Article

Performance, some carcass characteristics and intestinal morphology of Japanese quail feed by Ephedrine and on Probiotics

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Abstract
This experiment was conducted to evaluate the effects of feeding *Ephedra* and protexin on performance and some carcass characteristics and intestinal morphology of Japanese quail. A total of 240 seven days old quail chicks were divided into 8 treatments with 3 replicates as factorial randomized design. The treatments were divided as basal diet with no protexin and *Ephedra* kept as control, and 0.02 % (E1), 0.04% (E2) and 0.06 % (E3) *Ephedra* with 0.01 % or without protexin as P0 and P 1 were used respectively. The live body weight gains and feed consumption of birds were measured individually feed conversion efficiency were calculated. At the end of the trial for investigating the effect of using protexin and *Ephedra* supplementation on performance of quails, 2 birds form each replicates were slaughtered and some blood samples were taken for hematological parameters determination. Data showed that using of protexin and *Ephedra* increased feed intake (FI) in treatments compared to control. Also body weight (BW) (g/d) and Pre-slaughter weigh (g) were higher in protexin and *Ephedra* compared to the control. There were no significant differences ($p<0.05$) for feed conversation ratio (FCR) among treatments. Data showed that using of protexin and *Ephedra* could increase carcass yield (g), breast and drumstick meat percentage none significantly. Data showed that heart and intestine weight also increased by using protexin and *Ephedra* ($p<0.05$). Morphological investigations showed that using protexin and *Ephedra* could increase the length, width and height of intestinal villus. Data from this study showed that protexin and *Ephedra* may be used as ingredient in quails ration without harming effects on performance and carcass quality of birds.

Keywords *Ephedra*; protexin; performance; intestinal morphology; Japanese quail.

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1 Introduction

Ephedra (*Ephedra funereal*) is a genus of gymnosperm shrubs, the only genus in its family, Ephedraceae, and order, Ephedrales. The various species of Ephedra are widespread in many lands, native to southwestern North America, southern Europe, northern Africa, and southwest and central Asia, northern China, and western South America. Plants of the genus *Ephedra* have traditionally been used by indigenous people for a variety of medicinal purposes, including treatment of asthma, hay fever, and the common cold (Abourashed, 2003). The alkaloids ephedrine and pseudoephedrine are active constituents of Ephedra and other members of the genus. These compounds are sympathomimetics with stimulant and decongestant qualities and are related chemically to the amphetamines. Pollen of Ephedra spp. was found in the Shanidar IV burial site in Iraq, suggesting its use as a medicinal plant dates to over 60,000 years ago (Anon,1996). It has been suggested that *Ephedra* may be the Soma plant of indo Iranian religion (Solecki, 1975). Herbal *Ephedra* has been used in China to treat respiratory conditions for over 5,000 years; however, the herb is not used for weight loss or physical performance enhancement in eastern medicine. Ephedrine and its isomers were already isolated in 1881 from Ephedra dystachia and characterized by the Japanese organic chemist Nagai Nagayoshi of the 19th century. Its active alkaloid, ephedrine, was first used in western medicine as an asthma treatment in the 1930s. Since then, ephedrine (2-methylamino-1-phenyl-1-propanol) and other sympathomimetic alkaloids have been used in many over the counter decongestants and cold medicines (Cui, 1991). These alkaloids are structurally similar to amphetamines and have direct alpha- and beta agonistic properties and catecholamine releasing actions (Hoffman, 1996). It was not until the 3 early 1990s that herbal *Ephedra* and other products containing ephedrine began to be promoted as weight loss aids in the United States (Abourashed et al., 2003). Probiotics are live microbial feed supplements, which improve the intestinal microbalance (Salminen et al., 1999). The use of probiotics in poultry was pioneered by Tortuero (1973), who reported an increase in growth rate in chicks given a Lactobacillus acidophilus culture in drinking water for 11 days from hatching. Similar results on the beneficial effects of Lactobacillus cultures on the growth of chickens were also reported by several researchers (Kalbane et al., 1992; Jin et al., 1997). One of the probiotics used in poultry feed is Protexin. Protexin is a multi-strain probiotic containing live microbes to establish, enhance or re-establish essential microflora in the gut. Protexin is a highly concentrated pre-mix containing seven strains of bacteria and two yeasts (*Lactobacillus plantarum* 1.89×10^{10} cfu/kg (colony forming unit per kilo gram), *Lactobacillus delbrueckii* subsp. Bulgaricus 3.09×10^{10} cfu/kg, *Lactobacillus acidophilus* 3.09×10^{10} cfu/kg, *Lactobacillus rhamnosus* 3.09×10^{10} cfu/kg, *Bifidobacterium bifidum* 3.00×10^{10} cfu/kg, *Streptococcus salivarius* subsp. Thermophilus 6.15×10^{10} cfu/kg, *Enterococcus faecium* 8.85×10^{10} cfu/kg, *Aspergillus oryza* 7.98×10^{9} cfu/kg, *Candida pintolopesii* 7.98×10^{9} cfu/kg). All the microorganisms in the protexin are naturally occurring and have been isolated from a wide range of feed, plant, animal, bird and human sources (Ayasan et al., 2006). Protexin can be used in a wide range of circumstances, either to improve the general health of animals, address specific problems or to maximize animal's performance. Under general conditions Protexin has been promoted to: improve health naturally, stimulate appetite, aid in establishment of gut flora in immature animals like day old chicks, calves, lambs, kids, kittens, re-establish gut microflora after antibiotic treatment, optimize digestion of feed and reduce stress (Rajmane, 1998; Cyberhorse, 1999; Panda et al., 2000; Vali, 2009). Many studies have been conducted to test the efficacy of protexin on animal growth and performance. Balevi et al. (2000) indicated that supplementation of diets with protexin at 500 gr/tonne quality was shown to cause some improvement in feed intake. Ayasan and Okan (2001) investigated the effect of four different levels of protexin on fattening performance and carcass characteristics of Japanese quails. Because of the importance of birds as an economic and nutritious form of animal protein and the fast growing characteristics of this animal, research workers have devoted studies to the use of probiotics and some medical in poultry and quails. The objective of this study was conducted to evaluate the effects of protexin and *Ephedra* on performance, carcass characteristics and intestinal morphology in Japanese quail (*Coturnix japonica*).

