RESEARCH ARTICLE

Effect of Supplementation of Aloe Vera Juice on Growth Performance of Japanese Quails

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Abstract

An experiment was carried out in 300 Namakkal strain of Japanese quails from day-old to five weeks of age to study the effect of supplementation of Aloe vera (*Aloe barbadensis*) juice at different concentrations through drinking water on growth performance. The birds were divided into four treatment groups with three replicates in each treatment and each replicate had 25 birds. The four experimental groups consisted of T0 (control), T1, T2 and T3 supplemented with Aloe vera juice @ 0, 1.0, 1.5 and 2.0%, respectively, in drinking water. The body weight of quails was measured weekly from hatch till five weeks of age and feed consumption and feed conversion ratio were calculated weekly. Mortality and livability were recorded daily and weekly, respectively. The results revealed a significant difference ($p < 0.05$) in body weight and body weight gain among the groups supplemented with Aloe vera juice and control group. The cumulative feed consumption showed a significant difference ($p < 0.05$) in first to fourth week, whereas on the fifth week there was no significant difference between groups. A significant difference ($p < 0.05$) in feed conversion ratio among all groups supplemented with aloe vera juice and control group was observed from first to fifth week of age. Livability was not affected in quails by Aloe vera juice supplementation. Aloe vera juice supplementation (1.5%) was found beneficial in improving the overall growth performance of Japanese quails.

Keywords: Aloe vera, Body weight, Feed conversion ratio, Growth performance, Japanese quail.

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Introduction

Japanese quail farming is being practiced in many parts of the world. They provide solution to animal protein deficiency in the developing as well as developed countries (Shanaway, 1994). The quail meat has high protein (23%) and less fat (3%) (Genchev *et al.,* 2008) and is popular for its taste and tenderness. Feed alone contributes more than 70% of production cost in quail farming (Muhammad-Lawal *et al.,* 2017). Many countries over the years have banned the use of antibiotics as growth promoters in poultry due to their contribution in the development of resistance, which negatively impacts human health (Apata, 2009). Recently, research is also being carried out to replace these antibiotics with natural feed additives in poultry feeds (Weber *et al.,* 2012). Among the herbs, Aloe vera is a unique plant which is having great medicinal value (Ezeibekwe *et al.,* 2009). The gel contained in Aloe vera leaves is composed of more than 75 biologically active ingredients (Boudreau and Beland, 2006) which have medicinal effects that are useful in treating diseases. Aloe vera has 20 of the 22 required amino acids of which seven are essential amino acids (Jyotsana *et al.,* 2008) and it also contains antimicrobial, prebiotic, immune modulatory and antioxidant properties (Moghaddasi and Verma, 2011; Thivya, 2021), which indirectly influence the growth performance. There is paucity of literature on the effect of Aloe Vera juice on growth performance of quail birds. Therefore, the present study was carried out by supplementing Aloe vera juice through drinking water as a herbal growth promoter in Japanese quails.

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Materials and Methods

Experimental Birds and Diet

Day-old Japanese quails were procured from a reputed commercial quail farm hatchery in Puducherry, and the experiment was conducted after approval of IAEC in the Japanese quail unit of Livestock Farm Complex (LFC), Rajiv Gandhi Institute of Veterinary Education and Research (RIVER), Puducherry. A total of 300 day-old quail chicks were randomly divided into four treatment groups each of 75 birds. Each group was further divided into three replicates each of 25 birds. The commercially available Aloe vera (*Aloe barbadensis*) juice, with a concentration of 99.8% Aloe vera leaf pulp (which is approved by Ministry of Ayush, Government of India, for human consumption) was used for supplementation in drinking water. The groups T0 (Control), T1, T2 and T3 were fed with standard feed and were supplemented with Aloe vera juice in drinking water @ 0, 1.0, 1.5 and 2.0% level, respectively. The compounded feed was formulated as per the recommendation of Department of Poultry Science, Veterinary College and Research Institute, Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), Namakkal (Arunrao, 2021). The starter feed fed to the quails from 0 to 2 weeks of age contained 23.13% crude protein, 2950 Kcal/kg ME, 1.30% calcium and 0.78% total phosphorus, while the grower feed fed from 3 to 5 weeks of age contained 20.25% crude protein, 2950 Kcal/kg ME, 1.4% calcium and 0.83% total phosphorus.

During the brooding period of first two weeks feed was provided using one feed tray for each replicate, after which the birds were fed using one linear feeder per replicate. The chicks were provided measured quantity of feed daily.

Growth Parameters

Body weight, feed intake and mortality of the quails in the experimental groups were recorded weekly. Body weight gain, feed conversion ratio and livability were calculated both on weekly and on cumulative basis for all the experimental groups.

Statistical Analysis

The data collected was analyzed using Analysis of Variance (ANOVA) as per Snedecor and Cochran (1994). The data was grouped according to the treatment (T0, T1, T2 and T3) and were subjected to least square analysis of variance using SPSS 18.0.

