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REPLACING YELLOW CORN WITH PRICKLY PEAR PEELS IN GROWING JAPANESE QUAIL DIETS WITH OR WITHOUT ENZYME SUPPLEMENTATION

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Abstract :

The experimental work of the present study was carried out at the Poultry Research Station, Poultry Production Department, Faculty of Agriculture, Fayoum University. This experiment was conducted to study effect of replacing yellow corn (YC) with prickly pear peel (PPP) in growing Japanese quail diets with or without enzyme supplementation. The enzyme used in this study was kemzyme dry (KD). At 10 days of age, birds were divided into six treatments (60 birds each), each treatment contained 3 replicates of 20 birds each.

The experimental treatments were as follows:-

1. **The control diet (D_1).**
2. **The control diet (D_1) + 0.1% KD (D_2).**
3. **15% YC in D_1 was replaced by PPP.**
4. **15% YC in D_2 was replaced by PPP.**
5. **30% YC in D_1 was replaced by PPP.**
6. **30% YC in D_2 was replaced by PPP.**

Results obtained could be summarized in the following:

1- Replacing YC with PPP on live body weight in growing Japanese quail diets with or without enzyme supplementation was insignificant at all ages studied.

2- Quails fed control diet + KD or PPP 15% + KD had higher live body weight gain (LBWG) during the period from 10 to 38 days of age, while those fed diets containing PPP 30% + KD had lower LBWG during the same period.

3- Quails fed control diet had lower feed intake (FI) during all periods studied, while those fed diet containing 15% PPP + KD had the highest FI value during the period from 10 to 38 days.

4- Quails fed control diet + KD had better feed conversion values during the period from 10 to 38 days of age followed by control, 15% PPP +KD and 15% PPP.

5- Replacing YC with PPP on crude protein conversion and caloric conversion ratio in growing Japanese quail diets with or without enzyme supplementation was insignificant at 10-38 days of age.

6-Replacing YC with PPP in growing Japanese quail diets with or without enzyme supplementation were insignificant, regarding slaughter parameters.

7- Quails fed diet containing 15% PPP + KD had higher serum AST and ALT while quails fed diet containing 30% PPP + KD had the highest content of serum glucose.

8- Higher moisture and protein (lower EE%) values were observed for quails fed diet containing 15% PPP, while those fed control diet + KD had higher EE% (and consequently lower moisture, protein and ash%).

9- The percentage of mortality was 3.33% in quails fed diet containing 15% PPP or 30% PPP +KD. However, in quails fed diet containing 15% PPP + KD or 30% PPP, the percentage of mortality was 1.67%. The percentage of mortality was zero% in quails fed the other experimental diets.

10- Quails fed diet containing 15% PPP (D3) gave the best economical and relative efficiency values being 2.77 and 103.23%, respectively followed by quails fed control diet + KD (D2) when compared with the other treatments or the control.

In conclusion, the best performance was seen when 15% PPP was incorporated in quail diets. This would lead to conclude that PPP could be substituted by YC as source of energy in quail diets un-supplemented with KD without any adverse effect on the performance of quail.

Key words: prickly pear peel, enzymes, performance, Japanese quail.

INTRODUCTION

Feed costs amount to about 70% of the total production costs of poultry production. In Egypt, the major ingredients of poultry feeds are yellow corn (YC), representing about 65% of their composition. Most or even all the corn production in Egypt is used as human food without surplus for feeding poultry and animal. Attention is paid towards the use of some agricultural local by products, which are available in some areas of the country at low prices. Thus, it is important to find out local energy sources to replace YC which are imported at high prices. If wastes and neglected by-products from agriculture and food industry are transferred into animal protein, a great problem would be solved helping the people in the developing countries to avoid hunger and saving cereals and legumes for human consumption only. For instance, prickly pear peel (PPP) accumulate after processing of prickly pear that can cause environmental pollution.

Prickly pears have a fundamental economic importance in many desert areas, which are produced in abundant quantities. The fresh fruits have been long utilized as a source of carbohydrates and vitamins **(Duisberg and Hay, 1971).** Reports in the literature have also shown that the fruits could be utilized into various food products such as juices, jams and jellies **(El-Kholy, 1999).** The pods of the plant are used as animal fodder **(El-Nagmy *et al*., 2001).**

Some attempts were made to use PPP as a feed ingredient and to partially replace YC in poultry and quail diets. **El-Kholy (1999)** found that PPP are rich in vitamins A and E and free from alkaloids as anti- nutritional factors and can replace up to 75 % of YC in fish diets without any harmful effects. Also, he found that feed conversion was not affected due to replacing YC by PPP up to 75 %. **El-Nagmy *et al*. (2001)** found that PPP contained 61.57% NFE and the determined ME was 2800 Kcal/kg. They also reported that PPP could successfully replace up to 15% YC in quail diets without any adverse effects on their performance. Concerning the use of enzymes, **Farrel (1994) and El-Sebai and Osman (1999)** reported that enzyme addition to diets improved body weight of chicks which depends on type of diets. Also, **Ghazalah *et al*. (1994)** reported that supplementing enzyme mixture to broiler diets containing high level of fiber improved feed utilization. However**,** **El-Nagmy *et al*. (2001)** found no significant differences among treatment groups of quails in their feed intake due to replacing YC by PPP in their diets either un-supplemented or supplemented with Prozyme.

Therefore, the present experiment was conducted to study the effect of replacing yellow corn with prickly pear peels in growing Japanese quail diets with or without enzyme supplementation

MATERIALS AND METHODS

The experimental work of the present 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 **A.O.A.C. (1990)**.

The enzyme used in this study was 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. Peels of prickly pears (PPP) were collected from the sellers, and then spread on a clean floor for sun drying. After complete dryness, the material was ground and stored until formulating the experimental diets. Analysis of yellow corn and peel of prickly (ppp) used in formulating experimental rations on air dry matter basis as follows:

Items	**The present study**	**El-Nagmy, *et al.* (2001)**	**Ali (2001)**	**Corn(NRC) 1994**
Moisture, %	**11.58**	**14.99**	**14.49**	**11.00**
Crude protein,%	**10.21**	**7.20**	**7.30**	**8.50**
Ether extract,%	**3.85**	**2.55**	**2.00**	**3.80**
Crude fiber, %	**10.45**	**14.33**	**14.33**	**2.20**
Ash, %	**15.02**	**8.02**	**15.80**	**NA***
NFE %	**48.89**	**52.62**	**46.08**	**NA**
ME, kcal/kg	**2850***	**2800**	**2800**	**3350**

* NA = Non-analysed

Calculated according to **Carpenter and Clegg (1956) by applying the equation:-

ME (Kcal/kg)= (35.3 X CP%)+(79.5 X EE%)+(40.6 X NFE%)+199.