2 Materials and Methods

This experiment was carried out at the Aviculture farm of Islamic Azad University, Shahrekord, Iran. A total of 240 seven days old quail chicks with an average weight of 18.50±50 g were divided into 4×2 treatments and were further subdivided into 3 replicates with 10 birds on each. *Ephedra* was purchased from local market Shahrekord, Iran. Corn, soybean meal and were analyzed in the lab for determine amount of dry matter, crude protein, calcium, phosphorus and its crude fiber with Association of official analytical chemists (AOAC, 2000). The basal diet was balanced on the basis of corn and soybean meal as recommended by National Research council (NRC, 1994). The treatments were divided as basal diet with no protexin and *Ephedra* kept as control, and 0.02 % (E1), 0.04% (E2) and 0.06 % (E3) *Ephedra* with (0.01%) or without protexin as P0and P1 were used respectively. The compositions of basal diet are shown in Table 2. Diets and fresh water were provided adlibitum during this experiment. The live body weight gains and feed consumption of quails were measured individually, feed conversion efficiency were calculated weekly. At the end of experimental period, 2 birds form each replicates (totally 48 birds) were slaughtered for determination of other parameters. Body parts were separated and weighed as percentage weight. Dressing percentage was calculated free from giblets and the organs were weighed separately as percentage of carcass weight. Finally samples from small intestine tissue were collected for determination of intestinal characteristics such as mucosa, sub mucosa, musclaris, serosa and total (micron).

3 Statistic Model and Data Analysis

The statistic model was: Yijk = µ+ ά i+ ßj+ (ά +ß)ij+ eijk
where Yijk = average effect observed, µ = total average, άi= effect of *Ephedra*, ßj = effect of protexin, (ά +ß) ij = interactions (*Ephedra* × protexin), eijk = effect of errors.

The GLM procedure of SAS software (SAS, 2001) was used for data analysis of variance as completely randomized design. The significant difference among the mean were calculated by Duncan’s multiple range tests (1995).

4 Results

Data showed that use of protexin and *Ephedra* had increased feed intake (FI) significantly ($p<0.05$) in comparison to control (Table 1). Result showed that body weight BW (kg) was higher significantly when the birds fed by protexin and *Ephedra* compared to control. Although feed conversion ratio (FCR) were lesser in protexin and *Ephedra* group but there were no significant differences compared to the control.

Table 1 The effects of *Ephedra* and protexin on performance of Japanese quails.

