Bahnas, M. S., <u>M. S. Ragab,</u> N. E. A. Asker, and R.M.S. Emam (2009). Effects of using parsley or its by-product with or without enzyme supplementation on performance of growing Japanese quails. ***Egypt. Poult. Sci., 29: 241-262.***

EFFECTS OF USING PARSLEY OR ITS BY-PRODUCT WITH OR WITHOUT ENZYME SUPPLEMENTATION ON PERFORMANCE OF GROWING JAPANESE QUAILS

By

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Received: **09/02/2009** Accepted**: 16/03/2009**

ABSTRACT: *This study was carried out to investigate the impacts of different levels of Parsley (Petroselinium crispum) as dried leaves and its by by-product (as natural biological feed additives) with or without enzyme supplementation on growing Japanese quail performance. The total number of the experimental birds (480) at 10 days of age were divided into ten treatments (48 birds each). Each treatment contained 3 replicates of 16 birds. The experimental treatments were as follows:-*

***1** Control diet (free from Parsley (**P**) or Parsley by-products **(PBP)**, **(diet 1)**.*

***2-** Diet 1+ 0.1% kemzyme dry **(KD)**.*

***3-** Diet 1 + 0.25% P.*

***4-** Diet 1+ 0.25% P + 0.1% KD.*

5-** Diet 1+ 0.5% P**.

***6-** Diet 1+ 0.5% P + 0.1% KD.*

***7-** Diet 1+ 0.5% PBP.*

***8-** Diet 1+ 0.5% PBP +0.1% KD.*

***9-** Diet 1 + 1% PBP.*

***10-** Diet 1+1% PBP +0.1% KD.*

Results obtained could be summarized in the following:

No significant difference among dietary treatments in live body weight, live body weight gain, feed conversion, growth rate, performance index, crude protein conversion and caloric conversion ratio during the period from 10 to 38 days of age were observed. Significantly affected feed intake (FI) value during the period from 10 to 38 days of age were observed. Quails fed control diet + 0.1% KD had higher FI during the period from 10 to 38 days of age. However, quails fed control diet had low FI value during this period.

Feeding different levels of P and its by-product with or without enzyme supplementation insignificantly affected slaughter parameters of Japanese quails. Feeding treatments significantly affected moisture, protein and fat percentages of quail meat. Higher moisture and protein%

(consequently lower fat%) values were observed for quails fed control diet. However, those fed control diet + 0.25% P + 0.1 KD had higher fat % (and consequently low moisture and protein%).

Quails fed control diet + 0.5% PBP had higher serum calcium, cholesterol and triglycerides. Quails fed control diet + 0.5% P + 0.1 KD had lower calcium contents. Quails fed control diet had lower contents of serum cholesterol. Quails fed control diet + 0.25% P + 0.1 KD had lower contents of serum triglycerides. Percentage of mortality was 2.08% in quails fed control diet +0. 5% P. However, the percentage of mortality was zero% in quails fed the other experimental diets.

Quails fed control diet + 1 % PBP + 0.1 % KD gave the best economical and relative efficiency values being 2.752 and 103.3 %, respectively followed by quails fed control diet + 1 % PBP (2.728 and 102.4%, respectively) when compared with the other treatments.

INTRODUCTION

Feed additives are important materials that can improve the efficiency of feed utilization and animal performance. However, the use of chemical products especially those of antibiotics and hormones may cause unfavorable effects. Many attempts in the field of animal nutrition are being done to achieve an increase in animal production and thereby profit **(Abdou, 2001)**. Using medicinal herbs and plant with humans has been known since the old civilization. Old drugs industry depended upon the raw material of medicinal herbs and plant and their extracts, which always proved safe. Inversely, many synthesized chemicals caused many hazards to animals, plants and human. The world Health organization (WHO) encourages using medicinal herbs and plant to substitute or minimize the use of chemicals through the global trend to go back to nature **(Allam *et al.*, 1999).**

Medicinal and aromatic plants are cultivated in large areas in Egypt, about 48 thousands feddans were cultivated with medicinal and aromatic plants in Egypt **(Agricultural Economics, 2005)**.

Parsley (*Petroselinium crispum)* leaves, fresh, frozen or dried; roots dug in winter and dried; seeds when capsules are ripe could be used as feeding additives. The fresh leaves are rich source of manganese, vitamins and calcium. The leaves, roots and seeds are diuretic, reduce the release of histamines and scavenge skin aging free radicals. Grown near roses, parsley improves their health and scent **(Richmond and Mackley, 2000)**. Parsley's volatile oils - particularly myristicin - have been shown to inhibit tumor formation in animal studies, and particularly, tumor formation in the lungs. Myristicin has also been shown to activate the enzyme *glutathione-S-transferase*, which helps attach the molecule glutathione to oxidized molecules that would otherwise do damage in the body. The activity of parsley's volatile oils qualify it as a "chemoprotective" food, and in particular, a food that can help neutralize particular types of carcinogens (like the *benzopyrenes* that are part of cigarette smoke, charcoal grill smoke, and the smoke produced by trash incinerators). Parsley has 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)**. The dried leaves are also used for the same purpose

Apiol is the effective component that represent approximately 21-80% of parsley essential oil (**Tisserand and Balacs, 1995**). Chlorocompounds in parsley often show significant biological activities, e.g. antibiotic, antitumour, antiviral and pesticidal activities (**Holst and Engvild, 2000**). Parsley has an antioxidant activity, which has been used in phytotherapy (**Kery *et al.*, 2001**). parsley showed a marked anti-calculi activity and also had diuretic effects in male rats (**Ahsan *et al*., 1990**). It also exhibited a significant antiinflammatory and antihepatotoxic activities, which merits further detailed investigations (**Al-Howiriny *et al.*, 2003**).

Medicinal and aromatic plants and their by-products are preferable as feed additives and growth promoters. It was necessary to throw some light on these plants concerning their effects on growing birds performance. A little information is available about possibility of using herbal and aromatic by products in poultry diets. In this respect, several investigators reported that using medicinal and aromatic plants in broiler and rabbits diets improved body weight, body weigh gain and performance index, (**Osman *et al.*,2004; Ibrahim *et al.*, 2004** and **Ibrahim, 2005)**. **Osman *et al.* (2004)** found that replacing soybean meal by radish, rocket or parsley cakes up to 15% had no deleterious effects on feed consumption of broilers during the whole growth period.

