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EVALUATION OF USING DIFFERENT LEVELS AND SOURCES OF MEDICINAL HERBS IN GROWING JAPANESE QUAIL DIETS

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SUMMARY

Six hundred and seventy five one day old, unsexed, Japanese quails were performed to evaluate the effect of adding two levels, 0.3 or 0.5% of each source from some medicinal feed additives (MFA) i.e. Spearmint (*Mentha viridis*), Marjoram (*Marjorana hortensia*), Sweat basil (*Ocimum basillcum*), and Santonica (*Artemisia cinae*), to Japanese quail diet, on performance, digestibility, some metabolic functions and the economic efficiency. Quails were divided equally into 9 groups containing 75 birds each. Each group contained 3 replicates, of 25 quails. Each treatment of the tested diets contained one source of MFA at level of 0.3 or 0.5%. The control diet had no additions. The experiment was terminated when birds were 6 weeks old. Body weight, weight gain and feed intake were recorded. Feed conversion (feed / gain) was calculated. At the end of the experiment carcass characteristics were measured, blood samples were taken to determine some blood plasma constituents and some birds were kept for the digestibility experiments. The economic efficiency values were calculated.

The data revealed that, birds fed diets contain high (0.5%) level of Spearmint (S), Sweat basil (SB), or Santonica (SAN) recorded the highest ($P < 0.05$) body weight and body gain compared with other dietary treatments. Birds fed diets contain either 0.3 or 0.5% levels of SAN, recorded the lowest ($P<0.05$) values of feed intake and the best ($P<0.05$) feed conversion (feed, g/gain, g) efficiency. The absolute and the proportions of carcass and edible giblets were improved ($P<0.05$) when birds fed high level (0.5%) of dietary S.

Adding MFA i.e. S, M, SB and SAN to the control diet of Japanese quail improved ($P<0.05$) organic matter (OM), crude protein (CP), ether extract (EE), crude fiber (CF) and nitrogen free extract (NFE) digestibility. Birds fed control or 0.3% M diets recorded the lowest ($P<0.05$) values of CP digestibility. However, birds fed dietary 0.5% of S diet recorded the highest ($P<0.05$) values of CP digestibility compared with other MFA diets. The highest ($P>0.05$) value of CF digestibility was noticed when birds fed dietary 0.3% S compared with other MFA diets. Blood plasma samples presented an improvement ($P < 0.05$) in total protein, albumin and total lipids for birds fed diets containing MFA supplementation. The best ($P<0.05$) value of globulin was noticed when birds fed 0.3% SB diet. All birds fed MFA additions at 0.3 or 0.5% levels showed a reduction ($P<0.05$) in blood cholesterol values.

The inclusion of MFA in Japanese quail diets recorded the higher economic efficiency (expressed as % net revenue/feed cost) compared with control diet. Moreover, the Santonica diets recorded the best economic efficiency compared with other diets.

Key words: *medical herbal, performance, digestibility, metabolic functions, quail*

INTRODUCTION

Many attempts have been undertaken in order to improve the utilization of diet nutrients by adding dietary supplementation of several growth feed additives from different sources (Boulos

et al.,1992, Dorgham *et al.*, 1994, El-Gendi *et al.*, 1994, Ibrahim *et al.*, 1998 and Abdel-Azeem, 2002). Using dietary supplementation has greatly increased, although feed additives contain chemical components, hence the cumulative effect of these components induced deterrent effects on human health. So that, the using of natural feed additives has been important to minimize these adverse effects. Some vegetables, herbs, edible plants and seeds are used as tonics and restoratives such as Trigonella Foenum Graecum, Sessamum Indicum and Lepidium Sativum (Boulos, 1983).

Several medicinal herbs are used in the medication of various diseases, for example help to reduce high blood cholesterol concentrations, providing some protection against cancer, protect against chronic diseases and/or stimulate the immune system. Furthermore, these herbs not only serve as a medicinal purpose but also contain aromatic substances and essential oils used in food industries. (Evans and Pharm, 1975 and Craig, 1999).

