Effect of Dietary Supplementation of Chicory Root Powder and Avian Specific *Lactobacillus* spp on the Hematology, Blood Biochemical, Lipid, Enzyme and Antioxidant Profile of Broiler Birds

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An experiment was conducted to assess the effect of dietary supplementation of chicory root powder and avian specific *Lactobacillus* spp on blood biochemical and anti-oxidant profile of broiler birds. 250 day old commercial (Ven Cobb) broiler chicks were selected randomly and were distributed into five treatments groups. Duration of experiment was 42 days. Each treatment comprises of five replicates with 10 chicks in each replicate. Dietary treatment consists of: Group 1 - control (basal diet as per BIS, 2007), Group 2 - (basal feed + BMD 0.5g/kg), Group 3 - (basal feed + 1% chicory root powder), Group 4 - (basal feed + *Lactobacillus* spp), Group 5 - (basal feed + 1% chicory root powder + *Lactobacillus* spp). Haematological parameters were not affected due to treatment imposed in the study except PCV which was higher (P<0.05) in CRP+LB group. Serum SGPT was found to be significantly decreased (P<0.01) in CRP & LB group at day 28, and average level in serum SGOT was also observed to be significantly decreased (P<0.05) for all treatment groups as compared to AGP group. Total protein value showed significant increased (P<0.05) in CRP+LB group at day 42. Globulin level was observed to be significantly increased (P<0.05) in CRP & CRP+LB group at day 42. Serum triglyceride level was significantly decreased (P<0.01) for all the treatment group as compared to AGP group. Serum LDL concentration was found to be significantly decreased (P<0.05) in CRP and CRP+LB group as compared to control, AGP & LB group on day 42, and serum HDL level was significantly increased (P<0.01) for all treatment group as compared to AGP group. The anti-oxidant profile as indicated by FRAP value showed significant increase (P<0.01) in CRP+LB group as compared to other treatment groups. Thus, the result from the study suggests that chicory root powder and avian specific *lactobacillus* spp are both beneficial feed supplement which can substitute antibiotic in the diet of broiler.

**Keywords**
Chicory root powder, *Lactobacillus* spp, Biochemical parameters, Haematology

**Article Info**
Accepted: 12 September 2019
Available Online: 10 October 2019

**Abstract**

An experiment was conducted to assess the effect of dietary supplementation of chicory root powder and avian specific *Lactobacillus* spp on blood biochemical and anti-oxidant profile of broiler birds. 250 day old commercial (Ven Cobb) broiler chicks were selected randomly and were distributed into five treatments groups. Duration of experiment was 42 days. Each treatment comprises of five replicates with 10 chicks in each replicate. Dietary treatment consists of: Group 1 - control (basal diet as per BIS, 2007), Group 2 - (basal feed + BMD 0.5g/kg), Group 3 - (basal feed + 1% chicory root powder), Group 4 - (basal feed + *Lactobacillus* spp), Group 5 - (basal feed + 1% chicory root powder + *Lactobacillus* spp). Haematological parameters were not affected due to treatment imposed in the study except PCV which was higher (P<0.05) in CRP+LB group. Serum SGPT was found to be significantly decreased (P<0.01) in CRP & LB group at day 28, and average level in serum SGOT was also observed to be significantly decreased (P<0.05) for all treatment groups as compared to AGP group. Total protein value showed significant increased (P<0.05) in CRP+LB group at day 42. Globulin level was observed to be significantly increased (P<0.05) in CRP & CRP+LB group at day 42. Serum triglyceride level was significantly decreased (P<0.01) for all the treatment group as compared to AGP group. Serum LDL concentration was found to be significantly decreased (P<0.05) in CRP and CRP+LB group as compared to control, AGP & LB group on day 42, and serum HDL level was significantly increased (P<0.01) for all treatment group as compared to AGP group. The anti-oxidant profile as indicated by FRAP value showed significant increase (P<0.01) in CRP+LB group as compared to other treatment groups. Thus, the result from the study suggests that chicory root powder and avian specific *lactobacillus* spp are both beneficial feed supplement which can substitute antibiotic in the diet of broiler.

