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Effect of azolla supplementation on blood biochemical parameters of Narmadanidhi birds in the Vindhya region of Madhya Pradesh

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Abstract
The proposed investigation is planned to study the hemato-biochemical parameter of Narmada Nidhi birds using Azolla supplemented diet (5% and 10% level). The present work was carried out in the Department of Livestock production management, College of Veterinary Science & Animal Husbandry, Rewa. A total of 72 day old straight run chicks of Narmada Nidhi birds were obtained from the hatchery unit. The study was carried out from day old to 12 weeks of age. Day old straight run chicks was put into three groups, each with three replicates and eight birds in each replicate. The chicks were wing banded, weighed individually, and randomly placed in treatment groups based on uniform body weight. The birds was housed in deep litter system. The birds of the control group (T_1) was fed a basal diet while the other group (T_2) and (T_3) was fed 5% and 10% of basal diet replaced by sun dried Azolla powder on DM basis. The basal diet (Layer chick ration) was procured from market containing 20% CP and ME 2800 Kcal/ Kg feed (BIS 2007). The birds were reared up to the attainment of market weight (flock average-1.0 kg live body weight). Blood samples was collected from wing vein at fortnightly interval to estimate the RBCs (million/µl), WBCs (Thousand/µl), DLC (%), Hb (g/dl), PCV (%), MCV (μ^3), MCH (pg/cell), Blood glucose (mg/dl), Total protein (g/dl), Albumin (g/dl), Globulin (g/dl), A:G Ratio, Cholesterol (mg/dl). The present study revealed that there was no significant difference in different treatment groups on RBC (red blood cell), WBC (white blood cell), DLC (differential leucocyte count), Hb (hemoglobin), PCV (packed cell volume), MCV (mean corpuscle volume), MCH (mean corpuscle hemoglobin). There was no significant difference was observed among different treatment groups on blood glucose, total protein, albumin, globulin, A: G ratio and cholesterol. It may be concluded that dried Azolla powder may be supplement in Narmada Nidhi poultry feed upto 10% on dry matter basis without any adverse effect on hematological and biochemical parameters.

Keywords: Azolla, blood biochemical parameter, Narmadanidhi

1. Introduction
The raising of poultry has become one of the most successful agricultural and associated industries, producing healthy meat and eggs for human use. In 2021-22, India's poultry population was 851.81 million. A total 9.29 million tonnes of meat were produced, of which 51.44% came from poultry. India ranked fifth in globally in terms of chicken meat production (BAHS, 2022) [3]. The availability of high-quality feed at an affordable cost is essential for the profitability of a poultry enterprise. Since feed accounts for 70% of the total expenditure of chicken production (Banerjee, 1992) [2]. To remain competitive in the market, it would be prudent to incorporate novel feed ingredients into diet formulation in order to reduce poultry production costs. The FAO programme focuses on improving feed-based production systems to locally available feed resources. This may be accomplished by making efficient use of non-traditional feed resources such as Azolla, either by substituting a portion of their diet or through choice feeding.

The plant *Azolla pinnata* is very rich in protein (26% on a DM basis), calcium (1.11% on a DM basis), and minerals comprising magnesium, iron, potassium, carotenoids phosphorus, manganese, and other vitamins (Pillai *et al*., 2004) [10]. Despite its high content of water, the plant grows quickly and has a high dry matter yield. (Kamalasanana *et al*., 2002) [7]. Narmada Nidhi is an enhanced dual purpose bird developed by the AICRP on Poultry Breeding, Nanaji Deshmukh Veterinary Science University Jabalpur. The variety was produced in such a way that terminal crosses have 25% Kadaknath breed inheritance and 75% Jabalpur coloured birds inheritance.

Narmadanidhi is distinguished by its multi-coloured plumage pattern (black, brown, grey, and mixed) with a robust body conformation that allows it to move quickly in its natural environment. These features aid in scavenging as well as safeguarding the birds from predators. Narmadanidhi birds survive in extremely difficult climatic conditions and are valued by farmers even in urban slums (Yadav *et al*., 2022) [15].

Despite the fact that much research was conducted on the benefits of Azolla supplementation on poultry bird performance, (Shukla *et al*., 2018; Kashyap *et al*., 2017; Tawasoli *et al*., 2018; Bhattacharyya *et al*., 2015; Dhumal *et al*., 2009) [11, 8, 14, 4, 5]. There is a lack of data on the performance of enhanced birds created for rural poultry production. In view of the above, the objective of the study was to investigate the effect of feeding different levels of *Azolla Pinnata* on hemato-biochemical parameters of Narmada nidhi birds.

