International Journal of Veterinary Sciences and Animal Husbandry

ISSN: 2456-2912
VET 2024; 9(3): 351-356

www.veterinarypaper.com
Received: 08-03-2024
Accepted: 13-04-2024

S Sumanth
M.V.Sc Scholar, Department of Poultry Science, Madras Veterinary College, Tamil Nadu Veterinary and Animal Sciences University, Chennai, Tamil Nadu, India

K Sangilimadan
Professor and Head, Poultry Research Station, MMC, TANUVAS, Chennai, Tamil Nadu, India

R Richard Churchil
Professor and Head, Department of Poultry Science, MVC, Chennai, Tamil Nadu, India

PSL Sesh
Professor and Head, Department of Veterinary Bio-Chemistry, MVC, Chennai, Tamil Nadu, India

Corresponding Author:
K Sangilimadan
Professor and Head, Poultry Research Station, MMC, TANUVAS, Chennai, Tamil Nadu, India

Effect of dietary supplementation of amla (*Emblica officinalis*) fruit powder, tulsi (*Ocimum sanctum*) leaf powder and their combination on production performance of Japanese quails

S Sumanth, K Sangilimadan, R Richard Churchil and PSL Sesh

Abstract
A study was conducted to the effect of dietary supplementation of amla fruit powder, tulsi leaf powder and their combination on production performance of Japanese quails. For this study 252 day-old straight run Japanese quails were randomly distributed into seven treatments consisting of six replicates each. Each replicate had six birds. The birds were reared in cages throughout the biological experiment and Japanese quail brooder mash diet was provided as control diet (T_1), brooder mash with amla fruit powder (AFP) at the rate of 0.5% (T_2), 1.0% (T_3), tulsi leaf powder (TLP) at the rate of 0.25% (T_4), 0.5% (T_5), amla fruit powder 0.5% + tulsi leaf powder 0.25% (T_6),amla fruit powder 1.0% + tulsi leaf powder 0.5% (T_7) were used. The results revealed that there was significant difference between the treatment groups in body weight up to fourth week of the experiment. During 5thweek there was statistically non-significant improvement in all treatment groups than in control. The statistical analysis of the data in the study revealed that, there was significant (p<0.05) difference in weekly body weight gain of Japanese quails from first to fifth week of age. The supplementation of phytobiotics separately or in combination positively influenced the body weight gain. Supplementation of AFP and TLP alone or in combination significantly (p<0.05) influenced the feed intake during third and fifth week of age. However, the supplementation had no significant (p>0.05) effect on overall feed intake of birds. The overall feed efficiency showed statistically non-significant (p>0.05) improvement among the treatment groups. The overall livability of birds (from day-old to five weeks) showed no significant (p>0.05) difference among the treatment groups. It was concluded that the results revealed that there was significant difference between the treatment groups in body weight up to fourth week of the experiment. The birds supplemented with combination of AFP and TLP at both higher and lower levels in feed recorded significant (p<0.05) increase in weight gain in second and third weeks. The overall feed intake, feed efficiency and livability showed statistically non-significant (p>0.05) improvement among the treatment groups.

Keywords: Japanese quail, amla, tulsi, body weight, livability part of M.V.SC., thesis work

1. Introduction
Quail farming incurs less cost of production as they consume less feed when compared to broiler chicken and produces tastier meat with less fat content. Recently ban on the use of antibiotics growth promoters (AGP) in poultry feeds has drawn the concerns of researchers towards Phytobiotics. These substances have beneficial properties such as anti-oxidant, anti-microbial, anti-fungal, anti-coccidial as well as immune modulatory effects. Phytobiotics help in digestion process and being a component of nature, they are considered safe, cost effective and environment friendly with no side effects. This study amla and tulsi of the two phytobiotics were used. Amla fruit is rich in vitamin C, quertin, phyllemblic compounds, gallic acid, tannins, flavonoids and pectin (Mc Dowell,2008) [16]. It also increases broiler chicken performance by improving digestion, metabolism and absorption of certain nutrients which ultimately improve live weight gain and FCR (Manojkumar and Singh, 2005) [15]. Tulsi is an aromatic shrub and is considered as queen of herbs. It contains eugenol, ascorbic acid, beta carotene, betosinosterol, palmitic acid and tannins as active components. Use of tulsi leaf powder combats oxidative stress and increases anti-oxidant enzyme levels in broiler chicken

(Reddy *et al.* 2008) [24]. Hence, the present study was to conducted to assess the production performance of Japanese quail diet included with amla fruit powder, tulsi leaf powder and their combinations.

