



EFFECT OF AN EARLY NUTRITIONAL SUPPLEMENT ON BROILER PERFORMANCE

N.V. Jadhav¹, Basavaraj Awati¹, Vivek M. Patil¹, D.T. Naik¹, Srikant Kulkarni¹, M.D. Suranagi¹,
K. Ravikanth², Adarsh^{2*}

¹Veterinary College, Bidar, Karnataka, India.

²Clinical Research & Development, Ayurved Limited, Baddi, H.P., India.

ABSTRACT

135 day old commercial broiler chicks were randomly divided in to 3 groups (n=45, 3 replicates). Group T0- unsupplemented control group, Group T1, supplemented with Chikimune @ 6 g paste/chick/day and Group T2, supplemented with Chikimune @ 8 g paste/chick/day (Chikimune supplemented for first two days at poultry farm and no feed was offered during this period). Immune modulatory effect, dressing yield, histopathology of intestine along with weight of lymphoid organs and biochemical parameters were studied respectively. The results revealed that Chikimune supplementation significantly (P<0.05) improved the average final body weight (g) (group T1-1788.42, group T2-1831.00) when compared with control (group T0-1742.35). Lymphoid organs weight also improved in Chikimune supplemented birds. Biochemical investigations recorded comparable improved values (mg/dl) of blood biochemical parameters in supplemented birds. The antibody titer against Ranikhet disease at 3rd and 5th week in treated groups was notably higher (1:128/256) than non-treated broilers (1:16/32) indicating better immunity set-up. Chikimune supplementation was efficacious in improving immunity and decreasing the incidence of mortality in chicks.

Keywords: Early feeding, FCR, HI Titer, biochemical parameters

humoral immunity is particularly effective against extracellular antigens, CMI responses are specialized in the elimination of intracellular antigens (Erf, 2004). Immunosuppression effects the growth and feed consumption in poultry birds (Li *et al.*, 2013). Under Immunosuppression, the immunoregulatory organs such as bursa of fabricius, thymus and spleen size decreases (Muneer *et al.*, 1988). Feeding possibly affects the growth and immune phenotype in chicks (Madsen *et al.*, 2004). Early feeding of newly hatched chicks affects performance and immunity (Bhanja *et al.*, 2010). Yang *et al.*, (2009) observed an inverse relationship between a feed deprivation period and weight gain of chicks. Early feeding is essential for the development and growth of the gastrointestinal system of the bird. Nutrients are required to provide the building blocks for immune cells and tissues. Phytogetic have been reported to enhance feed intake, activate digestive enzymes and stimulate immune function in poultry (Lee *et al.*, 2003). Plant metabolites may affect the physiological and chemical function of the digestive tract (Rahimi *et al.*, 2011). The stabilizing effect on intestinal microflora may be associated with intermediate nutrient metabolism (Jamroz *et al.*, 2003). Various herbs *Allium sativum*, *Glycyrrhiza glabra*, *Plantago major* and *Hippophae rhamnoides* were previously reported for their immunomodulatory potential (Dorhoi *et al.*, 2006). The present study was designed to check the efficacy of polyherbal formulation, Chikimune (M/S Ayurved Ltd, India) on growth and performance in broilers. Chikimune (M/S Ayurved Ltd, India), an early chick nutritional formula contains herbs viz. *Cassia fistula*, *Aegle marmelos*, *Vitis vinifera* and many more that are previously reported to possess antioxidant,

INTRODUCTION

In poultry the immune system, has developed several levels of defense strategies to cope with a wide spectrum of pathogens. In avian species,

***Corresponding author:**

Email: clinical@ayurved.in

gastrointestinal modulatory, immune modulatory and improved protein utilization activities (Siddhurajua *et al.*, 2002; Ghatule *et al.*, 2014; Liu *et al.*, 2012; Bruno-Soares *et al.*, 2011).