In recent years, there has been a concerted effort to improve the nutritive value of feedstuffs by using exogenous enzymes (A complex protein compound produced in living cells that speeds up chemical reactions without being changed or destroyed). Enzymes are added to animal feeds to supplement low enzyme production or to improve utilization of poorer quality feeds. It is well documented that most fungal and bacterial preparations effectively degrade the viscous polysaccharides (ie. β-glucan, arabinoxylan) in barley, oats, rye and to some extent in wheat. It has been shown that the anti-nutritional activity of arabinoxylans and β-glucans in chickens is not a function of the polymers *per se*, but of the intestinal viscosity that they create. On the basis of many reports, as reviewed by **Campbell and Bedford (1992) ; Chesson (1993) and Walsh *et al*. (1993),** it may be concluded that the nutritional and, therefore, economic value of barley, oats, rye and even wheat can be improved by the addition of the appropriate preparation of β-glucanase and xylanase enzymes.

The effectiveness of Kemzyme supplementation to the basal diet may be attributed to its effect in increasing the dietary energy utilization **(Lyons and Jacques, 1987),** or improving digestibility of starch, carbohydrates, protein, fat and cellulose **(Hashish *et al.,* 1992 and Wyatt and Goodman, 1993).** In addition, the enzyme supplementation of diet may have a positive effect on energy bioavailability and broiler performance.

Since, medicinal and aromatic plants (MAP) and their by by-products (accumulate after preparation of medicinal and aromatic plants for exportation that can cause environmental pollution) are preferable as feed additives and growth promoters. So, the objectives of the present study were to investigate the impacts of different levels of Parsley (as dried leaves) and its by-product (as natural biological feed additives) with or without enzyme supplementation on the performance of growing Japanese quail.

MATERIALS AND METHODS

This study was carried out at the Poultry Research Station, Poultry Production Department, Faculty of Agriculture, Fayoum University. Chemical analyses were performed in the laboratories of the same department according to the procedures outlined by **AOAC (1990).**

The total number of the experimental birds (480) at 10 days of age were divided into ten treatments (48 birds each), each treatment contained 3 replicates of 16 birds. **The experimental treatments were as follows:-**

1- Control diet (free from parsley (P) or Parsley by-product (PBP) as shown in Table 1, **(diet 1)**.

2- Diet 1 + 0.1% kemzyme dry (KD).

3- Diet 1 + 0.25% P.

4- Diet 1 + 0.25% P + 0.1% KD.

5- Diet 1 + 0.5% P.

6- Diet 1 + 0.5% P + 0.1% KD.

7- Diet 1 + 0.5% PBP.

8- Diet 1 + 0.5% PBP + 0.1% KD.

9- Diet 1 + 1% PBP.

10- Diet 1 + 1% PBP + 0.1% KD.

The experimental diets were supplemented with vitamins and minerals mixture and DL-methionine to cover the recommended requirements according to **NRC, 1994**. Diets were formulated to be iso-nitrogenous and iso-caloric, containing about 24% CP and 2900 Kcal ME/ Kg diet. The dried parsley leaves (sun dry) and its by-product (part of plant and leaves which non utilized are considered as by-product) used in the present study were obtained from the Egyptian Organic Agriculture Company, Fayoum Governorate, Egypt. The enzyme mixture used in this study is kemzyme dry (KD) which is manufactured by Kemin Company, Egypt. It is a multi-enzyme preparation that includes: alpha-amylase, bacillolysin (protease), beta-glucanase, cellulase complex and lipase.

Chicks were individually weighed to the nearest gram at the start of experiment, wing-banded and randomly allotted to the dietary treatments. Chicks were raised in electrically heated batteries with raised wire mesh floors and had a free access to feed and water. Batteries were placed into a room provided with a continuous light and fans for ventilation. The birds were reared under similar environmental conditions, and were fed the experimental diets from 10 days until 38 days of age. **Chemical composition of parsley and its by-product used in the present study (on air dried basis) are as follows :-**

Item	**leaves parsley**	**parsley by-product**
Moisture %	**10.98**	**14.01**
Crude protein%	**16.75**	**19.1**
Ether extract %	**0.16**	**0.72**
Crude fiber%	**6.31**	**8.42**
Ash%	**18.78**	**14.73**
Nitrogen-free extract%	**47.02**	**43.02**
ME/Kcal */Kg	**2712**	**2677**

*Calculated according to **Carpenter and Clegg (1956)** by applying the equation: ME(Kcal/kg)=(35.3*CP%)+(79.5*EE%)+(40.6*NFE%)+199.

Birds were individually weighed to the nearest gram at weekly intervals during the experimental period. At the same time, feed consumption was recorded and feed conversion (g feed / g gain) and body weight gain were calculated. Crude protein conversion (CPC), caloric conversion ratio (CCR) growth rate (GR), and performance index (PI) were also calculated **(Emam, 2007)**. Sex determination through plumage dimorphism (feather sexing) was done at 24 days of age.

At the end of the growing period (38 days of age), slaughter tests were performed using (2 males and 2 females) chicks around the average live body weight (LBW) of each treatment. Birds were individually weighed to the nearest gram, and slaughtered by severing the jugular vein (islamic method). After four minutes bleeding time, each bird was dipped in a water bath for two minutes, and feathers were removed by hand. After the removal of head, carcasses were manually eviscerated to determine some carcass traits, dressing% (eviscerated carcass without head, neck and legs) and total giblets % (gizzard, liver and heart). The eviscerated weight included the front part with wing and hind part. The abdominal fat was removed from the parts around the viscera and gizzard, and was weighed to the nearest gram. The bone of front and rear were separated and weighed to calculate meat percentage. The meat from each part was weighed and blended using a kitchen blender.

Chemical analyses of representative samples of the experimental diets and carcass meat (including the skin) were carried out to determine dry matter (DM), crude protein (CP) N x 6.25, ether extract (EE), crude fiber (CF) and ash contents according to the methods of **AOAC (1990).** Nitrogen free extract (NFE) was calculated by difference.

