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Nutritive Value of Culban (*Vicia peregrina*) Seeds as Dietary Protein Source for Japanese Quail (*Coturnix coturnix japonica*)

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Abstract: A 6 week feeding trial was conducted to evaluate the nutritive value of raw *Vicia peregrina* seed as a possible protein source in the diet of Japanese quail (*Coturnix coturnix japonica*) and identify the limitations to its use arising from palatability or apparent toxicity factors. At the end of experiment the body weight of Japanese quails ranged from 167.1 and 208.4 g and live weight of quails fed diets A and B were significantly ($p<0.001$) higher than those fed with diet C and D. Feed intake, Body Weight Gain (BWG), Feed Conversion Rate (FCR), Specific Growth Rate (SGR) and the carcass weight of Japanese quail chick fed with diets A and B was significantly ($p<0.001$) higher than those fed with diets C and D whereas there is no significant ($p>0.05$) differences among diets in terms of Protein Efficiency Ratio (PER) and Energy Efficiency Ratio (EER). There are no significant ($p>0.05$) differences among diets in terms of percentage of DP, heart and liver whereas the percentage of gizzard of Japanese quails fed diet with A and B was significantly lower than those fed diets C and D. As a conclusion *Vicia peregrine* seed has potential as an alternative feed ingredient and can be used up to 10% of diet as protein source in diets of Japanese quails without any adverse effects. *Vicia peregrina* seed should be processed if inclusion rate exceeded 10% of diet.

Key words: Culban, *Vicia peregrina* seed, nutritive value, quail, growth

INTRODUCTION

It was well known that feed accounts for 70-80% of the production cost of poultry. Protein sources are one of the most important ingredients of poultry and fish diets. Recently, the increase in cost of conventional protein sources such as soybean and fish meal has resulted in an attempt to look for locally available and cheap alternative protein sources of feed ingredients for poultry and fish ration (Sudaryono *et al*., 1999; Davis *et al*., 2002; Adebayo *et al*., 2004; Buyukcapar and Kamalak, 2006). One of possible source of cheap protein is legume plant, *Vicia peregrine* seeds, which is well adapted to harsh and low rainfall environments in South Mediterranean of Turkey. Considering, the recent increase of *Vicia peregrine* production in the low rainfall/drought prone areas and its low cost coupled with the shortage and high cost of protein sources in poultry rations, justifies investigation into possible use of *Vicia peregrine* seed as an alternative plant protein source for poultry in South Mediterranean of Turkey. Although, recently several researchers have carried out some experiment to find out the nutritive value of *Vicia peregrine* seeds for fish (Buyukcapar and Kamalak, 2006) there is no published reports on the nutritive value of *Vicia peregrine* seeds for poultry.

Therefore, the aim of the present study, was to determine inclusion rate of raw *Vicia peregrine* seed as protein source for Japanese quail (*Coturnix coturnix japonica*) and identify the limitations to its use arising from palatability or apparent toxicity factors.

MATERIALS AND METHODS

This experiment was carried out at Mustafa Kemal University, Samandag Vocational School, Hatay, Turkey. The one day old quails Japanese quails were obtained from Department of Animal Science, Faculty of Agriculture, University of Kahramanmaras Sutcu Imam, Turkey. A completely randomized design was adopted for four isocaloric and isonitrogenous diets with 3 replicates. Each replicate had 15 Japanese quail chicks. Each treatment group was fed *ad libitum* a diet supplemented with 0 (control), 100, 200, 300 g raw *V. peregrina*

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Table 1: Ingredients and chemical composition of the experimental diets (as fed)

	Diets			
Ingredients (g kg^{-1})	Control (0)	A(100)	B(200)	C(300)
Maize	622.8	549.0	475.3	405.5
Soya bean meal	333.2	290.0	247.0	203.0
Vicia peregrina	0.0	100.0	200.0	300.0
Sunflower oil	7.3	25.0	43.0	58.0
Limestone	16.4	17.0	17.3	17.5
DCP[1]	12.6	12.0	11.2	10.4
Salt	2.0	2.0	2.0	2.0
Lysine	2.5	2.0	1.4	1.0
Methionine	0.7	0.5	0.3	0.1
Vit-Min.[2]	2.5	2.5	2.5	2.5
Total	1000.0	1000.0	1000.0	1000.0
Composition (g kg^{-1})				
DM	890.0	893.3	894.9	894.4
Ash	52.1	59.4	57.2	56.6
EE	45.8	55.3	56.3	66.2
CP	205.2	204.5	203.9	203.1
ME[3]	12.6	12.6	12.6	12.6