2. Materials and Methods

A Biological experiment was planned, designed and conducted at Department of Poultry Science, Madras Veterinary College, Tamil Nadu Veterinary and Animal Sciences University, Chennai. The details of the experimental design are shown in Table1.

Table 1: Experimental design

Treatment		Replicate						
		R1	R2	R3	R4	R5	R6	Total
T_1	Control (Basal diet)	6	6	6	6	6	6	36
T_2	Basal diet + 0.5% amla fruit powder	6	6	6	6	6	6	36
T_3	Basal diet + 1.0% amla fruit powder	6	6	6	6	6	6	36
T_4	Basal diet + 0.25% tulsi leaf powder	6	6	6	6	6	6	36
T_5	Basal diet + 0.50% tulsi leaf powder	6	6	6	6	6	6	36
T_6	Basal diet + 0.5% amla fruit powder + 0.25% tulsi leaf powder	6	6	6	6	6	6	36
T_7	Basal diet + 1.0% amla fruit powder + 0.50% tulsi leaf powder	6	6	6	6	6	6	36
Total								252

3. Results and Discussion

3.1. Bodyweight

A total of 252 day-old straight run Japanese quail chickens were purchased from College of Poultry Production and Management, Hosur, Tamil Nadu. The birds are wing banded, weighed and randomly allotted into seven treatment groups. Each treatment had six replicates comprising six chicks per replicate. The standard recommended commercial diet was prepared as per NRC (1994) [19] with similar nutrient composition for all treatments. Fresh amla fruits are procured from local market and cleaned, deseeded, made into pieces and dried. The temperature was set at 40° to 42 °C for drying and after drying, powder was prepared by grinding. Fresh tulsi leaves were collected sun dried and powdered. The commercial feed was purchased from Central Feed Technology Unit, Kattupakkam, Tamil Nadu Veterinary and Animal Science University. The feed used for all the seven treatment groups was iso-caloric and iso-nitrogenous. The parameters like hatch weight, body weight, weight gain, feed consumption was recorded. Birds were provided *ad libitum* feed throughout the experimental period. At the end of every week, left over feed was weighed and net feed consumption was calculated per replicate. Feed efficiency for each replicate was calculated by dividing average feed consumption by average body weight. Mortality was recorded as and when birds death and recorded data was used to calculate percent livability. Data was subjected to statistical analysis by adopting appropriate methods of analysis of variance as described by Snedecor and Cochran (1994) [27].

The body weight of Japanese quail with different age was presented inTable2. The mean body weights among different groups were significantly (p<0.05) different at the end of first, second, third and fourth weeks. When compared to control, the supplementation of AFP at the rate of 0.5% resulted in improved (p<0.05) body weight during second and third weeks of age; whereas, 1% AFP supplementation significantly (p<0.05) improved the body weight of Japanese quails from first week to fourth week of age. Gaikwad *et al.* (2016) [7] also reported similar results of significantly (p<0.05) improved body weights due to AFP supplementation at the rate of 0.5% and 1.0% at six weeks of age in broilers. Similar findings were also reported in broilers by Begum *et al.* (2019) [2] and Dalal *et al*. (2018) [6] by AFP supplementation. In contrary, Kumar *et al.* (2013) [12] reported non-significant (p>0.05) effect on body weight due to supplementation of AFP in broilers when Indian gooseberry was supplemented in combination with multi enzyme. Similar reports of no effect of amla fruit powder supplementation on body weight were also reported by Nakajyoti *et al.* (2019) [18]. The Japanese quail fed with 0.25% TLP attained significantly (p<0.05) higher body weight from first to fourth week. At higher inclusion level of 0.5% TLP, the Japanese quails recorded significantly (p<0.05) higher body weights during second, third and fourth weeks of age in this study. Similar findings of improvement in body weight due to TLP supplementation were reported by Alom *et al.* (2015) [1] and Tanwar (2018) [29]. However, Vasanthakumar *et al.* (2013) [30] found that the supplementation of TLP (0.5%) and commercial grade tulsi extract (0.1%) for 42 days did not improve final body weight of broilers. The combination of herbal supplementation at lower levels (A-0.5% + T- 0.25%) significantly (p<0.05) improved body weights during third and fourth week; whereas at higher levels (A-1.0% + T-0. 5%), improvement (p<0.05) was observed only at third week. There is no citable literature on combination of AFP and TLP indicating the improvement of body weight in poultry. Although the body weights of Japanese quails in herbal supplemented groups (T_2 –T_7) had numerically higher body weights than control at the end of experiment (five weeks of age), the statistical analysis revealed no significant difference (p>0.05). Similar reports of statistically non-significant (p>0.05) improvement of body weight in broilers were given by Sanjyal and Sapcota (2012) [26] when they supplemented growth promoters such as amla, tulsi and ashwagandha for period of six weeks.

