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Interaction Effect of Dietary Supplementation of Giloy Herb and Ascorbic acid with Different Bedding Materials on Fortnight Body Weight and Gain of Japanese Quail During Growth Period

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ABSTRACT

The present experiment was conducted on four hundred thirty two (432) seven day-old Japanese quail chicks for a period of 24 weeks to investigates the effects of supplementation (giloy, ascorbic acid and combination of both) along with different bedding materials (sand, saw dust and wheat straw) on body weight and body weight gain of Japanese quails (*Coturnix coturnix japonica*). Birds were randomly and uniformly distributed in total 12 treatment groups comprising of 36 birds in each group and each group further divided into two replicates comprising 18 birds in each replicate. Highly significant ($P<0.01$) effect of incorporation of supplements and different bedding material was found on mean body weight and mean body weight gain. The interaction effect of bedding material and supplementation was significant on body weight and body weight gain of earlier age. The highest mean body weight and gain of Japanese quail was found in sand bedding material group. The present studies show that combination of dietary supplements giloy and vitamin- C significantly improves body weight of quail.

HIGHLIGHTS

- Supplementation of giloy and ascorbic acid in the diet improves body weight and body weight gain in Japanese quails.
- The interaction effect of dietary supplementation with bedding material on body weight and body weight gain in Japanese quail were found significant at earlier age.

Keywords: Ascorbic acid, Giloy, Bedding material, Body weight, Body weight gain, Japanese quail

Poultry is one of the fastest growing components of the agricultural sector in India. Poultry plays an important role as animal protein source in human diet in terms of egg and meat. Japanese quail (*Coturnix coturnix japonica*) is one of the most efficient biological machines for converting feed into animal protein of high biological value (Das *et al*., 2012). In recent years, the use of dietary plant derived natural bioactive compounds (phytobiotics) and feed additive has attracted increased attention to augment performance and health in poultry production. Various types of feed additives such as antibiotics, enzymes, hormones, prebiotics, probiotics, herbal products *etc*., are being used as growth stimulants in poultry production. *Tinospora cordifolia*, which is known by the common names heart-leaved moonseed, guduchi, and giloy, is an herbaceous vine of the family Menispermaceae indigenous to tropical regions of the Indian subcontinent (Sengupta *et al*., 2011). Giloy is a rich source of protein and micronutrients, such as iron, zinc, copper, calcium, phosphorus, and manganese (Saeed *et al*., 2020). The most clearly established functional role for vitamin- C

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involves collagen biosynthesis. Beneficial effects result from ascorbic acid in the synthesis of "repair" collagen (Bera *et al*., 2010).

In agriculture, Quail litter is a mixture of quail excreta, spilled feed, spontaneously fallen feathers and farm bedding material (Seidavi *et al*., 2015). Wood sawdust is the most common used bedding material, however there were many alternative materials that may be used such as peanut hulls (Lien *et al*., 1998), rice and wheat straw (Benabdeljelil and Ayachi, 1996), rice hull ash (Chamblee and Yeatman, 2003) and other dry, absorbent, low-cost organic materials. Birds spend their entire life in contact with the litter material. Therefore, its quality is considered a crucial factor of poultry welfare (Savory, 1995).

Hence, the present experimental design was planned to carry out study of effect of bedding materials such as sand, wheat straw and saw dust with dietary supplementation of giloy herb (*Tinospora cordifolia*) and ascorbic acid and their combination on body weight and gain of Japanese quail.

MATERIAL AND METHODS

Location of study area

The present study was conducted at Poultry unit, Livestock Farm Complex, College of Veterinary and Animal Science, Bikaner, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan and the proximate analysis of feed and supplements was carried out at Department of Animal Nutrition, College of Veterinary and Animal Science, RAJUVAS, Bikaner, Rajasthan.

Experimental design of study

The study was undertaken on four hundred thirty two (432) seven day-old Japanese quail chicks which were purchased from central poultry development organization, Chandigarh. The study was conducted for a period of 24 weeks. These birds were equally and randomly divided into twelve treatments groups according to feed supplements and different bedding materials as sand, saw-dust and wheat straw and each treatment group was further replicated into two sub-groups (R_1-R_2) to make sure uniformity in various treatment groups as shown in Table 1. Thus, factorial design (3×4) was adopted for the present study to estimate the effect of giloy at 5 gm/kg and ascorbic acid at 240 mg/kg level alone as well as in combination, along with interaction effect of dietary supplementation and bedding material on body weight and body weight gain and total number of interaction groups was 12 in present study.