A total number of 360 one-day old unsexed Japanese quail (Coturnix coturnix japonica) birds were used in this experiment and were initially fed a control diet (containing about 24% CP and 2900 Kcal ME / Kg) for ten days. Chicks were wing-banded and randomly allotted to the dietary treatments. Birds were raised in electrically heated batteries with raised mesh wire 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 given the experimental diets from 10 days until 38 days of age.

At 10 days of age, birds were divided into six treatments (60 birds each), each treatment contained 3 replicates of 20 birds each. The experimental treatments were as follows:-

1. The control diet (D_1).
2. The control diet (D_1) + 0.1% KD (D_2).
3. 15% YC in D_1 was replaced by PPP.
4. 15% YC in D_2 was replaced by PPP.
5. 30% YC in D_1 was replaced by PPP.
6. 30% YC in D_2 was replaced by PPP.

The experimental diets were supplemented with minerals and vitamins mixture and DL-methionine to cover the quail recommended requirements according to **NRC, 1994** (Table1). 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 (FC) (g feed / g gain) and live body weight gain (LBWG) were calculated. Crude protein conversion (CPC) and caloric conversion ratio (CCR) were also calculated **(Ragab, 2001)**.

Cumulative mortality% was also calculated. At the end of the experiment (38 days), a slaughter test was performed using four chicks (males) around the average LBW of each treatment. Birds were individually weighed to the nearest gram, and slaughtered by severing the carotid artery and jugular veins (islamic method). After four minutes of bleeding, 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, including 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 parts around the viscera and gizzard, and 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 percentages of dry matter (DM), crude protein (CP), ether extract (EE), crude fiber (CF) and ash contents according to the methods of **A.O.A.C (1990).** Nitrogen free extract (NFE) was calculated by difference.

At the end of the growing period (38 days), individual blood samples were taken from 6 birds (4 males and 2 females). The blood samples were collected into dry clean centrifuge tubes and centrifuged at 3000 rpm for 20 min. The clear serum samples were carefully drawn and transferred to dry, clean, small glass bottles, and stored at–20Ċ in a deep freezer until the time of chemical determinations. The biochemical characteristics of blood serum were determined colorimetrically, using commercial kits. Serum total protein was measured by colorimetric method as described by **Weichselbaum (1946)**. Albumin concentration was determined according to the method of **Drupt (1977)**. Globulin concentration was calculated as the difference between total protein and albumin. Cholesterol concentration was measured by the method of **Allain (1974)**. Triglycerides concentration was determined by the method of **Werner *et al.* (1981)**. Aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were measured according to **Reitman and Frankel (1957)**. Calcium concentration was determined by the method of **Baver (1981)**. Glucose concentration was measured by the method of **Trinder (1964)**.

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. The economical efficiency of treatments were then calculated as the net revenue per unit of feed cost. Analysis of variance was conducted according to **Steel and Torrie (1980).** Significant differences among treatment means were separated using Duncan's multiple range test **(Duncan, 1955).**

RESULTS AND DISCUSSION

Live Body Weight (LBW): Data presented in Table 2 show that effects of replacing YC with PPP on LBW in growing Japanese quail diets with or without enzyme supplementation were insignificant at all ages studied. Therefore, it may be concluded that PPP used in this research can substitute up to 30 % of YC at 38 days of age without any detrimental effect on LBW. Similar observation were reported by other investigators. **Osei and Amo (1987)** found no significant differences in LBW of broilers at 8 weeks of age by using 5.1 and 15.0% date meal in their diets. **El-Nagmy *et al.* (2001)** reported that partial substitution of YC by PPP as a source of energy in quail diets had beneficial effects on performance.

Concerning sex effect (Table 2), females had significantly heavier LBW ($P \leq 0.01$) than males at 24, 31 and 38 days of age. Whereas, insignificant differences were observed between the two sexes at 10 and 17 days of age. Data presented in this table also show that PPP % and enzyme supplementation insignificantly affected LBW during the all ages studied. These results disagreed with those of **Farrel (1994) and El-Sebai and Osman (1999)** who found that enzyme treatment improved LBW of chicks.

Live body weight gain (LBWG): Results presented in Table 2 show that effects of replacing YC with PPP on LBWG in growing Japanese quail diets with or without enzyme supplementation were significant during the periods from 10 to 17, 18 to 24, 32 to 38 and 10 to 38 days of age. It is clear that quails fed diets containing PPP 15% + KD, control + KD, PPP 15% and control + KD had higher LBWG during the same periods. Whereas, quails fed control diet and PPP 15% had lower LBWG during the periods 10 to 17and 18 to 24 days of age, respectively and those fed diet containing PPP 30% + KD had lower LBWG during the periods 32 to 38 and 10 to 38 days of age. Data of LBWG during 10 to 38 days revealed that quails fed diet containing 15% PPP (diet 3 and 4) were higher than those fed diet 6 (containing 30%PPP).

Concerning sex effect (Table 2), females had significantly higher LBWG (P≤0.01) than males during all periods studied except during the period from 10 to 17 days of age. Level of PPP (Table 2) significantly affected LBWG during all periods studied except during the period from 10 to 38 days of age. Quails fed diet containing 15% PPP had higher LBWG values during the periods from 10 to 17 and 32 to 38 days of age. Concerning the period from 10 to 38 days of age, quails fed diet containing 15 % PPP had higher LBWG although not significant than those fed the 30% PPP level. Therefore, it may be concluded that PPP used in this study can substitute 15-30 % of YC at 10 to 38 days of age without any detrimental effects on LBWG.

These results are in harmony with those obtained by **El-Nagmy *et al*. (2001)** who reported that partial substitution of YC by PPP as source of energy in quail diet had beneficial effect on the quails performance. **Holder (1980) and Lee *et al*. (1985)** found no significant differences in LBWG for chicks fed diet containing up to 7.5% clover or wheat bran up to 10% compared to the control. Also, **Panigrahia (1991)** found that broiler chicks were able to utilize up to 28% of date stone meal without any significant depression on body weight gain but above this level body weight gain significantly declined. On the other hand, **Radwan *et al.* (1997)** reported that raising level of date stone meal in quail diets up to 24 % tended to improve LBWG of grower quail. Data presented in Table 2 showed that enzyme supplementation insignificantly affected LBWG during all periods studied. These results are in harmony with those obtained by **Emam (2007)** who reported that diets supplemented with Kemzyme had insignificantly affected LBWG of Japanes quail. However, **Zeweil (1996)** reported that body weight gain insignificantly increased in the period from 0-3 weeks of age for quails fed diets supplemented with Kemzyme as compared to quails fed diets without enzyme supplementation.

