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Effect of Poly herbal Phytobiotic on the Growth, Immunocompetence, Development of Digestive Organs and Carcass Characteristics of Commercial Broilers

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ABSTRACT

Seventy two, one week old, Cobb 400 broiler chickens were distributed into two experimental groups having four replicates. The birds of the control group were fed a basal diet (22.5% CP & 2830 K cal/kg ME) while the other group was offered a basal diet supplemented with a polyherbal phytobiotic, AV/SSL/12 in drinking water@ 4 ml/100 birds/ day during 1-2 weeks, 8 ml/ 100 birds/ day during 2-4 weeks and 15 ml/100 birds/ day during 4-6 weeks of age. AV/SSL/12 birds had a significantly higher ($P<0.05$) body weight compared to the control at 2nd week of age. The body weight gain of the birds in the liver tonic fed group was significantly higher ($P<0.001$) compared to the control group at 2nd week of age. Feed conversion ratio (FCR) was significantly better ($P<0.05$) in the phytobiotic group compared to the control group during 3-6 weeks and 1-6 weeks of age. Total immunoglobulins and mercaptoethanol sensitive (IgM) antibody titer (log 2) values in response to sheep red blood cells was significantly higher ($P<0.05$) in the phytobiotic compared to the control group. The herbal supplemented group had significantly higher ($P<0.05$) large intestine length compared to the control group at 6 weeks of age. However, there was no significant difference between the treatment groups in the carcass characteristics and yield of cut up parts of the broilers after 6 weeks of age. Hence, it may not be unreasonable to infer that poly herbal liver tonic, AV/SSL/12 possesses promising immunomodulatory potential and supplementation of poly herbal liver tonic may elicit growth of commercial broilers.

Keywords: Growth, Immunity, Phytobiotic, Broilers

Liver is an important organ involved in various metabolic pathways regulating growth and productivity in poultry. As liver has a wide range of functions, it is vulnerable to various diseases. Phytobiotics are plant derivatives such as herbs, plant extracts or spices and have a wide range of activities *viz.* stimulation of feed intake, growth and endogenous secretions in the gut. Phytobiotics possess hepatoprotective and hepatogenic properties, which tone up liver resulting in increased nutrient utilization and better performance. AV/SSL/12, poly herbal liver tonic (Ayurvet Ltd, Baddi, India) contains herbs *viz. Achyranthes aspera* (Prickly Chaff Flower, Devil's Horsewhip, Apamarga), *Andrographis paniculata* (Green chirayta, King of bitters, Kalamegha), *Azadirachta indica* (Neem), *Boerhaavia diffusa* (Spreading Hogweed, Punarnava), *Eclipta alba* (False Daisy, Bhringaraj) and *Ichnocarpus frutescens* (Black creeper, Utpalagopa), *Terminalia chebula* (Black myrobalan, Haritaki). These herbs have hepato-stimulant, hepato-protective, immunomodulatory and antioxidant activities (Sadekar *et al*., 1998; Manu and Kuttan, 2009; Michels *et al.,* 2011; Dash *et al*., 2007). Further, they optimize digestion and metabolism resulting in better protein utilization, improved mucosal function and reduced cost of metabolic deamination. Hence, a study was undertaken to evaluate the efficacy of a phytobiotic, AV/SSL/12 on the body weight, body weight gain, feed conversion ratio, immune competence traits, development of digestive organs and carcass characteristics of commercial broilers.

MATERIALS AND METHODS

Birds and experimental design

A total of seventy two, one week old, Cobb 400 broiler chickens were distributed into two experimental groups having four replicates each with nine birds. The birds of the control group were fed a basal diet (22.5% CP & 2830 K cal/kg ME) while the other group was offered a basal diet supplemented with a polyherbal liver tonic, AV/SSL/12 in drinking water@ 4 ml/100 birds/ day during 1-2 weeks, 8 ml/ 100 birds/ day during 2-4 weeks and 15 ml/100 birds/ day during 4-6 weeks of age.

