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EFFICACY OF DIFFERENT MEDICINAL HERBS BLENDS AS FEED ADDITIVES ON THE PERFORMANCE, BREAST MEAT COMPOSITION, NUTRIENT DIGESTIBILITY, TIBIA BONE CHARACTERISTICS AND ECONOMICAL EVALUATION OF JAPANESE QUAIL

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ABSTRACT: Six blends of medicinal herbs were used in Japanese Quail diet to study their effects on performance, plasma lipids, breast meat compassion, tibia bone characteristics and nutrient digestibly in Japanese Quail. One hundred eighty (180, one-day-old) unsexed quail were divided into six dietary treatments including basal diet with no addition of medicinal herbs (T1), basal diet plus 15 g/kg of herbal blends including; cinnamon and thyme powder (T2), rosemary and anise seed powder (T3), caraway and coriander powder (T4), Fenugreek and cumin seed powder (T5) and parsley and watercress powder (T6). The results showed that chicks were fed T6 mixture of parsley and watercress) achieved high % of crude protein in breast meat of Japanese, while ash% was higher in group fed T4 in which fed mixture diets with fenugreek and cumin. The digestibility of nutrients were significantly ($P<0.05$) enhanced in T6 except ether extract digestibility and ash retention, which were achieved the highest values in T4 (caraway and coriander) compared with the other groups. Supplementing the diets of Japanese quail with mixture of parsley seeds and watercress at level of 15 g/kg of basal diets resulted significant improvement in the performance, plasma lipid triglycerides, cholesterol, HDL, LDL., breast meat protein, , tibia bone characteristics (tibia weight, length, diameter, ash and robusticty index and nutrient digestibility (protein, calcium, phosphorus and nitrogen). T6 in which chicks were fed basal diet supplemented with 1.5% parsley and watercress powder (50%:50%) achieved the highest net revenue compared with the other supplemented treatments.

Key words: Herbs, Performance ,Fat, Tibia bone, Digestibility, Economical evaluation

1. INTRODUCTION

Health and performance of poultry could be support by supplementation of individual medicinal herbs or in mixtures (Stoev, *et al.* 2019; Khoobani, *et al*., 2020) . Medicinal herb blends may use as feed additives to replace antibiotics in poultry diets[3]. Phytogenic or botanicals contain certain components in active forms with biological functions to activate and support poultry intestinal health and performance during stress conditions when added in single or blends (Khoobani, *et al.,* 2020). Medicinal herb blends may use as feed additives to replace antibiotics in poultry diets (Ahmad, *et al.,* 2020) and to improve performance through improvement feed quality and properties (Safiullah *et al.,* 2019). However, the medicinal herbs plants contain certain components which accelerate the performance, ameliorate feed intake in broiler chicks (Ali, *et al*., 2019). Feed conversion ratio was improved by eleven percentage and mortality and sudden death cases were decreased by feeding herbal extracts (Abo Omar, *et al*., 2016).

Growth and hygiene promoting properties have been attributed to medicinal herbs blends (phytobiotics) usage in poultry. The medicinal herbs blends plays an important role in improving gut health including improving digestibility (Kroismayr, *et al.,* 2008), affecting the secretion of digestive enzymes, and improving gut histology (Jamroz, *et al*., 2003). Microbial toxins were reduced by phitobiotics through microbiome stabilization (Per'c *et al*., 2010). Manafi, (2015). reported that phytobiotic in poultry feed activate antimicrobial, anthelmintic, immune stimulation and it plays vital role in stimulation of feed intake. Enhancement the digestive enzymes (Jamroz, *et al*., 2006), feed conversion was positively affected, and functions of antioxidant and antibacterial (Winisch *et al.,* 2008) .

Medicinal herbs or phytobiotic as feed additives are natural, and safe to use in animal production when compared to chemical materials or antibiotics (Hady *et al*., 2016). Medicinal herbs extracts contain substances acts as antimicrobial, appetizing, and digestion stimulator properties (Diniz et al., 2020). Pyhtobiotics could be used as promoters to improve body weight gain (BWG) of poultry (Abdel-Ghaney, *et al.,* 2017). In the recent years consumers' needs meat products safe and free residues of antibiotics, and enhanced the productivity with optimum quality (Haque *et al.,* 2020).

The producer in poultry farm utilizing feed scientifically through sustainable poultry farming principles and led to use the medicinal herbs (Madhupriya *et al*., 2018). However,, feed costs represent about 70% of the total costs of poultry production (Fathi, *et al.,* 2019). Hence, medicinal herbs blends were considered an importance in poultry feeds for promoting growth and production with optimum cost (Singh and Yadav, 2020). Reduced feed intake was reported by Ahmadian, *et al*., (2020) and Galli, *et al*.,(2020) in broiler chicks fed mixtures of some herbal products.. Poultry producers goals is to maximize the qualitatively and quantitatively production (Abdulla, *et al.,* 2017). Probiotics as feed additive was safe to enhance the productivity of poultry and health (Reda, *et al*., 2020). On the other hand, no significant effects due to medicinal herbs addition on bone quality criteria (Hafeez, *et al.,* 2020).

