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Efficacy evaluation of herbal preparations and antioxidants on the growth, immunity, antioxidant status and *Escherichia coli* counts of broilers under heat stress

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ABSTRACT

The present experiment was conducted to evaluate the efficacy of different herbal preparations on the performance of broilers. For this, 250-day-old male broiler chicks were randomly divided into 5 treatment groups with 10 replicates of 5 birds each. The experimental design consisted of T1: control diet, T2: Herbal powder I, T3: Herbal powder II, T4: Herbal powder III, T5: vit E and Se. The results indicated that T4 and T5 had significantly higher body weight gain compared to other treatments at 42 d of age. However, among other test diets, cumulative body weight gain was comparable with vit E and Se. Feed intake was not influenced by different herbal supplementation, but significantly better feed conversion ratio was noticed in all the test diets. Lipid peroxidation, alkaline phosphatase, blood urea nitrogen, cholesterol, blood glucose levels and *E. coli* counts in small intestine were significantly low in treatment groups compared to control and at par with vit E and Se. All herbal preparations did not have any significant effect on various carcass parameters, total protein, albumin and HI antibody titer. From the results, it could be concluded that poly herbal preparations improved the overall performance of broilers.

Keywords: Body weight, Broilers, Cholesterol, Herbs, Lipid peroxidation

Heat stress causes huge economic losses in Indian poultry industry leading to heavy mortality and decreased performance. High temperatures, especially when coupled with high humidity, impose severe stress on broiler birds and lead to reduced performance (Ajakaiye *et al*. 2011). In the past few decades, several Ayurvedic herbal preparations have been extensively used in poultry to alleviate the negative effects of high environmental temperature. Polyherbal products containing different immunomodulator (*Withania somnifera*), antistressor (*Phyllanthus emblica, Mangifera indica*) and adaptogenic (*Ocimum sanctum*, *W. somnifera*) herbs have been used to enchance performance (Reddy *et al*. 2012) and decrease heat stress during summer season. In order to address the problem of heat stress, an experiment was conducted to investigate the effect of different herbal preparations on the performance of broilers.

MATERIALS AND METHODS

For this purpose, 250 day-old male broiler chicks (Vencobb) were distributed randomly into 5 dietary treatments of 10 replicates with 5 chicks in each replicate. At day one, chicks were wing banded and housed under deep litter system with optimum brooding conditions. Standard management practices were followed during the entire experimental period.

The birds were fed with maize and soybean meal-based diets containing 3050 and 3150 kcal ME and 21.5 and 19.5% crude protein, respectively during starter (1–28 d) and finisher (29–42 d) phases. The experimental design consisted of; T1: control, T2: herbal powder I (contains *Withania somnifera, Phyllanthus emblica, Glycrrhiza glabra, Tribulus terrestris and Asparagas racemosus*) @ 250 g/ton of feed, T3: herbal powder II (contains *Withania somnifera, Ocimum sanctum, Mangifera indica* and *Shilajit*) @ 1 kg/ton of feed, T4: herbal powder III (Ayuce herbal powder supplied by Ayurvet Limited, Baddi, India) @ 100 g/ton of feed, T5: vit E (70 mg per kg) and Se (0.15 mg/kg)**.** Weekly individual body weight and feed consumption of each group were recorded. After the experimental period (42 d), one bird from each replicate of all the treatment groups were sacrified for recording of carcass parameters. Blood samples were collected on 42 day of age. Blood glucose levels were estimated by using capillary blood glucose method. Serum samples were separated from the blood and were used for the estimation of different serum parameters using standard diagnostic kits of Erba Pvt. Ltd. Humoral immune response (HI titers) and *E. coli* counts was estimated as per standard protocol. The statistical analysis was done using SPSS20.0 version.

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RESULTS AND DISCUSSION

The present study was conducted to evaluate the efficacy of different herbal products in broilers under heat stress. Record of temperature was maintained on daily basis where mean maximum daily temperature of 41.07°C and minimum temperature of 36.8°C was recorded throughout the experiment. The temperature-humidity index (temperature 103°F and humidity 58%) was 107±1.10 were above the threshold established for poultry indicates that the birds were subjected to heat stress.