Abd EL-Latif, et. al., (2002), reported that growing Japanese quail fed diets inoculation medicinal herbs such as: Thyme (T), Black cumin (BC.), Dianthus (D), and Fennel (F) at a level of 1000 g/ton improved ($P < 0.05$) body weight, body gain and feed conversion (feed, g/gain, g) efficiency. Plasma total protein, globulin, and albumin were improved ($P < 0.05$) when birds fed dietary T or F (at 6 weeks of age). The greatest percent ($P < 0.05$) of dressing, abdominal fat, and edible giblets noticed when birds fed dietary F. Also, they concluded that inclusion Japanese quail diet on these medicinal herbs improved the economic efficiency of the diet.

Abdo, *et al.* (2003), fed broiler chicks on diets supplied with 1.5 or 3% of hot pepper, Marjoram and mixture of both sources (hot pepper, 1.5% and Marjoram, 1.5%). The best body gain was noticed when birds fed dietary Marjoram at 1.5% level. The best feed conversion efficiency was for birds fed the previous diet (1.5% Marjoram) followed by dietary mixture of both sources. In general, most of the digestibility coefficients parameters were not affected significantly by the treatments, except dietary red pepper at 3% and the combination of red pepper and Marjoram reduced the digestibility coefficients of most parameters. No adverse effects on blood alkaline phosphates, GOT or GPT were detected due to addition of different additives. However, total protein and albumin values were improved when birds fed diet containing the mixture of both sources.

Abdel-Azeem *et al.*, (2001) found that adding Lacto Sacc or Yea Sacc (1g/kg feed) as microbial probiotics additives to growing Japanese quail diets contain 20, 22, and 24% crude protein, improved body weight, body gain, feed conversion (feed/gain) efficiency, protein efficiency ratio, efficiency of energy utilization and economical efficiency percentage. But average feed consumption was decreased. Also, microbial probiotics supplementation improved the albumin/globulin ratio, total cholesterol, GOT and GPT.

The present study was conducted to evaluate the effect of adding two levels (0.3 or 0.5%) of some medical feed supplementation i.e. Spearmint (S), Marjoram (M), Sweat basil (SB), and Santonica (SAN) to growing Japanese quail diets on growth performance, carcass traits, digestibility, some metabolic functions and the economic efficiency.

MATERIAL AND METHODS

Six hundred and seventy five one day old, unsexed, Japanese quails were maintained in electrically heated battery

cages housed in light and temperature controlled room. Free access water and food were available during all times. The birds were divided into 9 groups (75 bird each) according to levels (0.3 and 0.5%) and sources (S, M, SB and SAN) of MFA additions. Each group contained 3 replicates of 25 birds.

Diets

The control diet contained adequate levels of nutrients for growing Japanese quail as recommended by the National Research Council, NRC, (1994) with no MFA additions. Eight additional diets were obtained by incorporating two levels (0.3 and 0.5%) of each one of S, M, SB and SAN into the control diet. Each additional diet contained one source and one level of the MFA. The sequence of the 9 dietary treatments was as follow:- Control (without additives), 0.3% S, 0.5% S, 0.3% M, 0.5% M, 0.3% SB, 5% SB, 0.3% SAN and 0.5% SAN. The composition of the control diet is shown in Table 1. The effective components and the useful of the MFA used in the experimental diets are shown in Table (2).

Measurements and determinations

Body weight and feed intake were recorded for birds biweekly and feed conversion values (feed, g/gain, g) were calculated. At 6 weeks of age, blood samples from randomly five birds of each treatment, were collected from the wing vein in heparinized tubes and centrifuged at 3000rpm /15minutes. The plasma was obtained and immediately stored at -20° C till analysis. Total protein, albumin, total lipids and cholesterol were determined according to Weischelbaum (1946), Doumas (1971), Frings *et al.*, (1972) and Stein (1986), respectively. The total globulin values were calculated by subtracting the values of total albumin from the values of total protein for each sample.

At the end of the experiment (6 weeks of age), three birds from each replicate were scarified after 12 hours fasting. After bleeding out, the birds were scalded, plucked with electrical cyclomatic picker and eviscerated. Eviscerated carcasses were individually weighed. The percentages of dressing, edible giblets (liver, gizzard, heart, and abdominal fat) and offals (blood, head, legs, and feathers) were calculated in relation to the live body weight.

