causing on slow motion for intestinal resulting from alpha humlone. The active compounds such as essential oil that existence in the peppermint were caused stimulate appetite, improve the digestion, mineral absorption and increase feed efficiency in broilers **(Asadi *et al*., 2017).** The previous results in the same tone with **Ameri *et al*. (2016)**, broilers whose diets were supplemented with peppermint powder had higher body weight on 7-42 day of the experiment. Al-Kassie **(2010)** analyzed the performance of broilers whose diets were supplemented with different doses of dry peppermint and observed higher weekly weight gain and lower FCR in chicks fed a lower (0.5%) than a higher (1.5%) peppermint dose. The same results for sage plant were obtained by **Agha *et al*. (2019)** who found that birds fed in diet supplemented with 1% *salvia officinalis* had higher body weight gain and feed intake compared with those fed in higher level (2%) from sage and control group during period from 1-42 day old. Also**, Rasouli *et al.* (2019)** found that the weight gain, feed intake were significantly (P≤0.05) lower with inclusion of 100 ppm *salvia officinalis* extract in the basal diet than the control group for the whole of experiment period (1–42 days) compared with the higher level (200, 300 and 400 ppm) from sage and control group.

Carcass Characteristics

The effects of experimental treatments on carcass characteristics are presented in Table 4. The results indicated that there were significant effect of the supplementation of different levels of sage (*Salvia officinalis*) and wild mint (*Mentha longifolia*) in chicken's diets on slaughter, carcass, gizzard, liver, giblet, leg and total giblet weight. Meanwhile, the heart, head, gut and lung weight did not significantly affect by addition of sage and wild mint on chickens diets compared to the control group. Similarly **Abu Isha *et al*. (2018)** stated that the liver and heart percentage of broiler did not affect significantly by the addition of spearmint (*Mentha spicata*) at level 0.5, 1 and 2%. Also, **Asadi *et al*. (2017)**. Mentioned that the addition peppermint at levels of 0.5 to 6 g/kg to broiler diets not significant effect on heart percentage compared with control group.

Table 3. Effect of experimental diets on growth performance (g) of broiler chicks during the experimental period (7 - 42 day)

Items	Body Weight Gain (g)	Live body weight (g)	Feed Intake (g)	Feed conversion ratio (g. feed/g. gain)
Control (T1)	2281.33a± 22.07	2456.37a±22.09	4436.60a± 72.52	1.66ab±0.04
Wild mint 10 g. (T2)	2278.33a± 65.13	2452.20ab±62.66	4043.76b±59.25	1.46c±0.08
Wild mint 20 g. (T3)	2383.87a± 43.14	2556.43a±42.50	4049.27b± 80.84	1.40c±0.03
Wild mint 30 g. (T4)	2216.53ab± 87.27	2394.40abc±95.60	3995.76b± 46.13	1.49bc±0.06
Sage 10 g. (T5)	2170.67ab±120.67	2357.33abc±127.4	4037.78b±24.40	1.52bc±0.04
Sage 20 g. (T6)	2000.10b± 89.36	2173.83bc±90.76	4077.44b± 42.05	1.71a±0.07
Sage 30 g. (T7)	1973.67b± 58.07	2155.00c±58.22	4055.89b± 64.66	1.65ab±0.03

a,b…Means followed by the same letter within each column are not significantly different at 0.05 level of probability