Feed intake (FI): The data of Table 3 indicate that the effect of replacing YC with PPP on FI in growing Japanese quail diets with or without enzyme supplementation were significant (P≤0.01) during all periods studied. Quails fed control diet had lower FI during all periods studied. Quails fed diet containing 15% PPP + KD had the highest FI values during the periods from 10 to 17, 32 to 38 and 10 to 38 days, respectively. Also, quails fed diet containing 30% PPP + KD had higher FI values during the periods from 18 to 24 and 25 to 31 days, respectively). Level of PPP (Table 3) significantly affected FI during all periods studied. Quails fed control diet had the lowest FI values during all periods, while quails fed diet containing 15 or 30% PPP had the highest FI values during these periods. This may be due to the major negative factor in this by-product i.e. the high fiber content which is associated with a lower ME. The high fiber level may induce a poor digestibility of the diets associated with a higher FI and poorer efficiency of feed utilization. These results disagreed with those of **El-Nagmy *et al*. (2001)** who found no significant differences among treatments due to replacing YC by PPP in quail diets either un-supplemented or supplemented with Prozyme.

Enzyme supplementation significantly affected FI during all periods studied (Table 3). Thus, feeding enzyme containing diet resulted in the highest FI values during all periods studied. These results agreed with the findings of **Zeweil (1996); El-Gendi *et al.* (2000)** and **Emam (2007)** who reported that birds fed diets supplemented with Kemzyme had significantly the highest feed consumption.

Feed conversion (FC): Results presented in Table 3 indicate that the effects of replacing YC with PPP on FC in growing Japanese quail diets with or without enzyme supplementation were significant (P≤0.05 or P≤0.01) during the periods from 18 to 24, 25 to 31 and 10 to 38 days of age. It can be observed that quails fed control diet had better FC values during the periods from 18 to 24 and 25 to 31 days of age. Concerning the entire experimental period (from 10 to 38), quails fed control diet + KD had better FC values during the this period followed by those fed the control, 15% PPP +KD and 15% PPP diets compared with the other group. However, **El-Nagmy *et al*. (2001)** reported no significant differences in FC values due to feeding quail chicks on PPP. Also, **Perez *et al.* (2000)** using layer hens reported that feed conversion was not affected by any level of palm kernel meal.

El-Kholy (1999) found that feed conversion of fish was not affected due to replacing yellow corn by prickly pear peel up to 75 %.

Level of PPP (Table 3) significantly affected FC during all periods studied except during the period from 10 to 17 days of age. Quails fed diets containing 0.0% PPP had the best FC values during the periods from 18 to 24 and 25 to 31 days of age. Quails fed diets containing 15 or 0.0% PPP had better FC values during the periods from 32 to 38 and 10 to 38 days of age (differences among 0.00 and 15% PPP were not significant). Therefore, it may be concluded that PPP used in this study can substitute up to 15 % of YC at 10 to 38 days of age without any detrimental effect on FC.

Data presented in this table also show that enzyme supplementation insignificantly affected FC values during all periods studied. These results disagreed with those of **Ghazalah *et al.* (1994); El-Sebai and Osman (1999)** and **El-Nagmy *et al.* (2001)** who found that supplementing enzyme mixture to broiler or quail diets containing high level of fiber improved feed utilization.

Crude protein conversion (CPC) and **caloric conversion ratio (CCR):** Results presented in Table 4 indicated that effect of replacing YC with PPP in growing Japanese quail diets with or without enzyme supplementation significantly affected CPC during the periods from 18 to 24 and 25 to 31 days of age and insignificantly affected CCR values during all periods studied except during the period from 25 to 31 days of age. It can be observed that quails fed control had better CPC and CCR values during these periods, while quails fed diet containing 30% PPP+KD had worst CPC and CCR values during the privies periods.

Concerning sex effect (Table 4), females had significantly better CPC and CCR than males during the periods from 18 to 24, 32 to 38 and 10 to 38 days of age. Level of PPP (Table 4) significantly affected CPC and CCR during all periods studied except the periods from 10 to 17 days of age. Quails fed diet containing 0.00% PPP had the best CPC and CCR values during the periods from 18 to 24 and 25 to 31 days of age, quails fed diet containing 15 or 0.00% PPP had better CPC and CCR values during the periods from 32 to 38 and 10 to 38 days of age, while those fed diet containing 30% PPP had worst CPC and CCR values during all significantly periods. Data presented in this table also show that enzyme supplementation insignificantly affected CPC and CCR during all periods studied.

Slaughter parameters : Data presented in Table 5 show that the effect of replacing YC with PPP on slaughter parameters in growing Japanese quail diets with or without enzyme supplementation were insignificant. Data presented in this table also show that either level of PPP or enzyme supplementation insignificantly affected slaughter parameters of Japanese quails except enzyme% effect on abdominal fat. Therefore, it may be concluded that PPP used in this study can substitute up to 30 % of YC at 10 to 38 days of age without any detrimental effect on slaughter parameters. These results are in harmony with those obtained by **Radwan *et al.* (1997)** in grower chicks and layers, **Hermes and Al-Homidan (2004)** in layers and **Radwan *et al.* (1997**) in growing quails.

Serum constituents: The results of serum constituents indicate that the effects of replacing YC with PPP on serum constituents in growing Japanese quail diets with or without enzyme supplementation were insignificant except for AST, ALT and glucose contents (Table 5). It can be seen that quails fed diet containing 15% PPP + KD had higher AST and ALT, while quails fed diet containing 30% PPP + KD had the highest content of serum glucose. Therefore, it may be concluded that PPP used in this study can substitute up to 30 % of YC at 10 to 38 days of age without any detrimental effects on serum constituents.

Concerning sex effect (Table 5), females had significantly ($P\leq0.05$ or $P\leq0.01$) higher calcium, triglycerides, AST, ALT, total protein and globulin than males. Whereas, insignificant differences were observed between the two sexes for others serum constituents. Data presented in this table also show that either level of PPP or enzyme supplementation insignificantly affected serum constituents of Japanese quails except PPP% effect on glucose, where quails fed diets containing 0.0 or 15% PPP had similar glucose but those fed the level of 30% PPP had significant higher glucose values.

Chemical composition of Japanese quail meat: Data presented in Table 6 show the effect of replacing YC with PPP in quail diet on chemical composition of quail meat. Significant values for moisture, CP, EE and ash percentages of quail meat were obtained. Higher moisture and CP (lower EE%) values were observed for quails fed diet containing 15% PPP while those fed control diet + KD had higher EE % (and consequently lower moisture, CP and ash%). However, insignificant differences were observed in NFE percentages of meat. The inverse relationship between percentage moisture and EE values obtained in the present study is in agreement with those reported by **Marks (1993); Ragab (2001) and Emam (2007)** in chemical composition of Japanese quail meat.

Carcass part significantly ($P\leq0.01$) influenced ash%, front part had higher ash %, than rear part (Table 6). Data presented in this table also show that level of PPP insignificantly affected chemical composition of quail meat. On the other hand, enzyme supplementation significantly affected moisture and EE%, higher moisture (lower EE%) values were observed for quails fed diet containing 0.0 %, while those fed 1.0% had lower moisture% and consequently higher EE%.

