

EFFECTS OF REPLACEMENT FERULA COMMUNIS (*Giant fennel*) IN DIET ON PRODUCTIVE PERFORMANCE AND SOME PHYSIOLOGICAL PARAMETER IN JAPANESE QUAIL.

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ABSTRACT

This study was conducted at the animal production department, College of Agriculture Engineering Sciences , University of Duhok, in order to investigate the effect of ration replacement with ferula on productive performance and some physiological parameters of quail. Three hundred sixty day old quail birds were divided into four groups with three replicates , group (30 birds replicate, the groups were treated from the age of 7days till the age of 42days as follows: T1(control): Reread on standard ration, T2: Reread on standard ration replaced with 10% ferula, T3: Reread on standard ration replaced with 15% ferula, T4: Reread on standard ration replaced with 20% ferula. The results revealed significant increases in live body weight (LBW) and body weight gain (BWG) of treatment as compared with control in all weeks. A significant increases in carcass weight, dressing percentage of ferula treatments as compared with control. Significant decreases mortality percentage of ferula treatments as compared with control group. Significant decreases in albumin and serum glucose in ferula as compared with control groups.

Keywords: Ferula, ration, body weight, feed intake, conversion ratio, serum glucose

طبيب

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تأثير استبدال الشمر في العلف على الأداء الإنتاجي وبعض الصفات الفسلجية في السمان الياباني

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المستخلص:

أجريت هذه الدراسة في قسم الإنتاج الحيواني بكلية علوم الهندسة الزراعية جامعة دهوك ، بهدف معرفة تأثير استبدال المواد الغذائية بالشمر على الأداء الإنتاجي وبعض الصفات الفسلجية للسمان. تم تقسيم ثلاثمائة وستين طائر السمان بعمر يوم واحد إلى أربع معاملات بثلاث مكررات/ مجموعة (30 طائر/ مكرر)، بدأ الأستبدال في المعاملات من عمر 7 أيام حتى عمر 42 يوماً على النحو التالي T1 مجموعة السيطرة): تم تربيتها على العليقة القياسية، T2: تم أستبدال المواد العلفية بنسبة 10% من الشمر، T3: تم أستبدال المواد العلفية بنسبة 15% من الشمر، T4: تم أستبدال المواد العلفية بنسبة 20% من الشمر، وقد أوضحت نتائج الدراسة ما يلي: زيادة معنوية في وزن الجسم الحي، والزيادة وزنية الأسبوعية للمعاملات (أستبدال بالشمر) مقارنة مع مجموعة السيطرة في جميع الأسابيع. وجد تحسن معنوي في معامل التحويل الغذائي للمجموعات المعاملة (أستبدال بالشمر) مقارنة مع مجموعة السيطرة، زيادة معنوية في وزن الذبيحة، نسبة التصافي لمعاملات أستبدال الشمر مقارنة مع مجموعة السيطرة، انخفاض معنوي في نسبة الهلاكات في معاملات الشمر مقارنة مع مجموعة السيطرة، انخفاض معنوي في الألبومين والكلوكوز في الدم في معاملات الشمر مقارنة بمجموعة السيطرة.

الكلمات المفتاحية: الصفات إنتاجية، وزن الجسم الحي، العلف المستهلك، نسبة التصافي، نسبة الهلاكات.

INTRODUCTION

Ferula belongs to the family Umbelliferae, which consists of 130 species distributed throughout the Mediterranean area and Central Asia (8, 14). *Ferula* which grows to about 2m by 1.5m and requires dry or moist soil. Mostly the dried latex (oleo gum resin) obtained by making deep incision in the roots or rhizomes are preferred for the medicinal as well as for culinary purpose (11). It is a perennial plant which attains a height of up to 12 feet in wild with a circular mass of 30-40 cm leaves. The stem leaves have wide sheathing petioles. Flowering stems are 2.5-3 m high and 10 m thick and hollow. These flowering stems have number of schizogenous ducts in the cortex containing resinous gums. The flowers are small and dirty yellow colored produced in large compound umbels. Fruits of this plant is oval, thin, flat, reddish brown in color and contains milky substance (21). *Ferula* plants include phytoestrogenic substances that affect reproductive hormones such as progesterone, testosterone and estrogens (7). One noteworthy point is that antibiotics, in addition to harmful bacteria, also eliminate the beneficial bacteria in the digestive tract, but herbal essences like probiotics, by eliminating or eliminating the competitive ability of gram-negative bacteria, increase the proliferation of gram-positive

bacteria (12, 16). The improvement in feed intake and feed efficiency achieved with herbal essential oil mixture could be attributed to their positive effects on nutrient digestibility, as reported by (6, 19, 20). Shadmani et al (18) showed that the body weight, body weight gain and immunity of broiler improved with supplemented *Ferula assa foetida* powder. The aim of this study to evaluate the effects of replacement ferula in diet on productive performance and some physiological parameters of birds.