Table 4. Effect of experimental treatments on carcass traits of broiler chicks

Items	Slaughter Weight	Carcass	Gizzard	liver	Heart	Leg	Head	Gut	Lung	Giblet	Total giblet
Control (T1)	2201.67ab ± 113.25	2136.67ab ±112.05	55.00ab ± 3.65	50,83ab ± 3.52	10.83a ±1.54	87.50a ±6.42	53.33a ±4.77	143.33a ±8.63	9.17a ± 1.54	116.67a ±5.58	2253.33ab ±115.93
Wild mint 10 g. (T2)	2260.50ab ± 61.99	2162.50ab ±60.66	62.50a ± 1.71	55.83a ± 4.90	10.83a ±0.83	95.83a ±7.24	48.33a ±3.07	154.17a ±8.11	12.50a ± 1.12	129.17a ±5.54	2291.67ab ±63.53
Wild mint 20 g. (T3)	2290.83a ± 72.40	2196.67a ± 64.48	60.00a ± 1.83	51.67a ± 3.33	9.17a ±1.54	95.00a ±2.24	50.83a ±2.39	127.50a ±7.83	10.83a ±1.54	120.83a ±5.39	2137.50a ±64.09
Wild mint 30 g. (T4)	2137.50abc ± 92.38	2055abc ± 87.44	58.33ab ±6.00	50.00ab ± 6.19	10.17a ±0.17	82.50ab ±6.29	50.00a ±2.24	147.50a ±13.15	13.33a ±1.05	118.50a ±11.97	2137.50abc ±89.83
Sage 10 g. (T5)	2177.50abc ± 96.27	2098.33abc ± 94.92	62.50a ±2.50	44.17ab ± 2.39	10.83a ±0.83	90.00a ±5.16	50.00a ±1.83	155.83a ±11.50	12.50a ±1.71	117.50a ±4.23	2215.83abc ±95.48
Sage 20 g. (T6)	1899.17c ± 97.44	1834.17c ± 97.86	48.33b ±2.11	38.33b ± 2.47	8.33a± 1.05	69.17b ±4.55	46.67a ±2.11	124.17a ±8.11	11.67a ±2.11	95.00b ±2.58	1929.17c ±97.06
Sage 30 g. (T7)	1970.00bc ±104.38	1895.00bc ±101.38	55.83ab ±3.27	64.67ab ± 3.80	9.17a± 0.83	80.83ab ±4.90	50.83a ±2.39	144.17a ±9.52	13.33a ±2.47	111.67ab ±5.58	2006.67bc ±105.65

a,b…Means followed by the same letter within each column are not significantly different at 0.05 level of probability

It could be observed that supplemented broiler diets with 20 g/kg wild mint (T3) significantly (P≤0.05) increased slaughter, carcass, gizzard, liver, leg, giblet and total giblet weight compared with chicks fed on diet supplemented with either 20 or 30 g/kg (T6 and T7) which achieved the lowest values of this traits. Also, no significant effects between birds fed in diet supplemented with 10, 20 and 30 g/kg of wild mint (T2, T3 and T4) and 10 g/kg of sage (T5) compared with control group (T1) respect to the pervious traits. The results of carcass traits in this study completely confirmed those of **Ameri *et al.* (2016)** who indicated that the birds fed in diet supplemented with 1 and 2% peppermint significantly had the highest values of carcass, gizzard and liver weights at 35 days of age and breast, gizzard and liver relative weights compared with the control group. In addition, **Al-Kassie (2010)** observed an improvement on carcass yield of broilers when broiler fed diet supplemented with 0.5% peppermint (*Mentha piperita*). In contrary, **Abdel-Wahab (2018), Gurbuz and Ismael (2015)**, **Toghyani *et al.* (2010)** found that, use of peppermint had not any significant effect on relative weight of organs and body parts. Also **Hernandez**

***et al*. (2004)** reported that, use of antibiotic or mixtures of plant extracts had not any significant effect on carcass traits of broilers.

Concerning sage plant, the same results were obtained by **Omidikia (2014)** found that the birds fed diets supplemented with Sage (*Salvia mirzayanii*) at levels 0, 0.25, 0.50, 0.75 and 1% had higher (P≤0.05) live weight and relative heart, weights compared with the control group. Contrary, **Bulbul *et al*. (2015)** found no affected in the weight of liver, heart, spleen, gizzard by supplementation with sage (*Salvia triloba* L.) oils in quail diets at three levels (100, 200 and 400 mg/kg) compared with the control group. On the other side, **Agha *et al*., (2019)** observed an improvement in carcass weight due to add found that add *salvia officinalis* leaves powder at levels 0.5%, 0.75%, and 1% to rations compared with the control group.

