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The Effects of Dietary *Yucca Schidigera* on Egg Yield Parameters and Egg Shell Quality of Laying Japanese Quails (*Coturnix coturnix japonica*)

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Abstract: The present study was carried out to determine whether dietary *Yucca schidigera* powder would affect egg yield parameters and egg shell quality of laying Japanese quail (*Coturnix coturnix Japonica*). In this study, 30 female Japanese quails were used. The experimental quails were divided into two dietary treatment groups of similar mean weight comprising 30 birds each, which was divided into 3 subgroups of birds each. A standard layer feed, basal diet of the trial was supplemented with 0 or 120 ppm *Yucca schidigera* powder. Feed and water were supplied ad libitum and light was provided 16 hours (from 8.00 to 24.00) each day. Laying performance was determined daily by measuring feed intake, feed conversion efficiency (feed intake/egg weight), egg production (number and weight). Egg quality, length, width, shape index (width/length), shell weight, shell thickness of each egg obtained on the sixth days of every week were recorded. After measuring width and length, the egg was broken was then separated and then weighted. Shell samples from top, middle and bottom sites of the egg were measured for thickness using a micrometer and the mean was calculated prior to statistical analysis. The results obtained in this experiment showed that *Yucca schidigera* supplementation to the diet tended to improve feed conversion efficiency, egg weight ($P<0.05$), while reducing egg shell thickness but not affected on feed intake, egg production, egg shell weight, egg shape index, number of eggs (42 days) ($P>0.05$).

Key words: Japanese quail, *Yucca schidigera*, egg yield parameters, egg shell quality

Introduction

Recently, Japanese quail *(Coturnix coturnix Japonica)* have become an important livestock in Turkey. The advantages of Japanese quail, which have been widely used for biological and genetic studies (Tsudzuki, 1994; Narayan *et al*., 1998) because it has a small body size, it is easily handled, and a large number of birds can be kept in a limited space. Their sexual maturation is rapidly accomplished, and turnover of generations is rapid. Because of high egg production, many offspring can be available from certain number of parents. Being an oviparous animal, it is, also, useful for embryological experiments (Ayasan and Okan, 2001).

Yucca plant extract contains two active ingredients: a glyco-component fraction which binds ammonia and sterodial saponin fraction which has surface active properties. These properties led researches to use Yucca schidigera for livestock production applications (Cheeke, 2000; Kaya *et al*., 2003).

The use of *Yucca schidigera* extract in poultry feed is a good alternative to maintain metabolic and environmental ammonia levels within acceptable limits in order to keep the animals unaffected, to reduce bad odors and to improve productivity parameters, mainly feed conversion and increased production (Anonymous, 2004b).

Several studies have been conducted to asses whether dietary supplemental *Yucca schidigera* can improve performance of broilers and layers but results have been variable. In studies with layers, Rowland *et al*., (1976), showed that dietary supplementation of *Yucca schidigera* increased growth performance.

A study on chickens and rabbits, Al-Bar *et al*. (1993) found that *Yucca schidigera* powder have proven beneficial to livestock and poultry producers.

Feeding of Yucca extract resulted in increases in average body weight gain and in some cases decreases in feed:gain (Walker, 1993).

Kutlu *et al*. (1998) observed an improvement in bird performance when diets were supplemented with *Yucca schidigera* extract. Preston *et al*. (1999) indicated that *Yucca schidigera* application improve live weight gain and feed conversion efficiency.

Guclu (2003) showed that the supplementation of *Yucca schidigera* extract to the diet of laying quail did not significantly affect performance. However, a decrease in feed intake by 7.20% and improvements in feed conversion efficiency indicate that further research is needed.

Kaya *et al*. (2003) investigated the effect of three different

levels of *Yucca schidigera* on laying performance, blood parameters and egg yolk cholesterol of laying quails. The results of the experiment showed that body weight, egg production, feed consumption and feed conversion efficiency were not different due to dietary treatments among the groups.

The application *Yucca schidigera* to pig feed has also shown better performance among pigs. Pigs fed 120 ppm *Yucca schidigera* extract gain weight percent faster and eat more feed than those pigs receiving the same feed without any *Yucca schidigera* saponins (Anonymous, 2004a).

