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Effect of different bedding material and dietary supplements on hemato-biochemical parameters of Rhode Island Red chicken

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Abstract
Rhode Island Red (RIR) is a single comb, prolific brown egg layer and an efficient feed converter. It has been popularized in most of the states of the country under government schemes. It is less susceptible to adverse environmental conditions. The present study was planned to investigate the effect of different bedding material and dietary supplements on Hemato-biochemical Parameters of RIR. The experiment was carried out at the Poultry unit, Livestock Farm Complex, College of Veterinary and Animal Science, Bikaner, Rajasthan University of Veterinary and Animal Sciences, Bikaner, (Rajasthan) from March to august, 2021. Day old 288 chicks reared under electrical brooder up to 7 days of age were randomly distributed in equal number into different bedding material (sand, saw dust and wheat straw) where they kept for 24 weeks. There was significantly (P<0.05) effect was recorded in serum triglycerides, serum creatinine and higher significant (P<0.01) effect was recorded in total serum protein. The mean value of haemoglobin, PCV, serum glucose, serum albumin, serum cholesterol, SGOT (IU/L), SGPT (IU/L) and H:L ratio was non-significantly effect was recorded. All these variations in Hemato-biochemical parameters in RIR birds may be due to the effect of different bedding material and their feed habits.

Keywords: RIR, hematology, biochemical, bedding material

1. Introduction
Poultry industry is one of the fastest growing segments of the agriculture sector of India, which has made impressive progress during the last three decades owing to comprehensive research and development initiated by the government and subsequently taken up by the organized private sector. Among the poor rural people, poultry farming is an age-old practice where they keep their birds either in backyard system or scavenge them nearby field with very little investment on health care and management. Although growth potential of rural poultry is low; however, whatever they produce is the net profit to the farmers (Thakur *et al*., 2012) [11]. RIR are famous for their hardy nature. This breed is a good choice for small poultry farmer. They produce eggs, even in poor housing conditions compared to other breeds and they can also handle marginal diets.

2. Materials and Methods
2.1 Location and Climatic conditions of the Experiment
The experiment was carried out at the Poultry unit, Livestock Farm Complex, College of Veterinary and Animal Science, Bikaner, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan from March to august, 2021.Geographically Poultry unit, Livestock Farm Complex, Bikaner is situated at an altitude of 201 meters above the mean sea level in Thar Desert. Bikaner witnesses extreme temperatures. The climate of the poultry unit is hot desert climate with a very little rain fall and extreme temperatures. In summer temperature can exceed 45 °C and during the winter season temperatures come down near 4° Centigrade. The average maximum and minimum temperatures recorded during the experimental period of this area were 37.72 and 29.84 °C, respectively.

2.2 Experimental Birds
The study was undertaken on day-old Rhode Island Red (288) chicks which were purchased from Central Poultry Development Organization (CPDO), Chandigarh. Out of 288 birds 36 birds were slaughtered at the end of experiment for evaluating carcass characteristics and

remaining 252 birds were further used for remaining traits (growth traits and egg production traits) entire the end of experimental trail. Standard norms for bio-security and minimal stress were strictly observed during the transportation of chicks. The birds were maintained under intensive system. The birds were fed commercially available readymade starter, grower and layer rations were procured and feed additives such as giloy (*Tinospora cordifolia*) herb and Vitamin E were supplemented. The giloy and Vit.-E were supplemented at 5 g/kg and 250 mg/kg in alone and combination, respectively. At last day of trial, two birds from each replication were randomly picked up for blood sample collection and estimation of Hemato-biochemical Parameters of RIR.

2.3 Hemato-biochemical Parameters

The following haemato-biochemical parameters were estimated as per standard method-

2.4 Hematological parameters

At last day of trial, two birds from each replication were randomly picked up for blood sample collection and estimation of Hemato-biochemical Parameters of RIR. Hematological study was carried out on heparinized blood sample collected from 2 birds from each replicate of RIR in all treatment groups. Hematological parameters were Hb (g/dl) and PCV (%).