Parameters studied

Fortnightly average body weight (BW) and Fortnightly average body weight gain (BWG)

All the seven day old experimental chicks were weigh on individual basis and after that they were weighing at fortnight interval.

STATISTICAL ANALYSIS

The data obtained in the experiment were analysed statistically for main effect of Geloi or ascorbic acid alone as well as interaction (Geloi × Ascorbic acid) and effect of different bedding material as well as interaction with feed supplementation in factoral design (3×4) by factorial analysis of variance interaction design technique (Snedecor and Cochran, 1989) using statistical package SPSS software (*Ver.* 26.0, 2005). The means of different experimental groups were tested for statistical significance by Duncan's New Multiple Range Test (DNMRT) as modified by Kramer (1956).

RESULTS AND DISCUSSION

Effect of dietary supplementation, bedding material and their interaction on body weight

The statistical analysis of variance of data revealed highly significant ($P<0.01$) effect of incorporation of supplements on mean body weight of Japanese quail from 3rd week to completion of study at 24th week (Table 2). During entire period of study the highest mean body weight of Japanese quail was found in T_3 group (combination of Giloy and Ascorbic acid as dietary supplement) followed by T_2 group (Ascorbic acid as dietary supplement), T_1 group (Giloy as dietary supplement) and T_0 group (control) respectively (Table 3).

Table 1: Random distributions of birds (Japanese quail) and experimental feeds offered in different treatment groups

Sl. No.	Type of bedding materials	Treatments Groups		Treatment details	Number of birds (Japanese quail)
1	B_1 (sand)	T_{10}	$T_{10}R_1$	Basal diet	18
			$T_{10}R_2$	Basal diet	18
		T_{11}	$T_{11}R_1$	Basal diet + 5 g/kg giloy**	18
			$T_{11}R_2$	Basal diet + 5 g/kg giloy**	18
		T_{12}	$T_{12}R_1$	Basal diet + 240 mg/kg ascorbic acid**	18
			$T_{12}R_2$	Basal diet + 240 mg/kg ascorbic acid**	18
		T_{13}	$T_{13}R_1$	Basal diet + mixture of 5 g/kg giloy and 240 mg/kg ascorbic acid**	18
			$T_{13}R_2$	Basal diet + mixture of 5 g/kg giloy and 240 mg/kg ascorbic acid**	18
2	B_2 (saw-dust)	T_{20}	$T_{20}R_1$	Basal diet	18
			$T_{20}R_2$	Basal diet	18
		T_{21}	$T_{21}R_1$	Basal diet + 5 g/kg giloy**	18
			$T_{21}R_2$	Basal diet + 5 g/kg giloy**	18
		T_{22}	$T_{22}R_1$	Basal diet + 240 mg/kg ascorbic acid**	18
			$T_{22}R_2$	Basal diet + 240 mg/kg ascorbic acid**	18
		T_{23}	$T_{23}R_1$	Basal diet + mixture of 5 g/kg giloy and 240 mg/kg ascorbic acid**	18
			$T_{23}R_2$	Basal diet + mixture of 5 g/kg giloy and 240 mg/kg ascorbic acid**	18
3	B_3 (wheat straw)	T_{30}	$T_{30}R_1$	Basal diet	18
			$T_{30}R_2$	Basal diet	18
		T_{31}	$T_{31}R_1$	Basal diet + 5 g/kg giloy**	18
			$T_{31}R_2$	Basal diet + 5 g/kg giloy**	18
		T_{32}	$T_{32}R_1$	Basal diet + 240 mg/kg ascorbic acid**	18
			$T_{32}R_2$	Basal diet + 240 mg/kg ascorbic acid**	18
		T_{33}	$T_{33}R_1$	Basal diet + mixture of 5 g/kg giloy and 240 mg/kg ascorbic acid**	18
			$T_{33}R_2$	Basal diet + mixture of 5 g/kg giloy and 240 mg/kg ascorbic acid**	18
	Total birds				432

** Prepared at farm by manual mixing of giloy and ascorbic acid in basal diet.

Table 2: Mean sum of squares for Body Weight at different weeks

Source of variation	DF	Age in weeks												
		MEAN SQUARES												
		1st	3rd	5th	7th	9th	11st	13rd	15th	17th	19th	21st	23rd	24th
Supplement	3	0.03	75.82**	480.54**	980.64**	1177.24**	1308.40**	1659.49**	1932.78**	1977.16**	1980.83**	1954.83**	1765.98**	1840.75**
Bedding	2	0.11	0.31	44.23**	90.89**	255.26**	387.30**	481.33**	481.05**	485.76**	449.36**	410.35**	338.78**	381.05**
Interaction (T×B)	6	0.29	0.68*	3.04**	1.18**	0.84	0.96	3.76*	6.56**	8.59*	7.21	7.55	8.97	8.68
Error	12	0.09	0.19	0.11	0.21	0.61	0.58	0.92	0.91	2.04	3.22	3.98	6.31	6.64

*= significant (P≤0.05), **= highly significant (P≤0.01).

