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Efficacy evaluation of polyherbal antistress formulation and synthetic vitamin C on broiler birds performance under physiological heat stress

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Abstract

A total of 160 sexed male broiler chicks of *Vencobb* strain of day-old age were randomly divided into 4 groups consisting of ten chicks in each group. All the Groups were maintained under same environmental (heat) stress Conditions (mean maximum daily temperature of 38 ± 1 °C, relative humidity (RH) $82.57 \pm 1.40\%$). Group 1 was maintained on control group and groups 2, 3 and 4 were supplemented with stressroak, ayucee and synthetic vitamin C, respectively. All the groups were maintained on iso-nitrogenous and iso-caloric diet for a period of 6 weeks. The performance parameters were recorded at weekly intervals. Heamatological parameters, serum creatinine, blood glucose and Serum Cortisol were carried out on 4th and 6th week. The stress control group had a significant ($P < 0.05$) reduction in body weight, Hb and pcv concentration and Creatinine, while FCR, RBC count, blood glucose and Serum cortisol were significantly ($P < 0.05$) increased. Supplementation with poly herbal formulation in groups 2 and 3 resulted in a marked improvement in all the above parameters as compared to those of stress control group. Performance profiles of Ayuucee supplemented group 2 was on par with synthetic vitamin C supplementation.

Keywords: Broiler birds, stress, performance, heamato-biochemical

1. Introduction

Broiler production in all hot regions suffers great losses every year due to the effect of heat stress [1]. High ambient temperatures can be devastating to commercial broilers; coupled with high humidity they can have an even more harmful effect. Depressed growth rate and decreased feed consumption of broilers raised in higher temperature environments have been reported in many studies over a number of years [2]. To optimize feed utilization and weight gain of broiler chickens, environmental temperature should be about 23 °C. Animals utilize multiple ways for maintaining thermoregulation and Homeostasis when subjected to high environmental temperatures, including increasing radiant, convective and evaporative heat loss by vasodilatation and perspiration [3]. Birds subjected to heat stress conditions spend less time for feeding, more time for drinking and panting, as well as more time with their wings elevated, less time moving or walking, and more time resting [4]. Chronic heat stresses significantly reduce feed intake (16.4%), lower body weight (32.6%), and higher feed conversion ratio (+25.6%) at 42 days of age in broilers [5]. Many additional studies have shown impaired growth performance in broilers subjected to heat stress [6, 7]. Ascorbic acid synthesis is decreased at elevated environmental temperature making it an essential dietary supplement during the summer [9]. Thus sticking to the emergency for dietary incorporation of vitamin C, it is being constantly added to poultry diet in synthetic form. However nowadays, the poultry industry has focused more attention towards addressing public concern for environmental and food safety [10]. Keeping in view the points as elaborated above, the present trial is conducted to assess efficacy of polyherbal antistressor and antioxidant formulation Stressroak premix is a polyherbal formulation containing *withania somnifera*, *Ocimum sanctum*, *phyllanthus emblica*, *shilajit* and bioflavonoids, Ayuucee (M/S Ayurvet Limited, Baddi, H.P. India), a natural source of ascorbic acid and bioflavonoids that owes its beneficial properties to the constituent herbs *Phyllanthus emblica*, *Ocimum sanctum*, *Terminalia chebula* and *Withania somnifera*.

2. Material and methods

The present study was carried out at Bidar, Karnataka State, India. Department of pharmacology and Toxicology, College of Veterinary Sciences, KVAFSU. During hot dry season. (April to July, 2016). The experimental chicks were housed in four different pens and each pen was partitioned for treatment group to have 4 replications accommodating 10 birds in each. Brooding was continued until 2 weeks of age in the respective pen of each replication and treatment group. The experimental birds were vaccinated against Ranikhet disease on 6th day, Gumboro disease/IBD on 14th day and vaccination of booster dose of Gumboro was carried out on 24th day and of Ranikhet (strain) disease given on 29th day. All the birds were subjected to natural induced heat stress. Record of temperature were maintained on daily basis with mean maximum daily temperature of 38±1 °C, relative humidity (RH) 82.57 ± 1.40% (Recorded twice daily at a fixed time by hygrometer)