2. Material and Methods

The current study took place in the Department of Livestock Production Management, College of Veterinary Science & Animal Husbandry, and Rewa (M.P.).The experimental site is located in the southern half of the third agro-climate zone, comprising the Kymore plateau and Satpura hills, at 24ºN and 81 º E longitudes at 450 MSL.

Day old straight run chicks was put into three groups, each with three replicates and eight birds in each replicate. The chicks were wing banded, weighed individually, and randomly placed in treatment groups based on uniform body weight. The birds was housed in deep litter system. The birds of the control group (T_1) was fed a basal diet while the other group (T_2) and (T_3) was fed 5% and 10% of basal diet replaced by sun dried Azolla powder on DM basis. The basal diet (Layer chick ration) was procured from market containing 20% CP and ME 2800 Kcal/ Kg feed (BIS 2007). The birds was reared up to the attainment of market weight (flock average-1.0 kg live body weight).

Table 1: Layout of the experiment

Groups	**T_1**			**T_2**			**T_3**		
Level of Azolla	**Daily diet comprise of 100% Basal diet without Azolla**			**Daily diet comprise of 95% Basal diet + 5% Azolla**			**Daily diet comprise of 90% Basal diet + 10% Azolla**		
Birds in each treatment group	24			24			24		
Replicate in each treatment	R1 8	R2 8	R3 8	R1 8	R2 8	R3 8	R1 8	R2 8	R3 8

Blood samples was collected from wing vein at fortnightly interval to estimate the RBCs (million/µl), WBCs (Thousand/µl), DLC (%), Hb (g/dl), PCV (%), MCV (µ³), MCH (pg/cell), Blood glucose (mg/dl), Total protein (g/dl), Albumin (g/dl), Globulin (g/dl), A:G Ratio, Cholesterol (mg/dl).

The recorded data obtain was analyzed by analysis of variance (Snedecor and Cochran, 1994) [12] using SPSS software version 23 statistical package.

3. Result and Discussion

3.1 Hematological studies

RBC (million/µl) value under different group T_1, T_2 and T_3 at different interval *viz*. at day 0, 14, 28, 42, 56, 70 and 84 have been presented in Table 02. Analysis of variable revealed a non-significant effect (p<0.05) of treatment groups and interval on RBC (million/µl). Under group T_1 the lowest and highest mean and standard error of RBC (million/µl) value ranged from 1.20±0.08 and 2.54±0.09, while lowest and highest value of RBC (million/µl) in T_2 and T_3 group was 1.36±0.06, 2.56±0.08 and 1.53±0.16, 2.65±0.09 respectively. RBC value shows non-significant that difference found in between group T_1, T_2 and T_3.

WBC (thousand/µl) Value under different groups T_1, T_2 and T_3 at different interval *viz.* at day 0, 14, 28, 42, 56, 70 and 84 have been are presented in Table 02. Analysis of variable revealed a non-significant effect (p<0.05) of groups and interval on WBC (Thousand/µl). Under group T_1 the lowest and highest mean and standard error WBC (Thousand/µl) value ranged from 22.64±0.18 and 29.77±0.31, while lowest and highest value of WBC (Thousand/µl) in group T_2 and T_3 was 22.66±0.25, 29.59±0.32 and 22.56±0.20, 30.22±0.36 respectively. WBC (Thousand/µl) value after randomly dividing on day 0, 14, 28, 42, 56, 70 and 84 that differ non-significantly.

Heterophil (%) are obtained under different groups on day 0, 14, 28, 42, 56, 70 and 84 have been given in Table 02. Analysis of variable revealed a non-significant effect (p<0.05) of interval under different groups on heterophil (%). The heterophil (%) value on day 0, 14, 28, 42, 56, 70 and 84 day was found non significantly differ at each interval with highest value are found in group T_2 that was 22.45±0.07, 22.86±0.17, 23.76±0.39, 24.78±0.28, 27.19±0.36, 27.20±0.22 and 28.44±0.52 respectively and lowest value are found in group T_1 that was 22.19±0.0.21, 23.02±0.26, 23.69±0.29, 25.35±0.30, 26.67±0.34, 27.75±0.29 and 29.60±0.30 respectively.

The eosinophil (%) value under different group T_1, T_2 and T_3 at different interval *viz*. at day 0, 14, 28, 42, 56, 70 and 84 have been depicted in Table 02 Analysis of variable revealed a non-significant effect (p<0.05) of groups and interval on eosinophil (%). The eosinophil (%) value on day 70 and 84non-significant difference found in all the three groups with each other, while the value of eosinophil (%) are found non-significant difference between group T_1, T_2 and T_3 on day 28 that was 1.74±0.03, 1.46±0.07, 1.75±0.03 on day 70 were 3.03±0.11, 3.30±0.11, 3.06±0.10 The highest value of eosinophil (%) in group T_1, T_2 and T_3 was recorded 3.01±0.18, 3.69±0.13 and 2.90±0.21, respectively.