Another five male birds from each treatment were used for the digestibility trail. The birds were housed individually and fed the tested diets. After 3 days acclimatization period, the collection period continued for 6 days during which feed intake was measured and excreta output was collected daily, oven dried (70°C for 24 hrs), weighed and ground). The representative samples were used for analysis. The chemical analysis of diets and excreta for DM, EE, CP, CF, and ash were conducted according to AOAC (1999). For calculating CP digestibility, the fecal protein was determined according to Ekman *et al.* (1949). To obtain urinary organic matter, the figure of urinary nitrogen was multiplied by the factor 2.62. This factor was computed by Galal (1968) as shown in Sturkie (1965). Cost of one kilogram feed and cost of feed/ kg gain were calculated based on the prices of feed ingredients and MFA prevailing 2002.

ANOVA and LSD procedures were performed as outlined be Snedecor and Cochran, (1980).

RESULTS AND DISCUSSION

Productive performance

The effects of MFA on body weight, body weight gain, feed intake and feed conversion (feed/gain) are shown in Table (3). It was observed that adding MFA at high 0.5% level to the control diet

Table (1): The composition and calculated analyses of the control diet

Ingredients	%
Ground corn, yellow	52.20
Broiler concentrate (52% CP)	10.00
Soybean meal (44% CP)	35.00
Poultry fat	2.00
Vitamins minerals mixture *	0.50
DL-Methionine	0.30
Total	100.00
Calculated analysis:	
Metabolizable energy K cal/kg	3011
Crude protein, %	24.05
Crude fiber, %	3.37
Ether extract ,%	3.20
Calcium, %	1.15
Available phosphorus, %	0.51
Methionine and cystine, %	0.80
Lysine, %	1.03

***Each 2.5 kg of vitamins and minerals mixture contain: 12000.000 IU vitamin A acetate; 2000.000 IU vitamin D_3; 10.000 mg vitamin E acetate; 2000 mg vitamin K_3; 100 mg vitamin B_1; 4000 mg vitamin B_2; 1500 mg vitamin B_6; 10 mg vitamin B_{12}; 10.000 mg pantothenic acid; 20.000 mg Nicotinic acid; 1000 mg Folic acid; 50 mg Biotin; 500.000 mg chorine; 10.000 mg Copper; 1000 mg Iodine; 300.00 mg Iron; 55.000 mg Manganese; 55.000 mg Zinc, and 100 mg Selenium.**

Table (2): The effective components and the useful of the medical feed additives used in the experimental diets

Medical herbal	Scientific name	The part of plant used	The effective components	The useful
Spearmint	*Mentha viridis*	Leaves	Volatile oils contains Carvona, Lemonene, Phellendrene and Pinene	Feed additives and curing flatulence and colic
Marjoram	*Marjorana hortensia*	Leaves	Volatile oils contains:- Terpinol (26%), Geroniol (20%), Eugenol (8%), and Linalol (6%)	Improve the palatability of feeds, use for carminative, curing the amenorrea and improving the sexual status
Sweat basil	*Ocimum basillcum*	All plant	Volatile oils contains :- Linalol (65%), Cineole, and Eugenol,	Use for carminative. Diuretic and Antirhaumatic
Santonica	*Artemisia cinae*	Herbs	Volatile oils contains :- Santonin and Artamisin	Use to drive away the Round worms

C.F. from Hosin (1984).

Table (3): Effect of dietary treatments on performance of growing Japanese quails