Table 2: Effect of supplementation of amla fruit powder, tulsi leaf powder and their combinations on weekly body weight (g) of Japanese quails from 0 to 5 weeks of age (Mean ± SE)

Treatments	Day-old	1st week	2nd week	3rd week	4th week	5th week
T_1 (Control)	10.00±0.16	35.87^{abc}±0.72	83.03^{a}±1.51	136.48^{a}±2.07	193.22^{a}±2.59	234.06±3.04
T_2 (A-0.5%)	10.45±0.18	37.82^{cd}±0.74	88.17^{bc}±1.40	146.07^{bc}±2.17	197.50^{ab}±2.81	237.36±3.80
T_3 (A-1%)	9.88±0.14	38.42^{d}±0.86	90.96^{c}±1.87	151.10^{bc}±2.74	205.24^{b}±3.18	246.88±5.03
T_4 (T-0.25%)	10.24±0.14	39.21^{d}±0.66	90.96^{c}±1.57	153.40^{c}±2.81	203.57^{b}±3.54	245.25±4.04
T_5 (T-0.5%)	10.16±13	37.32^{bcd}±0.57	88.60^{bc}±1.39	148.57^{bc}±2.43	203.19^{b}±3.03	238.63±3.91
T_6 (A-0.5% + T- .25%)	10.09±15	35.41^{ab}±0.64	86.09^{ab}±1.39	146.39^{bc}±2.49	206.08^{b}±3.37	241.34±3.88
T_7 (A-1% + T-0.5%)	10.00±13	34.83^{a}±0.76	85.88^{ab}±1.56	144.39^{b}±2.23	197.23^{ab}±2.69	241.55±3.60
F value	1.591 NS	5.322**	3.541**	4.993**	2.548*	1.284 NS

A-Amla fruit powder; T-Tulsi leaf powder

Means bearing different superscripts within a column differ significantly (p<0.05) NS- Not significant,

** Significant (p<0.01) *Significant (p<0.05)

3.2 Body weight gain

The body weight gain of Japanese quail with different age was presented in Table 3. In the present study AFP supplementation at both levels (0.5 and 1.0%) showed significant (p<0.05) improvement in weight gain during first, second and third weeks of age when compared to control. Patil *et al.* (2012) [23] also reported similar results to that of our study that the supplementation of AFP in broiler chicken recorded significant (p<0.05) improvement in body weight gain up to a period of six weeks. Similar reports of improvement in weight gain by feeding AFP in broilers were given by Chaudhary *et al.* (2015) [4] and Dalal *et al.* (2018) [6]. In contrary to present results, Nakajyoti *et al.* (2019) [18] stated that there is no significant (p>0.05) difference in body weight gain of broilers when they were supplemented with AFP at the rate of 5, 10 and 20 g and 250 mg of synthetic vitamin C per kg in their diets. Similar reports of no improvement in weight gain of broilers by feeding AFP were given by Mandal *et al.* (2017) [14]. AFP supplementation (0.5%) during fourth week, when compared to control showed significant (p<0.05) decrease in weight gain of Japanese quails. There is no citable literature stating that AFP supplementation decreased weight gain in poultry. In birds fed with TLP at the rate of 0.25% there was significant (p<0.05) increase in body weight gain during first, second and third weeks of age compared to control. Whereas, in the birds fed with higher levels of TLP (0.5%) there was significant (p<0.05) increase in body weight gain only during second and third weeks of age. Similar reports stating higher growth rate in early stage of life was reported by Bhosale *et al.* (2015) [3] in broilers by supplementing TLP at the rate of 5 g/kg and vitamin E at the rate of 100 mg/kg. In the same way, Jahejo *et al*. (2019) [10] and Chitra (2020) [5] supplemented tulsi leaf powder in diets and produced similar results of increase in weight gain of broilers. But Alom *et al.* (2015) [1] stated that broilers supplemented with tulsi leaf extract at the rate of 2 ml/L in drinking water showed significant (p<0.05) increase in weight gain only during third to fifth week of study. TLP supplementation at the rate of 0.25% deteriorated (p<0.05) the weight gain of Japanese quails during fourth week in the present study. There is no notable literature stating that dietary supplementation of TLP in poultry decreased weight gain. The birds supplemented with combination of AFP and TLP at both higher and lower levels in feed recorded significant (p<0.05) increase in weight gain in second and third weeks when compared to control. Sanjyal and Sapcota (2012) [26] also produced results similar to our study i.e., significant (p<0.05) improvement in body weight gain during third week of age in broilers by supplementation with herbal growth promoters such as amla, tulsi and ashwagandha over a period of six weeks. The results of the present study were also in agreement with Pande (2003) [20]. In contrary to our results, Mode *et al.* (2009) [17] reported that the treatment with *Ocimum sanctum* and *Emblica officinalis* at the rate of 3 g/kg feed for two weeks period was not found to be effective in increasing body weight gain in broilers. There is no significant (p>0.05) difference in overall weight gain (from day- old to five weeks of age) among the treatment groups but numerically there was improvement in weight gain in all treatment groups when compared to control. These results are in concomitant with that of Gatne *et al*. (2010) [8] who reported that Stresroak® premix improved body weight gain of broilers non-significantly (p>0.05) as compared to control group when supplemented for eleven days.