MATERIALS AND METHODS

The present research work was conducted by the scientist of Veterinary College, Bidar, Karnataka, India. The study was planned to test an herbal preparation Chikimune as a supplement in feed as early nutrition of chicks and its impact on growth & performance in broilers. 135 day old commercial broiler chicks were employed for the study reared on deep litter system and divided into 3 equal groups (Group T0, T1 and T2), of 3 replicates so that each comprising 15 birds per replicate. The supplementation of herbal product started immediately after reaching the poultry farm on day first and second. Group T0, unsupplemented control group. Group T1, supplemented with Chikimune at 6 g paste/chick/day and Group T2 supplemented with Chikimune at 8 g paste/chick/day (Chikimune supplemented for first two days at poultry farm and no feed was offered during this period, normal feeding continued after 48 hours). Parameters viz. weekly body weight, feed consumption, feed consumption ratio, serum biochemical parameters, dressing percentage, lymphoid organ weight, antibody titer and economics were studied during the experiment.

RESULTS

Body weight (g)

The weight of the chicks is an economically important feature because every 1 g increase in the initial weight results a 7 to 13 g increase in the harvest weight of the broilers (Wilson, 1991). The seven-day weight has significant impact on most important parameters such as performance, carcass and body composition. Weekly body weight of

broilers is given in table 1. From the 1st week of Chikimune supplementation, the weekly body weight varied significantly ($p < 0.05$) in supplemented birds till 5th week in comparison of control unsupplemented group. At 5th week the body weight was significantly higher in group T2, 1831 g followed by group T1, 1788.42 g and unsupplemented group T0, 1742.35 g.

Weight gain, feed consumption and FCR

Total body weight gain was significantly ($p < 0.05$) more in Chikimune supplemented group T2 (1783.35) followed by group T1 (1741.42) in comparison to control group T0 (1695.62). Feed consumption in the various groups varied non significantly (table 2). Feed consumption ratio (FCR) was significantly ($p < 0.05$) improved in Chikimune (8 g paste/chick/day) supplemented birds of group T2, 1.90. The FCR of Chikimune (6 g paste/chick/day) supplemented group T1 (1.94) and unsupplemented control group T0 (1.96) varied non significantly, but FCR value improved in group T1 (table 2).

Biochemical estimations

Blood biochemical parameters are given in table 3. Avian carbohydrate metabolism differs in several respects from that of mammals, which include the ability of birds to maintain their blood glucose, at a higher level, where the value is normally almost double than that in most mammals, even during prolonged starvation (Raji *et al.*, 2000). Sufficient and stable glucose status is critical for the late-term embryonic developmental hatching process and post hatch development of poultry until feed consumption is initiated (Ebrahimnezhad *et al.*, 2011). Blood glucose concentration in group T1 and group T2 birds increased after Chikimune supplementation. At the end of the study, during 5th week blood glucose concentration (mg/dl) was high in group T2 (166.3) followed by group T1 (164.78) in comparison to group T0 (157.06). Blood calcium

Table 1. Effect of feeding Chikimune on average body weight (g) of broiler chickens

Age (weeks)	Body weight (grams)		
	T0	T1	T2
0	46.73 ± 1.26	47.00 ± 1.32	47.65 ± 1.34
1	131.05 ^a ± 0.86	155.05 ^b ± 0.97	137.26 ^a ± 0.93
2	332.10 ^a ± 1.13	383.17 ^b ± 1.26	477.50 ^c ± 1.78
3	877.60 ^a ± 2.05	914.41 ^b ± 2.16	962.20 ^c ± 2.19
4	1271.00 ^a ± 2.09	1285.80 ^a ± 2.12	1416.85 ^b ± 2.46
5	1742.35 ^a ± 2.63	1788.42 ^b ± 2.39	1831.00 ^c ± 3.04

Means bearing different superscript in a row differed significantly ($p < 0.05$)

Table 2. Effect of feeding Chikimune on average weekly body weight gain and FCR in broiler chickens

Age (weeks)	T0			T1			T2		
	BWG(g)	FC(g)	FCR	BWG(g)	FC(g)	FCR	BWG(g)	FC(g)	FCR
1	84.32	225.00	2.66	108.05	219.51	2.03	89.61	202.38	2.25
2	201.05 ^a	487.17	2.42	228.12 ^a	512.82	2.24	340.24 ^b	714.50	2.09
3	545.50 ^a	864.86	1.58	531.24 ^a	833.33	1.56	487.70 ^b	787.17	1.61
4	393.40 ^a	833.33	2.11	371.39 ^a	885.71	2.38	454.65 ^b	832.43	1.83
5	471.50	911.76	1.93	502.62	941.17	1.87	414.15	861.11	2.07
Total	1695.62 ^a	3322.12	1.96 ^x	1741.42 ^b	3392.54	1.94 ^x	1783.35 ^b	3399.59	1.90 ^y