El-Mallah, *et al.,* (2005) mentioned that the digestibility NFE (nitrogen free

extract) was enhanced by addition of fenugreek seed powder at level of 2% in turkey diets.

The results of Kadhim, (2018) showed a significant improved BW, BWG, and decreased FC and significant improvement in FCR by addition of rosemary powder at different levels.

This study aimed to evaluate the impacts of different medicinal herbs blends on the performance, breast meat composition, nutrient digestibility, and tibia bone criteria of Japanese Quail.

2.MATERIALS AND METHODS

The experiment was conducted at Poultry Farm of Poultry Production Department in Assiut University under Department Council approval No. 121/14-2-2022 and Faculty of Agriculture Council approval No. 772/22-3-2022.

2.1. Birds, design and measurements:

One hundred eighty (180, one day old) Japanese Quails were divided randomly into six dietary treatments of 3 replicates each . Ten chicks/replicate. Chicks were reared in standardized conditions from temperature, air humidity, light programme and feeding conditions. Raising the birds was performed according to the standard technology recommended for this species**.** Quail requirements from water and feed water were supplied *ad libitum*. The composition and analysis of the basal diet are presented in Table 1. The medicinal herbs were added on the account of corn and soybean feedstuffs. Quail feed formulation were prepared to meet or exceed the requirements (NRC, 1994). The design of the experiment as follows**:** T1**:** Control without herbal blends addition**;** T2**:** Control included 1.5% blends of cinnamon and thyme powder (50%:50%)**;** T3: Control included 1.5% blends of of rosemary and anise Seed powder (50%:50%); T4: Control included 1.5% blends of of caraway and coriander powder (50%:50%); T5: Control included 1.5% blends of Fenugreek and cumin seed powder (50%:50%) and T6: Control included 1.5% blends of of parsley and watercress powder (50%:50%). Samples of the diets under study were examined for proximate chemical analysis according to (AOAC. 1990).

Performance criteria include body weight (BW) and feed consumed (FC) per replicate were recorded weekly. Then body weight gain, feed consumption and feed conversion ratio were calculated at three and six wks of age. Mortality rate were also recorded.

2.2. Breast meat proximate composition and tibia bone characteristics.

One representative bird from each replicate (three birds/ treatment) were slaughtered at six weeks of age. Breast meat and left tibia were discarded and kept till measurements. At the same time of slaughter, samples of blood were collected in heperanized tubes from the 3 chicks per treatment. Blood were centrifuged at 3000 rpm for 10 min to collect plasma. The clear plasma was transferred carefully to clean and dry vials and stored at -20 C until analysis for triglycerides, cholesterol, HDL, LDL and VLDL using kits purchased from Al-Gomheria for chemicals and Medicines , Assiut, Egypt. Whole breast meat was dried and prepared to proximate chemical analysis according to (AOAC, 1990). Left tibia was cleaned from flesh, then frozen for −20°C till analysis and weighed. Tibia length and width were measured by Calliper. Tibia moisture contents was determined by dehydration in oven at 100°C for 24 h, then the dry matter was calculated. Tibia ash content

was determined by the combustion of tibia bone at 550°C for overnight using Muffle Furnace.

The Robusticity index of tibia bone were calculated by the formula of Riesenfeld, (1972).

Robusticity index= bone length / cubic root of bone weight

2.3. Nutrient digestibility determination:

A digestion trial was conducted from 43 to 45 days of age using 3 replicates (3 birds each) per treatment, the birds were chosen to collect excreta (Attia, 1986). Chicks were fed the experimental diets for three days, in which feed consumed and excreta voided, were accurately recorded. The excreta was collected for each replicate, cleaned from feathers and feed then weighed, dried in a forced air oven at 70°C for 24 hours and at 105°C for 3 hours. Samples were ground and placed in screw-top glass jars till analyses. Proximate chemical analysis, calcium, phosphorus and nitrogen in feed and excreta were determined according to (AOAC, 1990) in Central Lab. of Faculty of Agriculture, Assiut University, Egypt. Calcium, phosphorus and nitrogen in feed and excreta samples were determined according to (AOAC, 1990) in the medical center Lab. in Sohag Governerate , Egypt.

The following equations were used to determine apparent nutrient digestibility (Emamzadeh and Yaghobfar, 2009)..

$$\text{Apparent nutrient digestibility (\%)} = \frac{\text{Nutrient retained (g/bird)}}{\text{Nutrient consumed (g/bird)}} \times 100$$

Nutrient retained in the body represent the difference between nutrient intake and nutrient excreted and it is expressed a function of nutrient consumed (Grana, et al., 2013).

2.4. Statistical analyses:

Data collected were analyzed by factorial arrangement (3*2) using the procedure of SAS, (2006) . Differences among means was determined by Duncan, (1955).

The statistical model as follows: $Y_{ij} = \mu + T_i + e_{ij}$

Where μ=general mean,T_i treatment effect , e_{ij}= experimental random error..