2.5 Biochemical parameters

Biochemical parameters were estimated from serum isolated from the blood sample at last day of trial, two birds from each replication were randomly picked up for blood sample collection and estimation of biochemical parameters of RIR. The blood samples were collected in sterile vial and kept in slating position for 30 minutes then centrifuged at 2000 rpm for 15 minutes. Biochemical parameters were Serum Glucose, Total Serum protein, Serum albumin, Serum Triglycerides, Serum Cholesterol, Serum Creatinine, Serum Alanine Transaminase (SGPT), Serum Aspartate Transaminase (SGOT) and Hetrophil-Lymphocyte Ratio by using standard diagnostic kit.

2.6 Statistical Analysis

The mean and SE for various traits were calculated according to standard statistical procedures (Snedecor and Cochran, 2004) [10]. Significant differences Hemato-biochemical parameters were tested by one-way ANOVA. One-way ANOVA was used to test for significant differences the traits mentioned in the tables.

3. Results and Discussion

The effects of different bedding material and dietary supplement on Hemato-biochemical parameter in RIR were presented in Table 1. The mean sum of squares obtained with analysis of variance is given in Table 2. The parameters recorded were Haemoglobin, Packed Cell Volume, Serum Glucose, Total Serum Protein, Serum Albumin, Serum Triglycerides, Serum Cholesterol, Serum Creatinine, Serum Alanine Transaminase (SGPT), Serum Aspartate Transaminase (SGOT) and Hetrophil-Lymphocyte Ratio.

3.1 Hematological parameters

3.1.1 Heamoglobin and Packed cell volume (%)

The numerically mean values of hemoglobin (%) was found in group B_1 treatment T_1 (giloy) to be 16.66 followed by T_3 (16.05), T_2 (14.76) and T_2 (12.96). Similarly in group B_2 treatment T_3 (combination of giloy and Vit.-E) it was 15.95 followed by T_0 (14.07), T_1 (13.35) and T_2 (12.41) and in group B_3 treatment T_1 (giloy) found to be 15.86 followed by T_3 (15.30), T_2 (14.85) and T_0 (12.90). The statistical analysis of data revealed that the non significant effect was observed among various treatment groups.

The numerically mean values of packed cell volume (%) was found in group B_1 treatment T_1 (giloy) to be 36.51 followed by T_2 (35.06), T_3 (30.25) and T_0 (26.56). Similarly in group B_2 treatment T_3 (combination of giloy and Vit.-E) to be (35.20) followed by T_0 (32.16), T_2 (31.41) and T_1 (30.70) and in group B_3 treatment T_1 (giloy) to be (36.46) followed by T_3 (35.20), T_2 (33.20) and T_0 (31.25). The statistical analysis of data revealed the non significant effect was observed among various treatment groups.

The results observed in present study were in similar with the finding of Hridoy *et al.* (2021), they reported no significant increased Hb value with supplementation of Vitamin E in broilers. Ekunseitan *et al.* (2021) [1] found significant decrease in Hb, PCV and TEC values, which was contrary to present findings with Vitamin E supplementation in broiler chicken.

Raza *et al.* (2018) [8] who found significant increase in Hb and no significant increase in PCV values, which was contrary to present findings with Vitamin E supplementation in broiler chicken.

Khobragade (2003) [3] who found non-significant differences in PCV, which was similar to present findings with geloi supplementation in broiler chicken. The increase in PCV might be attributed to increased hemoglobin level in treated broiler birds through profound effect on haemopoetic system and with the increase in haemoglobin containing cells. Further, in the groups supplemented with geloi and vitamin-E in combination, significantly higher values of hematological parameters as compared to control indicated synergistic effect of geloi and Vitamin-E in Kadaknath.

3.2 Biochemical parameters

3.2.1 Serum Glucose (mg/dl)

The numerically mean values of serum glucose (mg/dl) was found in group B_1 treatment T_1 (giloy) to be 195.05 followed by T_3 (192.06), T_0 (191.67) and T_2 (178.75). Similarly in group B_2 treatment T_1 (giloy) it was 194.77 followed by T_0 (189.17), T_2 (181.25) and T_3 (175.86) and in group B_3 treatment T_0 (Control) reported 191.39 followed by T_2 (185.79), T_1 (181.86) and T_3 (181.42).The statistical analysis of data revealed the non significant effect was observed among various treatment groups.

The results observed with respect to effect of giloy supplementation in present study are in contrary with Khobragade (2003) [3] who reported significant effect on serum glucose. With respect to Vitamin E supplementation, Sahin *et al.* (2001) [9] who reported significant decrease in glucose on inclusion of Vitamin E in broiler diet.