Experimental procedure and analyses

Weekly body weight and body weight gain was recorded till 6th week of age. After 6 weeks of age, general immune response was studied by taking nine birds from each treatment group and measuring important immunocompetence traits such as antibody response (log_2 titer) to 1% sheep red blood cells (SRBC) (Siegel and Gross, 1980; Van der Zijpp, 1983), 2-mercaptoethanol resistant antibodies (MER or IgG) and mercaptoethanol sensitive antibodies (MES or IgM) against SRBC (Martin *et al*., 1989) and cell mediated immune (CMI) response i.e. *in vivo* cutaneous basophilic hypersensitivity response to lectin phytohaemagglutinin from *Phaseolus vulgaris* (PHA-P) determined as foot web index (Corrier and DeLoach, 1990). After forty two days of the experimental trial, six representative birds from each treatment group was randomly selected and slaughtered to study the gastrointestinal tract development (proventriculus, gizzard, small intestine, large intestine & caeca) and various slaughter traits *viz.* pre slaughter fasting shrinkage in live weight, dressing yield, eviscerated yield, ready to cook yield, giblet yield (heart, liver & gizzard) as a percentage of live weight and yield of individual cut-up parts (thighs, drumsticks, breast, back, neck, wings) as a percentage of eviscerated yield.

Statistical analysis

Data were subjected to one-way analysis of variance in a completely randomized design (Snedecor and Cochran, 1980). Significant differences among treatment means were calculated as per Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Growth performance

The phytobiotic group birds had a significantly higher ($P<0.05$) body weight compared to the control at 2nd week of age (322.89 vs 289.44) (Table 1). Further, the weekly body weight of the birds in the phytobiotic fed group was apparently higher compared to the control group throughout the experiment. The body weight gain of the birds in the phytobiotic fed group was significantly higher ($P<0.001$) compared to the control group at 2nd week of age (Table 2). Our present findings pertaining to the phytobiotic group in broiler feed are in agreement with the reports of Kutlu and Forbes (1993), Bhattacharyya *et al*. (2013) who also reported improvement in body weight gain when various herbs were added to broiler feed.

Table 1. Effect of phytobiotic on the average weekly body weight (g) of commercial broilers during 1-6 week period

Treatment	1st wk	2nd wk	3rd wk	4th wk	5th wk	6th wk
Control	136.72	289.44^{a}	474.92	833.39	1067.25	1292.92
Phytobiotic	129.89	322.89^{b}	517.89	867.97	1091.50	1373.44
Pooled SEM	0.93	4.38	5.96	10.29	10.44	12.66
Significance level	NS	P<0.001	NS	NS	NS	NS

Means bearing different superscripts within a column differ significantly ($P<0.05$)

NS: Non significant ($P>0.05$) SEM: Standard error of means

Table 2. Effect of phytobiotic on the average weekly weight gain (g) of commercial broilers during 1-6 week period

Treatment	2nd wk	3rd wk	4th wk	5th wk	6th wk
Control	152.72[a]	185.47	358.47	233.86	225.67
Phytobiotic	193.00[b]	195.00	350.08	223.53	281.94
Pooled SEM	4.86	4.3746	9.87	10.18	7.32
Significance level	P<0.001	NS	NS	NS	NS

Means bearing different superscripts within a column differ significantly (P<0.05)
NS: Non significant (P>0.05) SEM: Standard error of means

Feed conversion ratio

FCR was significantly better (P<0.05) in the phytobiotic group compared to the control group during 3-6 weeks and 1-6 weeks of age (Table 3). Kumar *et al*. (2005) noted significant improvement in feed efficiency of the birds when the diet was supplemented with turmeric in broilers. Tiwari *et al*. (2012) also observed that feed conversion ratio was better in broilers were subjected to dietary supplementation of phytobiotics (0.5% turmeric powder, 0.5% neem leaf powder and 1 % amla pulp powder).