Mortality percentages: The calculated cumulative mortality % during the period from 10 to 38 days of age are presented in Table 6. Obtained results indicated that the percentage of mortality was 3.33% in quails fed diet containing either 15% PPP or 30% PPP +KD. However, for quails fed diet containing 15% PPP + KD and 30% PPP, the percentage of mortality was 1.67%, noting that the percentage of mortality was zero% in quails fed the other experimental diets. It appears that mortality % was not related to treatments studied.

Economical efficiency (EEf): Results in Table 7 showed that EEf value during the period from 10 to 38 days of age improved in quails fed diet either containing 15% PPP(D3) or control +KD (D2) as compared with the control diet (D1). Quails fed diet containing 15% PPP(D3) gave the best economical and relative efficiency values being 2.77 and 103.23%, respectively followed by quails fed control diet + KD (D2) 2.71 and 101.28%, respectively as compared with the quails fed the control diet (2.68 and 100%). Whereas, the quails fed diet containing 30%PPP+KD (D6) had the worst corresponding values, being 2.54 and 94.94%, respectively. The relative economical efficiency varied between –5.06 to + 3.23 % which is of minor importance relatively to the other factors of production. These results are in harmony with those obtained by **El-Nagmy *et al.* (2001)**, who found that feeding quails PPP diet increased relative economical efficiency by 4% as compared with groups fed corn as the only source of energy. Similar results with other agricultural by-products supplemented with enzyme preparation were reported by **Ghazalah *et al*. (1994)** and **El-Sebai and Osman (1999).**

Therefore, it may be concluded from the economical point of view that the best performance was seen when 15% PPP was incorporated in quail diets. This means that PPP could partially substitute YC as sources of energy in quail diets un-supplemented with KD without any adverse effect on the performance of quail. More research is necessary regarding the use of PPP in feeding different species of poultry with regard to their digestibility, amino acid profile and content of anti-nutritional factors.

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Table 1 : Composition and analyses of the experimental diets.

Item,%	Control	Prickly pear peels 15 %	Prickly pear peels 30 %
Yellow corn, ground	55.00	46.75	38.50
Prickly pear peels	0.00	8.25	16.50
Soybean meal (44%CP)	33.15	33.15	32.85
Broiler concentrate(48%CP*)	10.00	10.00	10.00
Corn oil	1.00	1.00	1.50
Sodium chloride	0.05	0.05	0.05
Di Ca Phos.	0.50	0.50	0.30
Vit. and Min. premix **	0.15	0.15	0.15
DL – methionine	0.15	0.15	0.15
Total	100.0	100.0	100.0
<u>Calculated analysis</u>*** :			
CP	24.15	24.29	24.30
EE	2.92	2.93	2.93
CF	2.60	3.28	3.95
Ca	1.02	1.03	0.99
Available P	0.51	0.53	0.51
Methionine	0.54	0.52	0.51
Methionine+Cystine	0.94	0.91	0.88
Lysine	1.40	1.38	1.35
ME, K cal./Kg	2928	2887	2888
<u>Determined analysis</u> :			
Moisture	9.62	10.10	10.03
CP	23.99	24.01	23.89
EE	2.55	3.20	2.91
CF	3.11	3.71	4.16
Ash	7.98	8.91	10.63
NFE	52.75	50.07	48.38
Cost (L.E./ton) ****	1489	1421	1367
Relative cost *****	100	95.43	91.81

<u>*Broiler concentrate manufactured by Hybrid International Company and contains:-</u>
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).
<u>Each 3.0 Kg of the Vit. and Min. premix manufactured by Agri-Vet Company, Egypt and contains :</u> 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.**
****** According to market prices of 2004.**
******* Assuming that the control equals 100.**

Table 2: Effect of replacing yellow corn with prickly pear peels (PPP) in growing Japanese quail diets with or without enzyme supplementation on live body weight (LBW, g) and live body weight gain (LBWG, g).

Items	LBW				
	10 days	17 days	24 days	31 days	38 days
Control	48.10±1.19[1]	78.86±1.82	116.76±2.36	150.59±2.91	176.43±3.87
Control + KD	49.10±1.33	83.16±2.04	121.96±2.64	157.59±3.26	189.29±4.34
PPP 15 %	48.99±1.35	83.35±2.06	117.32±2.68	150.52±3.30	183.19±4.95
PPP 15% +KD	48.75±1.35	83.77±2.06	120.96±2.68	154.42±3.34	187.44±4.52
PPP 30 %	49.31±1.35	82.84±2.06	120.59±2.68	153.04±3.30	178.59±4.46
PPP 30 %+ KD	50.25±1.39	82.63±2.12	121.25±2.79	151.12±3.44	175.83±5.31
Overall mean	49.08±0.54	82.44±0.83	119.81±1.08	152.88±1.33	181.80±1.88
<u>Sex effect:</u>					
Female	49.62±0.74	83.13±1.10	122.15±1.43^{A}	158.15±1.68^{A}	192.05±1.92^{A}
Male	48.05±0.83	80.24±1.24	115.98±1.60^{B}	145.10±1.88^{B}	160.55±2.18^{B}
<u>PPP level %:</u>					
0.00	48.54±0.88	80.77±1.35	119.06±1.76	153.70±2.17	182.13±2.91
15.00	48.87±0.95	83.56±1.46	119.15±1.89	152.44±2.35	185.51±3.36
30.00	49.77±0.96	82.74±1.48	120.90±1.93	152.12±2.38	177.45±3.43
<u>Enzyme %:</u>					
0.00	48.74±0.74	81.44±1.14	118.09±1.47	151.31±1.81	178.87±2.52
0.10	49.35±0.78	83.20±1.19	121.40±1.55	154.49±1.92	185.17±2.71
	LBWG				
	10-17 days	18-24 days	25-31 days	32-38 days	10-38 days
Control	30.77±0.90^{b}	37.89±0.91^{a}	33.83±1.17	25.84±1.86^{BC}	128.34±3.32^{ab}
Control + KD	34.06±1.01^{a}	38.80±1.02^{a}	35.64±1.31	31.70±2.08^{AB}	140.19±3.72^{a}
PPP 15 %	34.36±1.02^{a}	33.97±1.03^{b}	33.20±1.33	32.85±2.38^{A}	134.89±4.24^{ab}
PPP 15 % +KD	35.02±1.02^{a}	37.20±1.03^{a}	33.81±1.35	32.13±2.17^{AB}	138.55±3.87^{a}
PPP 30 %	33.52±1.02^{ab}	37.75±1.03^{a}	32.46±1.33	25.49±2.14^{BC}	129.28±3.82^{ab}
PPP 30 %+ KD	32.38±1.05^{ab}	37.74±1.07^{a}	29.87±1.39	23.61±2.55^{C}	125.12±4.56^{b}
Overall mean	33.35±0.41	37.23±0.42	33.13±0.54	28.61±0.90	132.73±1.61
<u>Sex effect:</u>					
Female	33.51±0.54	38.70±0.56^{A}	36.06±0.67^{A}	33.91±0.87^{A}	142.29±1.59^{A}
Male	32.19±0.61	35.74±0.63^{B}	29.13±0.74^{B}	15.61±0.99^{B}	112.86±1.80^{B}
<u>PPP level %:</u>					
0.00	32.23±0.68^{b}	38.29±0.68^{a}	34.63±0.87^{a}	28.44±1.39^{AB}	133.59±2.50
15.00	34.69±0.73^{a}	35.59±0.73^{b}	33.50±0.95^{ab}	32.46±1.61^{A}	136.89±2.89
30.00	32.96±0.74^{Ab}	37.75±0.75^{a}	31.22±0.96^{b}	24.72±1.65^{B}	127.56±2.95
<u>Enzyme %:</u>					
0.00	32.70±0.57	36.66±0.58	33.22±0.74	27.54±1.24	130.33±2.18
0.10	33.85±0.60	37.93±0.61	33.21±0.79	29.77±1.33	135.73±2.34