[1]Di calcium Phosphate, [2]Per 5 kg vitamin-mineral premix: 20.000.000 IU vitamin A, 2.00.000 IU vitamin D3, 200.000 mg vitamin E, 12.000 mg vitamin K_3, 20.000 mg vitamin B_1, 30.000 mg vitamin B_2, 200.000 mg niacin, 50.000 mg Ca-panthothenate, 20.000 mg vitamin B_6, 50 mg vitamin B_{12}, 500 mg D-biotin, 1.200 mg folic acid, 200.000 mg and 300.000 mg inositol.1.200.000 mg cholin chloride, 40.000 mg manganese, 30.000 mg Zinc, 800 mg Copper, 1.000 mg iodine, 150 mg Selenium, 40.000 mg magnesium, ME: Metabolisable Energy (MJ kg^{-1}), CP: Crude Protein (g kg^{-1}), [3]Calculated values

seed kg^{-1} of diets given in Table 1. Japanese quail chicks had also free access to water. A continuous lighting program was provided during the experiment period. In the feeding experiment, diets were formulated with raw *Vicia peregrina* seed replacing soy bean meal and maize grain on a dry matter basis to maintain crude protein and energy levels. The chemical composition of raw *Vicia peregrina* seed was previously reported by Buyukcapar and Kamalak (2006).

Quail chicks were individually weighed at the start of the experiment (0 day) and at 7 day intervals. The experiment lasted for 42 days. Growth performances were evaluated by Body Weight Gain (BWG), Feed Conversion Ratio (FCR) and Specific Growth Rate (SGR).

Body Weight Gain (BWG) (g) = Final body Weight (W_2) (g)-Initial Weigth (W_1) (g)

$$\text{Feed Conversion Ratio (FCR)} = \frac{\text{Dry feed consumed (g)}}{\text{Live body weight (g)}}$$

$$\text{Specific Growth Rate (SGR)} = \frac{\ln W_2 - \ln W_1}{\text{Experimental period (days)}} \times 100$$

Protein Efficiency Ratio

$$\text{(Crude protein intake (g g}^{-1}\text{ gain) (PER)} = \frac{\text{Protein intake (g)}}{\text{BWG (g)}}$$

Energy Efficiency Ratio ME intake

$$\text{(KJ g}^{-1}\text{ gain)) (EER)} = \frac{\text{Energy intake (g)}}{\text{BWG (g)}}$$

At the end of experiment 6 quails from each replicate were slaughtered and then carcass weight and edible inner organs (heart, liver and gizzard) were weighed. Dressing percentage was determined.

One-way Analysis of Variance (ANOVA) was carried out to determine the effect of diets on growth parameters using General Linear Model (GLM) of Statistica for windows. Significance between individual means was identified using the Tukey multiple comparison test (Pearse and Hartley, 1966). Mean differences were considered significant at $p<0.05$ (Table 1).

RESULTS AND DISCUSSION

Quail chicks in all dietary groups were fed actively on the experimental diets. There was no rejection of feed until end of the experiment. The acceptability of the diets is more or less similar. Two chicks fed diet C was died at 3rd week of experiment. One chick fed diet D was died at 5th week of experiment. Otherwise no mortality or any signs of disease were observed in any of dietary groups during the experiment period. The effect of inclusion rate of raw *Vicia peregrina* seed on the growth performance in terms of body weight is given in Fig. 1.

As shown in Fig. 1 the body weight of quail chicks increased with increasing age. There were significant ($p<0.001$) differences among live weight of Japanese quails fed different diets containing raw *Vicia peregrina* seed. At the end of experiment, live weight of Japanese quails fed diets A and B were significantly ($p<0.001$) higher than those fed with diet C and D. At the end of experiment the body weight of Japanese quails ranged from 167.1 and 208.4 g.