Basophil (%) value under different treatment groups *viz*. control, 5% and 10% Azolla groups at different interval *viz.* at day 0, 14, 28, 42, 56, 70 and 84 have been are presented in Table 02. Analysis of variable revealed there was non-significant difference between control, 5% and 10% Azolla groups. Although higher and lower value were 3.89±0.05, 3.93±0.04, 3.93±0.04 and 0.71±0.03, 0.71±0.03, 0.72±0.03 obtained.

Monocyte (%) value on day 0, 14, 28, 42, 56, 70 and 84 under control, 5%, and 10% treatment groups have been showing in table 02. Analysis of variance employed to find the effect of treatment groups and interval revealed non-significant effect on monocyte (%). The lowest value of monocyte (%) under control, 5% and 10% treatment groups were observed to be 1.14±0.01, 1.17±0.01 and 1.17±0.01 while the highest value

were 3.33±0.13, 3.35±0.14 and 3.31±0.13, respectively.

The value of lymphocyte (%) are obtained under different treatment groups on day 0, 14, 28, 42, 56, 70 and 84 have been given in Table 02. Analysis of variance employed to find the effect of treatment groups and interval revealed non-significant effect on Lymphocyte (%). The lowest value of Lymphocyte (%) under control, 5% and 10% treatment groups were observed to be 43.43±0.09, 43.42±0.16 and 43.24±0.25 while the highest value were 48.25±0.55, 48.41±0.60 and 48.25±0.0.52, respectively.

Hemoglobin (g/dl) value on day 0, 14, 28, 42, 56, 70 and 84 under different treatment groups have been showing in Table 02. Analysis of variance employed to find the effect of treatment groups and interval revealed non-significant effect (p<0.05) of both on hemoglobin. The hemoglobin value on day 28, group T_1 and T_2 differ significantly with group T_3. Although on day 42, 56, 70 and 84 hemoglobin (g/dl) value differ significantly (p<0.05) among groups with highest value being obtained under group T_3 that was 8.69±0.30, 9.47±0.17, 10.22±0.08 and 10.30±0.18 while lowest value obtained under control group were 9.08±0.19, 9.44±0.22, 9.64±0.28 and 10.21±0.18 respectively. However the highest value was observed in group T_3.

The value of packed cell volume (%) are obtained under different groups on day 0, 14, 28, 42, 56, 70 and 84 have been given in Table 02. Analysis of variable revealed a non-significant difference (p<0.05) of interval under different groups on PCV (%). The PCV (%) value on day 28, 42, 56, 70 and 84 day are found non-significant difference (p<0.05) at each interval with highest value are found in group T_3 that was 23.82±0.50, 26.95±0.56, 28.41±0.50, 30.67±0.38 and 30.91±0.55, respectively and lowest value are found in group T_1 that was 23.33±0.60, 27.25±0.56, 28.32±0.66, 28.92±0.84 and 30.62±0.54, respectively.

The MCH (pg/cell) value under different groups *viz* group T_1, T_2 and T_3 at different interval *viz*. at day 0, 14, 28, 42, 56, 70 and 84 have been are depicted in Table 02. Analysis of variable revealed a non-significant effect (p<0.05) of groups and interval on MCH (pg/cell). Under group T_1 the lowest and highest mean and standard error of MCH value ranged from 27.34±1.00 and 40.51±1.13, while lowest and highest value of MCH (pg/cell) in group T_2 and T_3 was 22.72±0.90, 43.20±1.16 and 26.57±1.26, 43.47±1.09 respectively.

MCV (μ^3) value on day 0, 14, 28, 42, 56, 70 and 84 under group T_1, T_2 and T_3 have been showing in Table 02. Analysis of variable employed to find the effect of groups and interval revealed non-significant effect (p<0.05) of both on mean corpuscular volume (μ^3). The lowest value of MCV (μ^3) under group T_1, T_2 and T_3 were observed to be 82.01±3.01, 68.15±2.71 and 79.70±9.50 respectively while the highest value were 121.52±3.40, 121.88±4.89 and 118.11±5.48, respectively. The MCV (μ^3) value after randomly dividing at day 0, 14, 28, 42, 56, 70 and 84 MCV (μ^3) value differ significantly (p<0.05) among three groups with highest value being obtained under group T_2 that was 107.78±84.51, 68.15±2.71, 102.22±4.78, 108.24±7.04, 118.30±3.31, 129.61±3.49 and 121.88±4.89 respectively.