[1] Mean ± standard error of the mean.

a, …b, and A,… C, 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 and $P \leq 0.01$ for A to C).

Table 3 : Effect of replacing yellow corn with prickly pear peels (PPP) in growing Japanese quail diets with or without enzyme supplementation on feed intake (FI, g) and feed conversion (FC).

Items	FI				
	10-17 days	18-24 days	25-31 days	32-38 days	10-38 days
Control	80.33 ± 0.29^{1E}	105.19 ± 0.28^{D}	131.86 ± 0.81^{D}	164.18 ± 0.49^{E}	481.56 ± 1.12^{E}
Control + KD	86.83 ± 0.33^{D}	107.99 ± 0.32^{C}	142.98 ± 0.91^{C}	174.45 ± 0.55^{C}	512.26 ± 1.26^{D}
PPP 15 %	89.39 ± 0.33^{C}	105.90 ± 0.32^{D}	153.35 ± 0.92^{AB}	172.85 ± 0.56^{D}	521.49 ± 1.27^{C}
PPP 15 % +KD	95.96 ± 0.33^{A}	113.82 ± 0.32^{B}	150.77 ± 0.92^{B}	181.86 ± 0.56^{A}	542.40 ± 1.27^{A}
PPP 30 %	93.36 ± 0.33^{B}	114.48 ± 0.32^{B}	152.95 ± 0.92^{AB}	176.53 ± 0.56^{B}	537.31 ± 1.27^{B}
PPP 30 %+ KD	88.78 ± 0.34^{C}	116.17 ± 0.33^{A}	154.46 ± 0.95^{A}	164.87 ± 0.58^{E}	524.27 ± 1.31^{C}
Overall mean	89.11 ± 0.33	110.59 ± 0.13	147.73 ± 0.37	172.46 ± 0.23	519.88 ± 0.51
PPP level %:					
0.00	83.21 ± 0.39^{C}	106.44 ± 0.34^{C}	136.79 ± 0.71^{B}	168.73 ± 0.63^{C}	495.17 ± 1.51^{B}
15.00	92.68 ± 0.42^{A}	109.86 ± 0.36^{B}	152.06 ± 0.76^{A}	177.88 ± 0.72^{A}	533.18 ± 1.72^{A}
30.00	91.13 ± 0.42^{B}	115.30 ± 0.37^{A}	153.68 ± 0.77^{A}	172.41 ± 0.73^{B}	532.53 ± 1.76^{A}
Enzyme %:					
0.00	87.04 ± 0.48^{B}	108.23 ± 0.39^{B}	144.80 ± 0.89^{B}	170.57 ± 0.63^{B}	510.65 ± 1.89^{B}
0.10	90.52 ± 0.50^{A}	112.56 ± 0.41^{A}	149.26 ± 0.94^{A}	173.89 ± 0.66^{A}	526.22 ± 1.98^{A}
FC					
Control	2.68 ± 0.10	2.84 ± 0.1^{b}	4.21 ± 0.2^{C}	9.02 ± 0.76	3.89 ± 0.10^{bc}
Control + KD	2.75 ± 0.10	2.92 ± 0.1^{ab}	4.40 ± 0.2^{BC}	6.93 ± 0.86	3.78 ± 0.11^{c}
PPP 15 %	2.73 ± 0.10	3.17 ± 0.1^{a}	4.89 ± 0.2^{AB}	6.80 ± 1.01	4.03 ± 0.13^{abc}
PPP 15 % +KD	2.81 ± 0.10	3.13 ± 0.1^{a}	4.65 ± 0.2^{BC}	6.58 ± 0.89	4.00 ± 0.12^{abc}
PPP 30 %	2.87 ± 0.10	3.13 ± 0.1^{a}	5.00 ± 0.2^{AB}	9.55 ± 0.88	4.24 ± 0.12^{ab}
PPP 30 %+ KD	2.82 ± 0.10	3.19 ± 0.1^{a}	5.49 ± 0.2^{A}	8.65 ± 1.05	4.28 ± 0.14^{a}
Overall mean	2.78 ± 0.04	3.06 ± 0.04	4.77 ± 0.09	7.92 ± 0.37	4.04 ± 0.05
PPP level %:					
0.00	2.71 ± 0.07	2.88 ± 0.06^{B}	4.29 ± 0.14^{C}	8.10 ± 0.57^{ab}	3.84 ± 0.07^{B}
15.00	2.77 ± 0.07	3.15 ± 0.06^{A}	4.77 ± 0.16^{B}	6.68 ± 0.67^{b}	4.02 ± 0.09^{B}
30.00	2.85 ± 0.07	3.16 ± 0.07^{A}	5.24 ± 0.16^{A}	9.18 ± 0.68^{a}	4.26 ± 0.09^{A}
Enzyme %:					
0.00	2.75 ± 0.06	3.03 ± 0.05	4.66 ± 0.13	8.65 ± 0.51	4.04 ± 0.07
0.10	2.80 ± 0.06	3.08 ± 0.05	4.83 ± 0.13	7.25 ± 0.54	3.99 ± 0.07

[1] Mean ± standard error of the mean.

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

Table 4 : Effect of replacing yellow corn with prickly pear peels (PPP) in growing Japanese quail diets with or without enzyme supplementation on crude protein conversion (CPC) and caloric conversion ratio (CCR).

