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Growth Performance Parameters of Broiler Chickens as Influenced by Herbal Poultry Feed

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ABSTRACT

Phytobiotics are used in the production of organic chicken to avoid the use of antibiotics and sustain the animal health. The present investigation was carried to find out the efficacy of three types of organic poultry feeds on growth performance of male birds. F1-Control, F2-VitaG, F3-Poultvita and F4-HerbaS were the treatments supplied to the 30 birds in triplicates in each group. Feed trial experiment for 7 weeks was carried out in a private farm at Namakkal, Tamilnadu, India to assess the growth performance. Body Weight Gain (BWG), Feed Intake (FI), Feed Conversion Ratio (FCR) and morphology of small intestine were evaluated. The body weight gain was recorded in the treatments and control were in the following order: Herba-S(F4)<Poultvita(F3)<Vita-G(F2)<Control (F1). Histological study revealed that the significant influence of herbal preparations on the small intestine height during 1-21 days among the experimental groups was ranging from 1.2% in Vita-G to 3.8% in Poultvita. Weight of the small intestine during 1-21 days among the experimental groups is ranging from 1% in Vita-G to 11.5% in Poultvita. During 22-49 days of trial, the height and weight of the small intestine was highly significant in Poultvita as 15.6% than the other treatments (14.4 in Vita-G and 9.8 in Herba-S) and Control. It is concluded that the phytobiotics in combination with maize, wheat, soyabean meal and other botanicals selectively improved the growth performance and intestinal growth. Therefore, the formulated herbal feeds viz., Poultvita, VitaG and HerbaS in various botanicals based combinations could be recommended for the poultry industry.

Key words: Herbal poultry feed, growth performance, feed intake, body weight gain, feed conversion ratio

INTRODUCTION

The success of the poultry industry depends on the animal feed, cost of the feed and disease management. The cost of feeding ranges between 60-70% of the total cost of production. With this background, cost-effective, nutritive and disease resistant herbal poultry feed is prepared as an alternative to the chemical antibiotic rich poultry feed. This study emphasizes on the type of feed given to chicken with a focus on disease resistance and increases the body weight.

Digestion in monogastrics like chicken is mostly carried out by enzymes residing in the gastro-intestinal tract. Chicken requires a high-quality feed which provides readily available nutrients to the enzymes¹. Besides feed composition as the most important factor that determines the efficiency of feed utilization by animals was also another important factor for the optimal nutrient utilization²⁻⁴.

“Phytogenic Alternatives” are the buzzword in Livestock field to avoid the use of antibiotics and chemical growth hormones. The use of the antibiotics, chemical growth hormones and related health concerns were well documented⁵⁻¹⁰.

Phytobiotics have lot of attention because of its natural, nontoxic and residue free components. To improve the performance of agricultural livestock, plant derived products in the form of fresh extracts, dried powder and oil were added as poultry feed additives¹¹⁻¹².

Numerous researches do the research on increasing the production of healthy organic chicken and on the form of diets to be used in feeding broilers¹³⁻¹⁷.

The present study was focused to investigate the efficacy of phytobiotics in the production of organic chicken with regard to growth performance parameters such as body weight gain, feed intake, feed conversion ratio and morphology of the small intestine.

MATERIALS AND METHODS

Preparation of herbal feed: *Achyranthes splendens* Linn., *Leucas aspera* (Willd.) Linn. and *Swertia chirayita* Linn., were collected from the college campus, Kolli hills and Paramathi of Tamil Nadu. On the basis of the crude protein profile using HPLC technique studied by Yasodha and Laavu¹⁸, these medicinal herbs were selected for the present investigation. Leaves were cleaned and air dried for 2-3 days. The dried leaves were ground to a fine powder in a mixer. The selected medicinal plants were highly medicinal and available in large quantity in Tamil Nadu, India. Leaves of these selected medicinal plants were taken in the form of aqua extract. Air dried powder of extracts were added to the formulations in the proportion of 3:2:1 ratio and named as follows:

- F1:** Commercial feed with antibiotic hormone
- F2:** Vita-G-Granules of maize seed, wheat flour and *Achyranthes splendens* Linn.
- F3:** Poulvita-Granules of soya seed, wheat flour and *Leucas aspera* Linn.
- F4:** Herba-S- Granules of green gram seed, wheat flour and *Swertia chirayita* Linn.

These phytobiotics were added as additives along with other botanical ingredients of organic feed formulation for the starters, growers and the finishers given in the Table 1.

Experimental birds and feed trial experiments: Lohmann broiler male chicks were allotted into three treatments and one control (Fed with commercial feed without any phytobiotics), each of 30 birds in triplicates for 7 weeks trial.

The chicks were reared under standard hygienic conditions. Three experimental feed diets were formulated to study the growth performance of the male broiler chicks. Thirty birds in each group were fed with herbal feeds. All birds have free access to feed and water and were vaccinated at regular intervals. Three birds from the triplicates of each group were sacrificed to study the morphological difference in the small intestine of the male birds.