MATERIALS AND METHODS

This study was carried out in the Animal production department College of Agriculture University of Duhok, to investigate the effect of ferula on productive performance and some physiological parameter of quail. A total 360 day-old mixed sex Japanese quail were divided into 4 dietary treatment groups of equal mean weight, comprising 90 birds in each, which were further divided into 3 subgroups containing 30 quails in each. During the reared period the quails were kept in cages (50 cm × 50 cm × 17 cm). They were subjected to 24 h light for 1–5 weeks. Feed and water were provided for ad-libitum consumption. The commercial grower diet included 21.9% CP and 2850 Kcal /Kg ration, and was used as a basal diet of the experiment (Table 1).

Table 1. Diets ingredient (as percent) for experimental bird's starter grower and finisher diets and their calculated chemical analysis.

Ingredient	Control		T2 Ferula 10%		T3 Ferula 15%		T4 Ferula 20%	
	Starter	Finisher	Starter	Finisher	Starter	Finisher	Starter	Finisher
Wheat	57.83	58.23	50.83	51.23	47.83	48.23	44.83	45.23
Soya bean meal	31	31	28	28	26	26	24	31
Ferula	-	-	10	10	15	15	20	20
Breed mix	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Sun flower oil	1.5	1	1.5	1	1.5	1	1.5	1
Wheat bran	4	4	4	4	4	4	4	4
Lime stone	1	1	1	1	1	1	1	1
Di calcium phosphate	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Salt	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
Methionine	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Lysine	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Anti coccidian	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Choline	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Mineral premix	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Bio vet premix	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Vitamin	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Enzyme	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Approximately analysis								
Crude protein %	21.93	22.0	21.85	21.91	21.87	21.92	21.90	22.01
ME.Kcal/kg	2886	2850	2886	2850	2886	2850	2886	2850
C/P ratio	21.24	20.79	21.24	20.79	21.24	20.79	21.24	20.79
Crude fiber	4.31	4.28	4.43	4.44	4.45	4.46	4.47	4.48
Available Ca %	1.07	1.05	1.07	1.05	1.07	1.05	1.07	1.05
Available P %	0.69	0.70	0.69	0.70	0.69	0.70	0.69	0.70
Lysine %	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Methionine %	0.59	0.61	0.59	0.61	0.59	0.61	0.59	0.61

* Premix -1kg contain: Vitamins: 334000 IU A, 67000 mg E, D3 500mg, B1 167 mg, B2 1000mg, B6 0.66 mg, B12 67mg, Niacin 1000mg.

*Minerals: Fe 1.667mg, Mn 3.334mg, Colin 17000mg, folic acid 17mg, Biotin 1.33mg, Zn 2.667mg, Cu 334mg, I 17mg. Methionine 27.000mg, Zn-Bastracin 667mg, Anti oxidant 3.333 ppm, P 10.6% and Na 4-4.5%.

* NRC: Chemical analysis of ingredient depending on NRC (1994).

Treatments were as follows: control group 1 (non replacement diet), treatment 2 (10% ferula powder replacement), treatment 3 (15% ferula powder replacement) and treatment 4 (20% ferula powder replacement) for 5 weeks. Preparing of ferula: It was obtained from Amedy city-Matina mountain, dried inside a building to avoid losing the nutritional value. The chemical compound of ferula shows in Table 2 and active compound shows in Table 3.

Table 2. Show chemical compounds of ferula

Material	Percentage
Crude Moisture	6.65
Protein	18.04
Ash	10.36
NDF	43.2
ADF	24.83
Crude Fiber	16.44
Fat	2.67
Calicium	0.4
Phosphorus	0.33

Table 3 . active compound of ferula sample 10gm extract 2.2521gm

Amount of sample	DPPH% 1,1-Diphenyl-2- picrylhydrazyl	CUPRAC CUPric Reducing Antioxidant Capacity	FRAP Fluorescence Recovery After Photobleaching
Water extract			
1000 µg/ml	79.644	1.557	2.631
500 µg/ml	61.059	0.949	2.236
250 µg/ml	44.881	0.506	1.765
125 µg/ml	30.790	0.338	1.451
62.5 µg/ml	23.640	0.253	1.364
Total	98.852±0.62	-	28440±1.01
Methanol extract			
1000 µg/ml	82.650	1.548	2.561
500 µg/ml	71.119	0.889	2.401
250 µg/ml	64.019	0.542	2.039
125 µg/ml	50.541	0.375	1.736
62.5 µg/ml	36.128	0.294	1.531
Total	70.589±0.29	-	31440±0.45
Neuroprotective Activity result			
	Acetylcholinesterase (AChE ^a) (Inhibition %±SD)	Butyrylcholinesterase (BChE ^b) (Inhibition %±SD)	
Water extract	62.36±0.25**	71.09±0.85**	
Methanol extract	45.96±0.75*	56.59±0.39*	