Items	CPC				
	10-17 days	18-24 days	25-31 days	32-38 days	10-38 days
Control	0.645±0.02[1]	$0.685±0.02^{b}$	$1.01±0.05^{B}$	2.17±0.18	0.937±0.02
Control + KD	0.663±0.02	$0.703±0.02^{ab}$	$1.06±0.05^{BC}$	1.67±0.21	0.911±0.03
PPP 15 %	0.655±0.02	$0.661±0.02^{a}$	$1.18±0.05^{AB}$	1.64±0.24	0.968±0.03
PPP 15 % +KD	0.675±0.02	$0.753±0.02^{a}$	$1.12±0.05^{BC}$	1.58±0.21	0.963±0.03
PPP 30 %	0.683±0.02	$0.745±0.02^{ab}$	$1.19±0.05^{AB}$	2.27±0.21	1.01±0.03
PPP 30 %+ KD	0.672±0.03	$0.758±0.02^{a}$	$1.31±0.05^{A}$	2.06±0.25	1.02±0.03
Overall mean	0.666±0.01	0.734±0.009	1.14±0.02	1.90±0.09	0.97±0.01
<u>Sex effect</u>					
Female	0.66±0.01	$0.71±0.01^{B}$	1.11±0.07	$1.63±0.30^{B}$	$0.89±0.01^{B}$
Male	0.67±0.02	$0.77±0.01^{A}$	1.27±0.07	$4.69±0.35^{A}$	$1.11±0.01^{A}$
<u>PPP level %</u>					
0.00	0.653±0.02	$0.693±0.01^{B}$	$1.03±0.03^{B}$	$1.95±0.14^{ab}$	$0.925±0.02^{B}$
15.00	0.665±0.02	$0.757±0.02^{A}$	$1.15±0.04^{A}$	$1.61±0.16^{b}$	$0.965±0.02^{AB}$
30.00	0.678±0.02	$0.752±0.02^{A}$	$1.25±0.04^{A}$	$2.18±0.16^{a}$	$1.013±0.02^{A}$
<u>Enzyme %</u>					
0.00	0.660±0.01	0.726±0.01	1.12±0.03	2.07±0.12	0.968±0.02
0.10	0.670±0.01	0.737±0.01	1.16±0.03	1.74±0.13	0.957±0.02
	CCR				
Control	7.82±0.25	8.30±0.23	$12.28±0.56^{C}$	26.34±2.21	11.36±0.29
Control + KD	8.04±0.29	8.53±0.26	$12.85±0.62^{BC}$	20.24±2.48	11.05±0.33
PPP 15 %	7.86±0.29	9.13±0.26	$14.11±0.63^{ABC}$	19.61±2.93	11.61±0.37
PPP 15 % +KD	8.10±0.29	9.03±0.26	$13.41±0.64^{BC}$	18.97±2.58	11.55±0.34
PPP 30 %	8.26±0.29	9.02±0.26	$14.40±0.63^{AB}$	27.49±2.55	12.21±0.33
PPP 30 %+ KD	8.13±0.30	9.17±0.28	$15.82±0.66^{A}$	24.90±3.04	12.32±0.40
Overall mean	8.04±0.12	8.86±0.11	13.81±0.26	22.92±1.08	11.68±0.14
<u>Sex effect</u>					
Female	7.93±0.16	$8.55±0.14^{B}$	13.34±0.79	$19.96±3.64^{B}$	$10.70±0.14^{B}$
Male	8.10±0.18	$9.24±0.16^{A}$	15.34±0.88	$56.53±4.15^{A}$	$13.39±0.16^{A}$
<u>PPP level %</u>					
0.00	7.92±0.19	$8.40±0.17^{B}$	$12.53±0.42^{C}$	$23.64±1.66^{ab}$	$11.22±0.22^{B}$
15.00	7.98±0.21	$9.08±0.19^{A}$	$13.76±0.45^{B}$	$19.25±1.94^{b}$	$11.58±0.25^{B}$
30.00	8.20±0.21	$9.09±0.19^{A}$	$15.08±0.46^{A}$	$26.42±1.96^{a}$	$12.26±0.26^{A}$
<u>Enzyme %</u>					
0.00	7.97±0.16	8.77±0.15	13.48±0.36	25.06±1.46	11.70±0.19
0.10	8.09±0.17	8.90±0.16	13.97±0.38	20.99±1.55	11.55±0.21

[1] Mean ± standard error of the mean.

a, …b, and A,… C, 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 C).

Table 6 : Effect of replacing yellow corn with prickly pear peels (PPP) in growing Japanese quail diets with or without enzymes supplementation on chemical composition of meat and mortality rate.

Items	Chemical composition of male quail meat%					Mortality rate%
	Moisture	C P	E.E.	Ash	NFE	
Control	68.85 ± 0.22^{1B}	21.14 ± 0.41^{A}	6.98 ± 0.41^{C}	1.81 ± 0.16^{bc}	1.22 ± 0.04	0.00
Control + KD	63.51 ± 0.22^{E}	19.51 ± 0.41^{B}	13.97 ± 0.41^{A}	1.77 ± 0.16^{c}	1.24 ± 0.04	0.00
PPP 15 %	70.78 ± 0.22^{A}	21.99 ± 0.41^{A}	4.14 ± 0.41^{D}	1.85 ± 0.16^{bc}	1.24 ± 0.04	3.33
PPP 15 % +KD	64.78 ± 0.22^{D}	18.04 ± 0.41^{C}	13.20 ± 0.41^{A}	2.57 ± 0.16^{a}	1.21 ± 0.04	1.67
PPP 30 %	67.24 ± 0.22^{C}	18.52 ± 0.41^{BC}	10.66 ± 0.41^{B}	2.32 ± 0.16^{ab}	1.26 ± 0.04	1.67
PPP 30 %+ KD	69.21 ± 0.22^{B}	21.36 ± 0.41^{A}	6.07 ± 0.41^{C}	2.13 ± 0.16^{abc}	1.23 ± 0.04	3.33
Overall mean	67.43 ± 0.09	20.09 ± 0.17	9.17 ± 0.17	2.08 ± 0.06	1.23 ± 0.02	
<u>Carcass part:</u>						-----------------
Front	67.40 ± 0.13	19.91 ± 0.24	8.86 ± 0.23	2.60 ± 0.09^{A}	1.23 ± 0.02	-----------------
Rear	67.46 ± 0.13	20.02 ± 0.24	9.84 ± 0.23	1.56 ± 0.09^{B}	1.12 ± 0.02	-----------------
<u>PPP level %:</u>						-----------------
0.00	66.18 ± 0.91	20.33 ± 0.61	10.47 ± 1.38	1.79 ± 0.24	1.23 ± 0.02	-----------------
15.00	67.88 ± 0.91	20.01 ± 0.61	8.67 ± 1.38	2.21 ± 0.24	1.23 ± 0.02	-----------------
30.00	68.22 ± 0.91	19.94 ± 0.61	8.37 ± 1.38	2.23 ± 0.24	1.24 ± 0.02	-----------------
<u>Enzyme %:</u>						-----------------
0.00	68.96 ± 0.63^{A}	20.55 ± 0.47	7.26 ± 0.98^{b}	1.99 ± 0.20	1.24 ± 0.02	-----------------
0.10	65.90 ± 0.63^{B}	19.64 ± 0.47	11.08 ± 0.98^{a}	2.16 ± 0.20	1.22 ± 0.02	-----------------

[1] **Mean ± standard error of the mean.**

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

Table 7:Effect of replacing yellow corn with prickly pear peels in growing Japanese quail diets with or without enzymes supplementation on economical efficiency (EEf) during the period from 10 to 38 days of age.