**Introduction**

Poultry production has undergone an enormous expansion during the past decades throughout the world (Praveen *et al.*, 2017). India’s poultry industry has shown to grow at a steady rate of around 7-8% per year (Soundararajan, 2017). The poultry industry
benefitted from the inclusions of antibiotic
growth promoters (AGP) in feed which
enhance the performance and health of broiler
birds (Awad et al., 2009).

Current trends in poultry production aim at
reducing the repeated use of antibiotic growth
promoters, and the use of alternatives to
antibiotic growth promoters because of
development of antimicrobial resistance, and
antibiotic residue in meat (Jackson et al.,
2004). Potential alternatives to antibiotics in
broilers are prebiotics and probiotics.
Probiotic lactic acid bacteria and
oligosaccharide have been showing positive
effect in the digestive tract of birds.(Spring
et al., 2000).

Chicory root (Cichorium intybus) is a source
of inulin & fructo-oligosaccharides (FOS)
considered as prebiotic. Research showed that
the addition of chicory root fructans either
inulin or oligo fructose to broiler feed
improved body weight gain, feed conversion,
carcass yield and increased the small intestine
length of female broilers (Yusrizal and Chen,
2003). Another feed additive is probiotics,
which are live microorganisms that have a
positive effect on the host by improving the
balance of pathogenic to beneficial bacteria in
the gut (Simon et al., 2001). The benefits of
probiotics are based on two main functions,
stimulating the growth of beneficial
microflora and suppressing the growth of
pathogenic bacteria.

Among different probiotics, Ghareeb et al.,
(2012) reported that the administration of the
probiotic containing avian- specific
Lactobacillus spp to broiler chickens can help
reduced C. jejuni by altering the gut
microbiota that is beneficial for the intestine
and provide protection against invasion from
harmful pathogens. The potential health
benefits associated with using a probiotics
include improved digestion, stimulation of
gastrointestinal immunity and increased
natural resistance to enteric disease (Tellez et
al., 2001).

When probiotic & prebiotic are used together
in the diet, they can help improve the
microbial count and viability of beneficial
microorganisms, since they can use prebiotics
as a substrate for fermentation in the GI tract
(Bengmark, 2001).

Therefore, this study was conducted with the
hypothesis that avian specific Lactobacillus
spp and chicory root inulin would have
beneficial effect on the blood biochemical
parameters and antioxidant profile of the
broiler birds.

Materials and Methods

Experimental design and diets

A total of 250 day old broiler chicks having
similar body weight from a single hatch were
purchased and distributed randomly into 5
treatment groups, with 50 birds kept in each
group following completely randomized
design. Each group consists of 5 replicate with
10 birds in each replicate. All the chicks were
reared under the same management and
condition. Due attention was adopted to
maintain the biosecurity and avoid stress
inside and outside the farm. Three types of
broiler diets were formulated and prepared i.e.
broiler pre-starter (1-7d), broiler starter (8-
21d) feed and broiler finisher (22-42d) feed
as per specified by BIS (2007). Group 1
(CON) was fed standard basal diet without
any additional supplements. Birds in group 2
(AB) was fed basal diet with Antibiotic
Growth Promoters i.e. Bacitracin methylene
disalicylate (BMD) @ 0.5g/kg of feed. Group
3(CRP) was fed basal diet with chicory root
powder @ 1% of feed. Group 4 (LB) was fed
basal diet with avian specific Lactobacillus
spp at prescribed dose rate @10^6/g diet. Group
5 (CRP+LB) was fed the basal diet with combination of chicory root powder and avian specific *Lactobacillus* spp. Chicory root powder was purchased commercially from Earth Expo Company, Gujarat, India and it was incorporated in the diet at the rate of 1% diet. *Lactobacillus* spp was isolated from healthy broiler birds following standard procedures and used as probiotic in the diet of experimental birds. Birds were reared under deep litter system of management. The experimental birds were offered *ad libitum* feed everyday using a clean feeder. Vaccination against New Castle Disease (NDV) & Infectious Bursal Disease (IBD) was given on day 7 and day 14 respectively.

