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Effect of Dietary Supplementation of Giloy (*Tinospora cordifolia*) Herb and Ascorbic Acid Along with Different Bedding Materials on Cost Economics of Japanese Quail Rearing

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ABSTRACT

The present studywas conducted during October, 2020 to April, 2021 at the Poultry unit, Livestock Farm Complex, College of Veterinary and Animal Science, Bikaner, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India to investigate the effects of Giloy and ascorbic acid supplementation along with different bedding materials (sand, saw dust and wheat straw) on cost economics of Japanese quails rearing for 24 weeks .Four hundred thirty two (432) laying Japanese quails (7 day old) were divided into three of different bedding material and each bedding material group further subdivided into four groups on the basis of supplementation (control, Giloy, ascorbic acid and combination of both). Thus, 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. Quails were fed a basal diet and the basal diet supplemented with 5 g kg^{-1} giloy supplement of diet, 240 mg of ascorbic acid kg^{-1} supplement of diet and a combination of 5 g kg^{-1} giloy and 240 mg of ascorbic acid kg^{-1} supplement of diet. The net profit/bird based on overall interaction effect was found highest in the group supplemented with giloy alone and reared on wheat straw as bedding material followed by saw dust and sand bedding material group, which were supplemented with giloy alone, respectively. The present study shows that dietary supplementation of giloyalong with wheat straw bedding material is beneficial for cost economics.

KEYWORDS: Ascorbic acid, cost economics, giloy, wheat straw

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1. INTRODUCTION

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. India ranks fourth in total production of poultry meat in the world (Anonymous, 2019). The popularity of poultry meat is on the rise during the last two decades. The total poultry population in the country has increased by 16.80% over the previous census and the total poultry in the country is 851.81 million numbers in 2019 (Anonymous, 2019a).

Japanese quail (*Coturnix coturnix japonica*) is one of the most efficient biological machines for converting feed into animal protein of high biological value. Japanese quails have less feeding requirement (about 20–25 g day^{-1}) compared to chicken (120-130 g day^{-1}). Quail attains a market weight of 140–180 g between 5–8 weeks of age and reaches peak egg production at the age of 5–8 weeks (Garwood and Diehl, 1987).

Recent trend in broiler production is to provide feed containing the feed additives to improve efficiency and get maximum returns in shortest possible time. Various types of feed additivessuch 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). The most clearly established functional role for vitamin C involves collagen biosynthesis. Beneficial effects result from ascorbic acid in the synthesis of "repair" collagen (Bera et al., 2010).

Wood sawdust is the most common used bedding material, however there were many alternative materials that may be used such as peanut hulls, rice and wheat straw, rice hull ash and other dry, absorbent, low-cost organicmaterials. Moreover, sand is occasionally used as a bedding material (Shields et al., 2005). Birds spend their entire life in contact with the litter material. Therefore, its quality is considered a crucial factor of poultry welfare.

Koli et al. (2017) investigated the effect of use of different litter material combination on growth performance and economics of broiler production. They reported that there were highly significant effects of different types of litter combination of different treatment groups on weekly body weight and mortality.

Mohammed et al. (2017) studied on impact of different litter materials on behavior, growth performance, feet health and plumage score of Japanese quail (*Coturnix japonica*). There was no significant effect of different bedding materials on quail performance (body weight, weight gain, feed consumption, feed conversion, feet problems, plumage score and mortality). Besides Ramadan et al. (2013); Chakma et al. (2012), also studiedperformance and carcass characteristics of broilers raised on different bedding materials such as saw dust, wood shavings and rice husks etc in broilers.

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 cost economics of rearing Japanese quail at poultry farm.

2. MATERIALS AND METHODS

2.1. Location of study area

The present study was conducted during October, 2020 to April, 2021 at Poultry unit, Livestock Farm Complex, College of Veterinary and Animal Science, Bikaner, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India.

2.2. 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. Out of 432 birds 72 birds were slaughtered at the age of 8 weeks for evaluating carcass characteristics and remaining 360 birds were further used for remaining traits (growth traits and egg production traits) entire the end of experimental trail. The study was conducted for a period of 24 weeks.

The factorial design (3×4) was adopted for the present study. The 432 seven-day old Japanese quail chicks were equally and randomly divided into twelve treatments groups according to feed supplements and different bedding materials and each treatment group was further replicated into two sub-groups (R1-R2) to make sure uniformity in various treatment groups. The chicks were reared on sand, saw-dust and wheat straw in group B_1, B_2 and B_3 respectively, to study effect of bedding material on various traits. Further, each bedding material were subdivided in one control and three dietary treatment groups (giloy, ascorbic acid and combination of both) equally and denoted by T_0, T_1, T_2 and T_3, respectively to study dietary effect on traits. Thus, total number of interaction groups was 12 in present study.

