



Effects of dietary *Yucca schidigera* on hatchability of Japanese quails

TUGAY AYASAN¹

East Mediterranean Agricultural Research Institute, Adana, Turkey

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ABSTRACT

The present study was carried out to determine whether dietary *Yucca schidigera* powder would affect hatchability parameters of laying Japanese quail (*Coturnix coturnix Japonica*). In this study, 30 female Japanese quails were used. The experimental quails were divided into 2 dietary treatment groups of similar mean weight comprising 30 birds, which was divided into 3 subgroups of birds. 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 lib.* and light was provided 16 h (from 8.00 to 24.00) each day.

Results showed that *Yucca schidigera* supplementation to the diet did not affect hatchability of total eggs set, hatchability of fertile eggs set and fertile egg%.

Key words: Hatchability, Japanese quail, *Yucca schidigera*

Yucca plant extract contains two active ingredients: a glyco-component fraction which binds ammonia and steroidal 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). *Yucca schidigera* is believed to inhibit the production of ammonia by bacteria in the gut or by binding ammonia in poultry excreta (Al-Bar *et al.* 1998).

Studies assessed whether dietary supplemental *Yucca schidigera* can improve performance of broilers, quails and layers but results have been variable. The effect of *Yucca schidigera* on performance parameters in broiler chickens is reported as nonsignificant by Biernasiak and Slizewska (2009) while some other reported that *Yucca schidigera* supplementation has significant effect on layer performance (Ayasan *et al.* 2005, Gurbuz *et al.* 2011).

On the contrary Rizkalla *et al.* (2008) showed that adding *Yucca schidigera* extract to Dandrawi and Dokki- 4 male chicken diets significantly increased live body weight and body weight gain than the controls.

Supplementation of *Yucca schidigera* to the layer hens' diet can improve egg production and final weight. It may be hypothesised that *Yucca schidigera* can have an effect on nutrient utilization in the gastrointestinal tract (Savage *et al.* 1996). 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 indicated that further research is needed. In addition to, Guclu and Iscan (2004) reported that the effects of ration containing *Yucca schidigera* extract on the live weight, live weight gain and dressing percentage of quails were not statistically significant among the groups. Addition of the *Yucca schidigera* extract to the diet of vaccinated birds improved average daily gain and feed conversion ratio at 42 d of age compared with the other treatments (Alfaro *et al.* 2007).

Fertility and hatchability are affected by sex ratio, genotypic factors, traits of eggs, age, nutrition and live weight of parent in quail breeding. As a result, optimum conditions before or after hatching should be provide to reach the highest percentage of fertility and hatching in quail breeding (Seker 2003, Guclu 2011).

Wang and Kim (2010) found that the addition of 120 mg/kg caprylic acid and 120 mg/kg *Yucca* extract exerted positive effects on egg weight and feed efficiency, decreased the serum and yolk cholesterol concentration and reduced the proliferation of *Escherichia coli*.

Fertility and hatchability are major parameters of reproductive performance, which are most sensitive to environmental and genetic influences. There are many factors contributing to the failure of a fertile egg to hatch, which include lethal genes, insufficient nutrients in the egg and exposure to conditions that do not meet the needs of the developing embryo. Breeder factors that affect hatchability include strain, health, nutrition and age of the flock, egg size, weight and quality, egg storage duration and conditions (King'ori 2011).

Present address: ¹tugay_ayasan@yahoo.com.

Although there are many plants and their extracts have been reported to have potential to replace antibiotic growth promoters, very few of them have been investigated and their potential are not explored as safe and sustainable feed additives.

As seen in the previous studies, there has been limited information in the literature on the effect of dietary *Yucca* supplementation on hatchability of Japanese quail. Therefore, the present study was conducted to investigate the effects of *Yucca schidigera* on hatchability of Japanese quails

MATERIALS AND METHODS

The present study was carried out to determine whether dietary *Yucca schidigera* powder would affect hatchability characteristics of Japanese quail (*Coturnix coturnix japonica*). In this study, 30 female Japanese quails at 8 weeks of age were used. The experimental quails were divided into 2 dietary treatment groups of similar mean weight comprising 30 birds, which was divided into 3 subgroups of birds.

A standard layer feed (Table 1), obtained from a commercial feed company was 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). The diets were formulated to meet or exceed NRC (1994) specifications.

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	Potassium,%	0.69

*Each kg of vitamin premix contains 6000000 IU vitamin A; 800000 IU vitamin D₃; 14000 mg vitamin E; 1600 mg vitamin K₃; 1250 mg vitamin B₁; 2800 mg vitamin B₂; 8000 mg niacin; 4000 mg Ca-D-pantothenate; 2000 mg vitamin B₆; 6 mg vitamin B₁₂; 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 iodine; 150 mg selenium.