Individual blood samples were collected during exsanguinations, immediately centrifuged at 3500 rpm for 15 min. Serum was harvested after centrifugation of the clotted blood, stored at–20ºC in the deep freezer until the time of chemical determinations. The biochemical characteristics of blood were determined colorimetrically, using commercial kits as previously described **(Emam, 2007).** Accumulative mortality rate was obtained by adding the number of dead birds during the experiment divided by the total number of chicks at the beginning of the experimental period. To determine the economical efficiency for meat production, the amount of feed consumed during the entire experimental period was obtained and multiplied by the price of one Kg of each experimental diet which was estimated based upon local current prices at the experimental time. Analysis of variance was conducted according to **Steel and Torrie (1980).** Significant differences among treatment means were determined using Duncan's multiple range test **(Duncan, 1955).**

RESULTS AND DISCUSSION

Live body weight (LBW), live body weight gain (LBWG), feed intake (FI) and feed conversion (FC): Results presented in Table 2 revealed no significant difference among dietary treatments in LBW, LBWG and FC values during the period from 10 to 38 days of age. On the other hand, lower LBW and LBWG values were recorded with quails fed control diet. Quails fed control diet + 0.1% KD had high LBW and LBWG values during the period from 10 to 38 days of age (the improvement noted in market body weight has been attained due to an increase in feed consumption). These results agree with those of **Jakic, *et al.* (1998)** who examined the influence of multienzyme on broiler performance and indicated that, LBW of group fed diets supplemented with multienzyme was higher at 42 days of age as compared with the control group.

The data of Table 2 indicated that feeding different levels of Parsley (P) and its by-product (PBP) with or without enzyme supplementation significantly ($P \leq 0.01$) affected FI value during the experimental period. Quails fed control diet + 0.1% KD had higher FI during the period from 10 to 38 days of age. However, quails fed control diet had the lowest FI value during this period.

In this respect **Ibrahim, *et al.* (2004)** and **Ibrahim (2005)** demonstrated that dill and parsley / or rocket (0.5 and 1%) or laurel (1%) supplementation significantly increased the daily feed intake of rabbits as compared with the control group, while, they showed no significant differences in feed conversion ratio. On the other hand, **Azouz (2001)** observed no significant differences in feed intake between broilers fed fenugreek seeds and those fed the control diets.

Concerning sex effect (Table 2), females had significantly heavier LBW, LBWG and better FC value during the period from 10 to 38 days of age than males. However, level of addition, parts used of P or PBP and enzyme supplementation insignificantly affected LBW, LBWG and FC during the experimental period (from 10 to 38 days of age) ,while, it significantly affected FI during the same period. Data presented in Table 2 show that level of addition of 0.25% P or PBP significantly decreased FI during the period from 10 to 38 days of age. Parts used of P or PBP and enzyme supplementation significantly affected FI during the period from 10 to 38 days of age, quails fed leaves of MAP diet had lower FI than PBP, while, enzyme supplementation significantly ($P \leq 0.01$) increased FI during the experimental period. Similar results were observed by **Zeweil (1996); Jakic, *et al.* (1998) and El-Gendi, *et al.* (2000)**.

Growth rate (GR), performance index (PI), crude protein conversion (CPC) and caloric conversion ratio (CCR):

Results presented in Table 2 indicated that feeding different levels of P and its by-product with or without enzyme supplementation insignificantly affected GR, PI, CPC and CCR values during the period from 10 to 38 days of age.

Concerning sex effect (Table 2), females had significantly higher GR, PI and better CPC and CCR ($P \leq 0.01$) than males during the experimental period (from 10 to 38 days of age). However, level of addition, parts used of P or PBP and enzyme supplementation insignificantly affected GR, PI, CPC and CCR during the same mentioned period (Table 2). These results disagree with the findings of **El-Gendi, *et al.* (2000)** who reported that broilers fed diet supplemented with Kemzyme significantly improved PI of chicks.

Slaughter parameters: -

Results presented in Tables 3 and 4 indicated that feeding different levels of P and its by-product with or without enzyme supplementation insignificantly affected slaughter parameters of Japanese quails. These results agree with the findings of **Ghazalah and Ibrahim (1996)** and **Abaza (2001)** who reported that addition of MAP had no negative impacts on carcass parameters. Moreover, **Azouz (2001); Abd El-Latif, *et al.* (2002); El-Husseiny, *et al*. (2002)** and **Hassan, *et al*. (2004)** found that addition of MAP had significantly higher dressing% in Japanese quail and broilers than those fed the control diets. **Also, Ibrahim, *et al.* (2004)** demonstrated that rabbits received either dill or parsley at 1.0 % dose showed a significant ($P \leq 0.05$) decrease in abdominal fat weight.

Level of addition of MAP or MAPB and enzyme supplementation insignificantly affected slaughter parameters. (Tables 3 and 4). These results are in harmony with those obtained by **Ghazalah, *et al.* (1994)** who reported that the dressing percentage, abdominal fat and total edible parts were not significantly affected by the addition of Kemzyme.

Parts used of P or PBP insignificantly affected slaughter parameters (Tables 3 and 4) except percentage of front meat where, quails fed leaves of MAP diet had higher front meat %.

Chemical composition of Japanese quail meat: -

Data presented in Table 4 show that the feeding treatments significantly ($P \leq 0.01$) affected moisture, protein and fat percentages of quail meat. Higher moisture and protein% (consequently lower fat%) values were observed for quails fed control diet, while, those fed control diet + 0.25% P + 0.1 KD had higher fat % (and consequently lower moisture and protein %), this is in accordance with results reported by **Al-Harthi (2004).** However, insignificant differences were observed in ash and NFE percentages of meat.

Carcass part significantly influenced fat and ash %, rear part had higher fat than front part, however, front part had higher ash than rear part. Data presented in Table 4 show that level of addition of MAP or MAPB significantly affected protein and fat % of quail meat. The highest protein (the lowest fat %) values were observed for quails fed the control diet.

Parts used insignificantly affected chemical composition of quail meat. However, enzyme supplementation significantly affected moisture and fat % of quail meat. Higher moisture % (consequently lower fat%) values were observed for quails fed control diet, while, those fed 0.1 KD had higher fat % (and consequently lower moisture %).

Serum constituents: -

Data of serum constituents analyses are summarized in Table 5. The results of serum constituents indicated that feeding different levels of P or its by-product with or without enzyme supplementation significantly affected calcium, cholesterol and triglycerides contents. It can be seen that quails fed control diet + 0.5% PBP had higher serum calcium, cholesterol and triglycerides (18.38, 13.6 and 15.44 mmol/L, respectively). Quails fed control diet + 0.5% P + 0.1 KD had lower calcium contents(6.60 mmol/L). Quails fed control diet had lower contents of serum cholesterol (6.05 mmol/L). Quails fed control diet + 0.25% P + 0.1 KD had lower contents of serum triglycerides (6.60 mmol/L). These results disagree with those of **El-Ghamry, *et al.* (2004)** with Muscovi ducklings who demonstrated that total cholesterol value in plasma of hot pepper and fenugreek seeds (1.5%) treatments were significantly lower than those of the control group.