Table 3: Effect of supplementation of amla fruit powder, tulsi leaf powder and their combinations on weekly body weight gain (g) of Japanese quails from 0 to 5 weeks of age (Mean ± SE)

Treatments	Day-old	1st week	2ndweek	3rd week	4th week	5th week	0-5 weeks
T_1 (Control)	10.00±0.16	25.42^{ab}±0.72	47.16^{a}±1.10	53.44^{a}±1.09	56.74^{cd}±1.35	40.85^{ab}±2.35	223.61±2.99
T_2 (A-0.5%)	10.45±0.18	27.82^{c}±0.69	50.36^{b}±1.00	57.90^{b}±1.2	51.43^{ab}±1.45	39.86^{ab}±2.02	227.36±3.77
T_3 (A-1%)	9.88±0.14	28.55^{c}±0.78	52.54^{b}±1.22	60.14^{bc}±1.28	54.14^{abc}±1.33	41.64^{ab}±2.55	237.00±4.96
T_4 (T-0.25%)	10.24±0.14	28.97^{c}±0.61	51.75^{b}±1.16	62.44^{c}±1.39	50.17^{a}±1.43	41.67^{ab}±1.68	235.01±3.98
T_5 (T-0.5%)	10.16±13	27.16^{bc}±0.54	51.28^{b}±0.97	59.97^{bc}±1.48	54.62^{bc}±1.60	35.43^{a}±2.33	228.47±3.86
T_6 (A-0.5% + T- 0.25%)	10.09±15	25.34^{ab}±0.61	50.68^{b}±1.06	60.30^{bc}±1.22	59.69^{d}±1.29	35.26^{a}±1.59	231.27±3.83
T_7 (A-1% + T-0.5%)	10.00±13	24.83^{a}±0.69	51.06^{b}±1.13	58.50^{b}±1.07	52.85^{abc}±1.40	44.31^{b}±1.72	231.55±3.56
F value	1.591 ^{NS}	6.274**	2.439*	5.089**	5.229**	2.659*	1.383^{NS}

A-Amla fruit powder; T-Tulsi leaf powder

Means bearing different superscripts within a column differ significantly (p<0.05)