Table 3: Effect of dietary supplementation on Body Weight (g) at different weeks

Supplement effect	Age in weeks												
	1st	3rd	5th	7th	9th	11st	13rd	15th	17th	19th	21st	23rd	24th
T_0	25.36	104.84^a	167.03^a	190.07^a	205.66^a	217.12^a	223.09^a	229.83^a	229.94^a	230.32^a	231.54^a	229.81^a	227.69^a
T_1	25.42	106.23^b	170.72^b	195.54^b	212.09^b	224.1^b	233.66^b	242.63^b	242.75^b	243.72^b	244.99^b	242.89^b	240.81^b
T_2	25.51	108.7^c	176.54^c	204.07^c	221.76^c	234.16^c	244.13^c	252.47^c	252.76^c	253.81^c	254.88^c	253.11^c	251.22^c
T_3	25.53	112.94^d	187.52^d	219.39^d	237.86^d	251.14^d	262.11^d	272.38^d	272.95^d	273.44^d	274.42^d	270.46^d	269.17^d
SEM	0.12	0.17	0.13	0.19	0.32	0.31	0.39	0.38	0.58	0.73	0.81	1.02	1.05

Means having different superscripts in a column differ significantly (P≤0.05).

The highly significant (P<0.01) effect of bedding materials on mean body weight of Japanese quail was obtained from 5th week to completion of study at 24th week except at 3rd week (Table 2). During entire period of study the highest mean body weight of Japanese quail was found in B_1 group followed by B_2 group, and B_3 group respectively (Table 4).

The effect of interaction between dietary supplements and different bedding materials on mean body weight of Japanese quail was found to be highly significant (P<0.01) on 5th, 7th and 15th week and significant (P<0.05) at 3rd, 13rd and 17th week (Table 2). The highest increase in body weight during entire period of study was reported in interaction group T_{13} in which sand bedding material was used with supplementation of both combination of giloy and ascorbic acid (Table 5).

The similar result of dietary supplementation of giloy on mean body weight was observed by Maryamma *et al*. (1990) in Duck. Similarly, the present result were also agreed with the findings observed in Japanese quails by Ipek *et al.* (2006), Tuleun *et al*. (2011), Gupta *et al*. (2016), Sigolo *et al.* (2019) and Abou-Kassem *et al*. (2020). The result of bedding material conforms the findings of Bilgili *et al*. (1999) who observed Sand was best a litter material for broilers in three successive trials. Similarly, Farghly *et al.* (2015) observed significant effect of bedding material on body weight in Japanese quail.

Effect of dietary supplementation, bedding material and their interaction on mean body weight gain

The highly significant (P<0.01) effect of incorporation of supplements on mean body weight gain of Japanese quail from 3rd week to completion of study at 24th week was observed (Table 6). In which at 3rd week highest body weight gain was recorded in T_3 group followed by T_2, T_1 and then control group T_0. Then body weight gain gradually decreases in all groups in further weeks of study (Table 7). Bedding materials had highly significant (P<0.01) effect of on mean body weight gain of Japanese quail from 5th

Table 4: Effect of bedding materials on Body Weight (g) at different weeks

Bedding	Age in weeks												
effect	1st	3rd	5th	7th	9th	11st	13rd	15th	17th	19th	21st	23rd	24th
B_1	25.58	108.39	178.10^{c}	205.81^{c}	224.87^{c}	238.30^{c}	248.78^{c}	257.59^{c}	257.87^{c}	258.23^{c}	258.88^{c}	255.52^{c}	254.21^{c}
B_2	25.44	108.13	174.64^{b}	201.89^{b}	219.58^{b}	232.16^{b}	240.17^{b}	248.18^{b}	248.54^{b}	249.41^{b}	250.91^{b}	249.18^{b}	247.06^{b}
B_3	25.34	108.01	173.62^{a}	199.10^{a}	213.58^{a}	224.42^{a}	233.30^{a}	242.21^{a}	242.39^{a}	243.32^{a}	244.59^{a}	242.51^{a}	240.41^{a}
SEM	0.11	0.15	0.11	0.16	0.27	0.27	0.34	0.33	0.50	0.63	0.70	0.88	0.91

Means having different superscripts in a column differ significantly (P≤0.05).