**Hematological examination**

Blood was collected by sample vial (EDTA) at day 42. Estimation of haematological parameters like packed cell volume (PCV), red blood cells (RBC), white blood cells (WBC), hemoglobin (Hb), was done with the help of automated haematology cell counter (Model: MS4e) following the standard procedures as per the manufacturer's protocol.

**Biochemical indices examination**

2ml of blood sample was collected in a vial from all replicate of the treatment group from the wing vein at day 28 and day 42. The samples were left stand to clot for 30 min, and then centrifuged at 3000 rpm for 10 mins to separate the serum. The blood biochemical, enzyme and lipid profile was determined using Fujifilm clinical chemistry analyser as per manufacturer's protocol.

**Anti – oxidant profile**

Blood was collected in sample vial on day 28 and day 42, serum was collected by centrifugation at 3000rpm for 10 mins. Anti – oxidant profile for each treatment group were determined by using ferric reducing anti-oxidant power (FRAP) assay (Benzie & Strain, 1996). The serum samples was then run in U.V - Spectrophotometer. The value obtained was expressed as Trolox equivalent (10µgTE/10µl).

**Statistical analysis**

The statistical analysis of the recorded or estimated data was done using standard analytical procedure (Snedecor and Cochran, 1994). Differences among means were separated using Duncan’s multiple range test (Duncan, 1955). Probability values less than 0.05 is considered to be statistically significant and values P≤ 0.01 was declared a trend.

**Results and Discussion**

**Hematological parameters**

Average values of blood WBC, RBC, PCV, Hb level in different treatment groups at different age are presented in table 1. Statistical analysis revealed that there were no significant (P>0.05) difference in the WBC & RBC count and Hb level among the different treatment groups at day 42. However, the packed cell volume (PCV) was significantly (P<0.05) increased at 42 days in CRP and LB group as compared with control, AGP and CRP+LB group. Similar finding have been reported by Akoy (2015) who observed increased level of PCV in treatment groups diet supplemented with inulin and probiotic. On contrary to our findings, Beski and Al-Sardary (2015) reported that supplementation of fructooligosaccharide (FOS) and probiotics (strain of Lactic Acid Bacteria) did not have significant (P>0.05) effect on the PCV of broiler birds. Hashem and Mohamed (2009) also observed no significant (P>0.05) difference in the PCV of broiler birds fed inulin (5%diet) and probiotics (protexin 0.5g/L) in the diets of broiler birds. The
increased PCV value in LB group could be due to the probiotics of Lactobacillus spp which might have reduced the nutritional stress and maintaining a healthy gut status in broiler birds (Karoglu and Drudag, 2005).

**Blood biochemical parameters**

Blood biochemical parameters like glucose, total protein, albumin and globulin concentration on serum of different experimental groups are presented in Table 2. Glucose level showed no significant difference (P>0.05) between the treatment groups at both day 28 and day 42. Total protein level was observed to be significantly (P<0.05) different, with highest protein value observed in CRP+LB groups at day 42.

The present finding is in consistency with the findings of Mousa et al., (2017) who reported significant increased in protein level on supplementation with Cichorium intybus and/or Moringa oleifera. However, the present study is in conflict with Koksal et al., (2011) could not observe any significant difference (P>0.05) in total protein due to supplemental inulin in the diet of broiler birds. Globulin concentration was observed to be significantly (P<0.05) increased in CRP & CRP+LB group as compared to other groups.

The observed difference in globulin is comparable with the findings of Ashayerizadeh et al., (2009), Hashem and Mohamed (2009) who observed significant difference in the level of protein between the treatment and control group.

However, the present findings is in disagreement with the findings of, Yenge et al., (2018) and Kowalczuk-Vasilev et al., (2017) who reported no significant difference (P>0.05) in the level of globulin on supplementation of inulin in the diet of broiler birds. This change in total protein level in serum indicates better metabolism of proteins in the body by providing feed additives (like prebiotic MOS, FOS) in the diet (Burkhardt, 2000).