3. RESULTS AND DISCUSSIONS

3.1. Growth performance parameters.

Medicinal herbs blends and their effects on performance criteria are shown in Tables 2 and 3.. Body weight (BW) was significantly ($p < 0.05$) affected by blends of parsley and watercress in treatment 6 (T6) at 6 wks of age compared to other treatments. Also, BW of chicks fed blends of parsley and watercress (T6) improved by 3.52% compared to control groups at 6 wks of age. The increase in BW of chicks fed parsley and watercress agree with (Tahan and Bayram, 2011) who concluded that the use of dry parsley in the layer quail rations as feed additives have a significant effect on BW. Similar trend in BWG was observed, it was significantly ($P<0.05$) increased in (T6) in which birds fed blends of parsley and watercress at 6 wks of age as compared to control birds and other groups. However, body weight of these chicks improved by 3.52% compared to unsupplemented groups at 6 wks of age.

At 3 wks of age, the medicinal herbs blends did not affect ($P> 0.05$) on BWG this findings agree with those of (Bahnas, *et al.*, 2009) Who mentioned that no difference among dietary treatments due to parsley supplementation on BW and BWG during the period from 10 to 38 days of age .

At three and six weeks of age, Feed conversion Ratio (FCR) was significantly ($P<0.05$) affected by blends of medicinal herbs blends. However, it was improved in chicks fed blend of parsley and watercress (T6) compared to the other treatments and control Bahnas, *et al.*, (2009) reported that parsley seed powder quail diets had beneficial effect on the productive performance and as well as economic efficiency. The improvements in performance criteria of quail fed mixture of parsley and watercress could be due to the increased in the digestive enzymes which led to the increased in the digestive capacity and nutrient absorption. Chloro compounds of parsley have properties of antibiotic, antitumour, antiviral and pesticidal activities (Bahnas, *et al.*, 2009).

The antioxidant activity of parsley have used in phytotherapy (Kery, *et al.*, 2001) . Grown near roses, parsley have a good effects on bird health (Richmond and Machley, 2000) . Myristicin in parsley have the ability to activate the enzyme glutathione-Stransferase, which helps attach the molecule glutathione to oxidized molecules that would otherwise do damage in the body. Parsley contain carminative, tonic and aperient action, but is chiefly used for its diuretic properties, a strong decoction of the root being of great service in gravel, stone, congestion of the kidneys, dropsy and jaundice (Duke, *et al.*, 2009). Medicinal plants as growth promoters (Abaza, 2001; Aysan, 2013) have an efficiency to improve the productive performance of poultry have been proven. Reports indicate that medicinal plants increase the production of digestive enzymes and improve the utilization of digestive products (Williams and Losa, 2001; Hernadez, *et a*l., 2004). Improved in BWG, FC, FCR, has been reported as consequences of adding herbal plants to poultry diet (Bahadori, *et al.*, 2013) .

3.2. Plasma Lipid concentrations

Medicinal herbs blends effects on plasma concentrations of triglycerides, cholesterol, high-density lipoprotein (HDL), Low-density lipoprotein (LDL) and Very-low density lipoprotein (VLDL) are found in Table 4. Significant ($P<0.05$) effects due to supplementation of medicinal blends on plasma triglycerides, HDL, LDL and VLDL were observed. No significant differences was achieved on cholesterol concentrations. Chicks were fed T6 (mixture of parsley and watercress) had low concentrations of triglycerides in blood plasma compared with yhe other treatments. Vice versa with LDL and VLDL. High concentrations of plasma HDL were achieved in chicks fed T5 (mixture of fenugreek and cumin) and in T6 (mixture of parsley and watercress). Also, chicks in same previous two treatments had numerically the low concentrations of cholesterol compared to control or the other treated groups.

The results of the present experiment agree with Sonia, *et al.*, (2021) who found that Quail fed 3% black cumin had lowest serum cholesterol of 166.26mg/dl of total serum cholesterol and highest HDL value of 41.83 mg/dl as compared to control group. Also, they showed that in Japanese quail fed 3% fenugreek showed lowest value of total serum cholesterol (159.19mg/dl), serum triglyceride (370.11mg/dl), serum LDL cholesterol (40.19mg/dl) and VLDL cholesterol (74.02) at this level of fenugreek. Furthermore, Lecithin and choline in fenugreek help to dissolve cholesterol and fatty substances, minerals, B. complex, iron, Phosphates, para-amino

benzoic acid (PABA), and vitamins A and D.

Moreover, fenugreek also contains neurin, biotin, trimethylamine which tends to stimulate the appetite by their action on the nervous system (Michael and Kumawat 2003). However, herbal blends in poultry feeding lead to reduce plasma total lipids and total cholesterol in Hubbard broiler chicks and improves antioxidant status and production performance in laying hens. Fenugreek seeds improved the physiological performance of broiler breeder males, and revealed positive significant results of semen traits in aged broiler breeder males (Taha, 2011) .