Table 5: Effect of dietary supplements × bedding materials Interaction on Body Weight (g) at different weeks

Interaction	Age in weeks												
Effect	1st	3rd	5th	7th	9th	11st	13rd	15th	17th	19th	21st	23rd	24th
T_{10}	25.44^{bc}	104.49^{a}	169.37^{c}	194.72^{d}	211.48	223.63	232.10^{d}	240.09^{d}	240.59^{d}	240.6	241.56	239.47	237.74
T_{11}	25.85^{c}	106.18^{b}	174.74^{e}	198.33^{e}	217.21	230.75	240.14^{f}	248.58^{f}	248.32^{f}	249.74	250.47	248.21	246.50
T_{12}	25.52^{bc}	109.11^{d}	178.60^{g}	207.07^{h}	227.08	240.67	251.99^{h}	260.13^{h}	260.05^{h}	260.16	260.79	258.25	257.27
T_{13}	25.51^{bc}	113.79^{f}	189.72^{j}	223.14^{k}	243.72	258.16	270.89^{j}	281.58^{k}	282.53^{k}	282.43	282.70	276.17	275.32
T_{20}	25.7^{bc}	105.12^{a}	165.33^{a}	189.28^{b}	205.53	217.4	221.08^{b}	226.84^{b}	227.17^{b}	227.69	229.39	228.26	225.16
T_{21}	24.78^{a}	106.31^{b}	168.74^{c}	195.59^{d}	212.03	223.91	233.22^{d}	242.11^{d}	242.49^{de}	243.17	244.80	242.2	240.26
T_{22}	25.58^{bc}	108.98^{d}	177.10^{f}	203.63^{g}	222.02	235.12	244.26^{g}	252.21^{g}	252.73^{g}	254.20	255.21	254.3	252.59
T_{23}	25.71^{bc}	112.1^{d}	187.4^{i}	219.08^{j}	238.74	252.23	262.14^{i}	271.55^{j}	271.79^{j}	272.59	274.25	271.96	270.23
T_{30}	24.96^{ab}	104.90^{a}	166.39^{b}	186.22^{a}	199.96	210.33	216.10^{a}	222.57^{a}	222.08^{a}	222.68	223.68	221.71	220.18
T_{31}	25.62^{bc}	106.19^{b}	168.69^{c}	192.71^{c}	207.05	217.63	227.64^{c}	237.19^{c}	237.44^{c}	238.24	239.72	238.26	235.68
T_{32}	25.43^{bc}	108.00^{c}	173.93^{d}	201.53^{f}	216.18	226.69	236.15^{e}	245.08^{e}	245.52^{ef}	247.08	248.65	246.8	243.80
T_{33}	25.37^{bc}	112.93^{d}	185.46^{h}	215.95^{i}	231.13	243.02	253.31^{h}	264.02^{i}	264.54^{i}	265.31	266.31	263.27	261.98
SEM	0.22	0.31	0.23	0.32	0.55	0.54	0.68	0.67	1.01	1.27	1.41	1.77	1.82

Means having different superscripts in a column differ significantly (P≤0.05).

Table 6: Mean sum of squares for Body Weight Gain at different weeks

Source of variation	DF	Age in weeks MEAN SQUARES							
		3rd	5th	7th	9th	11st	13rd	15th	Cumulative
Supplement	3	72.81**	174.66**	88.39**	9.64**	3.49**	28.54**	12.90**	1917.18**
Bedding	2	0.05	37.14**	11.01**	44.21**	14.00**	12.51**	2.01	466.58**
Interaction (TxB)	6	1.19*	4.06**	5.96**	1.06	0.34	2.25	0.95	7.62**
Error	12	0.37	0.22	0.34	0.45	0.19	1.03	0.94	1.07

*= significant (P≤0.05), **= highly significant (P≤0.01)

Table 7: Effect of dietary supplements on Body Weight Gain (g) at different weeks

Supplement effect	Age in weeks							Cumulative
	3rd	5th	7th	9th	11st	13rd	15th	
T_0	79.48^{a}	62.19^{a}	23.04^{a}	15.59^{a}	11.46^{a}	5.97^{a}	6.74^{a}	204.46^{a}
T_1	80.81^{b}	64.49^{b}	24.82^{b}	16.55^{b}	12.01^{ab}	9.56^{b}	8.97^{b}	217.21^{b}
T_2	83.19^{c}	67.84^{c}	27.53^{c}	17.69^{c}	12.40^{b}	9.97^{bc}	8.34^{b}	226.96^{c}
T_3	87.41^{d}	74.58^{d}	31.87^{d}	18.47^{c}	13.28^{c}	10.97^{c}	10.27^{c}	246.85^{d}
SEM	0.25	0.19	0.23	0.27	0.17	0.41	0.39	0.42

Means having different superscripts in a column differ significantly (P≤0.05).