Item	D1	D2	D3	D4	D5	D6
Average feed intake (Kg/bird) a	0.482	0.512	0.522	0.542	0.537	0.524
Price / Kg feed (P.T.) b	148.9	151.9	141.68	144.68	135.87	138.87
Total feed cost (P.T.) = a x b = c	71.77	77.77	73.96	78.42	72.96	72.77
Average LBWG (Kg/ bird) d	0.128	0.14	0.135	0.139	0.129	0.125
Price / Kg live weight (P.T.) e	2063	2063	2063	2063	2063	2063
Total revenue (P.T.) = d x e = f	264.06	288.82	278.51	286.76	266.13	257.88
Net revenue (P.T.) = f - c = g	192.29	211.05	204.55	208.34	193.17	185.11
Economical efficiency = (g /c)	2.68	2.71	2.77	2.66	2.65	2.54
Relative efficiency (%) = r	100	101.28	103.23	99.16	98.81	94.94

b ……..….(based on average price of diets during the experimental time).
e.................(according to the local market price at the experimental time).
(g /c)...........(net revenue per unit feed cost).
r …………(assuming that the economical efficiency of the control group equals 100).

Table 5: Effect of replacing yellow corn with prickly pear peels (PPP) in growing Japanese quail diets with or without enzyme supplementation on some slaughter parameters and some serum constituents.

Items	Carcass traits% (only male)											
	Carcass before evisceration	Liver	Gizzard	Heart	Total giblets	Abdominal fat	Carcass after evisceration	Whole front	Whole rear	Front meat	Rear meat	Dressing
Control	78.44±1.36[1]	2.42±0.44	1.79±0.18	0.87±0.04	5.14±0.51	0.00±0.46	62.30±2.43	37.24±1.60	30.67±2.88	82.38±0.92	86.90±1.31	67.43±2.01
Control + KD	78.40±1.36	1.88±0.44	1.39±0.18	0.82±0.04	4.14±0.51	1.05±0.46	62.37±2.43	37.19±1.60	25.12±2.88	80.94±0.92	85.57±1.31	66.87±2.01
PPP 15 %	76.72±1.36	2.30±0.44	1.80±0.18	0.85±0.04	5.02±0.51	0.00±0.46	60.35±2.43	37.40±1.60	22.65±2.88	81.59±0.92	84.06±1.31	65.36±2.01
PPP 15 % +KD	79.25±1.36	2.07±0.44	1.67±0.18	0.83±0.04	4.63±0.51	0.98±0.46	63.96±2.43	38.10±1.60	25.35±2.88	83.61±0.92	84.79±1.31	68.59±2.01
PPP 30 %	78.11±1.36	1.89±0.44	2.12±0.18	0.82±0.04	4.89±0.51	0.00±0.46	62.63±2.43	37.85±1.60	24.34±2.88	81.82±0.92	84.31±1.31	67.52±2.01
PPP 30 %+ KD	79.02±1.36	2.20±0.44	1.97±0.18	0.90±0.04	5.14±0.51	0.33±0.46	62.10±2.43	36.75±1.60	24.83±2.88	81.86±0.92	84.83±1.31	67.24±2.01
Overall mean	78.32±0.56	2.13±0.18	1.79±0.08	0.85±0.02	4.83±0.21	0.39±0.19	62.34±0.99	37.42±0.65	25.49±1.18	82.04±0.38	85.08±0.53	67.17±0.82
PPP level %:												
0.00	78.42±0.91	2.15±0.28	1.59±0.14	0.84±0.03	4.64±0.35	0.52±0.36	62.52±1.53	37.21±0.95	27.89±1.69	81.66±0.67	86.24±0.80	67.15±1.29
15.00	77.99±0.91	2.19±0.28	1.74±0.14	0.84±0.03	4.82±0.35	0.49±0.36	62.15±1.53	37.75±0.95	24.00±1.96	82.60±0.67	84.43±0.80	66.98±1.29
30.00	78.56±0.91	2.05±0.28	2.05±0.14	0.86±0.03	5.02±0.35	0.16±0.36	62.36±1.53	37.30±0.95	24.59±1.96	81.84±0.67	84.57±0.80	67.38±1.29
Enzyme %:												
0.00	77.76±0.66	2.20±0.21	1.91±0.13	0.85±0.02	5.01±0.26	0.00±0.00^{b}	61.76±1.16	37.49±0.74	25.88±1.69	81.93±0.55	85.09±0.72	66.77±0.98
0.10	78.89±0.66	2.05±0.21	1.68±0.13	0.85±0.02	4.64±0.26	0.79±0.23^{a}	62.93±1.16	37.35±0.74	25.10±1.69	82.14±0.55	85.07±0.72	76.57±0.98

Serum constituents									
Items	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	Glucose mmol/L
Control	15.01±1.61	6.05±0.83	8.95±2.29	47.00±15.6^{b}	62.75±12.8^{bc}	33.63±5.25	19.39±2.39	14.24±3.38	13.84±0.68^{b}
Control + KD	14.82±1.61	6.62±0.83	12.41±2.29	68.00±15.6^{ab}	69.50±12.8^{abc}	35.44±5.25	21.33±2.39	14.11±3.38	14.32±0.68^{b}
PPP 15 %	13.12±1.61	6.57±0.83	10.27±2.29	79.00±15.6^{ab}	71.00±12.8^{abc}	51.92±5.25	28.56±2.39	23.36±3.38	13.77±0.68^{b}
PPP 15 % +KD	9.98±1.61	9.11±0.83	14.56±2.29	118.0±15.6^{a}	109.8±12.8^{a}	43.02±5.25	23.37±2.39	19.65±3.38	13.92±0.68^{b}
PPP 30 %	12.64±1.61	8.86±0.83	15.76±2.29	87.25±15.6^{ab}	103.0±12.8^{ab}	43.52±5.25	22.05±2.39	21.47±3.38	14.91±0.68^{b}
PPP 30 %+ KD	10.69±1.61	6.11±0.83	8.73±2.29	40.75±15.6^{b}	47.50±12.8^{c}	39.07±5.25	23.43±2.39	15.64±3.38	17.06±0.68^{a}
Overall mean	12.71±0.65	7.22±0.34	11.78±0.93	73.33±6.4	77.25±5.21	41.10±2.14	23.02±0.98	18.08±1.38	14.63±0.28
Sex effect:									
Female	17.04±0.93^{A}	7.56±0.48	19.73±1.32^{A}	94.50±9.0^{A}	101.5±7.4^{A}	46.21±3.03^{a}	24.91±1.38	21.30±1.95^{a}	14.95±0.39
Male	8.38 ±0.93^{B}	6.88±0.48	3.83±1.32^{B}	52.17±9.0^{B}	53.00±7.4^{B}	35.99±3.03^{b}	21.14±1.38	14.85±1.95^{b}	14.32±0.39
PPP level %:									
0.00	14.91±2.01	6.33±0.71	10.68±3.55	57.50±17.76	66.13±16.31	34.53±4.21	20.36±1.73	14.17±2.84	14.08±0.54^{b}
15.00	11.55±2.01	7.84±0.71	12.41±3.55	98.50±17.76	90.38±16.31	47.47±4.21	25.97±1.73	21.51±2.84	13.85±0.54^{b}
30.00	11.66±2.01	7.48±0.71	12.24±3.55	64.00±17.76	75.25±16.31	41.29±4.21	22.74±1.73	18.55±2.84	15.98±0.54^{a}
Enzyme %:									
0.00	13.59±1.65	7.16±0.60	11.66±2.84	71.08±15.16	78.92±13.35	43.02±3.67	23.33±1.54	19.69±2.39	14.17±0.50
0.10	11.83±1.65	7.28±0.60	11.90±2.84	75.58±15.16	75.58±13.35	39.18±3.67	22.71±1.54	16.47±2.39	15.10±0.50