Khan, *et al*., (2012a) mentioned that photobiotics or medicinal blends may be decreased lipid profile through its interfering with the biosynthesis of cholesterol in bird liver and the conversion of cholesterol into bile acid. Also, herbal medicinal blends inhibit the coenzyme-A reductase and fatty acid synthase which are rate limiting enzymes of liver (Khan, *et al*., (2012a and b). In addition, Hafeez, *et al.,* (2020) reported that a reduction in both triglyceride and total cholesterol levels in bird's blood, while, there was increased in HDL levels due to addition of blends consist of three herbal ingredients when added by 3.0 g/kg.

3.3. The chemical composition of breast meat of Japanese Quail.

Medicinal blends herbs effects on proximate chemical analysis of breast meat of Japanese Quail are illustrated in Table 5. No significant (P>0.05) effects due to medicinal herbs supplementation were observed on breast meat moisture content, dry matter and fat%. While, breast meat protein and ash% were significantly (P<0.05) affected by medicinal herbs addition. The results showed that T6 in which chicks fed mixture of parsley and watercress) achieved high % of crude protein in breast meat of Japanese Quail. Ash% was higher in group fed T4 in which fed mixture diets with fenugreek and cumin.

On the other hand, high numerically of fat% in group fed T6. Concerning with moisture content and dry matter of breast meat, The results of Muhammad, et al.,(2022) are in conflicted with the obtained results of dry matter but in the same trend with crude protein. They showed that the experimental groups (cumin supplementation) had substantially greater values of DM and crude protein of the breast meat than the control group. Vargas-Sanchez, et al., (2019) mentioned the herbs of natural origin in the diet of Japanese quail improved meat quality. Sabow, et al.,(2021) found that the chemical compositions of breast meat was not significantly different between the experimental herbal diets and control group. Also, Partovi and Seifi, (2018) found the herbal dietary supplements for Japanese quail diets had not affirmative effects in protein and fat values. Also, Shirzadegan and Falahpour (2014) found that broiler chickens meat fed dietary mixture of medicinal herbs similar in moisture, protein, and fat in comparison with control group.

3.4. Tibia bone characteristics

Table 6. summarized the results of the effect of different medicinal blends on tibia bone characteristics of Japanese Quail. Significant (P<0.05) effects due to medicinal herbs blends on the characteristics of tibia bone of Japanase Quail (tibia weight, length, diameter, ash% and robusticty index were observed. The obtained results showed that chicks fed T5 (fenugreek and cumin) and T6

(basal diet supplemented with mixture of parsley and watercress) achieved the highest values of all the previous mentioned parameters. The obtained results disagree with that reported by Hafeez, *et al*., (2020), who mentioned no significantly changes bone quality parameters of broiler chicks between the control and treatment groups of medicinal blend

3.5. Nutrient Digestibility and economical evaluation of herbal medicinal blends.

Table 7. summarized the results of the effect of different medicinal blends on nutrient digestibility, Dry matter (DM), Crude protein (CP), Ether extract (EE), Crude fiber (CF), Nitrogen free extract (NFE), calcium, phosphorus and nitrogen of Japanese Quail. Significant ($P<0.05$) effects due to medicinal herbs blends addition on the digestibility of all the previous nutrients of were observed. Quails fed T5 (mixture of fenugreek and cumin) had the highest protein, calcium, phosphorus and nitrogen digestibilites compared with the other groups. While, fiber digestibility achieved the highest value in T6 in which chicks fed parsley and watercress compared with the other groups. Ether extract digestibility and ash retention were achieved the highest value in T4 (caraway and corinader) compared with the other groups. Medicinal herbs blends, stimulate the secretion of enzymes (Zeng, *et al*., 2015) and modulate the intestine positively by increasing the villus height and their surface area (Oso, *et al*., 2019).

Enhanced the t digestion of nutrients and absorption from the gut of broiler chickens (Abudabos, *et al.*, 2017). Phytobiotics have a positive effect in increasing absorption and digestibility of nutrients in broiler chickens (Suresh, *et al*., 2008). Herbal blends enhance the palatability of birds, modify the intestinal walls, and improve nutrient absorption. Also, it reduce the pathogenic microbial load and inflammation along with the increased secretion of digestion enzymes, thus, it can enhance the nutrient digestibility (Yadav and Jha, 2019). In conclusion, use of mixtures of T5 and T6 enhanced digestibility% of dry matter, ether extract, crude protein and ash retention. These results are in the same trend of (Hassan, *et al*., 2015; and Farahat, *et al*., 2017).

3.6. Economical evaluation and treatment profitability

Regarding the economic analysis, it can be seen in Table 8 that T6 in which chicks fed diet supplemented with blends of parsley and watercress obtained the highest profitability with 56.72% and relative economic efficiency of 87.77%, which represents a profit of 30.77 I.E. per one kilogram of quail meat invested compared with the other treated groups except control one. With a similar result, the T3 obtained a return of 30.84% and relative economic efficiency of 47.7%. On the other hand, the lowest profitability was recorded by T3 in which chicks fed diet containing blends of rosemary and anise ground seeds, which tells us that for every kilogram of quail meat invested, represent 20 I.E compared with the other treated groups except control one. It can be concluded that, parsley or its by-product decreased the dietary cost. These results agree with those of Abd ElLatif, *et al*. (2002) who reported that the inclusion of herbal feed additives in Japanese quail diets resulted in the least feed cost/Kg gain and the highest percentage of economical efficiency as compared with the control diet or other treatments. Also, Hassan, *et al.* (2004) indicated that EEf

value at 6 weeks of age improved in broilers fed diets supplemented with the herbal feed additives as compared with the unsupplemented one. Osman, *et al.* (2004) reported that relative economical efficiency improved by increasing the inclusion level of parsley up to 15% by about 22.2 %,.