Table 2: Fortnightly Hematological parameters of Narmadanidhi Birds in different groups

Parameter	Groups	Day old Mean±SE	14 Day Mean±SE	28 Day Mean±SE	42 Day Mean±SE	56 Day Mean±SE	70 Day Mean±SE	84 Day Mean±SE
RBC (million/µl)	T_1	1.20±0.08^{aA}	2.25±0.03^{bA}	2.26±0.06^{bcA}	2.35±0.06^{bcA}	2.53±0.04^{cdA}	2.64±0.09^{dB}	2.54±0.09^{cdA}
	T_2	1.36±0.06^{aA}	2.46±0.04^{cdA}	2.22±0.04^{bA}	2.46±0.10^{cdA}	2.40±0.07^{bcdA}	2.33±0.06^{bcA}	2.56±0.08^{dA}
	T_3	1.53±0.16^{aA}	2.24±0.20^{bA}	2.41±0.09^{bcA}	2.49±0.11^{bcA}	2.50±0.09^{bcA}	2.37±0.07^{bcA}	2.65±0.09^{cA}
WBC (thousand/µl)	T_1	22.64±0.18^{aA}	25.20±0.20^{bA}	25.32±0.25^{bA}	26.58±0.26^{cA}	28.29±0.21^{dB}	28.97±0.31^{deA}	29.77±0.31^{eA}
	T_2	22.66±0.25^{aA}	25.43±0.21^{bA}	26.14±0.21^{bB}	27.09±0.23^{cA}	27.46±0.34^{cA}	29.15±0.26^{dA}	29.59±0.32^{dA}
	T_3	22.56±0.20^{aA}	25.20±0.24^{bA}	26.38±0.29^{cB}	26.97±0.22^{cA}	27.76±0.23^{dAB}	29.41±0.17^{eA}	30.22±0.36^{fA}
Heterophil (%)	T_1	22.19±0.21^{aA}	23.02±0.26^{bA}	23.69±0.29^{bA}	25.35±0.30^{cA}	26.67±0.34^{dA}	27.75±0.29^{eA}	29.60±0.30^{fA}
	T_2	22.45±0.07^{aA}	22.86±0.17^{abA}	23.76±0.39^{bA}	24.78±0.28^{cA}	27.19±0.36^{dA}	27.20±0.22^{eA}	28.44±0.52^{fA}
	T_3	22.37±0.24^{aA}	23.10±0.23^{aA}	24.62±0.24^{bA}	24.60±0.22^{bA}	26.35±0.33^{cA}	27.47±0.26^{dA}	28.46±0.37^{eA}
Eiosinophil (%)	T_1	0.69±0.04^{aA}	1.18±0.02^{bA}	1.74±0.03^{cB}	1.95±0.03^{cA}	2.73±0.11^{dA}	3.03±0.11^{eA}	3.01±0.18^{eA}
	T_2	0.77±0.04^{aA}	1.30±0.05^{bB}	1.46±0.07^{bA}	1.94±0.05^{cA}	2.44±0.13^{dA}	3.30±0.11^{eA}	3.69±0.13^{fB}
	T_3	0.71±0.04^{aA}	1.20±0.03^{bAB}	1.75±0.03^{cB}	1.96±0.03^{cA}	2.73±0.11^{dA}	3.06±0.10^{eA}	2.90±0.21^{deA}
Basophil (%)	T_1	0.71±0.03^{aA}	1.30±0.05^{bA}	2.36±0.10^{cA}	2.60±0.07^{dA}	2.91±0.05^{eA}	3.60±0.07^{fA}	3.89±0.05^{gA}
	T_2	0.71±0.03^{aA}	1.30±0.05^{bA}	2.35±0.10^{cA}	2.60±0.07^{dA}	2.92±0.05^{eA}	3.61±0.07^{fA}	3.93±0.04^{gA}
	T_3	0.72±0.03^{aA}	1.33±0.05^{bA}	2.30±0.11^{cA}	2.62±0.07^{dA}	2.92±0.05^{eA}	3.61±0.07^{fA}	3.93±0.04^{gA}
Monocyte (%)	T_1	1.14±0.01^{aA}	1.14±0.02^{aA}	1.97±0.09^{bA}	2.49±0.11^{cA}	2.81±0.11^{dA}	2.96±0.11^{dA}	3.33±0.13^{eA}