However, insignificant effects were observed in aspartate aminotransferase (AST), alanine aminotransferase (ALT), total protein, albumin, globulin, albumin/globulin ratio and glucose contents. It may be concluded that there were no adverse effects on blood components due to the addition of MAP, as well as no deleterious effects on liver function (as measured by AST and ALT activities). Similar trend was observed by **Abdo, *et al.* (2003); Soliman, *et al.* (2003) and Al-Harthi (2004)**.

Concerning sex effect (Table 5), females had significantly higher calcium, triglycerides, AST, ALT, albumin and globulin than males. Whereas, insignificant differences were observed between the two sexes for other serum constituents (cholesterol, albumin/globulin ratio and glucose contents).

Level of addition, parts used of P or PBP and enzyme supplementation insignificantly affected serum constituents, except, parts used with glucose (Table 5). These results disagree with those of **El-Gendi, *et al.* (2000)** who found that chicks fed Kemzyme had the highest averages of serum albumin and GPT.

Mortality rate%: -

The calculated cumulative mortality % during the experimental period (from 10 to 38 days of age) are presented in Table 6. Obtained results indicated that the percentage of mortality was 2.08% in quails fed control diet + 0.5% P. However, the percentage of mortality was zero% in quails fed the other experimental diets.

Economical efficiency (EEf):-

Results in Table 6 show the EEf value during the period from 10 to 38 days of age. Quails fed control diet + 1 % PBP + 0.1 % KD had the best economical and relative efficiency values being 2.752 and 103.3 %, respectively followed by quails fed control diet + 1 % PBP (2.728 and 102.4%, respectively) when compared with the other treatments. Whereas, quails fed diet containing 0.5 % P had the worst corresponding values, being 2.568 and 96.37%, respectively. The relative efficiency varied between 96.37% (control diet + 0.5 % P) to 103.3% (control diet + 1 % PBP + 0.1 % KD). Therefore, it can be concluded that, Parsley or its by-product decreased the dietary cost. These results agree with those of **Abd El-Latif, *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. Also, **Hassan, *et al.* (2004)** indicated that EEf value at 7 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 radish or parsley up to 15% by about 33.5 % and 22.2 %, respectively. Similarly when rocket was used up to 10 %, EEf was improved by about 15.9 % as compared to the control group.

It can be concluded from this study that:

- Parsley or its by-product in diets of Japanese quail had beneficial effect on the productive performance and as well as economical efficiency.
- More research is necessary to characterize the MAP and their by-products with regard to their digestibility, amino acid profile and content of anti-nutritional factors.
- Research under local conditions is required to determine the most economical methods for handling the MAP and their by-products in order to improve their nutritional quality and allow high inclusion levels in poultry diets.

Table 1: Composition and analyses of the control diet.

Item	%
Yellow corn, ground	**55.00**
Soybean meal (44%CP)	**33.00**
Broiler concentrate(48%CP*)	**10.00**
Corn oil	**1.00**
Sodium chloride	**0.05**
Di Ca P	**0.50**
Vit. and Min. premix **	**0.30**
DL – methionine	**0.15**
Total	**100.0**
Determined analysis :	
Moisture	**9.62**
CP	**23.99**
EE	**2.55**
CF	**3.11**
Ash	**7.98**
NFE	**52.75**
Calculated analysis* :**	
CP	**24.08**
EE	**2.87**
CF	**2.72**
Ca	**1.02**
Available P	**0.51**
Methionine	**0.62**
Methionine+Cystine	**1.02**
Lysine	**1.39**
…………………………………………….	**………………….**
ME, K cal./Kg	**2925**

***Broiler concentrate manufactured by Hybrid International Company and contains:- 48% Crude protein, 2.2% crude fiber, 4.5% ether extract, 8-10% calcium, 3% available phosphorus, 1.5% methionine, 2% methionine + cystine, 2.7% lysine, 2450 K cal ME/kg. Also, each 1 kg broiler concentrate contains :-120000 IU Vit. A; 25000 IU Vit. D3; 150 mg Vit. E; 15 mg Vit. K3; 10 mg Vit. B1; 50 mg Vit. B2; 20 mg Vit. B6; 150µg Vit. B12; 100 mg pantothenic acid; 300 mg nicotinic acid; 10 mg folic acid; 500µg biotin; 5000 mg choline chloride; 150 mg Cu; 10 mg I; 600 mg Fe; 800 mg Mn; 500 mg Zn; 1.5mg Se; 2 mg Co; 1250 mg anti-oxidant (ethoxyquin).**

****Each 3.0 Kg of the Vit. and Min. premix manufactured by Agri-Vet Company, Egypt and contains : Vit. A, 12000000 IU ; Vit. D_3 2000000 IU ; Vit. E, 10 g ; Vit. K_3, 2.0 g ; Vit. B1, 1.0 g ; Vit. B2, 5 g ; Vit. B6, 1.5 g; Vit. B12,10 mg ; choline chloride, 250 g ; biotin, 50 mg ; folic acid, 1 g ; nicotinic acid , 30 g ; Ca pantothenate, 10 g ; Zn, 50 g ; Cu,10 g ; Fe, 30 g ; Co, 100 mg ; Se, 100 mg ; I, 1 g ; Mn, 60 g and anti-oxidant, 10 g, and complete to 3.0 Kg by calcium carbonate.**

***** According to NRC, 1994.**

Table 2: Effects of feeding different levels of parsley (P) and its by-product (PBP) with or without enzyme supplementation on live body weight (LBW), live body weight gain (LBWG), feed intake (FI), feed conversion (FC), growth rate (GR), performance index (PI), crude protein conversion (CPC), and caloric conversion ratio (CCR) of Japanese quail.