Results and Discussion

Growth Performance

The mean weekly body weight (g) and body weight gain (g) of Japanese quails supplemented with various levels of Aloe vera juice from day-old to five weeks of age are presented in Tables 1 and 2, respectively.

The mean weekly body weights of quails of all three groups supplemented with 1.0, 1.5 and 2.0% Aloe vera juice were significantly higher ($p < 0.05$) than the control group from first to fifth week of age. T2 group has higher mean weekly body weight as compared to T1 and/or T3 groups at all weekly intervals with significant difference on first, second and fourth week (Table 1). The weekly mean body weight

Table 1: Effect of Aloe vera juice supplementation on weekly mean (± SE) body weight (g/bird) of Japanese quails

	Treatment groups			
Periods	*T0*	*T1*	*T2*	*T3*
Hatch Weight*	8.67 ± 0.04^{a}	8.65 ± 0.01^{a}	8.67 ± 0.03^{a}	8.65 ± 0.01^{a}
I Week*	27.81 ± 0.18^{a}	30.87 ± 0.41^{bc}	32.19 ± 0.95^{c}	30.40 ± 0.17^{b}
II Week**	61.19 ± 0.76^{a}	65.64 ± 0.79^{b}	67.66 ± 0.69^{c}	65.58 ± 0.65^{b}
III Week**	96.52 ± 1.58^{a}	106.08 ± 0.92^{b}	109.18 ± 1.04^{b}	106.99 ± 1.07^{b}
IV Week**	133.76 ± 1.97^{a}	149.96 ± 1.13^{b}	154.43 ± 1.31^{c}	152.10 ± 1.26^{bc}
V Week**	169.74 ± 2.24^{a}	191.87 ± 1.46^{b}	195.57 ± 1.64^{b}	193.82 ± 1.51^{b}

* Mean of 3 values, ** Mean of 75 values, ^{abc} Means within a row with different superscripts differ significantly ($P < 0.05$).

Table 2: Effect of Aloe vera juice supplementation on weekly mean (± SE) body weight gain (g/bird) of Japanese quails

	Treatment groups			
Periods	*T0*	*T1*	*T2*	*T3*
I Week*	19.14 ± 0.20^{a}	22.23 ± 0.40^{bc}	23.53 ± 0.93^{c}	21.75 ± 0.17^{b}
II Week*	33.38 ± 0.43^{a}	34.77 ± 0.57^{a}	35.47 ± 0.87^{a}	35.18 ± 0.61^{a}
III Week**	35.32 ± 0.94^{a}	40.44 ± 0.38^{b}	41.52 ± 0.47^{b}	41.41 ± 0.48^{b}
IV Week**	37.25 ± 0.77^{a}	43.88 ± 0.56^{b}	45.25 ± 0.58^{b}	45.12 ± 0.37^{b}
V Week**	35.98 ± 0.77^{a}	41.92 ± 0.76^{b}	41.14 ± 0.63^{b}	41.72 ± 0.59^{b}
Overall**	161.07 ± 2.24^{a}	183.23 ± 1.46^{b}	186.91 ± 1.63^{b}	185.17 ± 1.52^{b}

* Mean of 3 values, ** Mean of 75 values, ^{abc} Means within a row with different superscripts differ significantly ($P < 0.05$).

Table 3: Effect of Aloe vera juice supplementation on weekly mean (± SE) feed consumption (g/bird) of Japanese quails*

Treatment groups	*Periods*				
	*I Week***	*II Week*	*III Week*	*IV Week*	*V Week***
T0	47.88 ± 0.34^{a}	107.78 ± 0.59^{a}	119.24 ± 0.57^{a}	130.81 ± 2.59^{a}	153.04 ± 0.73^{a}
T1	46.29 ± 0.58^{b}	106.33 ± 1.16^{a}	115.27 ± 0.47^{a}	131.28 ± 1.40^{a}	157.97 ± 0.17^{b}
T2	46.15 ± 0.48^{b}	103.19 ± 2.77^{a}	113.29 ± 2.09^{a}	129.17 ± 1.28^{a}	156.64 ± 1.00^{b}
T3	44.93 ± 0.18^{b}	102.03 ± 2.18^{a}	113.18 ± 3.03^{a}	131.34 ± 0.24^{a}	156.19 ± 0.42^{b}

* Mean of 3 values, ** Means within a column with different superscripts differ significantly ($P < 0.05$)

Table 4: Effect of Aloe vera juice supplementation on cumulative mean (± SE) feed consumption (g/bird) of Japanese quails*

	Periods				
Treatment groups	*I Week***	*II Week***	*III Week***	*IV Week***	*V Week*
T0	47.88 ± 0.34^{a}	155.66 ± 0.92^{a}	274.90 ± 1.42^{a}	405.71 ± 2.62^{a}	558.76 ± 3.34^{a}
T1	46.29 ± 0.58^{b}	152.62 ± 0.85^{ab}	267.89 ± 1.30^{ab}	399.17 ± 2.40^{ab}	557.14 ± 2.35^{a}
T2	46.15 ± 0.48^{b}	149.34 ± 3.18^{ab}	262.64 ± 4.58^{b}	391.80 ± 4.95^{b}	548.45 ± 4.68^{a}
T3	44.93 ± 0.18^{b}	146.97 ± 2.20^{b}	260.14 ± 2.85^{b}	391.48 ± 2.90^{b}	547.67 ± 2.78^{a}