During the experimental period, the growth performance of the quail was assessed by measuring their body weight and feed intake and feed conversion ratio. At the end of the 5th weeks of the experiment, 4 birds of each replicate 2 females and 2 males were randomly chosen, slaughtering for dressing percentage and biochemical parameter. Mortality was recorded as it occurred. The data obtained in the experiment were analyzed statistically by using the One Way ANOVA procedure of SAS with Duncan's Multiple Range Test to identify the significant differences between means.

RESULTS AND DISCUSSION

Results of live body weight represented in Table 4 shows a significant effects ($P<0.05$) with ferula replacements from 1st to 6th weeks of age compared to control group, the highest live body weight noted in chicks fed on ferula (15 and 20) % at age 3, 4, 5 and 6 weeks of ages, the significant increases are showed clearly in weeks 4, 5 and 6, the final body weight of T₂, T₃ and T₄ are (193.07, 200.87 and 202.87)g respectively compared with control group 193.13g .Table 4 shows the results of body weight gain, there are significant ($P<0.05$) differences between treatments groups compared with control group, the increases in body weight gain started in weeks 5 and 6 of treatments compared to control group, in final body weight gain 1-6 weeks the increases appear

clearly (159.20, 166.40 and 167.87)g of T₂, T₃ and T₄ respectively compared with control group 150.53g. The feed intake represented in Table 5 no significant differences ($P<0.05$) are showed between treatment and control groups in all weeks but there are numerically increases in feed intake of control group compared with treatment groups in final periods 2-6 weeks. A significant differences are showed in feed conversion ratio between treatment and control group in week three the better feed conversion ratio are T₂ and T₃ compared to control group (1.05, 1.06 and 1.18) respectively, in week six a significant differences are clear, the better feed conversion ratio are in T₄, T₃ and T₂ compared to control group (3.40, 3.69, 5.29 and 6.56) respectively, in total feed conversion ratio (2-6) weeks T₄ and T₃ outperformed the T₂ and control group (2.12, 2.16, 2.26 and 2.40) respectively, this results are shows in Table 5. The results of carcass weight, dressing % and mortality % are represented in table 6, there are significant ($P<0.05$) differences between treatments and control group in carcass weight and dressing % (149.33, 143.33, 143.33 and 129.33) (77.04, 77.07, 76.29 and 73.85) T₄, T₃, T₂ and control respectively, also replacement of ferula lead to improve the mortality % that significantly decreased (0.50, 0.50, 1.17 and 2.67) T₄, T₃, T₂ and control respectively. The microbiology results are show in Table 6, no significant differences are show in total protein

and globulin between treatments and control group, while the replacement of ferula lead to significantly ($P < 0.05$) decrease treatments T₄, T₃, T₂ compared to control group in the albumin and serum glucose parameter (1.28, 1.32, 1.33 and 1.61) (224.36, 232.52, 240.41 and 294.13) respectively. Through the results of this study, it was found a significant increases of productive performance related with replacements of *ferula* for diet because the ferula contain a good amounts of many compounds such flavonoids, alkaloids and fenoles which effect on tissues formation and stimulate for proteins synthesis (5, 15). The results were identical with the many of studies, (4, 13) reported that supplement of *Ferula* in poultry diets lead to improve the productive performance because it is a source of many minerals necessary for body growth such as calcium, potassium, phosphorus and ferrate. (1, 3) reported that the gum of ferula asafetida has the ability to improve the recipes of the digestive system, improve appetite, contains a

digestive substance leads to increasing feed consumption. Other studies reported that the *ferula* feeding lead to enhance the poultry performance because of reduce the role and activity of pathogen bacteria inside the digestive system of birds (9, 13). The results were also supported by the results of (2, 10) they profess of the important role of *ferula* to invigorate the digestive system secretion. While (17) reported that the using of *Ferula asafoetida* in poultry diets lead to improve feed conversion coefficient this is because increase of production the digestive enzymes. (11) reported that the aqueous extract of the oleo gum resin shows promising anti-diabetic activity.