2.3. Composition of experimental ration and feeding

Commercially available readymade starter and finisher and layer rations were procured and feed additives such as giloy (*Tinospora cordifolia*) and ascorbic acid were supplemented. The giloy and ascorbic acid were supplemented at 5 g kg^{-1}

and 240 mg kg^{-1} in alone and combination, respectively.

2.4. Litter materials

Different litter materials such as sand, saw dust and wheat straw were used as per the experimental design. During first seven days, newspapers were spread on litter material and from 8th day onward till the completion of experiment chicks were reared on respective litter material of about 6 inches of depth.

2.5. Parameters studied

2.5.1. Cost economy

The cost of rearing chicks for complete experimental trial was calculated by taking into consideration the cost of chick, cost of supplement and cost of total feed consumed by bird. Gross profit per bird was calculated by subtracting total feed cost, cost of supplement and cost of chick from the price of egg and price fetched per bird after selling it in the local market on live per bird basis.

3. RESULTS AND DISCUSSION

The objectives of the present study were carried out to determine the effect of giloy (*Tinospora cordifolia*) and ascorbic acid (vitamin C) alone and in combination as dietary supplementation, assess the effect of different bedding materials (sand, saw-dust and wheat straw) and their interaction with supplements on performance, meat and egg production of Japanese quail. After completion of experiment, cost economics of various groups was also estimated.

3.1. Cost economics

On the basis of interaction between effect of dietary supplementation and bedding materials the net profit per bird was estimated on the basis of live bird selling, egg selling, total feed consumption, feed and supplements cost and quail chick cost. Before study of cost economics of this experiment, there is need to know interaction effect of dietary supplementation and bedding materials on body weight, body weight gain, feed consumption, FCR and egg production/bird. These results are summarized in tabular form as below.

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

The present studies show that combination of dietary supplements giloy and vitamin-C significantly improves body weight of quail. 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, 13th and 17th week. 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 1).

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), Sigolo et al. (2019) and Abou-Kassem et al. (2020).

Table 1: Effect of dietary supplements×bedding materials interaction on body weight (g) at different weeks

IE	Age in weeks												
	1st	3rd	5th	7th	9th	11th	13th	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

IE: Interaction effect; Means having different superscripts in a column differ significantly (p≤0.05)

Similarly, Farghly et al. (2015) observed significant effect of bedding material on body weight in Japanese quail.

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

The interaction between dietary and bedding material was found to be highly significant ($p \leq 0.01$) in earlier age of weeks (3rd, 5th and 7th week) afterwards interaction effect was non-significant on body weight gain. 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 2).

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.

Table 2: 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	11th	13th	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 ($p \leq 0.05$)

3.4. Effect of dietary supplementation, bedding material and their interaction on feed consumption

Non-significant effect of interaction between incorporation of dietary supplementation and different bedding materials on feed consumption was observed throughout the experiment except 3rd and 9th week of study. The highest Fortnight feed consumption of Japanese quail was found in sand bedding material group supplemented with combination (Table 3).

The similar result of dietary supplementation of giloy on feed consumption was observed by Dharmaraj (2015) and Jain (2018) in poultry. Similarly, the present results were also agreed with the findings observed in Japanese quails by Ipek et al. (2006) and Shit et al. (2012). Present results are in agreement with Giri (2004), Ramadan et al. (2013) they concluded significant effect of different bedding materials on quail performance including feed consumption. Dhaliwal et al. (2018) also reported significant effect of bedding materials on broiler performance.

3.5. Effect of dietary supplementation, bedding material and their interaction on feed conversion ratio (FCR)

The effect of interaction between incorporation of dietary supplementation and different bedding materials on feed conversion ratio was also observed to be highly significant during 3rd and 5th week of the experiment. The lowest FCR was reported in interaction group T_{13} in which sand was used as bedding material with supplementation of both combination of giloy and ascorbic acid.

Similar result was shown by Ipek (2006) who found significant ($p \leq 0.05$) effect of ascorbic acid on feed conversion ratio in Japanese quails. The findings of the above experiment were in close agreement with Jain (2018) in broilers also (Table 4).

The results of the present study were supported by Chakma et al. (2012) who observed that at 35 days the body weight of chicken reared on sawdust recorded best FCR than other litters. Similarly, Asaniyan et al. (2007) reported improved broiler FCR by use of different litter materials.