Performance parameters: The results indicated that cumulative body weight gain and feed conversion ratio (FCR) were significantly (P<0.05) improved by supplementation of various polyherbal preparations and vit E and Se compared to control diet (Table 1). The highest mean weight gain was noticed in T4 and T5 compared to other treatments at 42 d of age. However, among other test diets, cumulative body weight gain was comparable with vit E and Se. No significant (P>0.05) difference was observed among test diets but they had better feed efficiency compared to control. Supplementation of herbal preparation did not have any significant effect on feed intake of broilers at 42 days of age. These findings are in accordance with results of Karangiya *et al*. (2016) and Chaudhari *et al*. (2015) reported that supplementation of herbs significantly (P<0.05) increased the body weight gain in broilers. This is in agreement with many studies where supplementation of herbs (Mohamed *et al*. 2012, Pooja *et al*. 2017) had a significant (P<0.05) positive effect on the body weight gain and FCR of broilers. Contrary to these findings, Ademola *et al*. (2009) reported that herbs did not show significant (P<0.05) effect on FCR of broilers. The improvement in body weight and FCR might be due to stimulation of digestive enzymes in the intestinal mucosa and pancreas that improves the digestion of dietary nutrients and feed efficiency, subsequently increases growth rate (Ali, 2011).

Table 1. Effect of different herbal preparations on growth parameters of broilers at 42 days of age

Trt	Diet	Cumulative weight gain (g) /bird	Feed intake (g)/bird	Feed conversion ratio (FCR)
T1	Control	1960^{b}	3258	1.67^{b}
T2	Herbal powder I	1988^{ab}	3299	1.65^{a}
T3	Herbal powder II	1977^{ab}	3247	1.64^{a}
T4	Herbal powder III	2013^{a}	3307	1.64^{a}
T5	Vit E & Se	2017^{a}	3331	1.65^{a}
	SEM	17.002	25.06	0.004
	N	10	10	10
	P -value	0.006	0.814	0.003

Value bearing different superscripts within a column are significantly (P<0.05) different.

Mortality: It was observed that the highest mortality was noticed in control (4 out of 50 birds) group followed by T2 (3 out of 50 birds) and T4 groups (2 out of 50 birds). However, the mortality rate was within the acceptable range and no specific disease outbreak was recorded. Similar results were observed by Shiva kumar *et al*. (2005).

Carcass traits: The ANOVA revealed that all treatment groups failed to exert any significant (P>0.05) influence on carcass parameters like dressing weight and giblet weights (liver, heart and gizzard). Similarly, Kale *et al*. (2014) reported that supplementation of aswagandha did not show any significant effect on dressing percent, giblet and cooking yield. Similar observations were made by Dahale *et al*. (2014).

Serum parameters: Estimation of serum revealed that Lipid peroxidation, Alkaline phosphatase and blood urea nitrogen levels were significantly reduced in vit E and Se and herbal supplemented diets compared to control (Table 3). Heat stress increased red blood cell susceptibility to lipid peroxidation because of increased free radical generation, as indicated by lipid peroxidation concentration in serum. Similar results were also reported by Naresh *et al*. (2017) and Sujatha *et al*. (2010). The plasma glucose concentration (mg/dl) and total cholesterol in control group was significantly (P<0.05) higher in comparison to the treatment groups, however no significant difference was observed among test diets (Table 4). These findings are in accordance with results of Khwairakpam *et al*. (2016), Lanjewar *et al*. (2008) and Dwivedi *et al*. (2015) reported that supplementation of herbs to broilers causes significant reduction in serum LDL cholesterol, total cholesterol and triglycerides. In contrary, Dwivedi *et al*. (2015) did not found any difference in blood glucose values.

The values of total serum protein, albumin, globulin,

Table 2. Effect of different herbal preparations on carcass parameters of broilers at 42 days of age

Trt.	Diet	Dressed weight (g)	Abdominal fat (g)	Gizzard (g)	Heart (g)	Liver (g)	Spleen (g)
T1	Control	1664	21.92	41.24	13.04	38.00	3.180
T2	Herbal powder I	1774	20.48	41.50	12.45	42.75	2.450
T3	Herbal powder II	1802	24.94	43.56	10.88	37.42	2.480
T4	Herbal powder III	1784	19.03	41.72	11.55	38.83	3.517
T5	Vit E and Se	1797	22.26	44.28	11.58	39.68	2.600
	SEM	20.43	1.531	1.145	0.307	1.222	0.244
	N	10	10	10	10	10	10
	P-value	0.174	0.322	0.908	0.196	0.764	0.554

Value bearing different superscripts within a column are significantly (P<0.05) different.