3.2.2 Total serum Protein (mg/dl)

The mean values of total serum protein (mg/dl) was found in group B_1 treatment T_3 (combination of giloy and Vit.-E) to be 4.68 followed by T_1 (4.58), T_2 (4.20) and T_0 (3.03). Similarly in group B_2 treatment T_2 (Vit.-E) to be 6.61 followed by T_0 (4.81), T_3 (4.07) and T_1 (4.02) and in group B_3 treatment T_1 (giloy) to be 4.26 followed by T_2 (4.03), T_3 (3.65) and T_0 (3.65). The statistical analysis of data revealed the highly

significant (P<0.01) effect was observed among various treatment groups.
The highly significant results observed in present study of geloi are in contrary with the findings of Khobragade (2003) [3] who reported non-significant effect on total serum protein on inclusion of geloi herb in broilers. With respect to Vitamin E, the non-significant effect on total protein in present study was in not agreement with Misalkar (2010) [6], he reported no significant effect on total protein on supplementation of Vitamin E in broilers. The findings of the above experiment was in agreement with Sahin *et al.* (2001) [9] reported significant increase in total protein on inclusion of Vitamin E in broilers.

3.2.3 Serum Albumin (gm/dl)
The numerically mean values of serum albumin (gm/dl) was found in group B_1 treatment T_1 (giloy) to be 2.60 followed by T_3 (2.34), T_0 (2.11) and T_2 (1.53). Similarly in group B_2 treatment T_2 (Vit.-E) to be 3.61 followed by T_0 (2.44), T_1 (2.01) and T_3 (1.57) and in group B_3 treatment T_1 (giloy) to be 2.16 followed by T_2 (1.61), T_0 (1.61) and T_3 (1.50). The statistical analysis of data revealed the non significant effect was observed among various treatment groups.
The results observed in present study were in contrary with the findings of Sahin *et al.* (2001) [9] who reported significant increase in serum albumin on inclusion of Vitamin E in broilers. The result is similar to the findings, With respect to Vitamin E, the non-significant effect on albumin in present study was in partial agreement with Misalkar (2010) [6], and he reported no significant effect on serum albumin on supplementation of Vitamin E in broilers.

3.2.4 Serum Triglycerides (mg/dl)
The mean values of serum triglycerides (mg/dl) was found in group B_1 treatment T_0 (control) to be 183.00 followed by T_3 (178.50), T_1 (140.01) and T_2 (138.00). Similarly in group B_2 treatment T_2 (Vit.-E) to be 227.50 followed by T_3 (155.00), T_0 (130.01) and T_1 (103.01) and in group B_3 treatment T_1 (giloy) to be 145.01 followed by T_3 (130.01), T_2 (115.01) and T_0 (110.50). The statistical analysis of data revealed the significant (P<0.05) effect was observed among various treatment groups.
The results observed in present study were in contrary with the findings of Sahin *et al.* (2001) [9] they reported significant decrease in serum triglycerides by supplementation of Vitamin E in broilers.

3.2.5 Serum Cholesterol (mg/dl)
The numerically mean values of serum cholesterol (mg/dl) was found in group B_1 treatment T_1 (giloy) to be 188.01 followed by T_3 (180.01), T_2 (151.00) and T_0 (146.50). Similarly in group B_2 treatment T_2 (Vit.-E) 168.50 followed by T_0 (168.00), T_3 (157.01) and T_1 (129.50) and in group B_3 treatment T_1 (giloy) 175.00 followed by T_3 (152.01), T_0 (138.50) and T_2 (134.50). The statistical analysis of data revealed the non significant effect was observed among various treatment groups.
The results observed in present study were in similarly with the findings of Majekodumi *et al.* (2013) [5] reported non-significant lower level of cholesterol in geloi at graded levels and ascorbic acid either alone or in combination might be due to reduction of lipid peroxidation and enhancement of clearance of endogenous cholesterol.
The results observed in present study were in contrary with the findings of Sahin *et al.* (2001) [9], they reported significant decrease in serum cholesterol by supplementation of Vitamin E in broilers.