Table 3: Effect of dietary supplements×bedding materials interaction on feed consumption (g) at different weeks

IE	Age in weeks												
	3rd	5th	7th	9th	11th	13th	15th	17th	19th	21st	23rd	24th	Cumulative
T_{10}	182.02^{ac}	237.95	302.00	289.06^{a}	306.18	307.39	310.10	310.75	311.98	313.98	312.48	155.1	3339.01
T_{11}	201.77^{def}	247.91	306.76	321.50^{de}	311.60	313.33	315.68	316.59	318.16	318.94	316.74	157.18	3446.18
T_{12}	192.55^{bd}	244.59	305.81	294.44^{ab}	310	312.65	315.06	315.87	317.6	319	316.37	156.99	3400.94
T_{13}	206.90^{ef}	263.07	311.52	340.61^{f}	318.4	319.99	321.61	322.1	323.88	325	321.97	159.66	3534.74
T_{20}	185.95^{ab}	239.47	304.50	291.47^{ab}	311.58	314.02	316.16	316.61	317.05	318.60	316.5	157.08	3389.02
T_{21}	203.65^{ef}	253.10	308.26	326.85^{e}	316.25	318.17	319.68	321.02	323.08	323.09	320.81	159.06	3493.05
T_{22}	196.87^{de}	245.3	305.47	297.50^{bc}	312.17	313.75	315.65	316.59	318.02	319.99	318.06	157.62	3417.02
T_{23}	211.09^{f}	268.10	314.56	348.62^{g}	320.05	321.97	324.08	326.11	327.97	329.42	326.94	162.53	3581.46
T_{30}	192.63^{bcd}	253.15	305.86	304.87^{c}	313.07	315.99	317.57	318.65	320.08	322.16	320.57	158.43	3443.06
T_{31}	232.88^{g}	271.05	311.48	325.41^{e}	321.03	324.11	326.10	326.67	327.05	328.42	324.73	161.19	3580.15
T_{32}	226.57^{g}	268.95	308.84	314.47^{d}	317.71	319.23	321.11	321.19	322.94	324.32	322.03	160.13	3527.51
T_{33}	246.4^{h}	283.49	316.17	322.14^{de}	325.10	327.44	330.17	331.64	332.17	332.44	330.31	163.31	3640.82
SEm±	3.19	2.86	0.96	2.50	0.98	1.21	1.39	1.50	1.36	1.39	1.56	0.92	12.18

IE: Interaction effect; Means having different superscripts in a column differ significantly ($p \leq 0.05$)

Table 4: Effect of dietary supplement×bedding material interaction on feed conversion ratio (FCR) at different weeks

Interaction effect	Age in weeks		Cumulative
	3rd	5th	
T_{10}	2.30^{a}	3.66^{c}	2.98^{ab}
T_{11}	2.51^{c}	3.61^{bc}	3.06^{b}
T_{12}	2.30^{a}	3.51^{ab}	2.91^{a}
T_{13}	2.34^{ab}	3.46^{a}	2.90^{a}
T_{20}	2.34^{ab}	3.97^{de}	3.15^{c}
T_{21}	2.49^{c}	4.05^{ef}	3.27^{d}
T_{22}	2.36^{ab}	3.60^{bc}	2.98^{ab}
T_{23}	2.44^{bc}	3.56^{abc}	3.00^{ab}
T_{30}	2.40^{abc}	4.11^{f}	3.26^{d}
T_{31}	2.89^{e}	4.33^{g}	3.61^{f}
T_{32}	2.74^{d}	4.07^{ef}	3.41^{e}
T_{33}	2.81^{de}	3.90^{d}	3.36^{de}
SEm±	0.03	0.04	0.01

Means having different superscripts in a column differ significantly ($p \leq 0.05$)

3.6. Effect of dietary supplementation, bedding material and their interaction on total number of eggs produced

The mean total numbers of eggs produced by Japanese quail on the basis of interaction between dietary supplementation and different bedding materials are presented in Table 5. The statistical analysis revealed significant effect of interaction between incorporation of dietary supplementation and different bedding materials on mean total number of eggs produced. Further the comparison of means showed that highest total number of eggs produced was recorded in $B_3 \times T_3$ group. Lowest total number of eggs produced was found in $B_1 \times T_0$ group (Table 5). The results observed in present study were in agreement with the findings of Bardakcioglu et al. (2005) who found increased egg production in group of Japanese quail fed vitamin C. Shit et al. (2012) and Sigolo et al. (2019) also found significant effect of ascorbic acid supplementation on total number of eggs produced.