Table 3. Effect of phytobiotic on the FCR of commercial broilers during 1-4 week, 4-6 week and 1-6 week period

Treatment	1-3 wk	3-6 wk	1-6 wk
Control	1.76	2.07[a]	1.98[a]
Phytobiotic	1.75	1.87[b]	1.82[b]
Pooled SEM	0.02	0.02	0.02
Significance level	NS	P<0.05	P<0.05

Means bearing different superscripts within a column differ significantly (P<0.05)
NS: Non significant (P>0.05) SEM: Standard error of means

Immuno competence traits

Effect of poly herbal phytobiotic on the humoral immune responses to 1% sheep red blood cells (SRBC) at 6 weeks of age has been tabulated in Table 4. Total immunoglobulins and mercaptoethanol sensitive (IgM) antibody titer (log 2) values in response to SRBC was significantly higher (P<0.05) in the phytobiotic compared to the control group. This is in corroboration with the findings of various scientists who also noted that phytobiotics or herbal supplementation stimulate immune system and have potent antibacterial, antiviral, anti-inflammatory, cocciodiostatic and anthelminthic activity. Further, it has already been reported that certain mushroom and herb polysaccharides can be used in prevention of bacterial (Yuan *et al*., 1993), viral (Yu and Zhu, 2000) and parasitic disease (Pang *et al*., 2000) in chickens. AV/SSL/12 contains herbs viz. *Andrographis paniculata*, *Boerhaavia diffusa* and *Eclipta alba* that have potent immunomodulatory activities

Table 4. Effect of phytobiotic on the humoral immune responses [antibody titer (log 2) values to SRBC] and cell mediated immune response (response to PHA-P) (foot web index) **a**t 6 weeks of age

Treatments	HA	IgG	IgM	Foot web index
Control	4.00b	1.80	2.20b	0.12
Phytobiotic	7.40a	1..40	6.00a	0.34
Pooled SEM	0.42	0.17	0.43	0.04
Significance level	P<0.05	NS	P<0.05	NS

Means bearing different superscripts within a column differ significantly (P<0.05)
NS: Non significant (P>0.05) SEM: Standard error of means

Table 5. Effect of phytobiotic on the development of digestive organs of commercial broilers at 6 weeks of age

Treatment	Proventricular weight (g/100g)	Small intestine weight (g/100g)	Small Intestine length (cm/100)	Large Intestine weight (g/100g)	Large intestine length (cm/100)	Average caecal length (cm/100g)	Caecal weight (g/100g)
Control	0.42	5.07	15.75	0.10	0.50[a]	2.73	0.71
Phytobiotic	0.43	4.66	13.18	0.18	0.81[b]	2.54	0.51
Pooled SEM	0.01	0.21	0.45	0.01	0.05	0.09	0.09
Significance level	NS	NS	NS	NS	P<0.05	NS	NS

Means bearing different superscripts within a column differ significantly (P<0.05)
NS: Non significant (P>0.05) SEM: Standard error of means

Table 6. Effect of phytobiotic on the carcass quality characteristics of commercial broilers at 6 weeks of age

Treatment	Shrinkage (%)	Dressing (%)	Eviscerated wt (%)	Heart wt (%)	Liver wt (%)	Gizzard wt (%)	Total ready to cook yield (%)
Control	7.20	75.75	57.15	0.32	2.22	2.69	62.39
Phytobiotic	5.51	74.25	58.90	0.46	2.42	2.55	64.32
Pooled SEM	0.43	0.36	0.83	0.02	0.07	0.08	0.80
Significance level	NS	NS	NS	NS	NS	NS	NS

NS: Non significant (P>0.05) SEM: Standard error of means

Table 7: Effect of phytobiotic on the cut up-parts of commercial broilers at 6 weeks of age

Treatment	Thighs %	Drumstick %	Breast %	Back %	Neck %	Wings %
Control	16.37	15.80	31.68	19.43	5.48	11.24
Phytobiotic	16.10	15.66	30.10	19.91	4.42	13.81
Pooled SEM	0.20	0.28	0.47	0.51	0.20	0.64
Significance level	NS	NS	NS	NS	NS	NS