Treatments*	FI (Kg)**	BW(Kg)	FCR (kg/kg)
(*Ephedra*)			
Control	20.45[c]	6.55[ab]	3.71
E (1)	20.63[c]	6.62[ab]	3.41
E (2)	21.01[b]	6.28[ab]	3.24
E (3)	21.48[a]	7.42[a]	3.09
P Value	0.687	0.310	0.002
(Protexin)			
P (0)	20.32[b]	6.17[a]	3.54
P (1)	21.06[a]	6.38[a]	3.20
P Value	0.378	0.006	0.003
(*Ephedra* × Protexin)			
Control× P (0)	20.41[b]	7.36[bc]	3.76
E (1) × P (0)	21.07[ab]	7.79[bc]	3.3.
E (2) × P (0)	21.27[ab]	7.81[ab]	3.24
E (3) × P (0)	21.54[ab]	8.25[b]	3.11
Control× P (1)	20.59[b]	7.33[bc]	3.45

E (1) × P (1)	21.67[b]	8.51[b]	3.02
E (2) × P (1)	22.42[a]	8.67[b]	2.93
E (3) × P (1)	22.87[a]	8.89[a]	2.80
P Value	0.63	0.641	0.921
SEM	0.918	0.310	0.055

*No protexin and Ephedra kept as control, and for others 0.02% (T1), 0.04% (T2) and 0.06% (T3) Chicoridin without (P0) or with (P1) (0-0.01% g/kg) protexin. **Feed intake (FI), body weight (BW), feed coefficient (FCR). ***Means within row with no common on letter are significantly different (p<0.05).

According to Table 2, the carcass percentage had increased none significantly by using *Ephedra* and protexin. The breast weight percentage was changed no significantly by using experimental diets. Also drumstick weights percentage also were tended to increase by using *Ephedra* and protexin and they were at the lowest on control and at the highest on e (3) × P (1). As result was relevant from Table 2 there were significant differences (p≤0.05) between carcass traits for about intestine and heart percentage.

Table 2 The effects of *Ephedra* and protexin on some organs percentage.

Treatments*	Carcass %	Breast %	Drumstick %	Heart %	Intestine %
(*Ephedra*)					
Control	81.36	36.39	24.85	1.18[d]	3.76
E (1)	81.92	36.76	25.62	1.24[c]	3.81
E (2)	82.88	37.81	26.31	1.46[b]	3.92
E (3)	83.63	38.93	26.99	1.58[a]	3.94
P Value	0.063	0.325	0441	0.321	0.136
(Protexin)					
P (0)	81.32	36.50	25.20	1.01[b]	3.60
P (1)	82.76	38.06	26.76	1.49[a]	3.90
P Value	0.510	0.410	0.365	0.300	0.114
(*Ephedra* × Protexin)					
Control× P (0)	81.03	36.40	25.22	1.16[c]	3.33
E (1) × P (0)	82.01	36.90	27.12	1.31[c]	3.52
E (2) × P (0)	82.14	36.96	27.56	1.50[bc]	3.63
E (3) × P (0)	82.72	37.22	26.74	1.68[ab]	4.02
Control× P (1)	82.63	36.91	26.03	1.22[c]	3.45
E (1) × P (1)	82.74	38.45	27.77	1.71[ab]	4.05
E (2) × P (1)	83.43	33.28	27.93	1.96[b]	4.37
E (3) × P (1)	84.51	39.43	29.29	2.18[a]	4.59
P Value	0.453	0.902	0.768	0.0001	0.537
SEM	4.32	2.87	2.12	0.013	0.638

*No protexin and Ephedra kept as control, and for others 0.02% (T1), 0.04% (T2) and 0.06% (T3) Chicoridin without (P0) or with (P1) (0-0.01% g/kg) protexin. **Feed intake (FI), body weight (BW), feed coefficient (FCR).***Means within row with no common on letter are significantly different (p<0.05).

As result relevant form Table 3 lengths, width and height of intestinal villus were increased by using *Ephedra* and protexin compared to control. Although using Ephedra and protexin lead to increase intestinal mucosal muscle but also there were no significant differences between treatments in this case.

Table 3 The effects of *Ephedra* and protexin on intestinal morphology of quails (Micron).