[1] Mean ± standard error of the mean.

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

استبدال الذرة الصفراء بقشر التين الشوكي في علائق السمان الياباني النامي مع او بدون اضافة الإنزيمات

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الملخص العربي

اجريت هذه التجربة في المزرعة التجريبية الخاصة بقسم الدواجن - كلية الزراعة – جامعة الفيوم. بغرض دراسة تأثير استبدال الذرة الصفراء بقشر التين الشوكي في علائق السمان الياباني النامي مع او بدون اضافة مخلوط الإنزيمات التجارية كيم زايم دراي. قسمت الطيور علي عمر ١٠ ايام الي ٦ معاملات (٦٠ طائر / معاملة) واحتوت كل معاملة علي ٣ مكرارات (٢٠ طائر / مكرر) كما يلي:

١: كنترول.
٢: كنترول + ٠,١ % كيم زايم.
٣: استبدال ١٥% من الذرة الصفراء في عليقة ١ بقشر التين الشوكي.
٤: استبدال ١٥% من الذرة الصفراء في عليقة ٢ بقشر التين الشوكي.
٥: استبدال ٣٠% من الذرة الصفراء في عليقة ١ بقشر التين الشوكي.
٦: استبدال ٣٠% من الذرة الصفراء في عليقة ٢ بقشر التين الشوكي.

وتتلخص النتائج المتحصل عليها فيما يلي:-

١- لم يكن هناك اي تأثير معنوي نتيجة لإستبدال الذرة الصفراء بقشر التين الشوكي في علائق السمان الياباني النامي مع او بدون اضافة الإنزيمات علي وزن الجسم الحي طوال فترات الدراسة.
٢- أظهرت الطيور المغذاه علي عليقة الكنترول +الأنزيم أوالعليقة المحتوية علي ١٥% قشر التين الشوكي +الأنزيم أعلي قيم بالنسبة للزيادة في وزن الجسم الحي خلال الفترة من ١٠ -٣٨ يوم من العمر. بينما أظهرت الطيور المغذاه علي عليقة تحتوى على ٣٠% قشر التين الشوكي +الأنزيم أقل قيم للزيادة في وزن الجسم الحي خلال نفس الفترة.
٣- أظهرت المجموعة التي تغذت علي عليقة الـكنترول أقل كمية غذاء مأكول خلال جميع فترات التجربة. ومع ذلك اعطت الطيور المغذاه علي عليقة تحتوي علي ١٥% قشر التين الشوكي+ الأنزيم أعلي كمية غذاء مأكول في الفترة من ١٠-٣٨ يوم من العمر.
٤- أعطت الطيور التي تغذت على عليقة الـكنترول + الأنزيم أحسن معدل تحويل للغذاء خلال الفتره من ١٠-٣٨ يوم من العمر تلاها السمان المغذي علي عليقة الكنترول ثم المجموعة المغذاة علي ١٥% قشر التين الشوكي+ الانزيم ثم المغذاة علي ١٥% قشر التين الشوكي.
٥- لم يكن هناك اي تأثير معنوي نتيجة لإستبدال الذرة الصفراء بقشر التين الشوكي في علائق السمان الياباني النامي مع او بدون اضافة الإنزيمات علي معدل تحويل كل من البروتين والطاقة خلال الفتره من ١٠-٣٨ يوم من العمر.
٦- لم يكن لأي من المعاملات التجريبية أي تأثير علي صفات الذبيحة.
٧- أعطت الطيور التي تغذت على عليقة تحتوي علي ١٥% قشر التين الشوكي+ الأنزيم اعلي مستوي للإنزيمات AST, ALT في الدم بينما أعطت الطيور التي تغذت على عليقة تحتوي علي ٣٠% قشر التين الشوكي +الأنزيم أعلي مستوي لجلوكوز الدم.
٨- أظهرت المجموعة التي تغذت علي عليقة تحتوي عل ١٥% قشر التين الشوكي اعلي القيم للرطوبة والبروتين% (أقل قيمة للدهن%) بينما اعطت المجموعة التي تغذت علي عليقة الكنترول + الأنزيم أعلي قيمة للدهن% (أقل قيمة للرطوبة والبروتين والرماد %).
٩- كانت نسبة النفوق ٣,٣٣% في السمان المغذي علي عليقة تحتوي علي ١٥% قشر التين الشوكي أو ٣٠% قشر التين الشوكي + الأنزيم. بينما كانت نسبة النفوق ١,٦٧% في السمان المغذي علي عليقة تحتوي علي ١٥% قشر التين الشوكي +الأنزيم، ٣٠% قشر التين الشوكي وقد كانت نسبة النفوق صفر% بالنسبة للسمان المغذى علي باقي العلائق.
١٠- أعطي السمان المغذي علي عليقة تحتوي علي ١٥% قشر التين الشوكي أحسن كفاءة اقتصادية واعلي كفاءة اقتصادية ونسبية (٢,٧٧ و ١٠٣,٢٣%) يليها السمان المغذي علي عليقة الكنترول + الأنزيم عند مقارنتها بالمعاملات الأخري أو الكنترول.

ومن هذة النتائج يمكن استنتاج أن احسن أداء أنتاجي للسمان الياباني النامي كان عند تغذيتة علي عليقة تحتوي علي ١٥% قشر التين الشوكي. وعليه يمكن أستبدال جزء من الذرة الصفراء بقشر التين الشوكي كمصدر للطاقة في علائق السمان الياباني النامي بدون أضافة الأنزيمات وذلك بدون حدوث أي تأثير ضار علي النمو والكفاءة التحويلية للغذاء.