3.2.6 Serum Creatinine (mg/dl)
The mean values of serum creatinine (mg/dl) was found in group B_1 treatment T_1 (giloy) to be 0.56 followed by T_3 (0.53), T_2 (0.48) and T_0 (0.19). Similarly in group B_2 treatment T_2 (Vit.-E) 0.66 followed by T_0 (0.47), T_3 (0.41) and T_1 (0.36) and in group B_3 treatment T_1 (giloy) to be 0.44 followed by T_0 (0.38), T_2 (0.35) and T_3 (0.34). The statistical analysis of data revealed the significant (P<0.05) effect was observed among various treatment groups. The statistical analysis of data revealed significant effect due to geloi and vitamin-E supplementation of geloi and vitamin-E either alone or in combination.

3.2.7 Serum Alanine Transaminase (SGPT)
The numerically mean values of serum alanine transaminase (U/L) was found in group B_1 treatment T_1 (giloy) to be 45.50 followed by T_3 (40.50), T_0 (39.50) and T_2 (35.00). Similarly in group B_2 treatment T_2 (Vit.-E) 48.00 followed by T_3 (37.01), T_1 (36.00) and T_0 (35.01) and in group B_3 treatment T_1 (giloy) to be 39.00 followed by T_2 (33.01), T_3 (33.01) and T_0 (32.00). The statistical analysis of data revealed the non significant effect was observed among various treatment groups.
The results observed in present study were in contrary with the findings of Jadhav *et al.* (2014) [2] and Naresh (2016) [7] reported significant improvement in ALT by supplementation of polyherbal feed in broilers. Lower levels of ALT on supplementation of geloi and ascorbic acid either alone or in combination in broilers could be due to antioxidant activity of both which may act together to scavenge the free radicals during stress *i.e.* chronic heat stress.
The findings was in partial agreement with findings of Sahin *et al.* (2001) [9], they reported significant decrease in serum ALT by supplementation of Vitamin E in broilers.

3.2.8 Serum Aspartate Transaminase (SGOT)
The numerically mean values of serum aspartate transaminase (U/L) was found in group B_1 treatment T_1 (giloy) to be 191.01 followed by T_2 (190.01), T_3 (158.50) and T_0 (128.01). Similarly in group B_2 treatment T_2 (Vit.-E) to be 202.50 followed by T_0 (166.01), T_3 (165.01) and T_1 (147.01) and in group B_3 treatment T_0 (control) to be 183.50 followed by T_2 (170.01), T_3 (169.50) and T_1 (153.01). The statistical analysis of data revealed the non significant effect was observed among various treatment groups.
The results observed in present study were in contrary with the findings of Jadhav *et al.* (2014) [2] and Naresh (2016) [7] reported significant improvement in AST by supplementation of polyherbal feed in broilers, which was on contrary to findings with geloi supplementation. Lower levels of AST on supplementation of geloi and ascorbic acid either alone or in combination in broilers could be due to antioxidant activity of both which may act together to scavenge the free radicals during stress *i.e.* chronic heat stress. The findings was in partial agreement with findings of Sahin *et al.* (2001) [9], they reported significant decrease in serum AST and ALT by supplementation of Vitamin E in broilers.

3.2.9 Hetrophil-Lymphocyte Ratio (%)
The mean values of Hetrophil-Lymphocyte ratio (%) was found in group B_1 treatment T_1 (giloy) to be 7.02 followed by

T_3 (6.93), T_2 (6.62) and T_0 (5.33). Similarly in group B_2 treatment T_1 (giloy) to be 6.06 followed by T_3 (5.75), T_0 (5.71) and T_2 (4.94) and in group B_3 treatment T_0 (control) to be 6.59 followed by T_3 (5.94), T_2 (5.72) and T_1 (5.64). The statistical analysis of data revealed the non significant effect was observed among various treatment groups.

The H/L ratio in birds is a reliable indicator of stress (Langsdorf and Zydney, 1993) [4]. The findings of H/L ratio obtained in the present study are in accordance with the results of Raza *et al.* (2018) [8], they reported significant decrease in H/L ratio on Vitamin E supplementation in broilers. The reduction in H/L ratio due to supplementation of Tulsi leaf powder at graded levels or Vitamin E alone and various combinations of both may be due to antistress effect of both through the reduction in the synthesis of adrenal steroid in broilers. On contrary, Misalkar (2010) [6] reported no significant decrease in H/L ratio on supplementation of Tulsi leaf powder and Vitamin E in broilers.