Blood Constituents

From data are presented in Table 5 due to dietary sage (*Salvia officinalis*) and wild mint (*Mentha longifolia*) it could be noted that there were no significant effect on total protein, albumin, globulin, A/G ratio, and glucose among all treatments. These results in agreement with **Elamin *et al*. (2015)** showed that no significant differences between birds fed in diet supplemented with 1, 1.5 and 2% spearmint compared with the control group in serum total protein and glucose. This agreed with, **Fallah *et al*. (2013)** who stated that the serum total protein and glucose of broiler did not affect significantly by the addition of Mentha (*Mentha pipperita*) extract in at level 200mg/kg in drinking water . Similar, **Al-Kassie, (2010)** mentioned that the no significant (P<0.05) effects in serum total protein between different treatments (0, 0.25, 0.5, 1 and 1.5%) peppermint and the control group. In contrary, **Abu Isha *et al*., (2018)** mention that there were significant increases in the concentration of serum total protein in groups fed diet supplemented with 0.5, 1 and 2% spearmint compared to the control group.

Concerning sage plant, the same results were obtained by **Rasouli *et al*. (2019)** who found that there is no significant effect in blood glucose in birds fed in diet supplemented with four levels of sage extract in drinking water (0, 100, 200, 300 and 400 ppm, respectively). On the other hand, **Ali and Alsaadi (2016)** showed decreased in blood glucose in birds fed in diet supplemented with 1 and 2 % sage oil. Also, who mention increased in total protein due to the treatment compared with the control group.

Economic Evaluation

The economics of the experimental birds under different treatment groups up to fifth week of age are presented in Table 6. After

Table 5. Effect of experimental treatments on blood biochemical parameters of broiler chicks

Terms	Total Protein (g/ dl)	Albumin (g/ dl)	Globulin (g/dl)	A/G ratio	Glucose (mg/dl)
Control (T1)	3.91a±0.06	2.09a±0.14	1.83a±0.14	1.21a± 0.18	248.00a±7.69
Wild mint 10 g. (T2)	3.79a±0.18	1.93a±0.09	1.87a±0.20	1.14a±0.20	228.00a±4.86
Wild mint 20 g. (T3)	3.97a±0.08	2.03a±0.07	1.94a±0.11	1.07a±0.08	262.33a±13.99
Wild mint 30 g. (T4)	3.89a±0.07	1.96a±0.06	1.94a±0.05	1.02a±0.04	227.83a±22.29
Sage 10 g. (T5)	3.87a±0.05	1.89a±0.08	1.97a±0.07	0.97a±0.07	245.50a±15.12
Sage 20 g. (T6)	3.79a±0.08	2.02a±0.17	1.77a±0.19	1.34a±0.39	231.33a±16.04
Sage 30 g. (T7)	3.90a±0.10	1.96a±0.11	1.94a±0.13	1.05a±0.11	252.33a±8.62

a,b…Means followed by the same letter within each column are not significantly different at 0.05 level of probability

Table 6. Effect of experimental diets on economic efficiency of broiler chicks

Treatments	Fixed Cost[1]	Total feed cost	Total Cost	LBW (Kg.)	Total revenue[2]	Net revenue[4]	EE [5]	REE [6] %
Control (T1)	5.70	20.82	26.52	2.46	66.32	39.80	1.50	100.00
Wild mint 10 g. (T2)	5.70	19.21	24.91	2.45	66.21	41.30	1.66	110.49
Wild mint 20 g. (T3)	5.70	19.62	25.32	2.56	69.02	43.70	1.73	115.00
Wild mint 30 g. (T4)	5.70	19.65	25.35	2.35	63.43	38.08	1.50	100.11
Sage 10 g. (T5)	5.70	19.10	24.80	2.36	63.65	38.85	1.57	104.37
Sage 20 g. (T6)	5.70	19.61	25.31	2.17	58.69	33.38	1.32	87.89
Sage 30 g. (T7)	5.70	19.71	25.41	2.16	58.19	32.77	1.29	85.95

1- Fixed cost: Bird price + rearing cost.