Items	LBW,g	LBWG,g	FI,g	FC	GR	PI	CPC	CCR
Treatment								
Control (C)	176.43±3.96[1]	128.34±3.43	481.6±1.1^{F}	3.89±0.10	1.140±0.02	1.01±0.05	0.94±0.03	11.40±0.29
C+ 0.1% KD[2]	189.29±4.44	140.19±3.84	512.3±1.2^{A}	3.78±0.11	1.177±0.02	1.12±0.05	0.91±0.03	11.08±0.33
C + 0.25% P	182.60±4.50	132.89±3.89	492.6±1.2^{CD}	3.81±0.11	1.142±0.02	1.04±0.05	0.92±0.03	11.16±0.33
C + 0.25% P+0.1% KD	181.18±4.56	133.05±3.95	489.4±1.2^{DE}	3.82±0.12	1.160±0.02	1.07±0.05	0.92±0.03	11.18±0.34
C + 0.5% P	177.31±4.56	129.12±3.95	493.8±1.2^{BC}	3.96±0.12	1.146±0.02	1.02±0.05	0.96±0.03	11.58±0.34
C + 0.5% P+0.1% KD	185.55±4.50	137.10±3.89	492.9±1.2^{C}	3.70±0.11	1.169±0.02	1.08±0.05	0.89±0.03	10.83±0.33
C + 0.5% PBP	180.96±4.50	132.23±3.89	496.9±1.2^{B}	3.88±0.11	1.148±0.02	1.01±0.05	0.94±0.03	11.35±0.33
C + 0.5% PBP+0.1% KD	180.39±4.56	130.52±3.95	488.8±1.2^{E}	3.83±0.12	1.133±0.02	0.98±0.05	0.92±0.03	11.21±0.34
C + 1% PBP	183.05±4.50	133.79±3.89	495.[illegible]1.2^{BC}	3.81±0.11	1.154±0.02	1.04±0.05	0.92±0.03	11.16±0.33
C + 1% PBP+0.1% KD	184.61±4.50	136.61±3.89	494.4±1.2^{BC}	3.75±0.11	1.168±0.02	1.10±0.05	0.91±0.03	10.99±0.33
Overall mean	182.76±1.17	133.94±0.97	493.8±0.38	3.81±0.03	1.155±0.01	1.05±0.01	0.92±0.01	11.15±0.09
Sex effect:								
Female	198.6±1.68^{A}	148.9±1.38^{A}	-------------	3.39±0.04^{B}	1.20±0.01^{A}	1.23±0.02^{A}	0.82±0.01^{B}	9.93±0.12^{B}
Male	166.9±1.64^{B}	119.0±1.35^{B}	-------------	4.22±0.04^{A}	1.11±0.01^{B}	0.88±0.02^{B}	1.02±0.01^{A}	12.4±0.12^{A}
Level of addition%:								
0.00 %	182.1±2.96	133.6±2.57	495.2±1.12^{a}	3.84±0.07	1.156±0.01	1.06±0.03	0.93±0.02	11.25±0.22
0.25 %	181.9±3.20	133.0±2.78	491.0±1.21^{b}	3.81±0.08	1.151±0.01	1.05±0.04	0.92±0.02	11.17±0.24
0.50 %	181.1±2.27	132.3±1.96	493.1±0.86^{ab}	3.84±0.06	1.149±0.01	1.02±0.03	0.93±0.01	11.24±0.17
1.00 %	183.8±3.18	135.3±2.76	495.1±1.21^{a}	3.78±0.08	1.161±0.01	1.07±0.04	0.91±0.02	11.07±0.24
Parts used:								
Leaves	181.7±2.20	133.1±1.91	492.2±0.65^{b}	3.82±0.06	1.154±0.01	1.05±0.03	0.92±0.01	11.19±0.16
By-product	182.3±2.20	133.4±1.91	494.0±0.65^{a}	3.82±0.06	1.151±0.01	1.03±0.03	0.92±0.01	11.18±0.16
Enzyme %:								
0.00	179.9±1.95	131.2±1.69	491.6±0.74^{B}	3.87±0.05	1.146±0.01	1.02±0.02	0.93±0.01	11.33±0.14
0.10	184.3±2.01	135.6±1.74	495.7±0.76^{A}	3.78±0.05	1.161±0.01	1.07±0.02	0.91±0.01	11.06±0.15

[1] Mean ± standard error of the mean. [2] KD: kemzyme dry

a, …b, and A,…F, values in the same column within the same item followed by different superscripts are significantly different (at $P \leq 0.05$ for a to b; $P \leq 0.01$ for A to F).

Table 3: Effects of feeding different levels of parsley (P) and its by-product (PBP) with or without enzyme supplementation on some slaughter parameters of Japanese quail.

Treatment	Carcass traits %								
	Carcass weight before evisceration	Liver	Gizzard	Heart	Total giblets	Abdominal fat	Carcass weight after evisceration	Whole front	Whole rear
Control (C)	78.44±0.92[1]	2.42±0.52	1.79±0.15	0.865±0.06	5.14±0.51	0.00±0.55	62.30±1.56	37.24±1.2	30.66±2.2
C+ 0.1% KD[2]	78.40±0.92	1.89±0.52	1.39±0.15	0.816±0.06	4.14±0.51	1.05±0.55	62.73±1.56	37.19±1.2	25.12±2.2
C + 0.25% P	79.95±0.92	2.10±0.52	1.78±0.15	0.964±0.06	4.91±0.51	0.86±0.55	63.65±1.56	38.74±1.2	24.38±2.2
C + 0.25% P+0.1% KD	78.71±0.92	1.97±0.52	[illegible]54±0.15	0.848±0.06	4.52±0.51	1.72±0.55	63.03±1.56	37.19±1.2	25.48±2.2
C + 0.5% P	77.45±0.92	2.89±0.52	1.35±0.15	0.849±0.06	5.24±0.51	1.12±0.55	64.36±1.56	38.39±1.2	25.53±2.2
C + 0.5% P+0.1% KD	78.99±0.92	1.82±0.52	1.73±0.15	0.900±0.06	4.51±0.51	0.97±0.55	64.44±1.56	37.84±1.2	26.22±2.2
C + 0.5% PBP	78.00±0.92	1.90±0.52	1.51±0.15	0.911±0.06	4.38±0.51	1.20±0.55	61.98±1.56	36.79±1.2	24.78±2.2
C + 0.5% PBP+0.1% KD	77.80±0.92	1.89±0.52	1.68±0.15	1.003±0.06	4.63±0.51	2.25±0.55	62.49±1.56	37.72±1.2	24.34±2.2
C + 1% PBP	78.16±0.92	1.97±0.52	1.56±0.15	0.983±0.06	4.57±0.51	1.71±0.55	63.63±1.56	37.63±1.2	25.70±2.2
C + 1% PBP+0.1% KD	77.94±0.92	2.03±0.52	1.63±0.15	0.915±0.06	4.63±0.51	0.61±0.55	63.75±1.56	38.72±1.2	24.64±2.2
Overall mean	78.38±0.29	2.09±0.17	1.61±0.05	0.915±0.02	4.67±0.16	1.15±0.17	63.24±0.49	37.74±0.4	25.68±0.7
Level of addition%:									
0.00 %	78.42±0.57	2.15±0.34	1.59±0.11	0.840±0.04	4.64±0.33	0.52±0.42	62.52±0.96	37.21±0.8	27.89±1.4
0.25 %	79.33±0.57	2.04±0.34	1.71±0.11	0.906±0.04	4.71±0.33	1.29±0.42	63.34±0.96	37.96±0.8	24.93±1.4
0.50 %	78.06±0.41	2.13±0.24	1.57±0.08	0.939±0.03	4.69±0.24	1.39±0.30	63.32±0.68	37.68±0.5	25.22±1.0
1.00 %	78.05±0.57	2.00±0.34	1.60±0.11	0.949±0.04	4.60±0.33	1.16±0.42	63.69±0.96	38.17±0.8	25.17±1.4
Parts used:									
Leaves	78.77±0.35	2.20±0.22	1.63±0.08	0.913±0.03	4.79±0.19	1.17±0.26	63.87±0.51	38.04±0.4	25.40±0.3
By-product	77.97±0.35	1.95±0.22	1.59±0.08	0.953±0.03	4.55±0.19	1.44±0.26	62.96±0.51	37.71±0.4	24.86±0.3
Enzyme %:									
0.00	78.40±0.38	2.26±0.20	1.60±0.07	0.933±0.03	4.85±0.19	0.98±0.27	63.18±0.59	37.76±0.5	26.21±0.9
0.10	78.37±0.38	1.92±0.20	1.61±0.07	0.897±0.03	4.48±0.19	1.32±0.27	63.29±0.59	37.73±0.5	25.16±0.9