Items	Treatments								
	Control	Spearmint (S)		Marjoram (M)		Sweat basil (SB)		Santonica (SAN)	
		0.3	0.5	0.3	0.5	0.3	0.5	0.3	0.5
Initial body weight (g, at 0 weeks old)	10.17±0.23	9.50±0.28	10.00±0.57	10.00±0.58	10.33±0.44	9.83±0.40	10.00±0.58	9.83±0.60	10.17±0.60
Final body weight (g, at 6 weeks old)	176.0^{b}±4.93	180.7^{b}±3.20	189.4^{a}±6.68	176.7^{b}±2.14	178.5^{b}±2.64	179.2^{ab}±1.68	188.2^{a}±4.64	182.1^{ab}±2.08	187.2^{a}±1.67
Body gain (g, from 0 to 6 weeks old)	166.0^{c}±5.34	171.2^{b}±2.97	179.4^{a}±7.18	166.7^{c}±1.71	168.2^{bc}±2.84	169.4^{bc}±5.28	178.2^{a}±5.04	172.3^{ab}±1.54	177.0^{a}±2.26
Feed intake(g)	580.0^{ab}±14.16	575.1^{ab}±7.40	555.4^{b}±17.04	552.0^{b}±4.76	538.0^{c}±11.38	572.5^{ab}±10.68	580.2^{a}±12.65	512.0^{d}±5.04	529.0^{c}±7.55
Feed conversion (feed, g/gain, g)	3.50^{b}±0.02	3.36^{c}±0.09	3.10^{cd}±0.04	3.31^{c}±0.05	3.20^{cd}±0.01	3.38^{c}±0.02	3.26^{cd}±0. 05	2.97^{e}±0.02	2.99^{e}±0.00

Data in the same row under each treatment followed by unlike letters differ significantly (P<0.05). ± S.E

Table (4): Effect of dietary treatments on carcass characteristics of growing Japanese quails

Items	Control	Treatments							
		Spearmint (S)		Marjoram (M)		Sweat basil (SB)		Santonica (SAN)	
		0.3	0.5	0.3	0.5	0.3	0.5	0.3	0.5
Body weight, g	176.7^{ab}±1.71	193.3^{a}±6.00	193.3^{a}±6.00	176.0^{c}±2.08	176.3^{c}±1.45	179.7^{bc}±0.33	186.0^{ab}±0.58	182.0^{bc}±0.58	185.0^{abc}±0.58
Carcass weight, g	137.1^{bc}±4.85	139.0^{b}±5.56	154.0^{a}±3.05	128.1^{c}±1.25	132.6^{bc} ±1.66	131.6^{bc}±0.81	133.2^{bc} ±2.16	131.3^{bc}±2.75	134.2^{bc} ±1.08
Edible weigh, g	9.30^{bc}±0.71	11.47^{ab}±1.58	12.04^{a}±0.98	9.40^{bc}±0.02	9.04^{c}±0.67	9.55^{bc}±0.99	10.14^{b}±1.28	8.42^{c}±0.55	11.45^{ab}±0.49
Offal weight, g	10.34^{bc}±0.99	12.67^{ab}±0.88	13.67^{a}±1.20	9.60^{c}±0.90	10.75^{bc}±1.12	10.58^{bc}±0.61	10.37^{bc}±0.20	9.79^{c}±0.37	11.02^{bc}±0.62
Dressing, %	77.59^{b}±2.02	71.86^{d}±0.66	79.71^{a}±0.88	72.79^{cd}±1.11	75.18^{bc}±0.76	73.79^{cd}±0.51	71.60^{d}±0.91	72.12^{cd}±1.45	72.54^{d}±0.44
Edible giblets, %	5.26^{bc}±0.37	5.89^{ab}±0.62	6.21^{a}±0.31	5.39^{b}±0.15	5.13^{b}±0.42	5.31^{b}±0.54	5.45^{bc}±0.21	4.63^{c}±0.31	6.19^{ab}±0.27
Offal , %	7.00±1.72	6.57±0.52	7.10±0.77	5.46±0.55	6.09±0.58	5.89±0.34	5.57±0.10	5.38±0.20	5.96±0.33

Data in the same row under each treatment followed by unlike letters differ significantly P<0.05). ± S.E

improved (P<0.05) body weight and body gain, except the dietary incorporating M. Birds fed dietary 0.5%S presented the greatest (P>0.05) value of these items. The positive effect of these MFA were supported by Abd El-Latif, *et al.*, (2002), they reported that adding MFA i.e. Thyme, Black cumin, Dianthus and Fennel to Japanese quail diet at a level of 1000 g/ton improved (P<0.05) body weight and body gain. In addition, this positive enhancement in gain may be due to the presence of vitamin F group (a mixture of essential fatty acids including linoleic, linolenic, and arachidonic acids) in supplemented MFA which have been essential for growth (Murray *et al.*, 1991). Moreover, the seniority of dietary S in improving these items may due to that the Spearmint contain up to 2% of an essential oil which has many medical preparations, and has a strong stimulating action on bile secretion as well as an antispasmodic and anti-inflammatory effect (Evans and Pharm, 1975).