2- The price was calculated due to the local market the price of one kg/ wild mint: (80 L. E.) and price of kg/ sage (60 L. E.)

3- Total revenue: Assuming that the selling price of 1 kg lives body weight is 27 L. E.

4- Net revenue: total revenue – total cost.

5- Economic efficiency (E.E.F): Net revenue per unit total cost.

6- Relative economic efficiency (R.E.E): Assuming that the relative economic efficiency of the control.

the end of the experiment, all the birds were sold in the market with a sale price of. 27.00 LE per live weight. The net revenue and economic efficiency values varied from 32.77- 43.70 and 1.29- 1.73, respectively. The highest values of net revenue, economic efficiency and relative economic efficiency were recorded for chicks fed diet supplemented with 20 g /kg of wild mint plant which recorded 33.38, 1.32 and 87.89%. Whoever, the lowest values of net revenue, economic efficiency and relative economic efficiency were recorded for birds fed diet supplemented 30 g /kg of the sage plant whole experimental period (7-42 days). The same results obtained with, **Abdel-Wareth *et al*. (2019)** who found that birds fed in diet supplemented with 15 g/kg of peppermint leaves had the higher total benefit compared with the control group. Also, **Mohanty *et al.* (2020)** found that birds fed basal diet supplemented with 0.5% peppermint powder had higher profit margin than the control birds.

Conclusion

It could be concluded that bird fed basal diet with 20g/kg wild mint improved the performance, carcass characteristics and economic efficiency without any adverse.

REFERENCES

Abdel-Wahab, A.; Abdel-Kader, I. and Ahmad, E.A. (2018). Evaluation of dried peppermint leaves as natural growth promoters alternative to antibiotics on Japanese quail. Egypt. Poult. Sci. J., 38.

Abdel-Wareth, A.A.A.; Kehraus, S. and Sudekum, K.H. (2019) Peppermint and its respective active component in diets of broiler chickens: growth performance, viability, economics, meat physicochemical properties, and carcass characteristics. Poul. Sci., 98:3850–3859.

Abu Isha, A.; El-Hamid, A.; Ziena, H. and Ahmed, H. (2018). Effect of spearmint (*mentha spicata*) on productive and physiological parameters of broiler chicks. Egypt. Poult. Sci. J., 38 (3): 815–829.

Agha, S.I.; Moussa, M. and Khalouf, M. (2019). Effect of adding different levels of *salvia officinalis* leaves powder to feed mixtures on some of productivity characteristics carcass traits of broiler. J. Hama Univ., 2 (8).

Ali and Alsaadi (2016). Effect of adding *salvia officinalis* oil to the ration on some blood serum biochemical traits of broiler ross 308. Europ. J. Pharm. and Med. Res., 8: 138-141.

Al-Kassie, G.A.M. (2010). The role of peppermint (*Mentha piperita*) on performance in broiler diets. Agric. Biol. J. N. Ame., 1:1009–1013.

Ameri, S.A.; Samadi, F.; Dastar, B. and Zerehdaran, S. (2016). Effect of peppermint (*Mentha piperita*) powder on immune response of broiler chickens in heat stress. Iran. J. Appl. Anim. Sci., 6: 435-445.

Asadi, N.; Husseini, D.S.; Tohidian, M.; Abdali, N.; Mimandipoure, A.; Rafieian-Kopaei, M. and Bahmani, M. (2017). Performance of Broilers Supplemented with Peppermint (*Mentha piperita* L.) Powder. J. Evidence-Based Complementary and Alternative Med., 1-4.