3.6. Effect of dietary supplementation, bedding material and their interaction on total number of eggs produced per bird

The significant effects of interaction between dietary supplementation and different bedding materials on total numbers of eggs produced per bird of Japanese quail are shown in Table 6. The comparison of means showed that highest total number of eggs produced per bird was recorded in $B_3 \times T_3$ group, and the lowest in $B_1 \times T_0$ group. The overall result indicates that there is beneficial effect of wheat straw with supplementation of both giloy and ascorbic acid on total number of eggs produced per bird of the Japanese quails. The results observed were in agreement with the findings of Dhaliwal et al. (2018).

The economics of entire experiment on interaction basis has been presented in Table 7, Table 8 and Table 9.

The net profit / bird based on overall interaction effect was

Table 5: Effect of dietary supplements × bedding materials Interaction on total number of produced eggsat different weeks

Interaction Effect	Age in weeks								Cumulative
	8-10W	10-12W	12-14W	14-16W	16-18W	18-20W	20-22W	22-24W	
T_{10}	72^{a}	83^{a}	85.5	94.5^{a}	94^{a}	97^{a}	100^{a}	101.5^{a}	727.5^{a}
T_{11}	77.5^{b}	93^{b}	107.5	116.5^{d}	117^{c}	119.5^{c}	124.5^{d}	127.5^{c}	883^{d}
T_{12}	71.5^{a}	84^{a}	94	105.5^{b}	108.5^{b}	111^{b}	114.5^{b}	118^{b}	807^{b}
T_{13}	90.5^{de}	110.5^{d}	119	128.5^{f}	128^{d}	129^{d}	134^{ef}	140^{d}	979.5^{h}
T_{20}	73^{ab}	94^{b}	97	103^{b}	110.5^{b}	112^{b}	120.5^{c}	117.5^{b}	827.5^{c}
T_{21}	92.5^{ef}	113.5^{de}	112.5	117^{d}	126^{d}	130^{d}	132.5^{e}	137^{d}	961^{g}
T_{22}	87.5^{cd}	102.5^{c}	105.5	113^{c}	118^{c}	120.5^{c}	123.5^{cd}	129.5^{c}	900^{e}
T_{23}	109.5^{h}	128.5^{f}	129	138.5^{g}	142^{f}	143.5^{g}	145.5^{h}	146.5^{ef}	1083^{j}
T_{30}	84^{c}	102.5^{c}	107	111^{c}	128.5^{d}	133d^{e}	137^{f}	138.5^{d}	941.5^{f}
T_{31}	102^{g}	118.5^{e}	124.5	131^{f}	133^{e}	137.5^{f}	141.5^{g}	144^{e}	1032^{i}
T_{32}	97^{f}	114de	117	123^{e}	130de	135^{ef}	137^{f}	138^{d}	991^{h}
T_{33}	117.5^{i}	129^{f}	136.5	144.5^{h}	146.5^{g}	147.5^{g}	149^{i}	149.5^{f}	1120^{k}
SEm±	1.54	1.62	1.69	1.09	1.32	1.36	0.98	1.14	5.09

Means having different superscripts in a column differ significantly ($p \leq 0.05$)

Table 6: Effect of dietary supplements × bedding materials Interaction on Egg production per bird at different weeks