Treatments*	Length	Width	Height	Mucosal Muscle
(*Ephedra*)				
Control	42.42^{d}	7.0^{b}	4.36^{c}	1.01
E (1)	48.37^{c}	7.13^{b}	5.15^{b}	1.18
E (2)	50.23^{b}	7.68^{ab}	5.36^{ab}	1.19
E (3)	54.31^{a}	8.32^{a}	6.17^{a}	1.25
P Value	0.652	0.789	0.456	0.009
(Protexin)				
P (0)	48.29^{b}	7.16	5.02	1.00
P (1)	52.11^{a}	7.68	5.55	1.19
P Value	0.052	0.0010	0.0001	0.0001
(*Ephedra* × Protexin)				
Control× P (0)	45.45^{d}	7.14^{c}	4.10^{c}	1.00
E (1) × P (0)	49.14^{b}	8.19^{b}	5.11^{b}	1.08
E (2) × P (0)	50.38^{ab}	8.38^{b}	5.26^{b}	1.26
E (3) × P (0)	51.52^{ab}	8.65^{ab}	5.46^{b}	1.45
Control× P (1)	48.47^{c}	7.38^{c}	4.67^{c}	1.11
E (1) × P (1)	54.16^{b}	9.11^{a}	5.16^{b}	1.66
E (2) × P (1)	56.69^{b}	9.39^{a}	6.98^{a}	1.86
E (3) × P (1)	58.34^{a}	10.11^{a}	7.12^{a}	1.92
P Value	0.814	0.324	0.310	0.0001
SEM	0.126	0.746	0.452	0.091

*No protexin and Ephedra kept as control, and for others 0.02% (T1), 0.04% (T2) and 0.06% (T3) Chicoridin without (P0) or with (P1) (0-0.01% g/kg) protexin. **Feed intake (FI), body weight (BW), feed coefficient (FCR).***Means within row with no common on letter are significantly different ($p<0.05$).

5 Discussion

In the present study, protexin and *Ephedra* supplementation had significant effects on the measured values in growing Japanese quails. The usage of protexin and *Ephedra* was significant influences on FI, BW, FCR and carcass yield.

These results are in agreement with the (Vahdatpour et al., 2011) who indicated that consumption of Protexin were more effective than other groups in BW, FI and FCR of Japanese quails. Also Balevi et al. (2001) showed that diet supplementation with probiotic could improve FI and FCR.

Oskbjerk and Sorensen (1996) reported that ephedrine was effective in reducing fat and increasing protein deposition in finishing pigs.

Zamiri and Karimi (2005) showed that weights of internal organs were not affected by ephedrine in their experiment on ram lambs and also they showed that ephedrine was effective in increasing the leg meat and leg meat as a percentage of live weight.

Many scientists showed that beneficial effects of herbal or active substances in animal nutrition may include the stimulation of appetite and feed intake, the improvement of endogenous digestive enzyme secretion, activation of immune response and antibacterial, antiviral, antioxidant and antihelminthic actions (Janssen, 1989; Manzanilla et al., 2001; Jamroz et al., 2003).

Parreira (1998) has showed that dietary supplementation of protexin increased growth performance and decreased mortality in broilers. Rajmane et al. (1998) showed a significant improvement in body weight, improved feed conversion efficiency and reduction in mortality with the use of protexin as a growth promoter such as coneflower in broilers. Shabani et al. (2012) showed that the chicken broilers feed with protexin have the lowest feed conversion ratio and was the most favorable.

These results are similar to the findings of Ayasan and Okan (2001) who reported that growth performance parameters and carcass characteristics of Japanese quails was not affected by protexin supplementation.

Because ephedrine is a sympathomimetic and a central nervous system stimulant, it is commonly used as an energy enhancer. Nutritional supplements (Mahuang) containing products are marketed and used to improve aerobic performance and endurance, reduce fatigue, increase alertness, improve reaction time, and even increase strength (M E Powers, 2001).

Toubro et al. (1993) concluded that the ephedrine/caffeine combination is safe and effective in long-term treatment in improving and maintaining weight loss.

Sarica et al. (2009) showed that use of essential oils in combination with the enzyme complex, a probiotic and a mannan oligosaccharide with or without the enzyme complex in the wheat based diet significantly reduced the intestinal viscosity compared to the control diet, these treatments negatively decreased plasma total cholesterol and triglyceride on quails. Data from this study showed that carcass percentage had increased significantly ($P<0.05$) by using *Ephedra* and protexin. This result is agree with (Kavyani et al., 2012) who indicated that carcass yield increased in broilers fed diets containing probiotic ($P<0.05$).

6 Conclusion

It can be concluded that the supplementation of quail diets with the *Ephedra* and protexin had beneficial effect on growth performance. Also the use of *Ephedra* and protexin in quail rations during the period from 7 to 44 may manipulate weight gain and decrease feed conversion ratio. *Ephedra* and protexin supplementation may be used as ingredient in quails ration up to level of (0.02 to 0.06%) with or without protexin (0-0.01%) without harming feed intake, weight gain and feed conversion ratio of quails. As mentioned above it has become clear that there is a quite bite of benefits *Ephedra* and protexin as source of a medical and nutritional resource to be used for quails respectively. However further studies are needed for more explanations.

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