[1] Mean ± standard error of the mean. KD: kemzyme dry

Table 4: Effects of feeding different levels of parsley (P) and its by-product (PBP) with or without enzyme supplementation on other slaughter parameters and chemical composition of Japanese quail.

Treatment	Carcass traits %			Chemical composition of Japanese quail meat %				
	Front meat	Rear meat	Dressing	Moisture	Protein	Fat	Ash	NFE
Control (C)	82.38±0.85[1]	86.90±1.10	67.43±1.3	68.85±0.96^{A}	21.14±0.49^{A}	6.977±0.91^{D}	1.81±0.37	1.22±0.03
C+ 0.1% KD[2]	80.94±0.85	85.57±1.10	66.87±1.3	63.51±0.96^{BCD}	19.51±0.49^{BC}	13.97±0.91^{BC}	1.77±0.37	1.24±0.03
C + 0.25% P	81.12±0.85	85.29±1.10	68.56±1.3	65.10±0.96^{BC}	19.95±0.49^{AB}	11.58±0.91^{C}	2.13±0.37	1.24±0.03
C + 0.25% P+0.1% KD	82.73±0.85	85.93±1.10	67.55±1.3	61.80±0.96^{D}	16.98±0.49^{D}	17.60±0.91^{A}	2.41±0.37	1.21±0.03
C + 0.5% P	82.87±0.85	85.84±1.10	69.60±1.3	64.56±0.96^{BCD}	18.67±0.49^{BC}	13.21±0.91^{BC}	2.33±0.37	1.23±0.03
C + 0.5% P+0.1% KD	84.57±0.85	84.31±1.10	68.94±1.3	65.05±0.96^{BC}	18.91±0.49^{BC}	12.35±0.91^{C}	2.43±0.37	1.26±0.03
C + 0.5% PBP	80.76±0.85	84.13±1.10	66.35±1.3	65.97±0.96^{B}	17.01±0.49^{D}	13.21±0.91^{BC}	2.58±0.37	1.23±0.03
C + 0.5% PBP+0.1% KD	82.15±0.85	85.43±1.10	67.12±1.[illegible]	62.12±0.96^{CD}	18.45±0.49^{BCD}	15.56±0.91^{AB}	2.63±0.37	1.24±0.03
C + 1% PBP	82.40±0.85	86.91±1.10	68.20±1.3	63.95±0.96^{BCD}	18.27±0.49^{CD}	14.35±0.91^{BC}	2.20±0.37	1.23±0.03
C + 1% PBP+0.1% KD	80.35±0.85	86.62±1.10	68.38±1.3	64.22±0.96^{BCD}	19.74±0.49^{ABC}	12.52±0.91^{C}	2.31±0.37	1.21±0.03
Overall mean	82.03±0.27	85.69±0.35	67.90±0.4	64.51±0.30	18.86±0.15	13.13±0.29,	2.26±0.12	1.23±0.01
Carcass part :								
Front	----------	----------	----------	64.74±0.58	18.77±0.34	12.49±0.69^{B}	2.76±0.11^{A}	1.24±0.01
Rear	----------	----------	----------	64.28±0.58	18.96±0.34	13.78±0.69^{A}	1.76±0.11^{B}	1.23±0.01
Level of addition%:								
0.00 %	81.66±0.78	86.24±0.69	67.15±0.9	66.18±0.88	20.33±0.47^{A}	10.47±1.02^{b}	1.79±0.24	1.23±0.02
0.25 %	81.92±0.78	85.61±0.69	68.05±0.9	63.45±0.88	18.47±0.47^{B}	14.59±1.02^{a}	2.27±0.24	1.23±0.02
0.50 %	82.59±0.55	84.93±0.49	68.00±0.6	64.42±0.62	18.26±0.33^{B}	13.58±0.72^{a}	2.50±0.17	1.24±0.01
1.00 %	81.37±0.78	86.77±0.69	68.29±0.9	64.08±0.88	19.01±0.47^{B}	13.44±1.02^{a}	2.25±0.24	1.23±0.02
Parts used:								
Leaves	82.82±0.46^{a}	85.34±0.45	68.66±0.5	64.13±0.59	18.63±0.36	13.69±0.65	2.32±0.18	1.24±0.02
By-product	81.41±0.46^{b}	85.77±0.45	67.51±0.5	64.06±0.59	1837±0.36	13.91±0.65	2.43±0.18	1.23±0.02
Enzyme %:								
0.00	81.91±0.49	85.82±0.48	68.03±0.6	65.68±0.51^{A}	19.01±0.34	11.87±0.64^{B}	2.21±0.16	1.23±0.01
0.10	82.15±0.49	85.57±0.48	67.77±0.6	63.34±0.51^{B}	18.72±0.34	14.40±0.64^{A}	2.31±0.16	1.24±0.01

[1] Mean ± standard error of the mean. KD: kemzyme dry

a, ...b, and A,... D, values in the same column within the same item followed by different superscripts are significantly different (at $P \leq 0.05$ for a to b ; $P \leq 0.01$ for A to D).