Feed trial experiment for 7 weeks was carried out in a private farm at Namakkal, Tamil Nadu, India to assess the growth performance. Body weight gain, feed intake, feed conversion ratio, height and weight of the small intestine were evaluated.

Statistical analysis: The data collected on various parameters were subjected to Duncan’s test as per the method suggested by Snedecor and Cochran¹⁹. Statistical significance was considered at $p < 0.05$.

RESULTS AND DISCUSSION

Crude protein content of phytobiotics and growth performance: Animal health and wellness depends on the quality of the feed given to them. In the present study the quality profile of the selected herbals, *Achyranthes splendens*, *Leucas aspera* and *Swertia chirayita* with reference to the crude protein are shown in Table 2¹⁸. *Achyranthes splendens*, *Leucas aspera* and *Swertia chirayita* were incorporated in three different herbal poultry feeds along with other botanicals as shown in Table 1.

Table 1: Organic feed composition for the broiler chicks (7 weeks)

Ingredients	Starter	Grower	Finisher
	(1-21 day)	(22-41 day)	(43-49 day)
	Quantity (g kg ⁻¹)		
Phytobiotic additives (F2/F3/F4)	400	600	575
Rice husk (de oiled)	100	50	50
Soya bean meal	150	100	100
Fish waste powder	100	70	75
Crab shell powder	100	75	75
Dried bone powder	100	50	65
Dried liver powder	10	05	15
Turmeric powder	08	10	05
Salt	10	15	15
Garlic powder	10	10	10
Ginger powder	05	05	05
Coriander seeds powder	05	05	05
Asafoetida	02	05	05

Table 2: Crude protein content of phytobiotics

Sr. No.	Phytobiotics	Crude protein content (µg g ⁻¹)
1	<i>Achyranthes splendens</i>	46.5
2	<i>Leucas aspera</i>	97.0
3	<i>Swertia chirayita</i>	84.5

Throughout the experiment, chicks in the F2, F3 and F4 showed an appreciable positive effect and weight gain. Healthy chickens were maintained in these treatments and compared to the commercial feed. There observed increase of body weight gain upto 10-15% in Poulvita and Herba-S than the commercial feed as shown in Table 3-5. This might be due to the crude protein contents of 46.5, 97 and 84.5 µg g⁻¹ in the *Achyranthes splendens*, *Leucas aspera* and *Swertia chirayita*, respectively.

Table 3: Average feed intake g bird⁻¹

Weeks	F1 (Control)	F2	F3	F4
1	1172.0±44	1131.2±45	1133.5±55	1127.5±58
3	1169.0±40	1148.5±41	1132.7±41	1121.3±49
5	1259.6±53	1228.2±51	1224.7±38	1036.4±46
7	1274.5±67	1237.5±39	1208±45	1007.1±45

Means±SD significance at p<0.05, F1-Control: Commercial feed, F2: Vita-G, F3: Poulvita, F4: Herba-S

Table 4: Body weight gain of broiler chickens (g bird⁻¹)

Weeks	F1 (Control)	F2	F3	F4
1	659.9±32	664.2(NS)	660.5(NS)	691.5±31
3	852.4±40	908.5±41	852.7(NS)	945.0±45
5	918.1±53	918. (NS)	924.7±55	1335.4±55
7	1192.5±72	1310.5±75	1372.0±71	1590.1±73

Means±SD, F1-Control: Commercial feed, F2: Vita-G, F3: Poulvita, F4: Herba-S, Significance at p<0.05

NS-Not significant

Table 5: Feed Conversion Ratio (FCR)

Weeks	F1(Control)	F2	F3	F4
1	1.78±0.09	1.70±0.03	1.72±0.07	1.63±0.04
3	1.37±0.06	1.26±0.04	1.32±0.04	1.19±0.03
5	1.80±0.06	1.34±0.02	1.21±0.02	1.28±0.02
7	1.57±0.03	1.14±0.06	1.13±0.07	1.57±0.07

Means±SD, F1-Control: Commercial feed, F2: Vita-G, F3: Poulvita, F4: Herba-S, Significance at p<0.05; NS: Not significant

Table 6: Effects of herbal poultry feed on small intestine morphology in male broiler chicks