General discussions:

Feed consumed was reduced in chicks fed parsley and watercress at 15 g/kg in comparison with control and other groups at 6 wks of age.. However, BWG and FCR were higher in T6 compared to the other treatments. The reduction in feed consumed was reported in broiler chicks fed such herbs (Duru, *et al.*, 2013) or combination of some other herbal products (Ahmadian, *et al.*, 2020 and Galli, *et al.*, 2021). However, reduced feed consumption may be due to the unpleasant smell, taste and antiproteolytic activities. The obtained results concerning, using of herbs at the rate of 1.5% of blends in T5 (chicks were fed basal diet with mixture of fenugreek and cumin) or T6 (parsley and watercress) exceeded CP, EE and NFE in birds at the end of the experiment. Apparently, the improved profile of these contents is the major reason for higher weight gain in the respective group. Fenugreek in T5 contains minerals, B-complex vitamins, iron, para amino benzoic acid, vitamin A and D, phosphates, lecithin and choline which have the ability to dissolve the fatty acids and cholesterol (Dixit, *et al*., 2005). Fenugreek as additive has the ability to increase the appetite by exerting pressure on the nervous system due to the presence of neurine, biotine and trimethylamine (Michael and Kumawat, 2003).

The effect of addition of fenugreek, on the quail performance may be due to their contents from certain chemical compounds such as 47% thymol, 32.8%,-terpinene, 15.2% p-cymene, 2.0% b-pinene, 0.6% myrcene and 0.7% limonene (Hassanzad, *et al*., 2018). The concentrations of triglycerides , cholesterol and LDL in plasma were significantly decreased while HDL was significantly increased in birds fed with herbal blends at the rate of 3.0 g/kg. The improved blood profile may be due to the presence of vitamins and minerals phosphates, lecithin and choline leading to the lower level of cholesterol profile (Liu, *et al.,* 2020). Increased the coefficient of digestibility may be due to herbal plants have enhanced effects on antimicrobial action, intestinal mucus secretion, release of digestive enzymes and gut morphology. Lowering the plasma lipid contents due to the interaction between medicinal herbs and the biosynthesis of cholesterol in liver and its conversion into bile acid (Tiangang and Chiang, 2009).

CONCLUSIONS.

Supplementing the diets of Japanese quail with mixture of parsley seeds and watercress at level of 15 g/kg of basal diets resulted significant improvement in the performance, plasma lipid triglycerides, cholesterol, HDL, low level of LDL., breast meat protein, , tibia bone characteristics (tibia weight, length, diameter, ash and robusticty index and nutrient digestibility (protein, calcium, phosphorus and nitrogen) and net revenue compared with the other supplemented treatments.

PROTOCOL AND APPROVALS

Experimental work was kept under the Animal Care and Use Committee (the Committee on Ethics of Animal Experimentation) pursuant to Board

Section number 121 dated 14/2/2022 and pursuant to College Board Resolution number 772 dated 22/3/2022. All experimental procedures involving quail were performed. Regulations and the management of affairs related to experimental animals has been approved by the regulations governing this in Egypt

DISCLOSURES

No affiliations with or involvement in any organization or entity with any financial interest.

Table (1): Composition of basal diet.

Feedstuffs	**%**
Yellow corn	53.80
Soybean meal (44%)	36.70
Corn gluten (60%)	6.40
Di-calcium phosphate	1.05
Vit . Min. Premix*	0.50
Limestone	1.25
Salt	0.30
TOTAL	100
Chemical analysis	
Dry Matter	87.82
Crude Protein	24.3
Ether Extract	2.6
Crude Fiber	2.73
Calculated analysis	
Dry Matter,%	87.6
Metabolizable Energy (kcal/kg)	2944
Crude Protein,%	24.3
Ether Extract,%	2.6
Crude Fiber,%	2.7
Calcium,%	0.8
Phosphorus, av.,%	0.32
Lys.	1.3
Met.	0.50

* Premix provide per kilogram of diet and contain: Vitamin A (as all-trans-retinyl acetate); 12000 IU; Vitamin E (all rac--tocopheryl acetate); 10 IU; k_3 3mg; Vit.D_3, 2200 ICU; riboflavin, 10 mg; Ca pantothenate,10 mg; niacin, 20 mg; Choline chloride, 500 mg; Vitamin B_{12}, 10g; Vitamin B_6, 1.5 mg; Thiamine (as thiamine mononitrate); 2.2 mg; Folic acid, 1 mg; D-biotin, 50g. Trace mineral (milligrams per kilogram of diet) Mn, 55; Zn, 50; Fe, 30;Cu, 10; Se, 0.1 and Ethoxyquin 3mg

Table (2): Effect of dietary medicinal blends on performance criteria of Japanese Quail at three weeks of age..