As seen in the previous studies, utilization of *Yucca schidigera* have mostly been assessed in broilers and layers. There has been a limited number of studies reported on effect of dietary supplemental *Yucca schidigera* on laying performance of Japanese quail. Therefore, the present study was conducted to investigate the effects of *Yucca schidigera* on egg production and egg shell quality of laying Japanese quails.

Materials and Methods

The present study was carried out to determine whether dietary *Yucca schidigera* powder would affect egg production parameters and egg shell quality of Japanese quail *(Coturnix coturnix Japonica)*. In this study, 30 female Japanese quails were used. A standard layer feed (Table 1), obtained from a commercial feed company was a used as a basal diet in the study. The diet was supplemented with 0 (control group) or 120 ppm *Yucca schidigera* powder (DK Powder 35, with 10.76% saponin content, produced by Desert King International, 3802 Main Street, Chula Vista, CA 91911 USA).

Each group was fed *ad libitum* with own diet for a period of 6 weeks and light was provided 16 hours (from 8.00 to 24.00) each day.

Laying performance was determined daily by measuring feed intake, feed conversion efficiency (feed intake/egg weight), egg production (number and weight). Egg quality, length, width, shape index (width/length), shell weight, shell thickness of each egg obtained on the sixth days of every week were recorded. After measuring width and length, the egg was broken was then separated and then weighted. Shell samples from top, middle and bottom sites of the egg were measured for thickness using a micrometer and the mean was calculated prior to statistical analysis.

The data regarding laying performance and egg quality were subjected to analysis of variance using GLM procedure of SAS (1997) and means were separated using Duncan's New Multiple Range Test.

Results and Discussion

The results obtained in the experiment summarized in Table 2. The results showed that *Yucca schidigera* powder supplementation to the diet had no significant ($P>0.05$) effects on feed intake, egg production, egg shell weight, number of eggs obtained in 42 days, egg shape index and body weight gain. However yucca supplementation tended to improve feed conversion efficiency, egg weight while reducing egg shell thickness.

Quail given diet containing 0 kg/tonne *Yucca schidigera* (control group), attained greater cumulative feed intake than the another group numerically but not significant ($P>0.05$). The results of present studies are in line with the results of Kutlu *et al.* (2000) who reported that the laying hens fed on rations containing *Yucca schidigera* extract had no significant difference in feed intake between different groups. In similarly Cabuk *et al.* (2004) found that feed intake was not affected by the supplementation of yucca extract to broiler diet at 120 ppm.

The average body weight gain per bird at 42nd day in groups were 65.5 and 61.6 g, respectively. The results of present study are in agreement with the findings of Kutlu *et al.* (2000); Guclu (2003) who reported that body weight gain was greater in birds no suplemented with Yucca schidigera as compared to supplemented *Yucca schidigera* groups. This result is contrary to that reported with quails, in which body weight gains were higher on *Yucca schidigera* supplemented groups than the control group (Nazeer *et al.*, 2002; Amber *et al.*, 2004).

The average feed conversion efficiency were 5.95 for control group (Group A), 5.28 for *Yucca schidigera* supplemented group (Group B). This feed conversion efficiency on Group B than the group A was mainly due to better utilization of feed as a result of *Yucca schidigera* supplementation. These results are consisted with previous experiment of Malecki *et al.* (1995); Nazeer *et al.* (2002) who observed to improve feed conversion efficiency with the supplementation of *Yucca schidigera* to the diet. In contrast to our results, Kaya *et al.* (2003) reported that the feed conversion efficiency was not different between groups.

Egg production (%) increased as a result of *Yucca schidigera* supplementation by laying quails. Egg production in control group A was 69.84 % and in group B was 70.22%. The findings of Kutlu *et al.* (2000) are in agreement with the result of this study, who reported that with the addition of *Yucca schidigera* improved egg production. But Guclu (2003), egg production for quail supplemented with *Yucca schidigera* was not different but was greater than for control quails.