Feed intake was declined for birds fed dietary contained MFA at all levels except birds fed dietary 0.5% SB. The depression in feed intake as affected by adding MFA may confirm the results obtained by Abd El-Latif et al (2002), they found that feed intake was declined (P<0.05) by adding Thyme, Dianthus and Fennel to Japanese quail diet at a level of 1000 g/ton during the entire period of the experiment (6 weeks old). Also, Abdo, *et al.*, (2003) reported that the feed intake was diminished in the broiler chicks by adding marjoram (1.5 or 5%), red pepper (1.5 or 5%) or both (marjoram,1.3% and red pepper, 1.3%) to the control diet, during the period from 1 to 6 weeks of age.

As a result of the decline in feed intake and the improvement in body gain, for birds fed MFA diets, the feed conversion (feed, g / gain, g) efficiency was enhanced (P<0.05) by adding MFA at all levels. The best (P<0.05) feed conversion value was noticed when birds fed dietary SAN at both levels (0.3 or 0.5%). This positive enhancement in feed conversion efficiency may supported by Zeweil (1997), who reported that feed conversion ratios were improved (P<0.05) by increasing level of Yea-Sacc in growing Japanese quail diets, from 1 to 1.5%, by about 2.1 to 6.28% respectively, as compared to the control diet.

Slaughter data

The absolute and proportional weights of carcass, edible giblets, and offals are presented in Table 4. Generally, the data showed that the greatest (P>0.05) values of carcass, giblets and offalls weights and/or dressing and giblets percentages were observed when quails fed dietary S. This result confirm the results of body weight and body gain (Table 3). Also, it give approve to the critical role of Spearmint essential oils in the metabolic functions as a strong stimulating action on bile secretion (Evans and Pharm, 1975). In addition, the positive effects of dietary S on carcass characteristics may insure the clear effect of herbal feed additives results reported by Abd El-Latif, *et al.*, (2002) they found that the highest (P<0.05) values of dressing and the proportions of abdominal fat, and edible giblets were noticed when quails fed diets supplemented by either dietary Thyme or Fennel at level of 1000 g/ton for each additive compared with other treatments. In the present study, there was no significant (P>0.05) difference in the proportion of offals as affected by adding MFA to the growing Japanese quail diet.

Digestibility coefficients

The digestibility coefficients of the different nutrients are presented in Table 5. In general, data obtained, revealed that MFA supplementation enhanced (P<0.05) the digestibility of all nutrients (OM, CP,

Table (5): Effect of dietary treatments on digestibility coefficients of nutrients for growing Japanese quails

Items	Control	Treatments							
		Spearmint (S)		Marjoram (S)		Sweat basil (SB)		Santonica (SAN)	
		0.3	0.5	0.3	0.5	0.3	0.5	0.3	0.5
Organic matter	75.37^{c}±0.31	75.70^{c}±0..05	76.87^{a}±0.44	77.00^{a}±0.25	76.87^{a}±0.27	75.87^{b}±0.32	76.10^{ab}±0.56	75.93^{b}±0.35	76.23^{ab}±0.42
Crude protein	85.09^{b}±0.52	86.63^{a}±0.23	86.8^{a}±0.75	85.67^{b}±1.01	87.13^{a}±0.23	87.20^{a}±0.17	87.00^{a}±0.20	87.20^{a}±0.92	87.00^{a}±0.31
Ether extract	64.43^{c}±0.66	66.60^{a}±0.03	66.70^{ab}±0.15	65.90^{a}±0.36	66.27^{a}±0.64	67.37^{a}±0.09	66.70^{a}±0.92	66.67^{a}±0.48	66.40^{a}±0.40
Crude fiber	20.55^{b}±0.18	21.53^{a}±0.08	21.43^{a}±0.09	21.47^{a}±0.28	21.00^{a}±0.15	21.37^{a}±0.09	21.43^{a}±0.18	21.50^{a}±0.12	21.10^{a}±0.45
NFE	77.20^{b}±0.85	78.83^{ab}±0.31	78.97^{ab}±0.34	79.83^{a}±0.32	79.87^{a}±0.39	79.30^{a}±0.55	79.00^{a}±0.84	79.37^{a}±0.50	79.47^{a}±0.12