**Lipid profile**

The effects of chicory root powder and avian specific lactobacillus spp treatments on serum lipid profile of broiler birds during day 28 and day 42 are presented in Table 3. Cholesterol level showed no significant difference (P>0.05) between all the treatment groups.

Triglyceride level was observed to be significantly (P<0.05) decreased in CRP, LB & CRP+LB group as compared to control and AB group. The observed reduction is in agreement with Yusrizal and Chen, (2003), Ashayerizadeh et al., (2009) and Elrayeh et al., (2011) who observed significant decreased (P<0.01) in the level of triglyceride of broiler birds supplemented with inulin and probiotic.

LDL and HDL showed significant decreased (P<0.05) in CRP, LB &CRP+LB groups as compared to control and AB group at day 42.. The observed significant difference (P<0.05) in the level of LDL was in line with the findings of Beski and Al-Sardary (2015) and Kalavathy et al., (2010). The reduction in the serum LDL might be due to the fact that, large amount of LDL is made up of cholesteryl esters and free cholesterol with little triglycerides (Mc Eneny et al., 2002), and treatment of both prebiotic and probiotic have the ability to reduce the cholesteryl esters level in LDL (Min-Tze Liong et al., 2007)

**Serum enzyme**

The effects of chicory root powder and avian specific lactobacillus spp treatments on serum enzyme of broiler birds during day 28 and day 42 are presented in Table 4.
Table 1 Effect of chicory root powder and avian specific *Lactobacillus spp* on hematological parameter

| Attributes | Treatment          | P value |
|------------|--------------------|---------|
|            | Group-1 (C)        |         |
| WBC        | 6.26±4.80          |         |
| RBC        | 2.33±0.26          |         |
| PCV        | 29.20±0.43         |         |
| Hb         | 14.40±0.66         |         |
|            | Group- 2 (AGP)     |         |
| WBC        | 6.93±8.35          |         |
| RBC        | 2.53±0.17          |         |
| PCV        | 31.03±1.23         |         |
| Hb         | 15.30±1.60         |         |
|            | Group- 3 (CRP)     |         |
| WBC        | 6.96±3.92          |         |
| RBC        | 2.74±0.32          |         |
| PCV        | 33.40±0.51         |         |
| Hb         | 15.66±0.86         |         |
|            | Group- 4 (LB)      |         |
| WBC        | 6.83±3.92          |         |
| RBC        | 2.60±0.23          |         |
| PCV        | 31.93±0.37         |         |
| Hb         | 15.20±0.41         |         |
|            | Group- 5 (CRP+LB)  |         |
| WBC        | 6.93±2.90          | 0.85^N  |
| RBC        | 2.56±0.08          | 0.45 NS |
| PCV        | 31.40±0.70         | 0.02*   |
| Hb         | 15.90±1.15         | 0.86^N  |

CON- Control; AB- Antibiotic growth promoter; CRP- Chicory Root Powder; LB- *Lactobacillus spp*; CRP+LB- Chicory Root Powder & *Lactobacillus spp*; *Calculated value; a,b,c means with different superscripts in a row differ significantly; NS= Non significant; * means (P<0.05); ** means (P<0.01); Avg- Average

Table 2 Effect of chicory root powder and avian specific *Lactobacillus spp* on serum enzyme SGPT (U/I) & SGOT (U/I)