	T_2	1.17±0.01^{aA}	1.13±0.02^{aA}	1.98±0.10^{bA}	2.45±0.10^{cA}	2.81±0.12^{dA}	2.97±0.11^{dA}	3.35±0.14^{eA}
	T_3	1.17±0.01^{aA}	1.11±0.02^{aA}	1.98±0.10^{bA}	2.43±0.10^{cA}	2.80±0.12^{dA}	2.97±0.11^{dA}	3.31±0.13^{eA}
Lympmphocyte (%)	T_1	43.43±0.09^{abA}	44.30±0.07^{abA}	41.46±4.67^{aA}	46.16±0.32^{abA}	47.37±0.31^{bA}	47.79±0.44^{bA}	48.25±0.55^{bA}
	T_2	43.42±0.16^{aA}	44.32±0.07^{aA}	46.33±0.41^{bcA}	45.68±0.56^{bA}	47.46±0.32^{cdA}	47.66±0.40^{dA}	48.41±0.60^{dA}
	T_3	43.24±0.25^{aA}	44.37±0.41^{bA}	46.31±0.41^{cA}	45.67±0.56^{cA}	47.52±0.33^{dA}	47.69±0.41^{dA}	48.25±0.52^{dA}
Hb (g/dl)	T_1	4.18±0.11^{aA}	6.13±0.19^{bB}	7.78±0.20^{cA}	9.08±0.19^{dA}	9.44±0.22^{dA}	9.64±0.28^{deA}	10.21±0.18^{eA}
	T_2	4.78±0.29^{aB}	5.56±0.18^{bA}	7.53±0.28^{cA}	8.68±0.31^{dA}	9.44±0.21^{eA}	10.03±0.12^{efAB}	10.29±0.13^{fA}
	T_3	4.03±0.16^{aA}	5.48±0.18^{bA}	7.95±0.17^{cA}	8.69±0.30^{dA}	9.47±0.17^{eA}	10.22±0.08^{fB}	10.30±0.18^{fA}
PCV (%)	T_1	12.56±0.34^{aA}	18.38±0.57^{bB}	23.33±0.60^{cA}	27.25±0.56^{dA}	28.32±0.66^{dA}	28.92±0.84^{deA}	30.62±0.54^{eA}
	T_2	14.33±0.88^{aB}	16.68±0.54^{bA}	22.60±0.84^{cA}	26.04±0.92^{dA}	28.31±0.63^{eA}	30.10±0.37^{efAB}	30.86±0.38^{fA}
	T_3	12.10±0.47^{aA}	16.43±0.54^{bA}	23.82±0.50^{cA}	26.95±0.56^{dA}	28.41±0.50^{eA}	30.67±0.38^{fB}	30.91±0.55^{fA}
MCH (pg/cell)	T_1	35.54±1.79^{bc}	27.34±1.00^{a}	34.60±1.22^{b}	38.95±1.29^{cd}	37.42±1.04^{bcd}	36.72±1.45^{bcd}	40.51±1.13^{d}
	T_2	35.93±3.11^{bc}	22.72±0.90^{a}	34.07±1.59^{b}	36.08±2.35^{bc}	39.43±1.10^{bcd}	43.20±1.16^{d}	40.63±1.63^{cd}
	T_3	28.17±2.45^{ab}	26.57±3.17^{a}	33.14±0.96^{bc}	35.51±2.13^{cd}	38.31±1.56^{cde}	43.47±1.09^{e}	39.37±1.83^{de}
MCV (μ^3)	T_1	106.63±5.36^{bcB}	82.01±3.01^{aA}	103.81±3.66^{bA}	116.85±3.88^{cdA}	112.27±3.12^{bcdA}	110.17±4.35^{bcdA}	121.52±3.40^{dA}
	T_2	107.78±84.51^{bcB}	68.15±2.71^{aA}	102.22±4.78^{bA}	108.24±7.04^{bcA}	118.30±3.31^{bcdA}	129.61±3.49^{dB}	121.88±4.89^{cdA}
	T_3	84.51±7.35^{abA}	79.70±9.50^{aA}	99.31±2.93^{bcA}	109.57±4.67^{cdA}	114.92±4.69^{cdeA}	130.42±3.26^{eB}	118.11±5.48^{deA}