The results showed that *Yucca schidigera* supplementation to the diet affected egg weight ($P<0.05$) significantly. In agreement with Kutlu *et al.* (2000), the addition of *Yucca schidigera* to diets affected on egg weight. But Kaya *et al.* (2003) reported that the control group had the highest egg weight value and yucca

Table 1: Ingredients and Chemical Composition of the Experimental Diet

Ingredients	g/kg	Analyses	
Corn	300.00	Dry Matter, %	88.22
Barley	198.82	ME (Kcal/kg)	2605.11
Wheat Bran	109.54	Crude Protein, %	17.00
Sunflower Meal	80.73	Ether Extract, %	4.70
Limestone	71.52	Crude Fiber, %	6.00
Poultry Offal Meal	60.00	Crude Ash, %	13.00
Full-Fat	43.88	Lysine, %	0.76
Meat and Bone Meal	41.29	Threonine, %	0.61
Wheat Middlings	43.43	Methionine + Cystine, %	0.66
Soybean	30.08	Isoleucine, %	0.62
Corn Gluten Meal	10.00	Leucine, %	1.35
Soda	2.51	Valine, %	0.80
Vitamin premix*	2.00	Phenylalanine, %	0.79
Bentonite	2.00	Ca, %	3.50
Toksisep	2.00	Available P, %	0.48
Mineral Premix**	1.50	Sodium, %	0.15
Alimet	0.70	Potasium, %	0.69*

Each kg of vitamin premix contains 6000000 IU Vitamin A; 800000 IU Vitamin D_3; 14000 mg Vitamin E; 1600 mg Vitamin K_3; 1250 mg Vitamin B_1; 2800 mg Vitamin B_2; 8000 mg Niacin; 4000 mg Ca-D-Pantothenate; 2000 mg Vitamin B_6; 6 mg Vitamin B^{12}; 400 mg Folic Acid; 18 mg D-Biotin; 20000 mg Vitamin C; 50000 mg Choline Chloride

** Each kg of mineral premix contains 80000 mg Mangan; 60000 mg Iron; 60000 mg Zinc; 5000 mg Copper; 200 mg Cobalt; 1000 mg Iod; 150 mg Selenium.

Table 2: The Effects of Dietary *Yucca schidigera* Powder on Performance and Egg Shell Quality of Laying Japanese Quails

	Dietary *Yucca*	*Schidigera* Powder (ppm)	SEM
Parameters	0	120	
Feed Intake (FI;g/bird/42 days)	1597.10a	1516.28a	2.07
Feed Conversion Efficiency	5.95b*	5.28a	0.55
Mean Egg Weight (g/egg)	11.67b	11.77a	0.08
Number of Eggs (42 days)	389	385	-
Egg Production (%)	69.84a	70.22a	0.76
Egg Shell Weight (g/egg)	1.41a	1.40a	0.03
Egg Shell Thickness (µ)	221.69a	200.10b	7.37
Egg Shape Index ((width/length)*100)	78a	79a	0.01
Body Weight Gain (g/42 days)	65.5a	61.6a	0.05*

a, b:parameters in the same row are significantly different between each other (P<0.05).

supplementation did not have an increasing effect on this parameter.

No positive effect of *Yucca schidigera* on egg shell weight was determined. A similar effect was found when laying hens were fed a diet no supplemented groups (Kutlu *et al.*, 2000).

Number of eggs laid during 42 days was also increased about %1.02 by 0 ppm yucca supplementation group. This is support with results obtained later by Kutlu *et al.* (2000).

The data of Table II demonstrate that egg shape index were found to be similar among the groups. The group receiving 120 ppm supplemental *Yucca schidigera* attained the highest egg shape index, while the group receiving 0 ppm *Yucca schidigera* highest egg shell thickness (P<0.05). Egg shell thickness in groups were found 221.69 and 200.10µ. This result is consisted that reported with layers and quails, in which egg shell thickness were higher on 0 ppm *Yucca schidigera* supplemented group than the yucca supplemented groups (Kutlu *et al.*, 2000; Nazeer *et al.*, 2002; Guclu, 2003).

The results obtained in this experiment showed that *Yucca schidigera* supplementation to the diet tended to improve feed conversion efficiency, egg weight, while reducing egg shell thickness without a positive or negative effects on feed intake, egg production, egg shell weight, egg shape index, number of eggs (42 days). This results may suggest that *Yucca schidigera* powder may have the potential to improve feed

conversion efficiency. This may be attributed to positive effects of steroid saponins on nutrient absorption in the gastro-intestinal tract. Reduction in feed intake but increase in laying quail performance obtained in this study could be attributed to better utilization and absorption of the nutrients in the gastro-intestinal tract, as it was evident with better feed conversion efficiency. In conclusion, *Yucca schidigera* may be used in laying Japanese quails, but further studies are recommended before arriving at definite conclusions.

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