Data in the same row under each treatment followed by unlike letters differ significantly P<0.05). ± S.E

Table (6): Effect of dietary treatments on some metabolic functions of growing Japanese quails

Items	Control	Treatments							
		Spearmint (S)		Marjoram (M)		Sweat basil (SB)		Santonica (SAN)	
		0.3	0.5	0.3	0.5	0.3	0.5	0.3	0.5
Total protein, g/100ml	3.30^{e}±0.05	3.72^{b}±0.04	3.77^{b}±0.09	3.60^{b}±0.050	3.63^{b}±.088	4.00^{a}±0.152	3.67^{b}±0.12	3.57^{b}±0.088	4.07^{a}±0.088
Globulin, g/100m	1.48^{b}±0.05	1.47^{b}±0.15	1.60^{ab}±0.10	1.45^{b}±0.14	1.45^{b}±0.079	1.75^{a}±0.133	1.58^{ab}±0.138	1.40^{b}±0.081	1.54^{ab}±0.003
Albumin, g/100ml	1.82^{c}±0.01	2.25^{b}±0.13	2.17^{b}±0.02	2.15^{b}±0.01	2.18^{b}±0.001	2.25^{b}±0.031	2.09^{b}±0.052	2.17^{b}±0.021	2.53^{a}±0.007
Total lipids	406.7^{d}±0.88	413.3^{b}±1.20	410.3^{b}±1.75	414.0^{b}±3.06	416.0^{ab}±2.082	419.7^{ab}±1.453	423.3^{a}±1.852	417.3^{ab}±0.331	422.0^{a}±7.024
Cholesterol,Mg/100ml	129.4^{a}±0.34	127.4^{b}±1.046	127.1^{b}±0.90	126.7^{b}±1.39	126.8^{b}±0.833	125.5^{c}±1.029	126.1^{bc}±1.037	126.9^{b}±1.020	127.3^{b}±0.551

Data in the same row under each treatment followed by unlike letters differ significantly P<0.05). ± S.E

EE, CF and NFE) compared with the control diet. The highest (P>0.05) value of CP digestibility was observed when birds fed dietary 0.5% M compared with other MFA diets. However, the highest (P>0.05) value of CF digestibility was noticed when birds fed dietary 0.3% S compared with other MFA diets. The positive effect of these coefficients as affected by adding MFA supplementation, was parlay with the enhancements in body weight, body gain (Table 3) and carcass characteristics (Table 4) and this may give approve to the critical role of these additives in improving growth performance and feed utilization (Ibrahim, *et al.*, 1998, Abd El-Latif, *et al.*, 2002, and Abdo, *et al.*, 2003). In addation, this enhancement may be due to incorporating these MFA in some essential nutrients such as:- natural tonic, restoratives, antibacterial and parasitic drugs (Soliman et al 1995), which may improve the absorption of nutrients through the small intestine of the bird as will as increasing the digestibility coefficients. These results agreed with Ibrahim, et al (1998), they reported that adding different sources of a natural growth promoters such as :-Bio-Tonic, Compisol, and Bio-Tonic & Compisol 1:1 by level of 1000 gm/ton in broiler chicken diets improved OM, CP, and EE digestibility compared with the control diet.

Metabolites changes

Changes in blood plasma total protein, albumin, globulin, total lipids, and cholesterol as affected by dietary MFA are listed in Table 6.

Total protein, albumin and globulin

Data showed that, adding MFA supplementation i.e S, M, SB, and SAN to Japanese quail diet enhanced (P<0.05) plasma total protein and albumin compared with the control diet. The highest (P<0.05) plasma globulin value was noticed when birds fed 0.3% dietary SB. Also, some improvements (P>0.05) in globulin by adding 0.5% of S, SB, or SAN to the control diet were observed. These results contribute with the improving of performance and digestibility coefficients (Tables 3 and 5). This may explain the significant effects of dietary MFA in improving metabolic process. Similar results were observed by (Abd El-Malak *et al.*, 1995 and Abd El-Latif, 2002). Moreover, this positive improvement of these values as affected by adding MFA may be due to the inclusion of these supplementation of some vitamins especially vitamin E which enhance the total protein and globulin (Franchini *et al.*, 1990 and Abd El-Latif, 1999). Also, fatty acids which present in these MFA may affect muscle protein synthesis and protein deposition through a prostaglandin-depend mechanism (Palmer, 1993).