Treatment	Body weight (g)	Body weight gain (g)	Feed consumption (g)	Feed conversion ratio (g.feed/g.gain)
T1	108.61	101.01	244.50	2.42^{c}
T2	109.44	101.54	265.17	2.61^{abc}
T3	109.44	101.84	265.17	2.61^{abc}
T4	104.44	96.59	278.89	2.89^{a}
T5	110.28	102.68	278.50	2.72^{abc}
T6	109.72	101.92	248.28	2.44^{bc}
SEM	1.4	2.3	1.2	0.11
P value	0.0791	0.0897	0.0654	0.0432

[a-d]Means within the columns with different superscript are significant difference (P<0.05).T1=Basal control diet; T2=basal diet+1.5% of blends of cinamon and thyme; T3= basal diet+ 1.5% of blends of rosemary and anise seeds powder; T4= basal diet+ 1.5% of blends of caraway and coriander ; T5= basal diet+ 1.5% of blends of fenugreek and cumin seeds powder; T6= basal diet+ 1.5% of blends of parsley and watercress.BW21day=Body weight at 21 days of age; BWG21day=Body weight gain at 21 days of age. FC 21day= Feed consumed at 21 days of age; FCR 21 day= Feed conversion ratio at 21 days of age.

Table (3): Effect of dietary medicinal blends on performance criteria of Japanese Quail at six weeks of age..

Treatment	Body weight (g)	Body weight gain (g)	Feed consumption (g)	Feed conversion ratio (g.feed/g.gain)
T1	220.56^{b}	212.96^{b}	712.83	3.34
T2	217.78^{b}	209.88^{b}	804.33	3.83
T3	219.09^{b}	211.49^{b}	864.69	4.08
T4	221.11^{b}	213.26^{b}	761.67	3.57
T5	218.89^{b}	211.29^{b}	759.61	3.59
T6	228.33^{a}	220.53^{a}	693.56	3.14
SEM	0.91	0.86	40.9	0.18
P value	0.0412	0.0453	0.0711	0.0654

[a-d]Means within the columns with different superscript are significant difference (P<0.05).T1=Basal control diet; T2=basal diet+1.5% of blends of cinamon and thyme; T3= basal diet+ 1.5% of blends of rosemary and anise seeds powder; T4= basal diet+ 1.5% of blends of caraway and coriander ; T5= basal diet+ 1.5% of blends of fenugreek and cumin seeds powder; T6= basal diet+ 1.5% of blends of parsley and watercress. BW 42day=Body weight at 42 days of age; BWG 42 day=Body weight gain at 42 days of age. FC 42 day= Feed consumed at 42 days of age; FCR 42 day= Feed conversion ratio at 42 days of age

Table (4): Effect of dietary medicinal blends on plasma lipid concentrations of Japanese Quail at six wks of age.

Treatment	Triglycerides. (mg/dl)	Cholesterol (mg/dl)	HDL (mg/dl)	LDL (mg/dl)	VLDL (mg/dl)
T1	258^{a}	231.5	47.7^{d}	165.4^{a}	23.5^{e}
T2	220^{b}	263.5	52.3^{c}	94.8^{f}	116.45^{b}
T3	230^{b}	309.5	54.4^{b}	142.8^{b}	112.5^{b}
T4	200^{c}	315	45.7^{e}	123.4^{c}	146.1^{a}
T5	157.5^{d}	202	58.1^{a}	103.9^{e}	40.2^{d}
T6	84^{e}	229.5	$53.9b^{c}$	107.4^{d}	68.3^{c}
SEM	2.56	29.8	0.85	0.71	0.95
P value	0.0432	0.0781	0.0422	0.0412	0.0452

$^{a-d}$Means within the columns with different superscript are significant difference ($P<0.05$).T1=Basal control diet; T2=basal diet+1.5% of blends of cinamon and thyme; T3= basal diet+ 1.5% of blends of rosemary and anise seeds powder; T4= basal diet+ 1.5% of blends of caraway and coriander ; T5= basal diet+ 1.5% of blends of fenugreek and cumin seeds powder; T6= basal diet+ 1.5% of blends of parsley and watercress. HDL (high-density lipoprotein); LDL(Low-density lipoprotein); VLDL (Very-low density lipoprotein)

Table (5): Effect of dietary medicinal blends on breast meat composition of Japanese Quail at six wks of age.