The Feed Intake (FI) and growth parameters such as Body Weight Gain (BWG), Feed Conversion Ratio (FCR) Specific Growth Rate (SGR), Protein Efficiency Ratio (PER) and Energy Efficiency Ratio (EE) are presented in Table 2. Feed intake, BWG, FCR and SGR of Japanese quail chick fed with diets A and B was significantly ($p<0.001$) higher than those fed with diets C and D whereas there is no significant ($p>0.05$) differences among diets in terms of PER and EER (Table 2).

The effect of diets containing raw *Vicia peregrina* seed on carcass weight, dressing percentage and edible inner organs of Japanese quails is given in Table 3. The carcass weight of Japanese quails fed diet A and B were significantly ($p<0.001$) higher than those fed diets C and D. There are no significant ($p>0.05$) differences among diets in terms of percentage of DP, heart and liver whereas

Table 2: Growth parameters of Japanese quails fed different diets containing raw *Vicia peregrina* seed (n = 45)

	Diets					
Parameters	A (0%)	B (10%)	C (20%)	D (30%)	SEM	Sig.
In W	7.960	7.980	7.9600	7.97	0.068	NS
Fi (W) (g)	208.400a	207.600a	185.700b	167.10b	5.093	***
BWG (g)	200.480a	199.610a	177.490b	157.20c	3.735	***
FI (g chicks^{-1})	751.800a	736.400ab	684.900bc	629.90c	12.250	***
FCR	3.750ab	3.690a	3.850ab	4.00c	0.068	*
SGR (%)	7.770a	7.760a	7.490b	7.22c	0.049	***
PER	0.768	0.752	0.789	0.816	0.027	NS
EE	47.090	46.450	48.850	50.68	1.677	NS

[ab]Row means with common superscript do not differ (p>0.05), Diet A, B, C and D, containing 100, 200 and 300 g raw treated *Vicia peregrina* seed, respectively. In W: Initial body weight (g), Fi W: Final body weight (g), BWG: Body Weight Gain (g), FI: Feed Intake (g), FCR: Feed Conversion Ratio, SGR: Specific Growth Rate (%), PER: Protein Efficiency Ratio, EE: Energy Efficiency, Sig: Significance level NS: Non Significant (p>0.05), *:p<0.05, ***: p<0.001

Table 3: Carcass weight, dressing percentage and edible inner organs of Japanese quails fed different diets containing raw *Vicia peregrina* seed (n = 18)

	Diets					
Traits	A (0%)	B (10%)	C (20%)	D (30%)	SEM	Sig.
Carcass weight	156.9a	152.09a	148.53a	134.32b	3.184	***
DP (%)	69.78	70.44	70.47	71.78	0.968	NS
Heart (%)	0.84	0.82	0.81	0.82	0.030	NS
Liver (%)	2.42	2.43	2.37	2.57	0.132	NS
Gizzard (%)	1.99a	1.96a	2.05a	2.43b	0.079	***

[ab]Row means with common superscript do not differ (p>0.05), Diet A-D, containing 100, 200 and 300 g raw treated *Vicia peregrina* seed, respectively, DP: Dressing Percentage. Sig: Significance level NS: Non Significant, ***: p<0.001

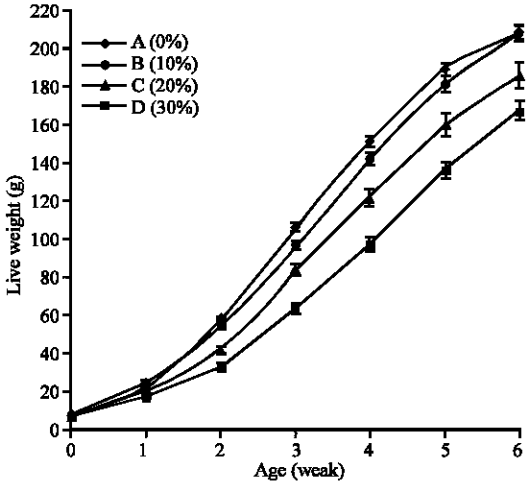

Fig. 1: The effect of the inclusion rate of raw *Vicia peregrina* seed on the body weight of quail chicks (n = 45)

the percentage of gizzard of Japanese quails fed diet with A and B was significantly (p<0.001) lower than those fed diets C and D.