** Significant (p<0.01)

* Significant (p<0.05) NS- Not significant

3.3 Feed intake

The feed intake of Japanese quail with different age was presented in Table4.The treatment group fed with AFP at the rate of 0.5% registered significant (p<0.05) decrease in feed intake during third and fifth weeks of age when compared to control. Whereas, the treatment group fed with AFP at the rate of 1.0% showed significant (p<0.05) decrease in feed intake than control only during fifth week of age. Similar findings were reported by Gaikwad *et al.* (2016) [7], wherein they found that the broilers fed with 1% AFP had lower feed intake when compared to other groups. In contrary to our results, Patel *et al.* (2016) [22] stated that AFP in diet of broilers increased the feed intake of birds. The Japanese quails supplemented with TLP showed no significant (p>0.05) difference in feed intake during the entire period of biological experiment. In consonance to the results of our present study, Lanjewar *et al.* (2008) [13] also found that broiler diet supplemented with TLP at the rate of 0.5 and 1% of the diet did not affect the feed intake of birds. Kumar *et al.* (2016) [11] and Gohel *et al.* (2019) [9] also stated similar results of TLP supplementation having no influence on feed intake of broilers. In contrary to our results, Pandian *et al.* (2013) [21] in RIR layers found that inclusion of 0.1% TLP to the diet increased feed consumption significantly (p<0.01). Vasanthakumar *et al.* (2013) [30] also found increase in feed intake of broilers supplemented with TLP (0.5%) and commercial grade tulsi extract (0.1%) in diet for 42 days. The treatment groups supplemented with combination of herbal supplements at lower levels (A-0.5% + T-0.25%) registered significant (p<0.05) decrease in feed intake only during fifth week. There is no notable research report supporting our findings could be traced in literature. In contrary Kavita *et al.* (2006) [10] found significant (p<0.05) increase in the feed intake of birds when herbal liver stimulant (Superliv DS®) containing *Ocimum sanctum* and *Emblica*

officinalis was supplemented at the rate of 125 and 250 g/T of feed. Similar results of increase in feed intake were given by Sanjyal and Sapcota (2012) [26].The statistical analysis on data of overall feed intake (0 to five weeks) did not show any significant (p>0.05) difference among the treatment groups. Similar findings were given by Patil *et al*. (2012) [23] in AFP supplementation and Thange (2009) [28] in TLP supplementation.

Table 4: Effect of supplementation of amla fruit powder, tulsi leaf powder and their combinations on weekly feed intake (g) of Japanese quails up to 5 weeks of age (Mean ± SE) (n=6)

Treatments	1st week	2nd week	3rd week	4th week	5th week	0-5 weeks
T_1(Control)	37.62±6.28	71.43±5.70	94.04^{bc}±4.34	154.76±12.96	247.62^{c}±4.71	605.47±25.78
T_2 (A-0.5%)	30.95±3.50	73.80±2.83	85.71^{a}±1.53	128.57±12.44	226.19^{a}±1.19	545.24±17.89
T_3 (A-1%)	32.14±3.36	73.90±2.85	88.09^{ab}±1.68	136.90±17.89	230.95^{ab}±3.94	561.90±25.70
T_4 (T-.25%)	32.14±3.36	73.84±2.83	89.29^{ab}±1.53	139.28±18.16	239.28^{bc}±6.48	573.80±23.53
T_5 (T-0.5%)	33.33±4.81	76.19±2.17	90.47^{abc}±1.19	135.72±14.28	241.66^{bc}±4.06	577.38±15.61
T_6 (A-0.5% + T- 0.25%)	34.52±4.23	73.86±2.83	88.09^{ab}±1.68	140.48±17.94	232.14^{ab}±2.83	569.04±24.78
T_7 (A-1% + T-0.5%)	39.28±4.34	78.57±2.48	96.43^{c}±1.68	144.05±19.30	235.72^{abc}±1.53	594.04±26.54
F value	0.498 NS	0.475 NS	2.901*	0.245 NS	3.389*	0.740 NS

A-Amla fruit powder; T-Tulsi leaf powder
Means bearing different superscripts within a column differ significantly (p<0.05)
*Significant (p<0.05) NS- Not Significant