NS: Non significant (P>0.05) SEM: Standard error of means

(Puri *et al*., 1993; Mathew and Kuttan, 1999; Manu and Kuttan, 2008; Mungantiwar *et al*., 1999; Christybapita *et al*., 2007). CMI was apparently higher in the phytobiotic group compared to the control group (0.34 vs 0.12) (Table 4). The phytobiotic used contains *Boerhaavia diffusa* which modulates cell mediated immune response (Manu and Kuttan, 2008). Higher CMI response of commercial broilers at 6 weeks fed herbal supplements has also been reported by Tiwari (2008) and Goswami (2008).

Development of digestive organs

The herbal supplemented group had significantly higher (P<0.05) large intestine length compared to the control group at 6 weeks of age (Table 5). Singh (2009) also noted that dietary supplementation of 1% tulsi leaf powder resulted in significantly higher (P<0.05) length of the large intestine compared to the control group. However, no such difference was observed in the other digestive organs between the treatment groups. This is in corroboration with Goswami *et al.* (2008) and Singh (2009) who also noted that herbal supplementation did not alter the development of digestive and intestinal organs in broilers.

Carcass characteristics and yield of cut up parts

There was no significant difference between the treatment groups in the percent shrinkage, dressing, eviscerated weight, heart weight, liver weight, liver weight gizzard weight and total ready to cook yield (Table 6). Further, there was also no significant difference in the percent yield of thighs, drumstick, breast, back, neck and wings (Table 7).

CONCLUSION

It may be inferred that poly herbal phytobiotic, AV/SSL/12 possesses promising immunomodulatory potential and supplementation of poly herbal liver tonic may elicit growth of commercial broilers.

REFERENCES

Bhattacharyya, A., Garg, S.K., Kumar, V., Roy, D., Ravikanth, K. and Maini, S. 2013. Effects of superliv concentrate on the growth, immunocompetence traits and nutrient retention of commercial broilers during extreme winter. *Int. J. Poult. Sci*., **21:** 51-54.

Christybapita, D., Divyagnaneswari, M. and Dinakaran Michael, R. 2007. Oral administration of *Eclipta alba* leaf aqueous extract enhances the non-specific immune responses and disease resistance of *Oreochromis mossambicus*. *Fish Shellfish Immunol*., **23:** 840-852.

Corrier D. E. and Deloach J R. 1990. Evaluation of cell mediated, cutaneous basophil hypersensitivity in young chickens by interdigital skin test. *Poult. Sci.*, **69:** 403-408.

Dash, D.K., Yeligar, V.C., Nayak, S.S., Ghosh, T., Rajalingam, D., Sengupta, P., Maiti, B.C. and Maity, T.K. 2007. Evaluation of hepatoprotective and antioxidant activity of *Ichnocarpus frutescens* (Linn.) R.Br. on paracetamol induced hepatotoxicity in rats. *Trop. J. Pharm. Res*., **6:** 755-765.

Duncan D.B. 1955. Multiple range and multiple F tests. *Biometrics* **11:** 1-42.

Goswami, M., 2008. Effect of antibiotic and herbal supplement on the performance of commercial broilers, M.V.Sc. thesis submitted to U.P. Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go Anusandhan Sansthan, Mathura.

Kumar, M., Choudhary, R.S. and Vaishnav, J.K. 2005. Effect of supplemental prebiotic, probiotic and Turmeric in diet on the performance of broiler chicks during summer. *Int. J. Poult. Sci*., **40:** 137- 141.

Kutlu, H.R. and Forbes, J.M. 1993. Changes in growth and blood parameters in heat-stressed broiler chicks in response to dietary ascorbic acid. *Livest. Prod. Sci*., **36:** 335-350.