Each group was fed *ad lib.* with own diet for 6 weeks and light was provided 16 h (from 8.00 to 24.00) each day.

Determination of hatchability: The eggs that have the suitable characteristics for the brooding were placed at a brooder on the group basis. The number of the hatched chicks was recorded for 3 days after 18th days of brooding. Then the remaining non-hatched eggs were cracked, and the fertile and unfertile eggs were recorded (Guclu 2011).

The hatchability characteristics were calculated by the following formulae (Sari *et al.* 2010, Daikwo *et al.* 2011, Guclu 2011).

Fertility - Number of fertile eggs/number of total eggs set the brooder × 100

Hatchability (fertile egg set) - Number of hatched chicks/number of fertile eggs set the brooder × 100

Hatchability (total egg set) - Number of hatched chicks/number of total eggs set the brooder × 100

Statistical analysis: All data were subjected to analysis of variance using GLM procedure of SAS (1997) and means were separated using test.

RESULTS AND DISCUSSION

The results obtained in the experiment summarised in Table 2. The results showed that *Yucca schidigera* powder supplementation to the diet had no significant ($P>0.05$) effects on hatchability parameters.

The reproductive performance of Japanese quail is important in the overall management of the flock. Fertility, hatchability and embryo mortality are important indices for producing chicks from a breeding flock. Fertility is affected by different factors such as mating ratio, parental age, rate of laying, climatic and environmental (Daikwo *et al.* 2011).

In different researches reported on 8 to 52 weeks of ages Japanese quail the fertility, hatchability of fertile eggs, hatchability of eggs set were between 48.00 and 94.00% and 69.44–74.42% (Kumar *et al.* 1990, Seker *et al.* 2004).

In this study, no positive effect of the *Yucca schidigera* on hatchability of total eggs set was determined. The average hatchability of total eggs set were 66.75% for control group, 67.08% for 120 ppm the *Yucca schidigera* supplement group. Askar *et al.* (2012) reported a range of 57.50–83.33% for hatchability from total egg sets in Japanese quail.

The effects of the *Yucca schidigera* supplementation on

Table 2. Effects of *Yucca schidigera* level on hatchability,%

Parameters	Dietary <i>Yucca schidigera</i> powder (ppm)	
	0	120
Hatchability of total eggs set,%	66.75±2.12*	67.08±2.16
Hatchability of fertile eggs set,%	78.45±1.50	78.53±2.40
Fertility,%	85.09±1.37	85.42±1.49

*Not significant ($P>0.05$).

hatchability was not consistent with the results of the studies conducted on cocks by Enaiat *et al.* (2009). Enaiat *et al.* (2009) reported that there was a significant ($P \leq 0.05$) increase in hatchability percent for aluminum chloride treatments, while this increase was not significant for *Yucca schidigera* and *Yucca schidigera* aluminum chloride treatments.

According to Enaiat *et al.* (2009); regarding the increase in fertility and hatchability percentages, there are 2 assumptions, the first one may be the reduction of atmospheric NH_3 concentrations around the egg laid reflects on its interior quality such as egg pH and albumen quality where, these traits are strongly related with hatchability results. The second assumption in which the improvement obtained in semen characteristics may be beneficially reflected on cocks fertility and eggs hatchability by increasing their percentages.

Hatchability of fertile eggs set in control group was 78.45% and in another group was 78.53%. No significant difference was observed among groups ($P > 0.05$). Yerturk *et al.* (2006) reported a range of 74.46–78.81% for hatchability of fertile eggs in Japanese quail. Dere *et al.* (2009) reported that hatchability percentage was found overall 72%. Abd El-Samee *et al.* (2012) found that hatchability ranged between 72.22% and 96.97%. Askar *et al.* (2012) found that hatchability from fertile eggs between 68.98% and 88.93%.

King'ori (2011) reported that among the most influential egg parameters that influence hatchability are weight, shell thickness and shape index. Hatchability for small eggs is lower than medium and large eggs. Breeder factors that affect hatchability include health, nutrition and egg.

Quail given diet containing 120 ppm *Yucca schidigera* supplementation group, attained greater percentage of fertility than the control group numerically but not significantly ($P > 0.05$). The highest mean values (85.42%) for percentage of fertility was achieved by the group of birds fed on the 120 ppm *Yucca schidigera* supplemented diet. Abd El-Samee *et al.* (2012) found that fertility was changed between 81.82% and 96.97%.

Enaiat *et al.* (2011) found that cocks of *Yucca schidigera* and *Yucca schidigera*+ aluminum chloride treatments had recorded significantly ($P \leq 0.05$) higher fertility per cent than those of another groups.

As a result of this study, *Yucca schidigera* supplementation did not affect hatchability of total eggs set, hatchability of fertile eggs set and fertile egg ($P > 0.05$).

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