Table 5: Effects of feeding different levels of parsley (P) and its by-product (PBP) with or without enzyme supplementation on some serum constituents of Japanese quail.

Treatment	Serum constituents									
	Calcium mmol/L	Cholesterol mmol/L	Triglycerides mmol/L	AST U/ml	ALT U/ml	Total protein g/L	Albumin g/L	Globulin g/L	Albumin / Globulin ratio	Glucose mmol/L
Control (C)	15.01±1.6^{1AB}	6.05±0.95^{B}	8.95±2.20^{ab}	47.00±21.3	62.75±19.8	33.63±4.37	19.39±1.5	14.24±3.5	1.37±0.46	13.84±1.19
C+ 0.1% KD[2]	14.82±1.6^{AB}	6.62±0.95^{B}	12.41±2.20^{ab}	68.00±21.3	69.50±19.8	35.44±4.37	21.33±1.5	14.11±3.5	1.72±0.46	14.31±1.19
C + 0.25% P	12.77±1.6^{BC}	9.26±0.95^{B}	13.66±2.20^{ab}	67.50±21.3	73.75±19.8	47.64±4.37	23.84±1.5	23.80±3.8	1.03±0.46	14.87±1.19
C + 0.25% P+0.1% KD	8.84±1.6^{CD}	6.75±0.95^{B}	6.60±2.20^{b}	55.00±21.3	62.25±19.8	34.78±4.37	22.48±1.5	12.30±3.8	1.90±0.46	14.39±1.19
C + 0.5% P	9.17±1.6^{CD}	7.47±0.95^{B}	12.45±2.20^{ab}	53.50±21.3	75.75±19.8	38.24±4.37	22.10±1.5	16.14±3.8	1.42±0.46	14.56±1.19
C + 0.5% P+0.1% KD	6.66±1.6^{D}	6.77±0.95^{B}	6.78±2.20^{b}	70.25±21.3	92.25±19.8	38.57±4.37	22.01±1.5	16.56±3.8	2.95±0.46	15.92±1.19
C + 0.5% PBP	18.38±1.6^{A}	13.6±0.95^{A}	15.44±2.20^{a}	57.25±21.3	123.0±19.8	49.29±4.37	24.61±1.5	24.68±3.8	1.69±0.46	16.65±1.19
C + 0.5% PBP+0.1% KD	10.66±1.6^{BCD}	6.22±0.95^{B}	13.59±2.20^{ab}	140.8±21.3	138.0±19.8	37.42±4.37	21.92±1.5	15.49±3.8	1.67±0.46	17.20±1.19
C + 1% PBP	9.90±1.6^{BCD}	7.29±0.95^{B}	14.53±2.[illegible]^{a}	91.75±21.3	66.50±19.8	33.63±4.37	20.03±1.5	21.02±3.8	1.08±0.46	15.63±1.19
C + 1% PBP+0.1% KD	10.05±1.6^{BCD}	8.92±0.95^{B}	6.82±2.2[illegible]	54.00±21.3	62.25±19.8 [illegible]	35.11±4.37	20.76±1.5	14.35±3.8	1.51±0.46	17.87±1.19
Overall mean	11.63±0.51	7.89±0.30	11.12±0.70	70.50±6.74	82.60±6.25	38.37±1.34	21.85±0.5	17.27±1.2	1.64±0.14	15.52±0.38
Sex effect :										
Female	16.54±0.72^{A}	7.92±0.42	17.7±0.98^{A}	88.25±9.5^{a}	108.5±8.83^{A}	44.2±1.96^{B}	24.6±0.7^{A}	21.11±1.7^{A}	0.90±0.40	15.73±0.53
Male	6.71±0.72^{B}	7.87±0.42	4.55±0.98^{B}	52.75±9.5^{b}	56.70±8.83^{B}	32.5±1.96^{A}	19.1±0.7^{B}	13.43±1.7^{B}	1.93±0.40	15.32±0.53
Level of addition%:										
0.00 %	14.91±2.74	6.33±1.05	10.68±3.16	57.50±16.76	66.13±17.26	34.53±4.23	20.36±1.41	14.17±3.23	1.55±0.39	14.08±0.76
0.25 %	10.81±2.74	8.00±1.05	10.13±3.16	61.25±16.76	68.00±17.26	41.81±4.23	23.16±1.41	18.05±3.23	1.47±0.39	14.63±0.76
0.50 %	11.22±1.94	8.52±0.74	12.06±2.23	80.44±11.85	107.3±12.20	40.88±2.99	22.66±1.00	18.22±2.28	1.93±0.28	16.08±0.54
1.00 %	9.97±2.74	8.10±1.05	10.68±3.16	72.88±16.76	64.38±17.26	34.37±4.23	20.40±1.41	17.68±3.23	1.30±0.39	16.75±0.76
Parts used:										
Leaves	9.36±1.97	7.56±0.79	9.87±2.10	61.56±12.31	67.00±13.47	39.81±3.25	22.61±1.03	17.20±2.43	1.82±0.30	14.9±0.56^{b}
By-product	12.25±1.97	9.01±0.79	12.59±2.10	85.94±12.31	97.44±13.47	38.86±3.25	21.83±1.03	18.88±2.43	1.49±0.30	16.8±0.56^{a}
Enzyme %:										
0.00	13.05±1.70	8.73±0.65	13.01±1.90	63.40±10.42	80.35±11.58	40.48±2.66	21.99±0.91	19.96±1.93	1.32±0.24	15.11±0.52
0.10	10.21±1.70	7.06±0.65	9.24±1.90	77.60±10.42	84.85±11.58	36.26±2.66	21.70±0.91	14.56±1.93	1.95±0.24	15.94±0.52

[1] Mean ± standard error of the mean. KD: kemzyme dry

a, …b, and A,…D, values in the same column within the same item followed by different superscripts are significantly different (at P ≤ 0.05 for a to b ; P ≤0.01 for A to D).

Table 6: Effects of feeding different levels of parsley (P) and its by-product (PBP) with or without enzyme supplementation on mortality rate% and economical efficiency (EEf) of Japanese quail.