* Mean of 3 values, ** Means within a column with different superscripts differ significantly ($P < 0.05$)

Table 5: Effect of Aloe vera juice supplementation on cumulative mean (± SE) feed conversion ratio of Japanese quails*

	Periods				
Treatment groups	*I Week***	*II Week***	*III Week***	*IV Week***	*V Week***
T0	1.72 ± 0.02^{a}	2.54 ± 0.03^{a}	2.85 ± 0.02^{a}	3.03 ± 0.02^{a}	3.29 ± 0.01^{a}
T1	1.50 ± 0.04^{b}	2.33 ± 0.01^{b}	2.53 ± 0.02^{b}	2.66 ± 0.01^{b}	2.90 ± 0.02^{b}
T2	1.44 ± 0.03^{b}	2.20 ± 0.06^{c}	2.41 ± 0.06^{c}	2.54 ± 0.05^{c}	2.81 ± 0.05^{b}
T3	1.43 ± 0.06^{b}	2.24 ± 0.01^{bc}	2.44 ± 0.01^{bc}	2.56 ± 0.03^{bc}	2.80 ± 0.04^{b}

* Mean of 3 values, ** Means within a column with different superscripts differ significantly ($P < 0.05$)

gain was also significantly higher ($p < 0.05$) in groups T1, T2 and T3 supplemented with Aloe vera juice than that of the control group at all weekly intervals including overall values, except on second week, however the values among three supplemented groups were the same at all intervals, except in first week (Table 2). These results agree with Bejar (2021) who observed higher final body weight of quails supplemented with Aloe vera gel as compared to the control group. Durrani *et al*. (2008) also observed a significantly higher ($p < 0.05$) final body weight in broilers supplemented with Aloe vera gel through drinking water.

The effects of supplementation of Aloe vera juice at various levels on mean weekly feed consumption (g) and mean cumulative feed consumption (g) of Japanese quails from day-old to five weeks of age are presented in Tables 3 and 4, respectively. The control group had significantly higher mean weekly feed consumption ($p < 0.05$) on the first week and lower on the fifth week than that of supplemented groups, and the values among the three supplemented groups were statistically similar (Table 3).

The cumulative feed consumption showed a significant difference ($P < 0.05$) in first to fourth week, whereas, in the fifth week there was no significant difference between treatment groups. It can be inferred that irrespective of level of Aloe vera juice supplementation through drinking water, the feed consumption of Japanese quails decreased when compared to the control group, but the differences between the Aloe vera juice supplemented and control group were not statistically significant, except group T1 and T0 (Table 4). The result of the study concurred with Habibi and Ghahtan (2020) and Bejar (2021) who observed no significant difference ($P > 0.05$) in the feed consumption of quails supplemented with Aloe vera gel and the control group.

The weekly mean cumulative feed conversion ratio of Japanese quails supplemented with Aloe vera juice at various levels from day-old to five weeks of age is presented in Table 5. From the results obtained, it may be opined that all the levels of Aloe vera juice supplemented improved the cumulative mean feed conversion ratio. However, the best mean feed conversion ratio at five weeks of age was recorded in the birds supplemented with 2.0% Aloe vera juice (T3), closely followed by 1.5% level (T2). From the feed intake data, it may be deduced that Aloe vera juice supplementation might have contributed for the better utilization of nutrients from the feed, which might have resulted in better body weight and body weight gain from third week onwards.

The livability of Japanese quails from day old to five weeks of age was 100 per cent for the control group and all Aloe vera juice supplemented groups. This could be due to the best quality of Namakkal quail strain, provision of formulated

quality feed and implementation of standard management practices during the experimental period.

From the findings of the present study, it may be inferred that supplementation of Aloe vera juice at 1.0 to 2.0% levels through drinking water in Japanese quail did not have any adverse effect on the livability and production performance. Since all the supplemented groups had a higher mean body weight and a better feed conversion ratio than the control group on 35 days of age it may be also inferred that a positive impact on the growth performance can be achieved on supplementation of Aloe vera juice in Japanese quails, Among the treatment groups, the birds supplemented with 1.5% Aloe vera juice had the highest mean body weight and body weight gain at five weeks of age, while the birds supplemented with 2.0% level had the better feed conversion ratio. Superior body weight and feed conversion ratio in all groups of Aloe vera juice supplemented Japanese quails was achieved on consumption of similar quantity of feed as that of the control group, which implies better nutrient utilization due to the supplementation of Aloe vera juice that has both antimicrobial and prebiotic properties.

Conclusion

Japanese quails supplemented with Aloe vera juice through drinking water at 1.5% level performed better than the other treatment groups, and hence it may be concluded that Aloe vera juice supplementation at 1.5% was beneficial in improving the overall growth performance of Japanese quails.

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