Bulbul, T.; Ozdemir, V. and Bulbul, A. (2015). Use of sage (*Salvia triloba* L.) and laurel (*Laurus nobilis* L.) oils in quail diets. Eurasian J. Vet. Sci., 31: 95–101

Duncan, D. B. (1955). Multiple range and multiple F-teste. Biometrics, 11: 1-42.

Elamin, H.M.S.; Mohamed, K.A. and Mukhtar, M.A. (2015). Effect of Spearmint (*Mentha spicata*) on performance and blood serum parameter of broiler. J. Social Sci. Res., 8 : 2.

Fallah, R.; Kianim, A. and Azarfar, A. (2013). Effect of artichoke leaves meal and mentha extract (*Mentha pipreita*) on immune cells and blood biochemical parameters of broilers. Global Vet., 10 (1): 99-102.

Gurbuz, Y. and Ismael, I. (2016). Effect of peppermint and basil as feed additive on broiler performance and carcass characteristics. Iran. J. Appl. Anim. Sci., 6: 149-156.

Hernandez, F.; Madrid, J.; Garcia, V.; Orengo, J. and Megias, M.D. (2004). Influence of two plant extracts on broilers performance, digestibility, and digestive organ size. Poult. Sci., Jakubas, 83 (16): 169—174.

Jang, I.S.; Ko, Y.H.; Yang, H.Y.; Ha, J.S.; Kim, J.Y.; Kang, S.Y.; Yoo, D.H.; Nam, D.S.; Kim, D.H. and Lee, C.Y. (2004). Influence of essential oil components on growth performance and the functional activity of the pancreas and small intestine in broiler chickens. Asian australas. J. Anim. Sci. 17: 394–400.

Mohanty, S.; Panigrahi, B.; Babu, L.K.; Behera, K.; Nanda, S.M. and Sabat, G.P. (2020). Effect of Supplementing Different Levels of Peppermint Powder on Production Performance of Broilers. Int. J. Curr. Microbiol. App. Sci., 9(02): 2948-2955.

Omidikia (2014). Effects of Common sage (*Salvia mirzayanii*) powder on performance and some immunity parameters of broilers. M.Sc. Thesis, Dept. Anim. Sci., Fac. Agric., Univ. Zabol, Iran.

Rasouli, B.; Movahhedkhah, S.; Seidavi, A.; Haq, Q.M.; Kadim, I.; Laudadio, V.; Mazzei, D. and Tufarelli, V. (2020). Effect of sage (*Salvia officinalis* L.) aqueous leaf extract on performance,

blood constituents, immunity response and ileal microflora of broiler chickens. Agroforestry Systems.

Ross Broiler Manual, (2002). Available on www.Aviagen.com.

SAS Institute Inc. (2004). SAS procedures Guide for personal Computers, Statistical Analysis System Institute, Inc., Cary, N.C.

Sefidcon, F. (1996). Study of Qualitative and Quantitative of Two Species of Peppermint Essential Oil. Tehran, Iran: Research Institute of Forests and Rangelands (RIFR).

Toghyani, M.; Toghyani, M.; Gheisari, A.A.; Ghalamkari, G. and Mohammadrezaei, M. (2010). Growth performance, serum biochemistry, and blood hematology of broiler chicks fed different levels of black seed (*Nigella sativa*) and peppermint (*Mentha piperita*). Livest. Sci., 129: 173-178.

Mohamed, A.Y. and Mustafa, A.A. (2019). Gas Chromatography-Mass Spectrometry (GC-MS) Analysis of Essential Oil *Salvia Officinalis* in Sudan. J. Multidis Res. Rev., 1 (1): 43-45.