Item	Mortality rate			Economical efficiency								
	Total number*	Dead birds **	Mortality %	a	b	a*b=c	d	e	d*e=f	f-c=g	g/c	r
Control (C)	48	0	0	0.482	149.7	72.16	0.128	2066	264.4	192.3	2.665	100.0
C+ 0.1% KD[2]	48	0	0	0.512	152.7	78.18	0.140	2066	289.2	211.1	2.700	101.3
C + 0.25% P	48	0	0	0.493	150.4	74.15	0.133	2066	274.8	200.6	2.706	101.5
C + 0.25% P+0.1% KD	48	0	0	0.489	153.4	75.01	0.133	2066	274.8	199.8	2.663	99.93
C + 0.5% P	48	1	2.08	0.494	151.2	74.69	0.129	2066	266.5	191.8	2.568	96.37
C + 0.5% P+0.1% KD	48	0	0	0.493	154.2	76.02	0.137	2066	283.0	207.0	2.723	102.2
C + 0.5% PBP	48	0	0	0.497	149.7	74.40	0.132	2066	272.7	198.3	2.665	100.0
C + 0.5% PBP+0.1% KD	48	0	0	0.489	152.7	74.67	0.131	2066	270.6	196	2.625	98.48
C + 1% PBP	48	0	0	0.496	149.7	74.25	0.134	2066	276.8	202.6	2.728	102.4
C + 1% PBP+0.1% KD	48	0	0	0.494	152.7	75.43	0.137	2066	283.0	207.6	2.752	103.3

kemzyme dry: KD

* Total number of chicks at the beginning of Experiment .

** Number of dead birds.

Average feed intake (Kg/bird) a

Price / Kg feed (P.T.) b (based on average price of diets during the experimental time).

Total feed cost (P.T.) = a x b = c

Average LBWG (Kg/ bird) · d

Price / Kg live weight (P.T.) e (according to the local market price at the experimental time).

Total revenue (P.T.) = d x e = f

Net revenue (P.T.) = f - c = g

Economical efficiency = (g /c) (net revenue per unit feed cost).

Relative efficiency r (assuming that economical efficiency of the control group (1) equals 100).

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الملخص العربي

تأثير استخدام البقدونس أو مخلفاته مع أو بدون إضافة الأنزيمات علي أداء السمان الياباني النامي

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تهدف الدراسة الحالية إلي دراسة تأثير إضافة مستويات مختلفة من أوراق البقدونس المجففة ومخلفاته (كإضافات طبيعية وبيولوجية) مع أو بدون إضافة الأنزيمات علي أداء السمان الياباني النامي. تم استعمال عدد 480 كتكوت سمان ياباني عمر 10 أيام قسمت إلي 10 معاملات (48 طائر/ معاملة)، كل معاملة بها 3 مكررات (16 طائر / مكرر).

وكانت المعاملات التجريبية كالتالي :

1- غذيت الكتاكيت علي عليقة الكنترول الخالية من البقدونس أو مخلفاته.

2- غذيت الكتاكيت علي عليقة 1 مضاف إليها 0.1 % كيم زايم دراي.

3- غذيت الكتاكيت علي عليقة 1 مضاف إليها 0.25 %بقدونس.

4- غذيت الكتاكيت علي عليقة 1 مضاف إليها0.25 % بقدونس + 0.1 % كيم زايم دراي.

5- غذيت الكتاكيت علي عليقة 1 مضاف إليها 0.5 % بقدونس.

6- غذيت الكتاكيت علي عليقة 1 مضاف إليها 0.5 % بقدونس + 0.1 % كيم زايم دراي.

7- غذيت الكتاكيت علي عليقة 1 مضاف إليها 0.5 % مخلفات بقدونس.

8- غذيت الكتاكيت علي عليقة 1 مضاف إليها 0.5% مخلفات بقدونس + 0.1 % كيم زايم دراي.

9- غذيت الكتاكيت علي عليقة 1 مضاف إليها 1 % مخلفات بقدونس.

10-غذيت الكتاكيت علي عليقة 1 مضاف إليها 1 % مخلفات بقدونس + 0.1 % كيم زايم دراي.

وتتلخص أهم النتائج المتحصل عليها فيما يلي:-

لم يكن هناك أي تأثيراً معنوياً بين المعاملات بالنسبة لوزن الجسم الحي و معدل الزيادة في وزن الجسم و معدل تحويل الغذاء و معدل النمو و دليل الأداء الإنتاجي و معدل تحويل كلا من البروتين والطاقة خلال الفترة من 10-38 يوم من العمر. كان هناك تأثيراً معنوياً علي معدل استهلاك الغذاءخلال الفترة من 10-38 يوم من العمر. فأظهر السمان المغذي علي عليقة الكنترول + 0.1 % كيم زايم دراي أعلي قيمة لمعدل استهلاك الغذاء خلال الفترة من 10-38 يوم من العمر. بينما كان للسمان المغذي علي عليقة الكنترول أقل قيمة لمعدل استهلاك الغذاء خلال نفس الفترة.

لم يكن هناك أي تأثيراً معنوياً بين المعاملات علي صفات الذبيحة بالنسبة للسمان الياباني المغذي علي مستويات مختلفة من البقدونس أو مخلفاته مع أو بدون إضافة الأنزيمات.

أظهرت المجموعة التي تغذت علي عليقة الكنترول اعلي قيم للرطوبة والبروتين% (أقل قيمة للدهن%) بينما المجموعة التي تغذت علي عليقة الكنترول + 0.25 % بقدونس + 0.1 % كيم زايم دراي أعطت اعلي قيمة للدهن% (أقل قيمة للرطوبة والبروتين%).

أعطي السمان المغذى علي عليقة الكنترول + 0.5 % مخلفات بقدونس أعلى قيمة معنوية في نسبة الكالسيوم و الكوليسترول الجلسريدات الثلاثة في السيرم، بينما أعطي السمان المغذى علي عليقة الكنترول + 0.5 % بقدونس + 0.1 % كيم زايم دراي أقل قيمة معنوية في نسبة الكالسيوم في السيرم . اظهر السمان المغذى علي عليقة الكنترول + 0.25 % بقدونس + 0.1 % كيم زايم دراي أقل قيمة معنوية في نسبة الجلسريدات الثلاثة.

كانت نسبة النفوق 2.08% في السمان المغذي علي عليقة الكنترول + 0.5 % بقدونس ، بينما كانت نسبة النفوق تساوي صفراً بالنسبة للسمان المغذى علي باقي العلائق التجريبية.

أعطي السمان المغذي علي عليقة الكنترول + 1 % مخلفات بقدونس + 0.1 % كيم زايم دراي أحسن قيم للكفاءة الاقتصادية والنسبية 2.752 و 103.3 % علي التوالي ثم تلاها السمان المغذي علي عليقة الكنترول + 1 % مخلفات بقدونس (2.728 و 102.4 %) عند مقارنتها مع باقي العاملات.