Conclusion: The using of *ferula communis* in poultry diets as a replacement of asome materials lead to improve the production performance and enhance the biochemical parameters of birds, through the results of study we can use ferula as alternative of some materials for source of protein.

Table 4. Shows weekly live body weight and weight gain (mean±SE) in quail.

Age weeks	T1	T2	T3	T4
	live body weight			
1	32.60±0.31 ^c	33.87±0.24 ^b	34.47±0.26 ^{ab}	35.00±0.31 ^a
2	65.27±0.50 ^b	64.93±0.78 ^b	67.67±0.29 ^a	64.33±0.57 ^b
3	112.93±0.60 ^c	118.47±1.20 ^{ab}	120.27±0.76 ^a	116.13±0.94 ^b
4	146.07±0.91 ^b	150.87±1.48 ^a	152.27±0.76 ^a	149.60±1.08 ^a
5	168.33±0.91 ^b	175.20±1.16 ^a	175.13±0.78 ^a	175.07±0.63 ^a
6	183.13±1.20 ^c	193.07±1.09 ^b	200.87±1.29 ^a	202.87±1.01 ^a
	body weight gain			
2	32.67±0.59 ^{ab}	31.07±0.77 ^b	33.20±0.30 ^a	29.33±0.60 ^c
3	47.67±0.67 ^b	53.53±0.77 ^a	52.60±0.54 ^a	51.80±0.93 ^a
4	33.13±0.87	32.40±0.70	32.00±0.46	33.47±0.52
5	22.27±0.78 ^b	24.33±0.65 ^{ab}	22.87±0.51 ^b	25.47±1.04 ^a
6	14.80±0.71 ^d	17.87±0.51 ^c	25.73±0.84 ^b	27.80±0.52 ^a
2-6	150.53±1.16 ^c	159.20±1.08 ^b	166.40±1.24 ^a	167.87±0.92 ^a

ab Treatment means with different superscripts are significantly different ($P < .05$)

Table 5 shows weekly feed intake g/birds and feed conversion ratio (mean±SE) in quail

Age weeks	T1	T2	T3	T4
	feed intake			
2	50.09±0.71	50.92±0.86	50.23±0.77	50.59±0.97
3	56.04±0.93	56.25±0.35	55.73±0.90	55.45±0.97
4	69.37±0.75	68.96±1.14	69.29±0.90	68.42±0.53
5	90.69±2.63	90.08±1.70	89.79±2.03	88.93±2.23
6	95.70±1.83	94.39±0.68	94.19±1.56	94.51±1.41
2-6	361.88±1.88	360.60±1.04	359.24±6.07	357.91±4.72
	feed conversion ratio			
2	1.53±0.01 ^b	1.64±0.01 ^a	1.51±0.03 ^b	1.73±0.04 ^a
3	1.18±0.02 ^a	1.05±0.02 ^b	1.06±0.03 ^b	1.07±0.05 ^{ab}
4	2.10±0.10	2.12±0.05	2.16±0.04	2.04±0.04
5	4.10±0.28	3.70±0.06	3.93±0.16	3.53±0.23
6	6.56±0.63 ^a	5.29±0.17 ^b	3.69±0.27 ^c	3.40±0.10 ^c
2-6	2.40±0.03 ^a	2.26±0.02 ^{ab}	2.16±0.07 ^b	2.12±0.04 ^b

ab Treatment means with different superscripts are significantly different ($P < .05$)

Table 6 shows the Carcass weight, Dressing percentage, mortality and Biochemical parameter (mean±SE) in quail

Parameter	T1	T2	T3	T4
Carcass weight, Dressing percentage, mortality				
LBW	175.00±7.58 ^b	187.83±3.93 ^{ab}	186.00±2.39 ^{ab}	193.83±2.68 ^a
Carcass weight	129.33±6.06 ^b	143.33±3.47 ^a	143.33±1.78 ^a	149.33±2.20 ^a
Dressing %	73.85±0.35 ^b	76.29±0.60 ^a	77.07±0.28 ^a	77.04±0.28 ^a
Mortality %	2.67±0.33 ^a	1.17±0.31 ^b	0.50±0.22 ^b	0.50±0.22 ^b
Biochemical parameter				
Total protein	3.50±0.11	3.36±0.16	3.57±0.11	3.64±0.19
Albumin	1.61±0.13 ^a	1.33±0.08 ^b	1.32±0.05 ^b	1.28±0.05 ^b
Globulin	1.90±0.13	2.03±0.21	2.26±0.12	2.36±0.18
Serum glucose	294.13±19.41 ^a	240.41±6.26 ^b	232.52±2.53 ^b	224.36±2.64 ^b

ab Treatment means with different superscripts are significantly different (P < .05)

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