Different superscripts in small letter (A, B, C, D) in a row and capital letter (A, B, C, D) in a column differ significantly

Effect of Azolla feeding on RBC (red blood cell), WBC (white blood cell), DLC (differential leucocyte count), Hb (hemoglobin), PCV (packed cell volume), MCV (mean corpuscle volume), MCH (mean corpuscle hemoglobin), have been presented in table 2. However there was no significant difference among the groups in any of the hematological parameter. Our results are in agreement with the finding of Gupta *et al*. (2018) [6]. Alalade *et al.* (2007) [1] also noted that there was no significant difference in packed cell volume (PCV), red blood cell (RBC), hemoglobin (Hb) and white blood cell (WBC). Mishra *et al*. (2016) [9] reported that hematological profile of the Chabro bird was not affected by any treatment except heterophil and lymphocyte which was found higher.

3.2 Biochemical studies

The value obtained of blood glucose (mg/dl) of Narmadanidhi birds under different treatment groups at day 0, 14, 28, 42, 56, 70 and 84, have been given in Table 03. The blood glucose value (mg/dl) on day 0, 14, 28, 42, 56, 70 and 84 day are found non significantly differ (p<0.05) at each interval with lowest value are found in group T_1 that was 120.25±0.30, 125.13±0.87, 132.81±0.43, 140.09±1.53, 140.67±2.53, 140.18±3.02 and 144.72±2.89 respectively and highest value are found in group T_3 that was 121.92±0.87, 126.14±0.59, 134.53±1.03, 140.41±2.01, 140.73±2.52, 144.83±3.45 and 143.76±3.03, respectively. Under group T_2 the lowest and highest mean and standard error of blood glucose (mg/dl) value ranged from 121.44±0.59 and 143.76±3.03 respectively.
Total protein (g/dl) value under different groups *viz*. group T_1, T_2 and T_3 at different interval *viz*. on day 0, 14, 28, 42, 56, 70 and 84 have been presented in Table 03. Under group T_1, T_2 and T_3 the lowest and highest mean and standard error of total protein (g/dl) ranged from 3.46±0.15, 3.41±0.21, 3.48±0.22 and 4.71±0.37, 4.47±0.38 and 4.68±0.39 respectively. The obtained data of total protein (g/dl) shows increasing trend with increasing age in group T_1, T_2 and T_3 Azolla treatment groups. Total protein (g/dl) value on day 0, 14, 28, 42, 56, 70 and 84 day are found non significantly differ (p<0.05) at each interval with highest value are found in group T_1 and lowest value are found in group T_2.
The value of albumin (g/dl) of Narmada Nidhi under different groups at day 0, 14, 28, 42, 56, 70 and 84 have been given in Table 03. The mean and standard error of albumin (g/dl) value after randomly grouping on day 0, 14, 28, 42, 56, 70 and 84 day are found non significantly differ at each interval with highest value are found in group T_1 and lowest value are found in group T_3. Under group T_1 the lowest and highest albumin (g/dl) value ranged from 1.80±0.05 and 3.64±0.10 are found in day 0 and 84 respectively, while lowest and highest value of total protein in group T_2 and T_3 ranged from 1.73±0.07, 3.68±0.10 and 1.71±0.08, 3.64±0.09 are found in 0 and 84 day respectively.
Globulin (g/dl) are obtained under different groups on day 0, 14, 28, 42, 56, 70 and 84 have been presented in Table 03. The lowest and highest mean and standard error of globulin (g/dl) value in group T_1 were ranged 1.35±0.06 and 2.38±0.04, while lowest and highest value of globulin (g/dl) in group T_2 and T_3 was 1.35±0.06, 2.38±0.04 and 1.37±0.05, 2.43±0.04 respectively. However, the globulin (g/dl) value increases in group T_3 as increases with age and similar trend is follow in group T_1 and T_2 with non-significantly (p<0.05) higher value was obtained in group T_3.
Value of Albumin globulin ratio under different groups at day 0, 14, 28, 42, 56, 70 and 84 was given in Table 03. Analysis of variance employed to find the effect of different groups and interval revealed non-significant effect (p<0.05) of both on A: G ratio. The A: G ratio value on day 0, 14, 28, 42, 56 and 70 there was non-significant difference are recorded between all groups with each other with higher value was obtained in group T_1 and lower value was found in group T_3. The highest value was found in group T_2 that was 1.55±0.06, in group T_1 that was 1.53±0.05 and in group T_3 that was 1.50±0.05, respectively.
The value of cholesterol (mg/dl) of Narmadanidhi birds under different groups at day 0, 14, 28, 42, 56, 70 and 84 have been given in Table 03. Analysis of variance employed to find the effect of different groups and interval revealed non-significant effect (p<0.05) of both on cholesterol (mg/dl). The cholesterol (mg/dl) value in day 42 and 70 are differ non-significantly in all groups with higher value was obtained in group T_2 while difference in between group T_1 and T_3 on day 84 are non-significant.
There was no significant difference on effect of Azolla feeding on blood glucose, total protein, albumin, globulin, A: G ratio and cholesterol have been presented in table 03. Mishra *et al*. (2016) [9] reported that Blood glucose cholesterol, total protein, albumin, were found similar in all the groups and within the normal values for broiler chicken. Sujatha *et al*. (2013) [13] also noted that there was no significant difference in serum protein concentration between the control group fed basal diet and Azolla based diet in nicobari fowls.