2.1 Experimental design: 160 day old Vencob straight run commercial broiler chicks were randomly allotted to four treatment groups with each treatment having four replicates and each replicate comprised of ten birds. Group T0: Untreated control, Group T1: supplemented with stressroak premix @ 1kg/ton Group T2: supplemented with Ayucee premix @ 100gm/ton of feed from 0-42 days. Group T3: supplemented with synthetic ascorbic acid @ 100gm/ton of feed from 0-42 days

2.2 Parameters studied: The growth performance parameters (body weight, growth rate, cumulative weight gain, average feed intake and mean FCR) were recorded at weekly intervals throughout the experimental period. Blood samples were drawn from the wing vein for estimation of Rbc, Hb and PCV as per standard procedure. Serum samples were separated from the blood. These samples were used for the estimation of Blood Glucose [29] and creatinine [30] on 4th and 6th weeks and serum cortisol [14] on 6th week from 10 representative birds of each group (2 birds /replicate).

2.3 Statistical analysis: Observations were summarized in tabular form for each individual group. The data were analyzed following standard procedure (Snedecor and Cochran, 1994).

3. Results and Discussion

3.1 Growth and performance parameters

3.1.1 Body weight: Growth rate and body weight gain decreases at high environmental temperature which might be due to many factors which include decreasing feed consumption, inefficient digestion [11], and impaired metabolism [12]. Also at high ambient temperatures, there is a decrease in protein synthesis [13], probably due to reduced plasma amino acid

Concentration and to lower energy supply [14].

In the current study, the body weight at the end of 4th and 5th week was found to be significantly ($P < 0.05$) improved in Stressroak supplemented group T1 birds (1114.00gm and 1640.00gm, respectively) as compared to control group (1090.00gm and 1591.00gm, respectively). This significant ($P < 0.05$) improvement in body weight in Stressroak supplemented group T1 birds continued up to 6th week. The final body weight at the end of 6th week in Stressroak supplemented group T1 birds (2308.00gm) was found to be significantly ($P < 0.05$) better from unsupplemented control

group T0 birds (2118gm) and varied non-significantly from Ayucee T2 group (2226.00gm) and synthetic ascorbic acid supplemented group T3 birds (2220.00gm) (Table 2).

The mean weekly weight gains at 1st week of age were 75.76gm, 82.05gm, 84.20gm and 86.10gm for treatment group T0, T1, T2, and T3 respectively (Table 3). At 5th and 6th week of age significantly ($P < 0.05$) better body weight gain was found in Stressroak supplemented Group T1 birds (532.00gm and 668.00gm, respectively) as compared to control group (501.00gm and 526.00gm, respectively) and body weight gain varied non-significantly from Ayucee T2 group, synthetic ascorbic acid supplemented group T3 birds (517.70gm and 602.00gm), (603.67gm and 587.96gm, respectively) (Table 3). The improvement in weekly body weight and body weight gain may be attributed to ingredient herbs of Stress roak premix viz *Withania somnifera* *Ocimum sanctum*, *phyllanthus emblica* and *shilajit* which are known to have antistress and immunomodulatory properties [15, 16]. Perusal of literature reveals many authors had reported that dietary incorporation of synthetic and herbal antistressor vitamin C to increase body weight gain as well as improve growth and performance of birds during summer [17-19].

3.2 Weekly Feed Consumption and Feed conversion ratio (FCR)

Stress in broilers results in a decline in feed consumption and overall feed efficiency. Decreased feed consumption observed in heat stressed birds is closely related to the extra heat load accumulated in the course of heat stress [20]. Feed consumption was recorded to be non-significantly better in Stressroak supplemented group T1 birds throughout the experiment as compared to untreated control group T0 birds. FCR varied non-significantly between different treatment groups from 1st week to 5th week of age. At 6th week of age feed conversion was found to be significantly better in Stressroak supplemented group T1 birds (1.76) as compared to unsupplemented control group T0 birds (2.17) whereas feed consumption in group T1 birds varied non-significantly from Ayucee T2 group and synthetic ascorbic acid supplemented group T3 birds (1.92 and 1.91) (Table 4). Antioxidant plays an important role in both nutrition and production performance in poultry. Significantly better feed consumption ration in Stressroak supplemented group T1 birds may be attributed to its ingredient herbs viz *Ocimum sanctum* and *Phyllanthus emblica* which are known to have antistress and antioxidant property [21, 22].