Means bearing different superscript in a row differed significantly (p<0.05)

Table 3. Effect of feeding of Chikimune on average biochemical parameters in Broiler chickens (0-5 weeks)

Parameters	Groups/ Age (weeks)								
	T0			T1			T2		
	2 nd	3 rd	5 th	2 nd	3 rd	5 th	2 nd	3 rd	5 th
Blood glucose (mg/dl)	155.92 ±2.36	157.5 ±4.83	157.06 ±3.68	164.04 ±2.09	163.24 ±2.95	164.78 ±3.07	163.64 ±2.26	165 ±2.15	166.3 ±2.91
Blood calcium (mg/dl)	7.12 ±0.28	7.16 ±0.37	7.26 ±0.13	7.80 ±0.13	7.82 ±0.08	7.86 ±0.11	7.76 ±0.07	7.96 ±0.17	7.90 ±0.08
Blood cholesterol (mg/dl)	177.64 ±4.87	174.88 ±2.98	177.66 ±4.04	175.06 ±3.51	167.96 ±2.36	166.32 ±3.74	167.82 ±3.15	168.02 ±4.26	163.62 ±2.72

Table 4. Effect of Chikimune feeding on dressing yield, histopathology of intestine and weight of lymphoid organs in broiler chickens

Parameters	Groups/ Age (weeks)					
	T0		T1		T2	
	3 rd	5 th	3 rd	5 th	3 rd	5 th
Dressing yield (%)	---	67.54	---	69.41	---	71.45
Intestine length (cm)	125.2 ±1.53	173.6 ±1.22	129 ±1.41	178.4 ±1.22	133.2 ±0.83	182 ±0.75
Liver Weight (g)	---	46.06 ±0.34	---	46.8 ±0.77	---	48 ±0.68
Spleen Weight (g)	---	2.48 ±0.05	---	3.09 ±0.04	---	3.16 ±0.04
Bursa Weight (g)	---	2.31 ±0.19	---	2.63 ±0.11	---	2.96 ±0.04

(mg/dl) concentration was increased on Chikimune supplementation. Calcium is needed for the ossification of bones, skeletal and cardiac muscle activity, activation of several enzymes, transmission of nerve impulses, and pH etc (Ansar *et al.*, 2004). High blood calcium concentration on 5th week was recorded in group T2 (7.90) and in group T1 (7.86) in comparison of group T0 (7.26). During all sampling times blood cholesterol concentration (mg/dl) in Chikimune supplemented birds was low in comparison of unsupplemented group (table 3). On 5th week blood cholesterol concentration (mg/dl)

was significantly low in group T2 (163.62) followed by group T1 (166.32) and group T0 (177.66).

Dressing yield, length of intestine and weight of lymphoid organs

Dressing yield percentage was increased in Chikimune supplemented group T2 (71.45) and group T1 (69.41) in comparison of unsupplemented group T0 (67.54) (table 4). The gastrointestinal tract undergoes morphological and physiological changes including increased surface area of digestion and absorption during the post hatch period. Previous

Table 5. Antibody titer at 3rd and 5th week

Parameter	Groups/ Age (weeks)					
	T0		T1		T2	
	3 rd	5 th	3 rd	5 th	3 rd	5 th
HI titer	1:16	1:32	1:128	1:256	1:128	1:256

studies have shown that feeding immediately after hatching accelerates the morphological development of the small intestine (Noy and Sklan, 1999). Intestine length was increased in Chikimune supplemented birds in comparison of

spleen and bursa weights (g) were more in group T2 (3.16 and 2.96 respectively) followed by group T1 (3.09 and 2.63 respectively) and group T0 (2.48 and 2.31 respectively).