Table 3: Biochemical parameters of Narmadanidhi Birds in different groups

Parameter	Group	Day old Mean±SE	14 Day Mean±SE	28 Day Mean±SE	42 Day Mean±SE	56 Day Mean±SE	70 Day Mean±SE	84 Day Mean±SE
Blood Glucose (mg/dl)	T_1	120.25±0.30^{aA}	125.13±0.87^{aA}	132.81±0.43^{bA}	140.09±1.53^{cA}	140.67±2.53^{cA}	140.18±3.02^{cA}	144.72±2.89^{cA}
	T_2	121.44±0.59^{aA}	125.17±0.87^{aA}	134.16±0.90^{bA}	140.41±2.01^{cA}	140.73±2.52^{cA}	144.83±3.45^{cA}	143.76±3.03^{cA}
	T_3	121.92±0.87^{aA}	126.14±0.59^{aA}	134.53±1.03^{bA}	140.41±2.01^{bcA}	140.73±2.52^{bcA}	144.83±3.45^{cA}	143.76±3.03^{cA}
Total protein (g/dl)	T_1	3.46±0.15^{aA}	3.65±0.12^{aA}	3.80±0.17^{aA}	4.12±0.17^{abA}	4.60±0.22^{bA}	4.65±0.20^{bA}	4.71±0.37^{bA}
	T_2	3.41±0.21^{aA}	3.70±0.11^{abA}	3.82±0.17^{abcA}	4.18±0.17^{bcdA}	4.65±0.22^{dA}	4.73±0.21^{dA}	4.47±0.38^{cdA}
	T_3	3.48±0.22^{aA}	3.57±0.16^{aA}	3.73±0.20^{aA}	4.14±0.22^{abA}	4.48±0.26^{bA}	4.63±0.19^{bA}	4.68±0.39^{bA}
Albumin (g/dl)	T_1	1.80±0.05^{aA}	2.16±0.05^{bA}	2.67±0.07^{cA}	2.64±0.09^{cA}	2.56±0.06^{cA}	3.46±0.07^{dA}	3.64±0.10^{dA}
	T_2	1.73±0.07^{aA}	2.25±0.06^{bA}	2.60±0.06^{cA}	2.69±0.06^{cA}	2.52±0.07^{cA}	3.45±0.06^{dA}	3.68±0.10^{eA}
	T_3	1.71±0.08^{aA}	2.29±0.06^{bA}	2.60±0.05^{cdA}	2.73±0.06^{dA}	2.51±0.08^{cA}	3.48±0.06^{eA}	3.64±0.09^{eA}
Globulin (g/dl)	T_1	1.35±0.06^{aA}	1.70±0.05^{bA}	2.09±0.03^{cA}	2.20±0.05^{cA}	2.22±0.02^{cA}	2.20±0.03^{cA}	2.38±0.04^{dA}
	T_2	1.35±0.05^{aA}	1.64±0.05^{bA}	2.09±0.03^{cA}	2.21±0.04^{dA}	2.23±0.02^{dA}	2.22±0.03^{dA}	2.39±0.04^{eA}
	T_3	1.37±0.05^{aA}	1.65±0.05^{bA}	2.09±0.03^{cA}	2.19±0.03^{cdA}	2.27±0.04^{deA}	2.35±0.06^{efB}	2.43±0.04^{eA}
A:G Ratio	T_1	1.34±0.04^{bA}	1.27±0.03^{abA}	1.28±0.04^{abA}	1.21±0.05^{aA}	1.16±0.03^{aA}	1.57±0.02^{cA}	1.53±0.05^{cA}
	T_2	1.28±0.05^{bcA}	1.37±0.04^{cAB}	1.25±0.04^{abA}	1.22±0.04^{abA}	1.13±0.03^{aA}	1.55±0.02^{dA}	1.55±0.06^{dA}
	T_3	1.25±0.05^{bA}	1.39±0.04^{cB}	1.25±0.03^{bA}	1.25±0.03^{bA}	1.11±0.04^{aA}	1.49±0.05^{cA}	1.50±0.05^{cA}
Cholesterol	T_1	49.30±0.27^{aA}	72.20±0.37^{bB}	81.29±0.59^{cA}	88.54±1.0^{eA}	95.75±1.69^{eA}	97.62±1.64^{efA}	101.69±0.93^{fA}
	T_2	48.75±0.23^{aA}	70.92±0.20^{bA}	82.49±0.63^{cA}	93.22±0.19^{dB}	97.58±1.55^{eA}	99.32±0.92^{efA}	102.37±0.50^{fA}
	T_3	49.09±0.26^{aA}	72.49±0.35^{bB}	82.37±0.72^{cA}	91.65±0.96^{dB}	97.10±1.37^{eA}	99.36±1.50^{efA}	101.92±0.39^{fA}

Different superscripts in small letter (a, b, c, d) in a row and capital letter (A, B, C, D) in a coloumn differ significantly.