	Treatment							
Parameters,%	**1**	**2**	**3**	**4**	**5**	**6**	**SEM**	***P value***
Moisture	84.33	83.63	82.73	83.97	84.47	82.67	0.26	0.0654
Dry matter	15.7	16.37	17.27	16.03	15.53	17.33	0.26	0.0743
Protein	13.27^{b}	12.89^{b}	13.47^{b}	13.07^{b}	13.47^{b}	14.13^{a}	0.3	0.0454
Fat	1.44	1.26	1.34	1.28	1.43	1.53	0.18	0.0652
Ash	1.55^{b}	1.73^{ab}	1.61^{b}	1.86^{a}	1.73^{ab}	1.30^{c}	0.02	0.0432

$^{a-d}$Means within the rows with different superscript are significant difference ($P<0.05$).T1=Basal control diet; T2=basal diet+1.5% of blends of cinamon and thyme; T3= basal diet+ 1.5% of blends ture of rosemary and anise seeds powder; T4= basal diet+ 1.5% of blends of caraway and coriander ; T5= basal diet+ 1.5% of blends of fenugreek and cumin seeds powder; T6= basal diet+ 1.5% of blends of parsley and watercress.

Table (6): Effect of dietary medicinal blends on tibia bone characteristics of Japanese Quail at six wks of age

Parameter	Treatment						SEM	*P value*
	1	2	3	4	5	6		
Tibia Weight(g)	2.38^{ab}	$2,37^{ab}$	2.25^{c}	2.3^{bc}	2.36^{ab}	2.44^{a}	0.01	0.0344
Tibia Length, (cm)	4.2^{bc}	3.94^{c}	4.4^{ab}	3.95^{c}	4.15^{bc}	4.6^{a}	0.15	0.0164
Tibia Diameter,(mm)	2.15^{c}	2.25^{bc}	2.35^{ab}	2.41^{ab}	2.25^{bc}	2.48^{a}	0.1	0.0145
Ash(%DM)	33.5^{e}	36.45^{d}	40.2^{b}	41.05^{a}	38.1^{c}	40.95^{a}	0.25	0.0001
Robusticty	3.14^{bc}	2.95^{c}	3.36^{ab}	2.99^{c}	3.12^{bc}	3.42^{a}	0.06	0.0240

[a-d]Means within the rows with different superscript are significant difference (P<0.05). T1=Basal control diet; T2=basal diet+1.5% of blends of cinamon and thyme; T3= basal diet+ 1.5% of blends of rosemary and anise seeds powder; T4= basal diet+ 1.5% of blends ture of caraway and coriander ; T5= basal diet+ 1.5% of blends of fenugreek and cumin seeds powder; T6= basal diet+ 1.5% of blends of parsley and watercress.

Table (7): Effect of dietary medicinal blends on nutrient digestibility of Japanese Quail at six wks of age

Parameters	Treatment						SEM	*P value*
	1	2	3	4	5	6		
Dry Matter Dig.	77.57^{a}	72.42^{b}	77.54^{a}	76.72^{ab}	77.8^{a}	73.71^{ab}	1.94	0.0410
Protein Dig.	85.99^{ab}	81.42^{b}	86.42^{ab}	85.96^{ab}	88.35^{a}	84.41^{ab}	3.34	0.0136
Fiber Dig.	56.37^{f}	61.6^{d}	55.36^{c}	58.36^{e}	66.7^{b}	68.3^{a}	0.49	0.0356
Ether Extract Dig.	44.17^{e}	58.63^{cb}	52.47^{d}	66.97^{a}	56.2^{c}	60.8^{b}	0.54	0.0417
Ash retention	55.6^{b}	62.97^{a}	53.87^{cb}	65.33^{a}	51.43^{c}	53.77^{cb}	0.21	0.0389
NFE	71.5^{c}	76.47^{ab}	78.2^{a}	75.63^{ab}	74.87^{abc}	73.23^{bc}	0.49	0.0432
Calcium Digest.	57.145^{ab}	41.478^{b}	56.7^{ab}	58.65^{ab}	65.24^{a}	51.84^{ab}	10.47	0.0443
Phosohorus Dig.	52.39^{a}	22.41^{b}	41.69^{a}	45.77^{a}	49.59^{a}	47.33^{a}	2.84	0.0136
Nitrogen Dig.	85.98^{ab}	81.42^{b}	86.42^{ab}	84.32^{ab}	88.35^{a}	84.41^{ab}	3.3	0.0453

[a-d]Means within the rows with different superscript are significant difference (P<0.05).
T1=Basal control diet; T2=basal diet+1.5% of blends of cinamon and thyme; T3= basal diet+ 1.5% of blends of rosemary and anise seeds powder; T4= basal diet+ 1.5% of blends of caraway and coriander ; T5= basal diet+ 1.5% of blends of fenugreek and cumin seeds powder; T6= basal diet+ 1.5% of blends of parsley and watercress..NFE=nitrogen free extract. dig=digestibility

Table (8): Effect of dietary medicinal blends on economical evaluation of Japanese Quail at six wks of age