3.4 Feed efficiency

The feed efficiency of Japanese quail with different age was presented in Table 5. Supplementation of AFP, TLP and their combinations in feed influenced the feed efficiency of Japanese quails significantly during first (p<0.01), third and fourth (p<0.05) weeks in this study. When compared to control group, the birds in treatments that were supplemented with AFP, had significant (p<0.05) improvement in feed efficiency during first, third and fourth weeks at 1% level of inclusion and at first week alone at 0.5% level compared to control. Similar results of improvement in feed efficiency were reported by Dalal *et al*. (2018) [6] by supplementing AFP at the rate of 1% in broiler diets. Nakajyoti *et al.* (2019) [18], also obtained similar results. However, Patil *et al.* (2012) [23] concluded in the other way that broilers when supplemented with AFP at the rate of 250 gram of per ton of feed and Vitamin E during nutritional stress for zero to six weeks of age did not improve feed efficiency. TLP supplementation at the rate of 0.5% showed significant (p<0.05) improvement in feed efficiency during first, third and fourth weeks of age. At inclusion level of 0.25%, there is significant (p<0.05) improvement only in first- and third-week feed efficiencies when compared to control. Similar results were given by Jahejo *et al*. (2019) [10] in broilers by supplementation of basil seed powder at the rate of 5 g/kg in feed for five weeks. Kumar *et al.* (2016) [11] also reported results which are in consonance to our study that inclusion of tulsi (leaf extract or powder) in diet of broilers improved FCR significantly. However, Vasanthakumar *et al.* (2013) [30] stated that supplementation of TLP (0.5%) and commercial grade tulsi extract (0.1%) in the broilers diet did not show any improvement in FCR of broilers which are in contrary to our findings. Significant (p<0.05) improvement in feed efficiency was recorded in fourth week in treatment groups that were supplemented with combination of AFP and TLP at lower levels (A-0.5% + T-0.25%) when compared to control. Similar results of better feed efficiency were given by Reddy *et al.* (2012) [25] by feeding broilers with amla, tulsi and turmeric either alone or in combination at the rate of 0.25 and 0.5% levels. Pande (2003) [22] also stated similarly that supplementation of broiler diets with *Ocimum sanctum*, *Emblica officinalis* and *Withania somnifera* was found to improve the feed conversion. The overall feed efficiency showed statistically non-significant (p>0.05) improvement among the treatment groups.

Table 5: Effect of supplementation of amla fruit powder, tulsi leaf powder and their combinations on feed efficiency of Japanese quails from 0 to 5 weeks of age (Mean ± SE) (n=6)

Treatment	1st week	2nd week	3rd week	4th week	5th week
T_1 (Control)	1.26^{b}±0.01	1.58±0.01	1.79^{b}±0.02	2.23^{c}±0.03	3.11±0.04
T_2 (A-0.5%)	1.05^{a}±0.02	1.51±0.05	1.66^{ab}±0.05	2.06^{abc}±0.05	2.94±0.06
T_3 (A-1%)	1.04^{a}±0.05	1.45±0.06	1.59^{a}±0.07	2.00^{ab}±0.09	2.83±0.13
T_4 (T-.25%)	1.04^{a}±0.03	1.48±0.04	1.62^{a}±0.04	2.10^{abc}±0.04	3.00±0.04
T_5 (T-0.5%)	1.08^{a}±0.04	1.44±0.7	1.60^{a}±0.09	1.97^{a}±0.10	2.90±0.15
T_6 (A-0.5% + T-0.25%)	1.20^{ab}±0.04	1.55±0.06	1.66^{ab}±0.04	2.03^{ab}±0.03	2.92±0.05
T_7 (A-1% + T-0.5%)	1.36^{b}±0.11	1.65±0.6	1.79^{b}±0.03	2.18^{bc}±0.01	2.96±0.03
F value	5.777**	1.961 NS	2.522*	2.775*	1.086 NS

A-Amla fruit powder; T-Tulsi leaf powder
Means bearing different superscripts within a column differ significantly.
** Significant (p<0.01) *Significant (p<0.05) NS- Not Significant

3.5 Livability

During the biological experiment of five weeks mortality of birds was recorded only during the first and second weeks which is statistically not significant (p>0.05). There is 100% livability from third to fifth week of experiment (Table 6).The overall livability of birds (from day-old to five weeks) showed no significant (p>0.05) difference among the treatment groups. Supplementation of AFP, TLP and their combinations did not affect livability in Japanese quails. There is no literature available supporting our results, Mandal *et al.* (2017) [14], Jahejo *et al*. (2019) [10] reported that AFP and TLP supplementation in diet improved livability of the broilers.