Table 1: Effect of different bedding material and dietary Supplement on Heamato-biochemical parameter in Rhode Island Red

Bedding material	Treatment	Haemoglobin % (gm/dl)	PCV (%)	Serum Glucose (mg/dl)	Total Serum Protein (mg/dl)	Serum Albumin (gm/dl)	Serum triglycerides (mg/dl)	Serum cholesterol (mg/dl)	Serum creatinine (mg/dl)	SGPT (U/L)	SGOT (U/L)	H:L Ratio (%)
Sand (B_1)	B_1T_0	12.96	26.56	191.67	3.03^{a}	2.11	183.01^{cd}	146.50	0.19^{a}	39.50	128.00	5.33
	B_1T_1	16.66	36.51	195.05	4.58^{c}	2.60	140.00^{abc}	188.01	0.56^{bc}	45.50	191.00	7.02
	B_1T_2	14.76	35.06	178.75	4.20^{bc}	1.53	138.01^{abc}	151.00	0.48^{bc}	35.00	190.01	6.62
	B_1T_3	16.05	30.25	192.06	4.68^{c}	2.34	178.50^{bcd}	180.01	0.53^{bc}	40.50	158.50	6.93
Saw dust (B_2)	B_2T_0	14.07	32.16	189.17	4.81^{c}	2.44	130.00^{abc}	168.00	0.47^{bc}	35.01	166.01	5.71
	B_2T_1	13.35	30.70	194.77	4.02^{bc}	2.01	103.01^{a}	129.50	0.36^{ab}	36.01	147.00	6.06
	B_2T_2	12.41	31.41	181.25	6.61^{d}	3.61	227.50^{d}	168.50	0.66^{c}	48.00	202.50	4.94
	B_2T_3	15.95	35.20	175.86	4.07^{bc}	1.57	155.01^{abc}	157.01	0.41^{ab}	37.00	165.01	5.75
Wheat straw (B_3)	B_3T_0	12.90	31.25	191.39	3.65^{ab}	1.61	110.50^{ab}	138.50	0.38^{ab}	32.00	183.50	6.59
	B_3T_1	15.86	36.46	181.86	4.26^{bc}	2.16	145.01^{abc}	175.01	0.44^{bc}	39.01	153.00	5.64
	B_3T_2	14.85	33.20	185.79	4.03^{bc}	1.61	115.01^{abc}	134.50	0.35^{ab}	33.01	170.00	5.72
	B_3T_3	15.30	35.20	181.42	3.65^{ab}	1.50	130.01^{abc}	152.01	0.34^{ab}	33.01	169.50	5.94
SEM		1.12	2.93	6.32	0.24	0.43	20.79	12.98	0.07	5.42	31.08	0.71

Means superscripted with different letters within a column differ significantly from each other ($P \leq 0.01$, $P \leq 0.05$)

Table 2: Analysis of variance for Heamato-Biochemical in Rhode Island Red

Source of variance	DF	Sum Square										
		Haemoglobin % (gm/dl)	PCV (%)	Serum Glucose (mg/dl)	Total Serum Protein (mg/dl)	Serum Albumin (gm/dl)	Serum triglycerides (mg/dl)	Serum cholesterol (mg/dl)	Serum creatinine (mg/dl)	SGPT (U/L)	SGOT (U/L)	H:L Ratio (%)
Group	11	45.10	196.87	957.64	17.02^{**}	8.32	27661.46^{*}	7683.12	0.32^{*}	548.45	9627.33	9.16
Total	23	75.42	403.50	1916.34	18.49	12.87	38042.96	11729.63	0.45	1253.95	32817.33	21.29
Error	12	30.32	206.63	958.70	1.46	4.54	10381.5	4046.5	0.12	705.5	23190	12.13

*=significant ($P \leq 0.05$), **= highly significant ($P \leq 0.01$

4. Conclusion

From the present experiment it can be concluded that that combination of giloy and Vit.-E provides the highest positive effect on Heamato-Biochemical in RIR. There was significantly ($P<0.05$) effect was recorded in serum triglycerides, serum creatinine and higher significant ($P<0.01$) effect was recorded in total serum protein in immune response of birds. All these variations in hematological and biochemical parameters in Rhode Island Red birds may be due to the effect of different bedding material and their feed habits.

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