Manu, K.A. and Kuttan, G. 2008. *Boerhavia diffusa* stimulates cell-mediated immune response by up regulating IL-2 and down regulating the pro- inflammatory cytokines and GM-CSF in B16F-10 metastatic melanoma bearing mice. *J. Exp. Ther. Oncol*., **7:** 17-29.

Manu, K.A. and Kuttan, G. 2009. Immunomodulatory activities of Punarnavine, an alkaloid from *Boerhaavia diffusa. Immunopharm. Immunot*., **31:** 377-387.

Martin, A., Gross, W. B. and Siegel, P.B. 1989. IgG and IgM responses in high and low antibody selected lines of chickens. *J. Hered*., **80:** 249-52.

Mathew, S. and Kuttan, G. 1999. Immunomodulatory and antitumour activities of *Tinospora cordifolia*. *Fitoterapia*, **70:** 35-43.

Michels, M.G., Bertolini, L.C., Esteves, A.F., Moreira, P. and Franca, S.C. 2011 Anticoccidial effects of coumestans from *Eclipta alba* for sustainable control of *Eimeria tenella* parasitosis in poultry production. *Vet. Parasitol*., **19:** 177: 55-60.

Mungantiwar, A.A., Nair, A.M., Shinde, U.A., Dikshit, V.J., Saraf, M.N., Thakur, V.S. and Sainis, K.B. 1999. Studies on the immunomodulatory effects of *Boerhaavia diffusa* alkaloidal fraction. *J. Ethnpharmacol*., **65:** 125-131.

Pang, F.H., Xie, M.Q. and Ling, H.H. 2000. Effect of certain mushroom and herb polysaccharides in prevention of parasitic disease in chickens. *Chinese J. Vet. Parasit*., **8:** 1-3.

Puri, A., Saxena, R., Saxena, R.P. and Saxena, K.C. 1993. Immunostimulant agents from *Andrographis paniculata*. *J. Nat. Prod*., **56**: 995-999.

Sadekar, R.D., Kolte, A.Y., Barmase, B.S. and Desai, V.F. 1998. Immunopotentiating effects of *Azadirachta indica* (Neem) dry leaves powder in broilers, naturally infected with IBD virus. *Indian J. Exp. Biol*., **36:** 1151-1153.

Siegel, P.B. and Gross W.B. 1980. Production and persistency of antibodies in chickens to sheep erythrocytes. 1.Directional selection. *Poult. Sci*., **59:** 1-5.

Singh, S.K. 2009. A study on comparative efficacy of antibiotic and tulsi leaf powder on the performance of commercial broilers. M.V.Sc. thesis submitted to U.P. Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go Anusandhan Sansthan, Mathura.

Snedecor G W and Cochran W G. 1980. Statistical Methods. 6th ed. Iowa State University Press, Ames, Iowa.

Tiwari, M., 2008. Effect of probiotic and herbal supplement on the performance of commercial broilers. M.V.Sc. thesis submitted to U.P. Pt. Deen Dayal Upadhyay Pashu Chikitsa Vigyan Vidyalaya Evam Go Anusandhan Sansthan, Mathura.

Tiwari, M., Bhattacharyya, A. and Singh, H.N. 2012. Effect of probiotic and phytobiotics on feed conversion ratio, carcass quality traits and development of digestive organs of commercial broilers. *J. Anim. Res*., **2:** 53-60.

Van der zijpp A.J. 1983. The effect of genetic origin, source of antigen and dose of antigen on the immune response of cockerels. *Poult. Sci*., **62:** 205-11.

Yu, J.G. and Zhu, L.Y. 2000. Effect of mushroom and herb polysaccharides in prevention of viral disease in chickens. *J. Trad. Chinese Vet. Med*., **6:** 3-4.

Yuan, Y.L., Fan, B.T. and Zhang, Y.X. 1993. Effect of certain mushroom and herb polysaccharides in prevention of bacterial disease in chickens. *J. Trad. Chinese Vet. Med*., **3:** 6-10.