Total lipids and cholesterol

Data in Table 6 revealed that the greatest (P<0.05) values of total lipids were observed when birds fed diets contain 0.5% SB or SAN level. However, some improvement (P>0.05) in total lipids was detected by adding other additions to the control diet. All MFA additions reduced (P<0.05) the cholesterol level in the blood. Similar results were observed by (Abd El-Rahman 1994), they reported that broiler chicks fed diets contain 250, 500, and 750 mg/kg diet of probiotic had the highest value of total serum protein and the lowest concentration of cholesterol or lipids

These results confirm the metabolic function roles of these MFA additions which are as components of herbal tea mixtures, drops and syrups for diseases of respiratory passages and digestive disorders. Peppermint yields an essential oil that is used in pharmacy in the same

(7): The economical efficiency of the experimental diet (L.E* in 2003).

Prices (L.E.)	Treatments								
	Control	Spearmint (S)		Marjoram (M)		Sweat basil (SB)		Santonica (SAN)	
		0.3%	0.5%	0.3%	0.5%	0.3%	0.5%	0.3%	0.5%
Price of 1 kg of MFA / L.E.	0.00	6.00	6.00	12.00	12.00	18.00	18.00	6.00	6.00
Price of MFA / L.E.**	0.00	0.018	0.030	.0.036	0.060	0.054	0.090	0.018	0.030
Price of 1 kg control diet / L.E.	1.540	1.540	1.540	1.540	1.540	1.540	1.540	1.540	1.540
Total prices (1kg)	1.54	1.558	1.57	1.576	1.6	1.594	1.63	1.558	1.57
Feed/gain ratio (a)	3.50	3.20	3.10	3.31	3.20	3.38	3.26	2.97	2.99
Cost of 1 kg feed (b), L.E.	1.54	1.558	1.57	1.576	1.6	1.594	1.63	1.558	1.57
Feed cost of kg weight gain (a, b)	5.04	4.758	4.67	4.886	4.8	4.974	4.89	4.627	4.56
Market price of 1 kg live weight (c)	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Net revenue [c-(a.b)], L.E.	4.96	5.242	5.33	5.114	5.2	5.026	5.11	5.373	5.44
Percent of net revenue/ feed cost	98.413	110.172	114.133	104.666	108.333	101.045	104.499	116.117	119.298

* L.E. = Egyptian pound ** Price of the amounts of MFA added to the diet

way as the crude drug. Also it has a strong stimulating action on bile secretion as will as anti-inflammatory effect. Marjoram helps in digestion, relax spasms and have a disinfectant effect in intestinal disorder. Sweet basil promotes gastric function, stimulates the appetite, relieves flatulence and also has an expectorant action (Evans and Pharm, 1975).

Economical efficiency

The economical efficiency of dietary treatments are recorded in Table 7. The profitability of using MFA supplementation depends upon the MFA price and the growth performance of birds fed on these dietary additives. The feed cost of 1 kg weight gain was reduced by 5.595, 7.341, 3.056, 4.762, 1.310, 2.976, 8.194 and 9.524 by adding 0.3 % S, 0.5% S, 0.3 M, 0.5% M, 0.3% SB, 5% SB, 0.3% SAN and 0.5% SAN respectively. As a result of improvement in feed conversion efficiency of dietary 0.5% SAN, this diet recorded the highest depression in feed cost of 1kg weight gain and the greatest percent of economic efficiency (percent of net revenue/feed cost) compared with other dietary treatments. These results agree with Abd El-Latif *et al.,* (2002), they reported that, the profitability of adding MFA i.e. Thyme, Black cumin, Dianthus, and Fennel, at level of 1000 g / ton, to Japanese quail diet reduced the feed cost of 1 kg weight gain by 6.72, 15.34, 8.74, and 10.75%, respectively. The best value of the economic efficiency was calculated for diet contains Black cumin as feed additive. Also, Ibrahim *et al.,* (1998), found that adding some growth promoters such as, Bio-Tonic, Comprisol, or Bio-Tonic & Comprisol (1:1) reduced the feed cost of 1 kg weight gain by 10.86, 8.61, and 7.49%, respectively. Abd El-Malak *et al.* (1995) reported that increasing Bio-Tonic level, from 500 or 750 to 1000 g/ton diet as a supplement, in broiler chicks diet improved the relative economical efficiency expressed as percent of feed cost/kg body gain. The values were 100.00, 98.73, 98.10 and 98.10% for the experimental diets (control, 500, 750 and 1000 gm, Biotonic/Ton diet), respectively.