Table 8: Effect of bedding materials on Body Weight Gain (g) at different weeks

Bedding effect	Age in weeks							Cumulative
	3rd	5th	7th	9th	11st	13rd	15th	
B_1	82.81	69.71^{c}	27.70^{b}	19.05^{c}	13.43^{c}	10.47^{b}	8.81	232.016^{c}
B_2	82.68	66.51^{b}	27.25^{b}	17.68^{b}	12.58^{b}	8.01^{a}	8.00	222.736^{b}
B_3	82.66	65.61^{a}	25.48^{a}	14.47^{a}	10.83^{a}	8.88^{a}	8.91	216.87^{a}
SEM	0.21	0.16	0.20	0.23	0.15	0.35	0.34	0.366572

Means having different superscripts in a column differ significantly (P≤0.05).

Table 9: Effect of dietary supplements × bedding materials Interaction on Body Weight Gain (g) at different weeks

Interaction Effect	Age in weeks							Cumulative
	3rd	5th	7th	9th	11st	13rd	15th	
T_{10}	79.05^{a}	64.87^{c}	25.35^{c}	16.75	12.15	8.47	7.98	214.64^{d}
T_{11}	80.33^{abc}	68.55^{ef}	23.59^{b}	18.88	13.54	9.38	8.44	222.73^{g}
T_{12}	83.59^{e}	69.49^{f}	28.46^{e}	20.01	13.59	11.32	8.14	234.61^{i}
T_{13}	88.28^{g}	75.92^{h}	33.42^{g}	20.58	14.44	12.73	10.69	256.07l
T_{20}	79.42^{ab}	60.21^{a}	23.94^{b}	16.25	11.86	3.68	5.76	201.14^{b}
T_{21}	81.53^{cd}	62.43^{b}	26.84^{d}	16.44	11.88	9.31	8.89	217.33
T_{22}	83.40^{e}	68.12^{e}	26.53^{cd}	18.39	13.1	9.14	7.95	226.63^{h}
T_{23}	86.38^{f}	75.3^{h}	31.68^{f}	19.66	13.49	9.91	9.40	245.83^{k}
T_{30}	79.94^{ab}	61.48^{b}	19.83^{a}	13.74	10.37	5.77	6.47	197.61^{a}
T_{31}	80.57^{bc}	62.5^{b}	24.02^{b}	14.34	10.58	10.00	9.55	211.57^{c}
T_{32}	82.57^{de}	65.93^{d}	27.59^{de}	14.65	10.51	9.46	8.93	219.64^{f}
T_{33}	87.56^{fg}	72.53^{g}	30.49^{f}	15.17	11.89	10.28	10.71	238.65^{j}
SEM	0.43	0.33	0.41	0.47	0.31	0.71	0.68	0.73

Means having different superscripts in a column differ significantly (P≤0.05).

week to 13rd week except at 3rd week and 15th week (Table 6). The highest cumulative weight gain at 15th week was recorded in group reared on sand as compare to rest of the groups (Table 8). The interaction between dietary and bedding material was found to be highly significant (P≤0.01) in earlier age of weeks (3rd, 5th and 7th week) afterwards interaction effect was non-significant on body weight gain (Table 6). In which highest body weight gain was obtained in interaction group T_{13} in which sand was used as bedding material with supplementation of both combination of Giloy and ascorbic acid (Table 9).

The significant effect of supplementation of Giloy and ascorbic acid were similar to the findings of Ipek (2006) and Sigolo *et al*. (2019) in Japanese quails. Similar results were also reported by Singh *et al.* (2014) and Gupta *et al*. (2018) in broilers.

Shields *et al*. (2005) found sand a preferred resting substrate for growth in broiler. Ramadan *et al*. (2013) revealed that birds reared on (wheat straw + sand) exhibited significantly higher and body weight gain than birds reared on wheat straw.

CONCLUSION

Combination of giloy and vitamin- C provides the highest positive effect on mean body weight, body weight gain in Japanese quails. In present experiment, sand bedding material was found beneficial for performance traits. Sand with combination supplementation give better result for body weight and body weight gain in present experiment.

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