| Attributes | Treatment          | P value |
|------------|--------------------|---------|
|            | Group-1 (C)        |         |
| SGPT       | 7.00±0.40          |         |
| d 28       | 5.25±0.62          |         |
| d 42       | 6.25±0.47          |         |
| Average    | 6.62±0.44          |         |
|            | Group- 2 (AGP)     |         |
| SGPT       | 4.77±0.25          |         |
| d 28       | 3.75±0.47          |         |
| d 42       | 4.26±0.34          |         |
| Average    | 4.26±0.34          |         |
|            | Group- 3 (CRP)     |         |
| SGPT       | 4.25±0.47          |         |
| d 28       | 5.50±0.64          |         |
| d 42       | 4.87±0.81          |         |
| Average    | 5.75±0.60          | 0.03*   |
|            | Group- 4 (LB)      |         |
| SGOT       | 5.50±0.64          |         |
| d 28       | 6.00±0.57          | 0.14 NS |
| d 42       | 5.50±0.64          |         |
| Average    | 6.00±0.57          | 0.03*   |
|            | Group- 5 (CRP+LB)  |         |
| SGPT       | 0.01**             |         |
| d 28       | 164.25±11.6        |         |
| d 42       | 176.25±6.70        |         |
| Average    | 170.25±8.68        |         |
|            | Group- 2 (AGP)     |         |
| SGOT       | 204.50±9.36        |         |
| d 28       | 176.70±8.87        |         |
| d 42       | 195.50±19.1        |         |
| Average    | 200.00±16.1        |         |
|            | Group- 3 (CRP)     |         |
| SGOT       | 204.50±9.36        |         |
| d 28       | 171.00±0.57        |         |
| d 42       | 195.50±19.1        |         |
| Average    | 200.00±16.1        |         |
|            | Group- 4 (LB)      |         |
| SGOT       | 170.50±7.96        | 0.02*   |
| d 28       | 167.00±8.87        |         |
| d 42       | 187.57±7.08        |         |
| Average    | 170.00±8.87        |         |
|            | Group- 5 (CRP+LB)  |         |
| SGOT       | 0.27 NS            |         |
| d 28       | 171.00±0.57        |         |
| d 42       | 176.00±25.4        |         |
| Average    | 170.50±7.96        |         |

CON- Control; AB- Antibiotic growth promoter; CRP- Chicory Root Powder; LB- *Lactobacillus spp*; CRP+LB- Chicory Root Powder & *Lactobacillus spp*; *Calculated value; a,b,c means with different superscripts in a row differ significantly; NS= Non significant; * means (P<0.05); ** means (P<0.01); Avg- Average
**Table 3** Effect of chicory root powder and avian specific *Lactobacillus spp* on serum Glucose (mg/dl), Total protein (g/dl), Albumin (g/dl) and Globulin (g/dl) in broiler chickens

| Attribute       | Treatment                                      | P value |
|-----------------|-----------------------------------------------|---------|
|                 | Group-1 (C) | Group-2 (AGP) | Group-3 (CRP) | Group-4 (LB) | Group-5 (CRP+LB) |
| **Glucose**     |             |               |               |               |                   |
| d 28            | 228.00±9.81 | 262.75±26.9   | 202.75±10.0   | 228.00±14.38 | 201.25±10.0       | 0.08<sup>NS</sup> |
| d 42            | 242.75±14.0 | 295.25±21.4   | 235.25±8.27   | 272.25±31.96 | 257.75±3.68       | 0.21<sup>NS</sup> |
| Average         | 235.37±10.4 | 279.00±22.4   | 219.00±8.90   | 250.12±20.1  | 238.75±7.54       | 0.03<sup>*</sup> |
| **Total Protein**|           |               |               |               |                   |
| d 28            | 3.17±0.17   | 3.02±0.08     | 3.12±0.17     | 3.12±0.11    | 3.17±0.08         | 0.92<sup>NS</sup> |
| d 42            | 3.05±0.09   | 3.37±0.06     | 3.52±0.26<sup>b</sup> | 3.32±0.10<sup>b</sup> | 3.85±0.09<sup>a</sup> | 0.02<sup>*</sup> |
| Average         | 3.11±0.09<sup>b</sup> | 3.20±0.06<sup>b</sup> | 3.32±0.14<sup>ab</sup> | 3.22±0.07<sup>ab</sup> | 3.51±0.07<sup>a</sup> | 0.01<sup>**</sup> |
| **Albumin**     |             |               |               |               |                   |
| d 28            | 1.05±0.02   | 1.00±0.04     | 1.12±0.07     | 1.10±0.05    | 1.02±0.04         | 0.44<sup>NS</sup> |
| d 42            | 1.02±0.09   | 1.07±0.04     | 1.05±0.09     | 1.05±0.05    | 1.25±0.05         | 0.21<sup>NS</sup> |
| Average         | 1.03±0.04   | 1.03±0.03     | 1.08±0.06     | 1.07±0.05    | 1.13±0.02         | 0.27<sup>NS</sup> |
| **Globulin**    |             |               |               |               |                   |
| d 28            | 2.12±0.16   | 2.02±0.07     | 2.00±0.10     | 2.02±0.06    | 2.15±0.06         | 0.78<sup>NS</sup> |
| d 42            | 2.02±0.13<sup>b</sup> | 2.30±0.07<sup>a</sup> | 2.47±0.18<sup>a</sup> | 2.27±0.07<sup>ab</sup> | 2.60±0.05<sup>a</sup> | 0.03<sup>*</sup> |
| Average         | 2.07±0.07<sup>b</sup> | 2.16±0.05<sup>ab</sup> | 2.23±0.11<sup>ab</sup> | 2.15±0.05<sup>ab</sup> | 2.37±0.04<sup>a</sup> | 0.01<sup>**</sup> |