Generally, it could be concluded that, using dietary MFA i.e. S, M, SB, and SAN at levels of 0.3 or 5% for growing Japanese quails improved the growth performance, metabolic responses and economic efficiency.

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تقييم استخدام مستويات ومصادر مختلفة من الأعشاب الطبية فى علائق السمان الياباني النامى

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أجريت هذه التجربة بهدف دراسة تقييم تأثير إضافة مستويين ٠,٣ او ٠,٥% من بعض الأعشاب الطبية مثل النعناع والبردقوش والريحان والشيح إلى علائق السمان النامي على بعض الصفات الإنتاجية ومعاملات الهضم وبعض مكونات الدم. استخدم فى هذه التجربة ٦٧٥ طائر من السمان الياباني عمر يوم من كلا الجنسين وتم تقسيمها إلى ٩ مجاميع بكل مجموعة ٧٥ طائر وقسمت كل مجموعة إلى ٣ مكررات بكل مكررة ٢٥ طائر. واحتوت كل معاملة من المعاملات التجريبية على مستوى ومصدر واحد من الأعشاب الطبية المستخدمة. وانتهت التجربة فى عمر ٦ أسابيع. وتم تسجيل أوزان الجسم والمأكول من الغذاء كما أخذت عينات من الدم لدراسة بعض الوظائف التمثيلية وكذلك درست بعض خصائص الذبيحة كما أجريت تجربة هضم فى نهاية التجربة وحسبت الكفاءة الاقتصادية للعلائق. وكان من نتائج التجربة ما يلى: -

- أتضح أن إضافة الأعشاب الطبية المستخدمة فى التجربة إلى العليقة القياسية أدى إلى تحسن كل من وزن الجسم والزيادة فى وزن الجسم و وكذلك الكفاءة التحويلية للغذاء وكان أعلى معدل لتحسن الكفاءة التحويلية للغذاء عندما غذيت الطيور على علائق بها ٠,٣ أو ٠,٥% شيح كإضافات غذائية. كما أدت التغذية على علائق النعناع بمستوى ٠,٥% إلى تحسن نسب التصافى والأجزاء المأكولة من الطائر
- أتضح أيضا أن إضافة الأعشاب الطبية المستخدمة فى التجربة إلى العليقة القياسية ادى إلى تحسن معاملات الهضم لكل من المادة العضوية والبروتين الخام والدهن الخام والألياف الخام والمستخلص الخالي من الأزوت. كما لوحظ إن أفضل معاملات الهضم للبروتين عند إضافة مستوى ٠,٥% بردقوش للعليقة القياسية بينما أفضل معمل هضم للألياف الخام لوحظت عند إضافة النعناع الى العليقة القياسية بكلا مستوييه.
- استخدام الأعشاب الطبية أدى الى تحسن كل من البروتين الكلى والألبيومي و ادى الى انخفاض الكوليسترول فى دم الطيور التى غذيت على علائق هذه الإضافات. وكان أفضل تحسن فى تركيز الجلوبيولين ظهر فى دم الطيور المغذاة على عليقة ٠,٣% ريحان.
- . أتضح أن إضافة الأعشاب الطبية المستخدمة فى التجربة إلى علائق السمان الياباني النامى أدت إلى تحسن الكفاءة الاقتصادية للعلائق. وحققت علائق الشيح أفضل النتائج فى هذا التحسن