Table 6. Economic benefit analysis of incorporation of Chikimunein feeding of broiler chickens (0-5 weeks)

SR.N	Particulars	T0	T1	T2
1	Cost of day old chick (Rs./ chick)	32 = 00	32 = 00	32 = 00
2	Feed consumption			
	i) Power ration (g)	712.17	732.33	916.88
	ii) Starter & Finisher (g)	2609.95	2660.21	2482.71
3	Rate of feed (Rs./kg)			
	i) Power ration	24.10	24.10	24.10
	ii) Starter & Finisher	23.74	23.74	23.74
4	Total cost of feed (Rs./bird)			
	i) Power ration	17.16	17.64	22.09
	ii) Starter & Finisher	61.85	63.04	58.84
5	Miscellaneous cost (Rs./ bird)	5.00	5.00	5.00
6	Cost of supplementation (Approximate, Rs./ bird)	Nil	1.32	1.76
7	Total cost of production, Rs./ bird (1+4+5 +6)	116.01	119.00	119.69
8	Average live weight (g)	1742.35	1788.42	1831.00
10	Total return obtained @ Rs. 69/- per Kg live weight	120.19	123.37	126.33
11	Net profit/bird (Rs.)	3.18	4.37	6.64
12	Profit over group T0	--	Rs.1.19	Rs. 3.46

unsupplemented control group birds. Intestine length (cm) on 3rd-5th week in group T2 (133.2 cm and 182 cm respectively) and group T1 (129 cm and 178.4 cm respectively) was more in reference of unsupplemented group T0 (125.2 cm and 173.6 cm respectively) (table 4). The findings are in accordance with Petrolli *et al.*, (2012) and Garcia *et al.*, (2007) who reported changes in intestinal morphology after herbal extracts supplementation. Lymphoid organs (table 4) weight increased in Chikimune supplemented birds. On 5th week liver weight (g) was more in group T2 (48) followed by group T1 (46.8) and group T0 (46.06). On 5th week

Immunomodulatory findings

The antibody titer against Ranikhet disease was increased after Chikimune supplementation (table 5). On 3rd and 5th week of study in both Chikimune supplemented groups T1 and T2, the antibody titer was (1:128 and 1:256 respectively) significantly ($p < 0.05$) higher in comparison of unsupplemented group T0 (1:16 and 1:32 respectively). Hemagglutination inhibition (HI) titer increased in Chikimune supplemented birds because of constituents viz. *Spirulina*, *Embllica officinalis*, these ingredients increases several immunological

functions in the chickens (Qureshi *et al.*, 2006; Kaleem *et al.*, 2014)

Economic benefit analysis

Per capita consumption of poultry meat was 18.6 kg in Germany, 23.1 kg in EU countries and 48.8 kg in the USA (Damme *et al.*, 2011). An increase in per capita consumption by one egg and 50 grams of poultry meat can create employment for about 26,000 persons per year (Kazi, 2003). Economic benefit analysis presented in table 6. The higher level (8g/b/d) of Chikimune supplementation led to highest i.e. Rs. 3.46 net return in the broilers reared in the experiment. Net return on Chikimune supplementation at 6g/b/d was Rs.1.19.

Mortality

The mortality between all groups varied non-significantly (2 birds/group). Chikimune supplementation had significantly lowered the mortality in supplemented birds.

DISCUSSION

Body weight increase in poultry has economic advantage for the owner. Total weekly body weight gain was more in Chikimune supplemented bird, this increase in body weight in may be because of its constituent viz. *Vitis vinifera*, *Spirulina*, which have properties like increase protein utilization, rich protein source and have immunomodulatory properties (Khan *et al.*, 2005; Campanella *et al.*, 2002). Chikimune constituent herbs viz. *Ziziphus mauritiana* and *Terminalia bellerica* possess anti oxidant and hepatoprotective properties (Dahiru and Obidoa, 2008; Sabu and Kuttan, 2009), which has improved the feed consumption and weight gain in the supplemented birds. Chicken meat is risk factors for cardiovascular disease due to cholesterol content (Milicevic *et al.*, 2014). The decrease in cholesterol concentration in Chikimune supplemented birds may be because of its constituent viz. *Aegle marmelos* and *Terminalia chebula*, which possess hypolipidemic activity (Devi *et al.*, 2010; Maruthappan *et al.*, 2010). Herbal formulation Chikimune supplementation had increased the lymphoid organs weight. Sato *et al.*, (2009) found that the relative weights of the spleen and bursa of Fabricius in chicks fed immunobiotic diets were slightly higher than control values at 1 and 3 d age. Growth, performance parameters were significantly improved on Chikimune supplementation at different supplementation levels. Blood biochemical

parameters and immunological parameters were improved in both Chikimune supplemented groups. Overall Chikimune supplementation at 8 g paste/chick/day gave better economic returns. Herbal product Chikimune was found safe in birds as mortality in all groups was varied non-significantly.

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