Table 6: Effect of supplementation of amla fruit powder and tulsi leaf powder and their combinations on livability (Mean ± SE) of Japanese quails from 0 to 5 weeks of age (n=6)

Treatments	1st week	2nd week	3rd week	4th week	5thweek	0-5 weeks
T_1 (Control)	99.60±0.40	100.0±0.0	100.0±0.0	100.0±0.0	100.0±0.0	99.92±0.08
T_2 (A-0.5%)	99.60±0.40	99.60±0.40	100.0±0.0	100.0±0.0	100.0±0.0	99.84±0.16
T_3 (A-1%)	99.60±0.40	99.60±0.40	100.0±0.0	100.0±0.0	100.0±0.0	99.84±0.16
T_4 (T-0.25%)	99.60±0.40	99.60±0.40	100.0±0.0	100.0±0.0	100.0±0.0	99.84±0.16
T_5 (T-0.5%)	99.60±0.40	100.0±0.0	100.0±0.0	100.0±0.0	100.0±0.0	99.92±0.08
T_6 (A-0.5% + T-0.25%)	99.60±0.40	99.60±0.40	100.0±0.0	100.0±0.0	100.0±0.0	99.84±0.16
T_7 (A-1% + T-0.5%)	99.60±0.40	99.60±0.40	100.0±0.0	100.0±0.0	100.0±0.0	99.84±0.16
F value	1.67^{NS}	0^{NS}	0^{NS}	0^{NS}	0^{NS}	0^{NS}

A-Amla fruit powder; T-Tulsi leaf powder NS- Not Significant

4. Conclusions

The present study indicates that the supplementation of amla fruit powder and tulsi leaf powder in Japanese quail can be done up to three weeks of age. Use of these up to three weeks may have economically beneficial effects to the farmers.

5. Conflict of Interest

Not available

6. Financial Support

Not available

7. References

1. Alom F, Mostofa M, Alam MN, Sorwar MG, Uddin J, Rahman MM. Effects of indigenous medicinal plant tulsi (*Ocimum sanctum*) leaves extract as a growth promoter in broiler. Res Agric Livest Fish. 2015;2(1):97-102.
2. Begum K, Talukdar JK, Kalita TCKP, Roy RN, Rahman M. Effect of dietary supplementation of gooseberry/amla (*Emblica officinalis*) powder on the performance of commercial broiler chicken. Int J Chem Stud. 2019;7(6):587-591.
3. Bhosale DS, Bhagwat SR, Pawar MM, Kulkarni RC. Comparative efficacy of dietary addition of tulsi (*Ocimum sanctum*) leaf powder and vitamin E on broiler performance. Indian J Anim Nutr. 2015;32(3):348-350.
4. Chaudhary RK, Singh VK, Singh SP, Gutam S, Tewari D. Effect of herbal supplements of Curcuma longa, *Emblica officinalis* and Nigella sativa on performance of broilers. Indian J Anim Nutr. 2015;32(1):90-95.
5. Chitra P. Study the effect of dietary supplementation of garlic (*Allium sativum*) and tulsi (*Ocimum sanctum*) leaf powder on growth performance of broilers. J Pharm Innov. 2020;SP-9(7):70-72.
6. Dalal R, Panwar VS, Ahlawat PK, Tewatia BS, Sheoran N. Effect of supplementation of amla (*Emblica officinalis*) fruit powder on growth performance during different growth phases of broiler chicken. Indian J Anim Res. 2018;8(4):621-628.
7. Gaikwad DS, Nage SP, Chavan SD. Effect of supplementation of amla (*Emblica officinalis*) on growth performance of broilers. J Trop Agric. 2016;34(3):679-683.
8. Gatne MM, Patil R, Ravikanth K, Shivi M, Rekhe DS. Evaluation of immunodulatory effect of stresroak® premix in broiler chick. Vet World. 2010;3(3):122.
9. Gohel BC, Garg DD, Patil SS, Savsani HH, Trivedi SP, Kadam SJ. Efficacy of *Ocimum sanctum* (tulsi) and Aloe vera leaves powder as phytogenic growth promoter in diet of broiler chickens. J Entomol Zool Stud. 2019;7(2):379-383.
10. Jahejo AR, Rajput N, Wen-xia T, Naeem M, Kalhoro DH, Kaka A, Jia FJ. Immunomodulatory and growth promoting effects of basil (*Ocimum basilicum*) and ascorbic acid in heat stressed broiler chickens. Pak J Zool. 2019;51(3):801.
11. Kumar R, Maan NS, Sihag S, Sheoran N, Baloda S, Shunthwal J. Effect of garlic (*Allium sativum*) and tulsi (*Ocimum sanctum*) leaf powder supplementation on growth performance and carcass traits in broiler chicken. Indian J Anim Nutr. 2016;33(3):320-325.
12. Kumar M, Sharma RK, Chadhari M, Jakhar A. Effect of Indian gooseberry and multienzyme supplementation on the performance of broilers during hot weather. Indian J Anim Nutr. 2013;29(4):388-392.
13. Lanjewar RD, Zanzad AA, Ramteke BN, Deshmukh GB. Effect of dietary supplementation of tulsi (*Ocimum sanctum*) leaf powder on the growth performance and serum lipid profile in broilers. Indian J Anim Nutr. 2008;25(4):395-397.
14. Mandal AB, Kulkarni R, Rokade JJ, Bhanja SK, Singh R. Effect of dietary addition of amla (*Emblica officinalis*) on performance and HSP70 gene expression in coloured broiler chicken during extreme summer. Indian J Anim Res. 2017;7(2):233.
15. Manojkumar, Singh KCP. Effect of supplementation of herbal product on the production potential of chickens. Indian Poult Sci Assoc Proc XXII Annual Conf Natl Symp; c2005; p. 67.
16. McDowells LR. Vitamins in animal and human nutrition. John Wiley & Sons; c2008.
17. Mode SG, Funde ST, Waghmare SP, Kolta AY. Effect of herbal immune modulator on body weight gain in immunosuppressed broilers birds. Vet World. 2009;2(7):269-270.
18. Nakajothi N, Nanjappan K, Selvaraj P, Jayachandran S, Visha P. Amelioration of stress in broiler chickens by feeding amla. Indian J Anim Res. 2019;79(11):1116-1119.
19. NRC. Nutrient Requirements of Domestic Animals. Nutrient Requirements of Poultry. National Research Council, National Academy Press, Washington, DC; c1994.
20. Pande CB. Stress and its natural solution presented at Livestock Asia Expo, Kualalampur, Malaysia; c2003.
21. Pandian C, Sundaresan A, Omprakash AV, Babu M, Prabakaran R. Effect of phytobiotics on production performance in Rhode Island Red (RIR) chicken. Indian J Anim Nutr. 2013;30(2):188-190.
22. Patel AP, Bhagwat SR, Pawar MM, Prajapati KB, Chauhan HD, Makwana RB. Evaluation of *Emblica officinalis* fruit powder as a growth promoter in commercial broiler chickens. Vet World. 2016;9(2):207.
23. Patil AS, Wankhede SM, Khale VR. Effect of *Emblica*