الملخص العربي

أداء النمو والاستفادة الغذائية وصفات الذبيحة والكفاءة الاقتصادية ومكونات الدم للدجاج النامي المغذي على مستويات مختلفة من نباتي الحبق والمرمرية

مي علي عبدالعاطي حسين، محمود أحمد عبدالغفار، كامل إبراهيم سيد أحمد، أحمد محمد علي

قسم الإنتاج الحيواني والداجني، كلية العلوم الزراعية البيئية، جامعة العريش، مصر.

أجريت هذه الدراسة لمعرفة تأثير إضافة نباتي الحبق (النعناع الجبلي) والمرمرية على الأداء الإنتاجي وصفات الذبيحة ومكونات الدم للدجاج النامي خلال المدة من عمر يوم إلى 42 يوم. تم استخدام عدد 315 كتكوت عمر يوم غذيت الطيور في الأسبوع الأول على عليقة أساسية تحتوي على 22.8% بروتين. عند عمر 7 أيام قسمت الطيور عشوائيا إلى 7 مجموعات تحتوي كل مجموعة على 45 طائر في ثلاثة مكررات بكل مكررة 15 طائر. قسمت مدة التجربة إلى مرحلتين غذائيتين المرحلة الأولى (مرحلة البادئ) من عمر 7 إلى 21 يوم وتم تغذية الطيور فيها على علائق تحتوي على 22.8% البروتين، أما المرحلة الثانية (مرحلة النمو) فبدأت من عمر 22 يوم حتى نهاية التجربة (عمر 42 يوم) وتم تغذية الطيور فيها على علائق تحتوي على 19.12% بروتين. أظهرت النتائج وجود زيادة معنوية في متوسط الزيادة في وزن الجسم في الطيور المغذاة على علائق تحتوي على 20 جم/كجم من نبات النعناع الجبلي بالمقارنة بالطيور المغذاة على 20 و30 جم/كجم من نبات المرمرية والتي حققت أقل زيادة يومية في وزن الجسم وبدون اختلافات معنوية بالمقارنة بباقي المعاملات. أظهرت الطيور المغذاة على عليقة تحتوي على 20 جم/كجم من نبات النعناع الجبلي أفضل معدل تحويل غذائي بالمقارنة بباقي المعاملات. استهلكت الطيور المغذاة على عليقه الكنترول أعلي كمية علف مقارنة بباقي المعاملات. ولقد زاد معنوياً الوزن قبل الذبح والذبيحة والقانصة والكبد والأرجل والأجزاء المأكولة في الطيور المغذاة على علائق مضاف إليها 20 جم/كجم أوراق النعناع الجبلي مقارنة بالطيور الأخرى التي غذيت على عليقة مضاف إليها 10 و20 و30 جم/كجم من أوراق المرمرية وبدون فروق معنوية مع باقي المستويات الأخرى. لا توجد فروق معنوية في وزن القلب والرأس والمعدة والرئتين ومكونات الدم بين الطيور المغذاة على المستويات المختلفة من نبات المرمرية والنعناع الجبلي. كما حققت الطيور المغذاة على عليقة مضاف إليها 20 جرام من أوراق النعناع الجبلي أفضل عائد وكفاءة اقتصادية مقارنة بالمجموعة الكنترول والمعاملات الأخرى. من هذه الدراسة يوصى بتغذية دجاج اللحم على علائق مضاف إليها النعناع الجبلي حتي 20 جم لكل كيلو جرام بدون حدوث أي آثار جانبية على الصفات الإنتاجية.

الكلمات الاسترشادية: دجاج اللحم، النعناع البري، المرمرية، الأداء الإنتاجي، الذبيحة.

المحكمـــــون:

1- أ.د. عـــادل إبراهيـــم عطيـــه أستاذ الإنتاج الحيواني والداجني، كلية الزراعة، جامعة الزقازيق، مصر.

2- أ.د. محمد أحمد فؤاد المنيلاوي أستاذ الإنتاج الحيواني والداجني، كلية الزراعة، جامعة القاهرة، مصر.