4. Conclusion

The present study revealed that there was no significant difference in different treatment groups on RBC (red blood cell), WBC (white blood cell), DLC (differential leucocyte count), Hb (hemoglobin), PCV (packed cell volume), MCV (mean corpuscle volume), MCH (mean corpuscle hemoglobin). There was no significant difference was observed among different treatment groups on blood glucose, total protein, albumin, globulin, A: G ratio and cholesterol. It may be concluded that dried Azolla powder may be supplement in Narmada Nidhi poultry feed upto 10% on dry matter basis without any adverse effect on hematological and biochemical parameters.

5. References

1. Alalade OA, Iyayi, EA, Alalade TO. The nutritive value of Azolla (*Azolla pinnata*) meal in diets for growing pullets and subsequent effect on laying performance. The Journal of Poultry Science. 2007;44(3):273-277.
2. Banerjee GC. Poultry, 3rd edn. Oxford and IBH public Cooperative Private Limited New Delhi, Bombay, Calcutta; c1992.
3. Basic Animal Husbandry & Fisheries Statistics. Animal Husbandry Statistics Division, Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India; c2022.
4. Bhattacharyya A, Shukla PK, Roy D, Shukla M. Effect of feeding azolla (*Azolla pinnata*) on growth and immune competence of commercial broilers. Proceedings of the seminar, 9th International poultry show and seminar: Safe food, Healthy Nation, Dhaka, Bangladesh. 2015 Feb;19-21:116.
5. Dhumal MV, Siddiqui MV, Siddiqui MBA, Avai PE. Performance of broiler fed on different levels of azolla meal. Indian Journal of Poultry Science. 2009;44(1):65.
6. Gupta SK, Chandra R, Dey D, Mondal G, Shinde KP. Study of chemical composition and mineral content of sun dried Azolla Pinnata: Journal of Pharmacognosy and phyto-chemistry. 2018;7(6):1214-1216.
7. Kamalasanana P, Premalatha S, Rajamony S. Azolla: A sustainable feed substitute for livestock. Leisa India; c2002. p. 15-17.
8. Kashyap SS, Shukla KP, Bhattacharyya A, Sirohi R. Effect of dietary inclusion of azolla (*Azolla pinnata*) in raw and meal forms on the production performance, immunocompetence, Development of digestive organs and carcass quality traits of coloured chicken. Journal of Animal Research. 2017;8:73-78.
9. Mishra DB, Roy D, Kumar V, Bhattacharyya A, Kumar M, Kushwaha R, *et al*. Effect of feeding different levels of Azolla pinnata on blood biochemicals, hematology and immunocompetence traits of chabro chicken. Veterinary world. 2016;9:192-198.
10. Pillai PK, Premalatha S, Rajamony S. Azolla-A sustainable feed substitute for livestock. With special emphasis on silapauline based production and feeding technique. Bio-fertilizer technology; c2004. p. 209.
11. Shukla M, Bhattacharya A, Shukla KP, Roy D, Yadav B, Sirohi R. Effect of Azolla feeding on the growth, feed conversion ratio, blood biochemical attributes and immune competence trait of growing turkeys, veterinary world. 2018;11(4):459-463.
12. Snedecor GW, Cochran WG. Statistical methods, 7th Edition, oxford and IBH publishing co., New Delhi, India; c1994. p. 350.
13. Sujatha T, Udhayakumari D, Kundu A, Jeyakumar S, Sundar J, Kundu MS. Utilization of raw Azolla as a natural feed additive for sustainable production in Nicobari fowl. Animal Science Reporter, 2013, 7(4).
14. Tawasoli MJ, Kahate PA, Shelke RR, Chavan SD, Shegokar SR. Effect of feeding azolla meal on feed intake and feed conversion efficiency of Vanraja poultry birds. International Journal of Agriculture Sciences. 2018;10(14):6733-6736.
15. Yadav SK, Mishra AK, Gupta NM, Singh AK, Goyal G, Gaur S. Effect of Azolla Supplementation on Production Performance of Narmadanidhi Birds. Journal of Animal Research. 2022;12(1):131-134.