The FCR, PER and EER obtained in this experiment were considerably lower than that reported by Erener *et al.* (2002), who found that FCR, PER and EER ranged from 5.02-5.44, 1.20-1.29 and 64.81-69.92, respectively. The reason why the FCR, PER and EER values are lower in current experiments may be the initial weigh of Japanese quails used. In the current experiment, the initial weight of Japanese quails ranged from 7.96 and 7.98 g whereas, the initial weight of Japanese quails used in experiment carried out by Erener *et al.* (2002) was 27 g. The FCR, PER and EER were changed with age of quails (Kaur *et al.*, 2008; Genchev *et al.*, 2005). On the other hand, SGR obtained in this experiment was considerably higher than that reported by Erener *et al.* (2002), who found that SGR ranged from 5.40-5.53.

It is well known that FCR and SGR at early age of life were higher than those obtained at late age of life of poultry. However, FCR obtained in the current experiment was comparable with findings of Kuar *et al.* (2008).

CONCLUSION

Vicia peregrine seed has potential as an alternative feed ingredient and can be used up to 10% of diet as protein source in diets of Japanese quails without any adverse effects. *Vicia peregrina* seed should be processed if inclusion rate exceeded 10% of diet. The use of *Vicia peregrina* seed, which is locally available and relatively cheap as alternative protein sources for Japanese quails could reduce the feeding cost considerably.

REFERENCES

Adebayo, O.T., O.A. Fagbenro and T. Jegede, 2004. Evaluation of *Casia fistula* meal as a replacement for soybean meal in practical diets of *Oreochromis niloticus* fingerlings. Aquacult. Nutr., 10: 99-104. DOI: 10.1111/j.1365-2095.2003.00286.x.

Buyukcapar, H.M. and A. Kamalak, 2006. Raw and heat treated culban (*Vicia peregrina*) seed as protein source for mirror carp (*Cyrinus carpio*) fingerlings. S. Afr. J. Anim. Sci., 36 (4): 235-242. http://www.sasas.co.za/publications/buyukcaparb37issue1.pdf.

Davis, D.A., C.A. Arnold and I. McCallum, 2002. Nutritional value of feed peas (*Pisum sativum*) in practical diet formulations for *Litopenaeus vannamei*. Aquacult. Nutr., 8: 87-94. DOI: 10.1046/j.1365-2095.2002.00194.x.

Erener, G., N. Ocak and Ozdas, 2002. Effect of sodium chloride supplementation provided through drinking water and/or feed on performance of Japanese Quails (*Coturnix coturnix japonica*). Turk. J. Vet. Anim. Sci., 26: 1081-1085. http://journals.tubitak.gov.tr/veterinary/issues/vet-02-26-5/vet-26-5-15-0107-25.pdf.

Genchev, A.G., S.S. Ribarski, G.D. Afanasjev and G.I. Blohin, 2005. Fattening capacities and meat quality of Japanise quails of faraon and white english breeds. J. Cent. Eur. Agric., 6 (4): 495-500. http://www.agr.hr/jcea/issues/jcea6-4/pdf/jcea64-12.pd.

Kaur, S., A.B. Mandal, K.B. Singh and M.M. Kadam, 2008. Livest. Sci., 117: 255-262. DOI: 10.1016/j.livsci.2007.12.019.

Pearse, E.S. and H.O. Hartley, 1966. Biometrika Tables for Statisticians. 3rd Edn. Cambridge University Press. UK, 1: 1-270. ISBN: 13: 9780521059206.

Sudaryono, A., E. Tsvetnenko and L.H. Evans, 1999. Evaluation of potantial of lupin meal as an alternative to fish meal in juvenile *Peanaus monodon* diets. Aquacult. Nutr., 5: 277-285. DOI: 10.1046/j.1365-2095.1999.00117.x.