officinalis (amla) and vitamin E addition in the diet on growth performance of broiler chicken reared under nutritional stress. Indian J Anim Nutr. 2012;31(4):389-392.
24. Reddy LSS, Thangavel A, Leela V, NarayanaRaju KVS. Effect of dietary supplementation of tulsi (*Ocimum sanctum*) and selenium on lipid peroxidation levels and growth rate in broiler chickens. Tamil Nadu J Vet Anim Sci. 2008;3(3):144-149.
25. Reddy ET, Sudhakar Reddy P, Ramya P, Nagaraja Kumari K. Effect of supplementation of amla, tulsi and turmeric on bio-chemical parameters and immune responses in broilers. Indian J Poult Sci. 2012;47(1):114-117.
26. Sanjyal S, Sapcota S. Supplementation of broilers diet with different sources of growth promoters. Nepal J Sci Tech. 2012;12:41-50.
27. Snedecor GW, Cocharan WG. Statistical Methods. 8th ed. New Delhi, India: Affiliated East West Press Pvt. Ltd; c1994.
28. Thange HP. Efficacy of different herbal preparations in broiler diet for immunomodulation. Doctoral dissertation, MAFSU, Nagpur, India; c2009.
29. Tanwar R. Effect of Aloe vera (*Aloe barbadensis*) and tulsi (*Ocimum sanctum*) supplementation on performance of broiler chickens. Doctoral dissertation, Rajasthan University of Veterinary and Animal Sciences, Bikaner, India; c2018.
30. Vasanthakumar P, Sasikumar P, Pangayarselvi B, Chandrasekaran D, Doraisamy KA, Senthilkumar S, Purushothaman MR. Performance of broiler chicken fed tulsi leaf powder and leaf extract supplemented diets during summer to alleviate heat stress. Indian J Anim Sci. 2013;83(9):930-931.

How to Cite This Article
Sumanth S, Sangilimadan K, Churchil RR, Sesh PSL. Effect of dietary supplementation of amla (*Emblica officinalis*) fruit powder, tulsi (*Ocimum sanctum*) leaf powder and their combination on production performance of Japanese quails. International Journal of Veterinary Sciences and Animal Husbandry. 2024;9(3):351-356.