CON- Control; AB- Antibiotic growth promoter; CRP- Chicory Root Powder; LB- *Lactobacillus spp*; CRP+LB- Chicory Root Powder & *Lactobacillus spp*; *Calculated value; <sup>a,b,c</sup> means with different superscripts in a row differ significantly; NS= Non significant; * means (P<0.05); ** means (P<0.01); Avg- Average
### Table 4
Effect of chicory root powder and avian specific *Lactobacillus spp* on serum lipid: Triglyceride (mg/dl), Cholesterol (mg/dl), LDL (Mg/dl) and HDL (mg/dl) in broiler chickens

| Attributes | Treatment | P value |
|------------|-----------|---------|
|            | Group-1 (C) | Group-2 (AGP) | Group-3 (CRP) | Group-4 (LB) | Group-5 (CRP+LB) |
| Triglyceride |  |  |  |  |  |
| d 28 | 53.00±3.69 | 71.25±5.15 | 47.75±50.75 | 50.75±4.30 | 52.00±1.87 | 0.01** |
| d 42 | 48.50±5.83 | 65.75±3.63 | 40.50±1.84 | 43.00±1.47 | 42.75±3.40 | 0.01** |
| Average | 50.75±2.19 | 68.50±2.10 | 44.12±10.12 | 46.87±2.71 | 47.37±2.11 | 0.01** |
| Cholesterol |  |  |  |  |  |  |
| d 28 | 109.00±7.01 | 116.75±7.57 | 113.25±5.57 | 102.00±6.28 | 109.00±1.47 | 0.51 NS |
| d 42 | 109.25±6.22 | 110.25±10.94 | 102.50±3.27 | 100.75±0.47 | 104.25±0.85 | 0.72 NS |
| Average | 109.12±5.06 | 113.50±8.05 | 108.62±4.11 | 101.62±4.31 | 106.63±3.37 | 0.63 NS |
| LDL |  |  |  |  |  |  |
| d 28 | 17.35±3.92 | 14.30±2.60 | 14.00±0.40 | 13.50±0.64 | 12.75±0.62 | 0.62 NS |
| d 42 | 18.75±2.39 | 18.80±0.71 | 12.00±0.40 | 15.75±1.49 | 11.75±0.47 | 0.02* |
| Average | 18.05±1.26 | 16.55±1.23 | 13.00±0.36 | 14.62±1.02 | 12.25±0.36 | 0.053 NS |
| HDL |  |  |  |  |  |  |
| d 28 | 83.00±5.11 | 90.75±2.17 | 93.75±5.15 | 87.50±5.67 | 89.00±9.32 | 0.77 NS |
| d 42 | 84.75±4.53 | 72.50±3.86 | 94.75±1.54 | 92.25±5.02 | 87.50±0.64 | 0.01 NS |
| Average | 83.87±3.46 | 81.62±1.78 | 94.25±2.73 | 89.87±4.51 | 88.25±2.34 | 0.11 NS |