Interaction effect	Age in weeks								
	8-10W	10-12W	12-14W	14-16W	16-18W	18-20W	20-22W	22-24W	Cumulative
T_{10}	6^{a}	6.91^{a}	7.12	7.87^{a}	7.83^{a}	8.08^{a}	8.33^{a}	8.45^{a}	60.62^{a}
T_{11}	6.45^{b}	7.75^{b}	8.95	9.70^{d}	9.75^{c}	9.95^{c}	10.37^{d}	10.62^{c}	73.58^{d}
T_{12}	5.95^{a}	7^{a}	7.83	8.79^{b}	9.04^{b}	9.25^{b}	9.54^{b}	9.83^{b}	67.25^{b}
T_{13}	7.54^{de}	9.20^{d}	9.91	10.70^{f}	10.66^{d}	10.75^{d}	11.16^{ef}	11.66^{d}	81.62^{h}
T_{20}	6.08^{ab}	7.83^{b}	8.08	8.58^{b}	9.20^{b}	9.33^{b}	10.04^{c}	9.79^{b}	68.95^{c}
T_{21}	7.70^{ef}	9.45^{de}	9.37	9.75^{d}	10.5^{d}	10.83d	11.04^{e}	11.41^{d}	80.08^{g}
T_{22}	7.29^{cd}	8.54^{c}	8.79	9.41^{c}	9.83^{c}	10.04^{c}	10.29^{cd}	10.79^{c}	75^{e}
T_{23}	9.12^{h}	10.70^{f}	10.75	11.54^{g}	11.83^{f}	11.95^{g}	12.12^{h}	12.20^{ef}	90.25^{j}
T_{30}	7^{c}	8.54^{c}	8.91	9.25^{c}	10.70^{d}	11.08^{de}	11.41^{f}	11.54^{d}	78.45^{f}
T_{31}	8.5^{g}	9.87^{e}	10.37	10.91^{f}	11.08^{e}	11.45^{f}	11.79^{g}	12^{e}	86^{i}
T_{32}	8.08^{f}	9.5d^{e}	9.75	10.25^{e}	10.83^{de}	11.25^{ef}	11.41^{f}	11.5^{d}	82.58^{h}
T_{33}	9.79^{i}	10.75^{f}	11.37	12.04^{h}	12.20^{g}	12.29^{g}	12.41^{i}	12.45^{f}	93.33^{k}
SEm±	0.12	0.13	0.14	0.09	0.11	0.11	0.08	0.09	0.42

Means having different superscripts in a column differ significantly ($p \leq 0.05$)

found highest in the group supplemented with giloy alone and reared on wheat straw as bedding material followed by saw dust and sand bedding material group, which were supplemented with giloy alo ne, respectively.

Results obtained from cost economy of present experiment revealed that supplementation of giloy herb with or without ascorbic acid acts asexcellent growth promoter and these groups also reported better feed conversion ratio (FCR) as compared to rest of the groups. The profit was more where wheat straw was used as bedding material as compared to saw dust and sand bedding material. The results of the present study are in line with the findings of Vathana et al. (2002), Tuleun et al. (2010) and Choudhary (2010) who observed more profitable results in the group supplemented with giloy in basal diet as compared to control one.

Table 7: Over all Economics of groups reared on sand as bedding material

Particulars	Groups			
	T_{10}	T_{11}	T_{12}	T_{13}
Mean body weight at 24 week (g)	237.74	246.50	257.27	275.32
Total feed consumed (g)	3339.01	3446.18	3400.94	3534.74
Total rearing cost (feed+ sup-plements+chick cost)	100.17+0+6=106.17	103.38+3.70+6=113.08	102+7.40+6=115.40	106.02+11.10+6=123.12
Selling price/bird	50	50	50	50
Egg production/bird	60.62	73.58	67.25	81.62
Selling price of egg	60	73	67	81
Net profit (₹ bird^{-1})	3.83	9.92	1.60	7.88

Table 8: Over all Economics of groups reared on saw dust as bedding materials

Particulars	Groups			
	T_{20}	T_{21}	T_{22}	T_{23}
Mean body weight at 24 week (g)	225.16	240.26	252.59	270.23
Total feed consumed (g)	3389.02	3493.05	3417.02	3581.46
Total rearing cost (feed + supplements+chick cost)	101.67+0+6=107.67	104.79+3.70+6=114.49	102.51+7.40+6=115.91	107.43+11.10+6=124.53
Selling price	50	50	50	50
Egg production/bird	68.95	80.08	75	90.25
Selling price of egg	68	80	75	90
Net profit (₹ bird^{-1})	10.33	15.51	9.09	5.47

Table 9: Over all Economics of groups reared on wheat straw as bedding material

Particulars	Groups			
	T_{30}	T_{31}	T_{32}	T_{33}
Mean body weight at six week (g)	220.18	235.68	243.80	261.98
Total Feed consumed (g)	3443.06	3580.15	3527.51	3640.82
Total rearing cost (feed +supplements+chick cost)	103.29+0+6=109.29	107.40+3.70+6=117.10	105.81+7.40+6=119.21	109.20+11.10+6=126.30
Selling price	50	50	50	50
Egg production/bird	78.45	86	82.58	93.33
Selling price of egg	78	86	82	93
Net profit (₹ bird^{-1})	18.71	18.9	12.79	16.70

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5. CONCLUSION

The results obtained from the cost economy of the current experiment indicate that the addition of giloy herb, with or without ascorbic acid, serves as an effective growth promoter. These groups also demonstrated a

superior feed conversion ratio (FCR) compared to the other groups. Furthermore, it was observed that the use of wheat straw as bedding material resulted in higher profits compared to sawdust and sand bedding materials.

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