Table 3. Effect of different herbal preparations on antioxidant parameters of broilers at 42 days of age

Trt.	Diet	Lipid peroxidation (nmol MDA/mg protein)	Alkaline phosphatase (nmol MDA/mg protein)	Blood urea nitrogen (nmol MDA/mg protein)
T1	Control	4.526[a]	97.49[a]	65.81[a]
T2	Herbal powder I	3.747[b]	83.04[b]	62.51[b]
T3	Herbal powder II	3.610[b]	80.80[b]	62.87[b]
T4	Herbal powder III	3.371[b]	76.27[b]	62.31[b]
T5	Vit E & Se	2.594[c]	78.92[b]	61.99[b]
	SEM	0.193	5.628	0.280
	N	8	8	8
	P -value	0.025	0.05	0.001

Value bearing different superscripts within a column are significantly (P<0.05) different.

and HI antibody titer against Newcastle disease were similar in all the treatments indicating that supplementation of herbal preparations and vit E and Se did not have any significant effect on these parameters (Table 4). In contrary, Naresh *et al*. (2017) reported significant rise in titre value against Newcastle disease with herbal products in broiler diets.

E. coli *counts in small intestine*: Supplementation of various polyherbal preparation and vit E and Se significantly (P<0.05) decreased the *E. coli* counts in small intestine of broilers at 42 days of age. Allinson *et al*. (2013) reported that herbal extracts enhance the performance of poultry by significantly decreasing the bacterial count. Similarly, Taha *et al*. (2019) reported that coriander powder supplementation reduced the ileal total bacteria, *E. coli*, and *C. perfringens* counts compared to control group. It has been established fact that herbs in the diets stimulate lactic acid bacteria and decreases pathogenic bacteria such as mesophilic aerobic, coliform and *Escherichia coli* and thus improves absorption of nutrients leading to better weight gain of the birds.

Heat stress is a major welfare problem in the poultry industry leading to huge economic loss because of heavy mortality and decreased performance. Dietary supplementation of different herbal supplements and vit E and Se significantly (P<0.05) improved weight gain, FCR and reduced the *E. coli* colonization in small intestine, lipid peroxidation, alkaline phosphatase, blood glucose and serum cholesterol levels. Thus, it can be concluded that supplementation of herbal preparations to broiler chicks during summer season can overcome the heat stress.

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REFERENCES

Ademola S G, Farimu G O and Babatunde G M. 2009. Serum lipid, growth and haematological parameters of broilers fed garlic, ginger and their mixtures. *World Journal of Agriculture Science* **5**(1): 99 –04.

Ajakaiye J J, Perez-Bello A and Mollineda T A. 2011. Impact of Vitamins C and E dietary supplementation on leukocyte profile of layer hens exposed to high ambient temperature and humidity. *Acta. Veterinary Brno* **79**: 377–83.

Ali A. 2011. Effect of different levels of Chicory, zizaphora, nettle and savoury medicinal plants on the carcass characteristics of male broilers. *Journal of Medicinal Plants Reserach* **5**(17): 4354–59.

Allinson I B, Ekunseitan D A, Ayoola A A, Ogunade I M and Njoku C P. 2013. Effect of herbal supplement on growth response and faecal egg counts of cockerels. *Jouranl of Animal Feed Reserach* **3**: 68–73.

Chaudhary R K, Singh V K, Singh S P, Gautam S and Tewari D. 2015. Effect of herbal supplements of *Curcuma longa, Emblica officinalis* and *Nigella sativa* on performance of broilers. *Indian Journal of Animal Nutrition* **31**(1): 90–95.

Dahale G S, Wankhade S M and Kale. 2014. Growth performance, serum biochemical profile and carcass quality of broiler chicken fed diets supplemented with shatavari root powder. *Indian Journal of Animal Nutrition* **31**(2): 166–171.