CON- Control; AB- Antibiotic growth promoter; CRP- Chicory Root Powder; LB- *Lactobacillus spp*; CRP+LB- Chicory Root Powder & *Lactobacillus spp*; *Calculated value; a,b,c means with different superscripts in a row differ significantly; NS= Non significant; * means (P<0.05); ** means (P<0.01); Avg- Average

### Table 5
Effect of chicory root powder and avian specific *Lactobacillus spp* on FRAP(10TE/10µl) value in blood serum

| Attributes | Treatment | P value |
|------------|-----------|---------|
|            | Group-1 (C) | Group-2 (AGP) | Group-3 (CRP) | Group-4 (LB) | Group-5 (CRP+LB) |
| FRAP |  |  |  |  |  |
| d 28 | 1.14±0.07 | 1.39±0.12 | 1.20±0.07 | 1.06±0.08 | 2.08±0.54 | 0.10 NS |
| d 42 | 1.35±0.05 | 1.62±0.12 | 1.38±0.06 | 1.27±0.05 | 2.26±0.51 | 0.08 NS |
| Average | 1.25±0.05 | 1.50±0.12 | 1.29±0.06 | 1.16±0.06 | 2.17±0.50 | 0.01** |

CON- Control; AB- Antibiotic growth promoter; CRP- Chicory Root Powder; LB- *Lactobacillus spp*; CRP+LB- Chicory Root Powder & *Lactobacillus spp*; *Calculated value; a,b,c means with different superscripts in a row differ significantly; NS= Non significant; * means (P<0.05); ** means (P<0.01); Avg- Average
The blood serum lipid was significantly (p ≤ 0.05) decreased in SGPT and SGOT level at day 28. Similar findings was observed by Khodadadi et al., (2016) who observed reduction in SGPT level when supplemented with Cichorium intybus L. in the diet of broiler birds. Kanjilal et al.,(2014) observed significant decreased (P<0.05) in SGOT level of broiler birds fed with probiotic (Protexin®).

However, the findings are in contrast with the findings of Abdel Fatteh et al., (2009), Hashem and Mohamed (2009) who observed no effect on SGPT and SGOT supplemented with probiotics (protexin 0.5g/L) and inulin (5%diet) in the diet of broiler birds. The observed SGPT and SGOT level maybe due to the effect of inulin and probiotic which consist of antioxidant and free radical scavenging property that are effective in regulating the serum liver enzyme like SGPT and SGOT (Hassan and Yousef, 2010)

**Anti – oxidant profile**

Based on perusal of table 5, serum FRAP value (10µgTE/10µl) was found to be non - significant (P<0.05) among the treatment groups at day 28 and day 42. However, FRAP value in the treatment group was tended to be increased on both 28th and 42nd day when compared with control group, highest value observed in CRP+LB group. Overall, the average FRAP value was significantly (P<0.01) higher in CRP+LB group when compared with control, AGP, & LB groups.

The present findings are in agreement with Sohail et al., (2011) and Shen et al., (2014) who observed increased level of antioxidant for treatment group as compared to control group when supplemented with probiotic mainly Lactic acid bacteria.

However, the present study disagree with the finding of Capcarova et al., (2011) who observed significant difference (P<0.05) in the antioxidant level of broiler birds provided with Lactic acid probiotic.

The increased antioxidant value maybe due to chicory root inulin which can regulate glutathione metabolism to enhance the antioxidant defense, and regulate cellular metabolism, where its deficiency can result in oxidative stress (Wu and Luo, 2009).

**Acknowledgements**

The authors are thankful to College of Veterinary Sciences & A.H., CAU(I), Selesih, Mizoram for the facilities and financial support provided to carry out this research work.

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How to cite this article:

David Lalthlamuana, A. K. Samanta, L. Hmar, P. Behera, R. Buragohain, M. Ayub Ali and Vaisakh, V. P. 2019. Effect of Dietary Supplementation of Chicory Root Powder and Avian Specific Lactobacillus spp on the Hematology, Blood Biochemical, Lipid, Enzyme and Antioxidant Profile of Broiler Birds. Int.J.Curr.Microbiol.App.Sci. 8(10): 1511-1521. doi: https://doi.org/10.20546/ijcmas.2019.810.176