3.3 Hematological Parameters

Heat distress causes reduction in packed cell volume (PCV) and hemoglobin which is apparently associated with hemodilution because the excess glucocorticoids stimulate water and sodium chloride reabsorption in the kidney and cecum [23]. At 4th and 6th week of age hemoglobin level was found to be control group lower as compared to all other groups at the end of 4th wk (13.38±0.142, 13.04±0.214 and 13.58±0.179, respectively in groups T1, T2 and T3). There no significant difference among treated groups. At the end of 6th wk, the value of group T0 was 13.73±0.149, which was significantly ($p < 0.05$) lower from the other groups (15.06±0.316, 15.07±0.428 and 15.94±0.254, respectively. control group T0 was 29.98±0.522, which was significantly ($p < 0.05$) lower as compared to all other groups at the end of 4th wk In groups T1, T2 and T3 the values were 31.00±0.408, 32.89±0.347 and 30.64±0.369, respectively. At the end of 6th

wk, PCV in stress control group T0 was 30.64 ± 0.369 , which was significantly ($p < 0.05$) lower as compared to all other groups (33.57 ± 0.411 , 34.00 ± 0.802 and 31.74 ± 0.386 , respectively). There was no significant difference between groups T1 and T2 (Table 6).

The TEC ($10^6/\text{mm}^3$) in stress control group T0 at the end of 4th wk was 2.370 ± 0.007 , which was significantly ($p < 0.05$) lower as compared to all other groups (2.511 ± 0.063 , 2.413 ± 0.031 and 2.421 ± 0.030 , respectively in groups 2, 3 and 4) and the value did not differ significantly among the treated groups T1, T2 and T3. At the end of 6th wk, the value of group T0 was 2.709 ± 0.049 , which was significantly ($p < 0.05$) lower when compared to the treated groups T1, T2 and T3 (2.869 ± 0.041 , 2.854 ± 0.045 and 2.842 ± 0.028 , respectively) [24].

3.4 Biochemical Parameters

The concentration of blood glucose (g/dl) in stress control group T0 was significantly ($p < 0.05$) raised (145.4 ± 1.36) as compared to all other groups at the end of 4th wk (130.6 ± 0.60 , 128.0 ± 0.70 and 131.2 ± 0.66 , respectively in groups T1, T2 and T3). The value at the end of 6th wk in stress control group T0 was 210.0 ± 1.97 , which was significantly ($p < 0.05$) raised as compared to groups T1, T2 and T3 (185.2 ± 0.37 , 195.4 ± 0.50 and 204.0 ± 0.31 , respectively). The lowest concentration was recorded in group T1 among the treatments.

The concentration of serum creatinine (mg/dl) in group T1 was significantly ($p < 0.05$) raised (0.395 ± 0.006) compared to all other groups at the end of 4th wk (0.378 ± 0.004 , 0.386 ± 0.008 and 0.381 ± 0.007 , respectively in T1, T2 and T3). The values at the end of 6th wk in stress group T0 was 0.415 ± 0.006 which was significantly ($p < 0.05$) raised as compared to T1, T2 and T3 (0.407 ± 0.006 , 0.409 ± 0.005 and 0.405 ± 0.004 respectively). The lowest concentration was recorded in group T3 among the treatments the concentration of serum cortisol (Ug/dl) levels revealed a significant ($p < 0.05$) increase in stress control group (group T0) (8.77 ± 0.075) as compared to treated groups T1, T2 and T3 (5.30 ± 0.029 , 6.15 ± 0.028 and 6.20 ± 0.04 , respectively).

4. Conclusion

To alleviate the problem of heat stress recommendations regarding housing, ventilation, and cooling systems are possible at large commercial scale as it involves high cost. Instead, because of being practical, nutritional manipulation with its low cost is a common approach in poultry production. Thus it may be concluded that natural vitamin C and bioflavonoids supplementation in the form of Ayucee premix had beneficial effect on growth, feed efficiency and hemato-biochemical profile. Dietary incorporation of herbal stressroak and Ayucee premix will be beneficial to minimize the production losses out of heat stress in broilers growth, feed efficiency and hemato-biochemical profile. Dietary incorporation of herbal stressroak and Ayucee premix will be beneficial to minimize the production losses out of heat stress in broilers.

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