Morphology	Control (F1)	F2	F3	F4	SEM	p-value
Relative length (cm kg⁻¹) 1-21 days						
Duodenum	34.37	34.55	34.75	37.00	0.24	0.11
Jejunum	73.00	73.57	73.66	73.91	0.61	0.86
Ileum	10.34	11.03	11.74	11.32	0.67	0.59
Relative weight (g kg⁻¹) 1-21 days						
Duodenum	9.59	9.62	10.05	10.02	0.32	0.34
Jejunum	12.65	13.02	15.99	15.64	0.43	0.45
Ileum	10.55	10.69	10.73	10.70	0.20	0.39
Relative length (cm kg⁻¹) (22-42 days)						
Duodenum	11.37	12.55	12.75	12.24	0.24	0.61
Jejunum	29.00	32.09	32.54	31.07	0.81	0.37
Ileum	29.08	34.11	35.00	32.75	0.91	0.28
Relative weight (g kg⁻¹) 22-42 days						
Duodenum	6.59	7.02	7.85	7.17	0.23	0.14
Jejunum	8.65	9.70	9.99	9.78	0.15	0.09
Ileum	8.55	9.08	9.63	9.25	0.16	0.08

Data represents means from triplicates per treatment, SEM: Standard Error of Mean, Significance level at p<0.05

Similar kind of experimental diets for the pigs and poultry were prepared by Wondra *et al.*², Kidds *et al.*²⁰ and Willems *et al.*²¹ and their results had shown an increase of body weight due to Thr concentrations and crude proteins as various treatments.

These results were in accordance with the findings of Abbasi *et al.*²², Mack *et al.*²³, Dozier *et al.*²⁴, Kidd *et al.*²⁰ and Jahanian²⁵. Ciftci and Ceylan²⁶ in 2004 showed that increasing dietary Thr concentrations significantly increased breast yield. There was an enhancement in the feed conversion ratio ranging from 1.14 to 1.57 (Table 5) and moderate feed intake than the control and that could be due to protein profile (Table 1). The goodness of the phytobiotics present in the *Achyranthes splendens*, *Leucas aspera* and *Swertia chirayita* were incorporated in three different herbal poultry feeds as presented in Table 2.

The botanicals were in combination with various medicinal herbs viz., *Achyranthes splendens* Linn., *Leucas aspera* (Willd.) Linn. and *Swertia chirayita* Linn. treatments and had positive influence on the body weight (in 7th week) ranging from 1310,1372 and 1590.1 g bird⁻¹ of F2, F3 and F4, respectively. The over control (in which commercial feed with antibiotic growth hormone incorporated) was increased by it's tenfold in the treatments.

Similarly the height and weight of the small intestine of the male broilers during 22-42 days of growth period were increased from 9.8 to 15.6% effectively in the treatments F2 and F3 than the control (Table 6). This was due to the crude protein contents of the herbal formulations.

This was in accordance with Jamroz *et al.*¹², in their study they used 300 mg kg⁻¹ of carvacrol and improved the daily gain of chickens by 8.1% and reported that phytobiotics based diet

influenced the morphological parameters of stomach and jejunum walls positively. Many herbs and spices can be added to food with the benefit of enhancing organoleptic properties²⁷.

Alcicek *et al.*²⁸ suggested that feeding broilers with a diet supplemented with PFA results in stimulating the secretion of mucus in the intestine of broilers. This effect was assumed to reduce the adhesion of pathogens, thus stabilising microbial eubiosis in the gut of animals.

Brenes and Roura²⁹, in a review reported that the chickens may respond to low levels of spices in feed by increasing digestive secretions.

The secretion of digestive enzymes, immune stimulation, antibacterial, coccidiostatic, antihelminthic, antiviral or anti-inflammatory activity and antioxidant properties are from the phytobiotics. Many plant secondary metabolites, such as isoprene derivatives, flavonoids and glucosinolates, may act as antibiotics or as antioxidants in vivo, because of these beneficial effects they lead to an increase in body weight³⁰.

This study findings shows that there was upto 43% improvement in FCR of birds supplemented with the herbal formulations. Similar kind of results of Kidds *et al.*²⁰, revealed that feeding the broilers with herbal extract could be associated with improving the digestibility of dietary protein in the small intestine, enhances the crude protein utilization, absorption of nutrients and suppression of gram negative bacteria. Therefore it increases the appetite of the birds which improves the growth performance.

El-Gendy³¹ reported that the improvement in feed conversion ratio with feeding herbal extract could be associated with improving the digestibility of dietary protein in the small intestine. Therefore this improves the height and weight of the small intestine and body weight gain. This was supported by the experimental results of Abd El-Latif *et al.*³², Demir *et al.*³³, Grashorn³⁴ and Murali *et al.*³⁵.

CONCLUSION

Animal health was sustained throughout the study and body weight gain was observed in different treatments. Hence the order of beneficial effects of phytobiotics in poultry feed is as follows: Poulvita<Herba-S< Vita-G. Hence, it was concluded that the positive effect of phytobiotics is due to the plant constituents including terpenoids (mono- and sesquiterpenes, steroids) phenolics (tannins), glycosides, alkaloids (present as alcohols, aldehydes, ketones, esters, ethers and lactones) flavonoids and glucosinolate. This will reduce the entry of pathogens which affect the growth and possibility of limiting

the usage of antibiotic growth hormones. Hence these herbal feed formulations had been recommended to the poultry industry.

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