Dwivedi V, Singh V K, Tewari D, Gautam S, Singh V B and Dwivedi D. 2015. Growth performance, blood constituents

Table 4. Effect of different herbal preparations on serum parameters of broilers at 42 days of age

Trt.	Diet	Cholesterol (mg/dl)	Total Protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)	Blood glucose (g/dl)	HI titre	*Escherichia coli* (log 10 of cfu/ml count
T1	Control	194.0[a]	4.327	2.047	2.280	196.92[a]	8.012	6.75[a]
T2	Herbal powder I	182.8[b]	4.436	1.929	2.506	187.37[b]	7.625	6.66[ab]
T3	Herbal powder II	181.6[b]	3.902	1.935	1.967	185.81[b]	7.875	6.57[b]
T4	Herbal powder III	180.3[b]	4.386	2.061	2.325	183.70[b]	7.625	6.24[c]
T5	Vit E & Se	186.6[b]	4.327	1.904	2.423	186.40[b]	8.000	6.01[c]
	SEM	1.595	0.097	0.026	0.056	1.445	0.181	0.064
	N	8	8	8	8	8	8	8
	P -value	0.021	0.116	0.180	0.120	0.003	0.887	0.002

Value bearing different superscripts within a column are significantly (P<0.05) different.

and carcass traits of broiler chicken as affected by supplementation of Ashwagandha and Mangrail. *Indian Journal of Animal Nutrition* **32** (4): 428–33.

Kale V R, Wankhade S M and Kale S D. 2014. Effect of dietary supplementation of Ashwagandha on carcass quality of broiler chicken. *Indian Journal of Animal Nutrition* **31**(1): 81–85.

Karangiya V K, Savsani H H, Shrikant S P, Garg D D, Murthy K S, Ribadiya N K and Vekariya S J. 2016. Effect of dietary supplementation of garlic, ginger and their combination on feed intake, growth performance and economics in commercial broilers. *Veterinary World* **9**(3): 245–50.

Khwairakpam R, Tiwari D P and Mondal B C. 2016. Effect of dietary incorporation of garlic (*Allium sativum*) and turmeric (*Curcuma longa*) powder and their combination on feed intake, haemato-biochemical parameters and carcass traits in broiler chicken. *Indian Journal of Animal Nutrition* **33**(2): 184–90.

Lanjewar R D, Zanzad A A, Ramteke B N and Deshmukh G B. 2008. Effect of dietary supplementation of tulsi (*O. sanctum*) leaf powder on the growth performance and serum lipid profile in broilers. *Indian Journal of Animal Nutrition* **25**: 395–397.

Mohamed A B, Mohammed A M and Ali J Q. 2012. Effect of ginger (*Zingiber officinale*) on performance and blood serum parameters of broiler. *International Journal of Poultry Science* **11**(2):143–46.

Naresh P, Usha Rani M, Vijay Kumar M, Sunil Chandra U and Gopala Reddy A. 2017. Antioxidant and immunomodulatory activity of polyherbal antistress formulations in commercial broilers under summer stress. *Bulletin of Environment, Pharmacology and Life Sciences* **6**(3): 51–56.

Pooja A, Anil kumar and Pankaj Kumar Singh. 2017. Garlic and Amla powder addition in diet affects production performance of white leghorn laying hens. *Indian Journal of Animal Nutrition* **34**(1): 80–86.

Reddy E T, Reddy P S, Reddy P V V S and Shakila. 2012. Effect of herbal preparations on the performance of broilers. *Tamil Nadu Journal of Veterinary and Animal Sciences* **8**(4): 209–14.

Shiva Kumar M C, Javed Mulla, Pugashetti B K and Sarah Nidgundi. 2005. Influence of Supplementation of herbal growth promoter on growth and performance of broilers. *Karnataka Journal of Agricultural Sciences* **18** (2):481–84.

Sujatha V, Korde J P, Rastogi S K, Maini S, Ravikanth K and Rekhe D S. 2010. Amelioration of heat stress induced disturbances of the antioxidant defense system in broilers. *Journal of Veterinary Medicine and Animal Health* **2**(3): 18–28.

Taha A E, Saber S H, Ramadan S S, Ahmed A E, Mohamed E A, Hussein E, Islam M S, Ayman A S and Mohamed A E. 2019. Effects of supplementing broiler diets with coriander seed powder on growth performance, blood haematology, ileum microflora and economic efficiency. *Journal of Animal Physiology and Animal Nutrition* **6**: 1–10.