Treatment	Economical Effeciency Rate (EE)									
	Feed intake (Kg/bird)	**Price/kg feed (I.E)**	**Total feed cost (EB)**	**Total production cost (I.E)**	**Body weight (Kg)**	**Price (kg) (I.E)**	**Total Revenue (I.E)**	**Net Revenue (I.E)**	**Net Revenue %**	**Relative Econimal effeciny**
T1	0.713^{d} ± 001	12.1^{f} ±0	8.62^{e}± 0.01	11.62^{e} ±0	0.225^{c}±0	85.0	19.13^{b}±0	7.51^{a}± 0.01	64.62^{a} ±0.15	100^{a} ±0
T2	0.805^{b} ± 0	12.6^{e} ± 0	10.14^{c} ±0.01	13.1^{c} ±0	0.224^{f}±0	85.0	19.04^{b}±0	5.94^{d}± 0.01	45.34^{d} ±0.22	70.16^{d} ±0.1
T3	0.865^{a} ±0.001	13.1^{d} 0.01	11.33^{a} ±0	14.33^{a} ±0	0.221^{d}±0	85.0	18.75^{d}±0	4.42^{e}± 0.01	30.84^{e} ±0.18	47.7^{e} ±0.09
T4	762^{c} ± 0	13.5^{b} ±0	10.29^{b} ±0	13.2^{b} ±0	0.224^{b}±0	85.0	19.04^{b}±0	5.84^{d}± 0.01	44.24^{d} ±0.23	68.46^{c} ±0.11
T5	0.760^{c} ±0	134^{c} ±0	10.18^{c} ±0	13.18^{c} ±0	0.222^{e}±0	85.0	18.87^{c}±0	6.96^{c}± 0.01	52.81^{c} ±0.1	81.72^{bc} ±0.2
T6	0.694^{e} ±0	13.9^{a} ±0	9.64^{d} ±0	12.64^{d} ±0	0.233^{a}±0	85.0	19.81^{a}±0	7.17^{b}± 0	56.72^{b} ±0.1	87.77^{b} ±0.23

[a-d]Means in the same column with different superscripts are significantly different (P<0.05).1=Basal control diet; T2=basal diet+1.5% of blends of cinamon and thyme; T3= basal diet+ 1.5% of blends of rosemary and anise seeds powder; T4= basal diet+ 1.5% of blends of caraway and coriander ; T5= basal diet+ 1.5% of blends of fenugreek and cumin seeds powder; T6= basal diet+ 1.5% of blends of parsley and watercress.. Total production cost (IE)= Total feed cost (IE)+labour

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الملخص العربى

فعالية مزيج من الأعشاب الطبية المختلفة كإضافات اعلاف على معدل الأداء ، وتركيب لحم الصدر ، ومعامل هضم المركبات الغذائية ، وصفات عظمة الساق ,والتقييم الاقتصادى فى السمان الياباني

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مركز البحوث الزراعية – معهد بحوث الانتاج الحيوانى والدواجن– الجيزة– مصر

تمت دراسة ستة خلطات من الأعشاب الطبية في السمان الياباني على معدل الأداء ، ودهون بلازما الدم ، وتركيب لحم الصدر وخصائص عظام الساق ، ومعامل هضم المركبات الغذائية فى السمان الياباني .استخدم فى التجربة 180 كتكوت سمان عمر يوم، تم تقسيمهم عشوائيا الى ستة معاملات .المعاملة الاولى) T1 العلف الأساسي بدون إضافة الأعشاب الطبية (، المعاملة الثانية) T2 العلف الأساسي يحتوى 15 جم / كجم من مخلوط مسحوق القرفة والزعتر (، المعاملة الثالثة) T3 العلف الاساسى يحتوى 15 جم/كجم من مخلوط إكليل الجبل ومسحوق بذور اليانسون (، المعاملة الرابعة) T4 العلف الاساسى يحتوى 15 جم/كجم مخلوط من مسحوق الكراوية والكزبرة (، المعاملة الخامسة) T5 العلف الاساسى يحتوى 15 جم/كجم من مخلوط مسحوق بذور الحلبة والكمون(، المعاملة السادسة) T6العلف الاساسى يحتوى 15 جم/كجم من) مسحوق البقدونس والجرجير .(اظهرت النتائج ان الكتاكيت التى غذيت بمزيج T6 من البقدونس والجرجير حققت نسبة عالية من البروتين الخام في لحم الصدر فى السمان الياباني ، بينما كانت نسبة الرماد أعلى في المجموعة التي تم تغذيتها على T4 والتي تغذت على العلائق المخلوطة مع الحلبة والكمون .تحسنت معاملات هضم العناصر الغذائية معنويا ($P < 0.05$) في T6 فيما عدا معامل هضم مستخلص الأثير والمحتجز من الرماد .والتى تحققت أعلى قيمة لها في) T4 الكراوية والكزبرة (مقارنة بالمجموعات الأخرى .أدى تغذيةالسمان الياباني بمزيج من بذور البقدونس والجرجير بمستوى 15جم / كجم الى تحسن عالى فى معدل الاداء ، والدهون الثلاثية الدهنية في البلازما ، والكوليسترول ، HDL ، LDL، بروتين لحم الصدر ، وخصائص عظام الساق) وزن الساق ، الطول ، القطر ، الرماد ومؤشر القوة وهضم العناصر الغذائية) البروتين والكالسيوم والفوسفور والنيتروجين .كما حققت المعاملة 6 اعلى عائد اقتصادى نسبى مقارنة بالمعاملات المغذه على الاعشاب عدا الكنترول.