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Effect of herbal immune modulator on growth performance and survivability in Giriraja birds

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Abstract

The present experiment was conducted at Department of Poultry Science, Veterinary College, Bangalore during January, 2015. An experiment was planned to evaluate the effects of herbal immunomodulator powder and liquid form (with and without vaccine) comparing with levamisole powder (with and without vaccine) in Giriraja birds for 8 weeks duration to evaluate on growth performance. In a completely randomised design, 525 day old Giriraja chicks were assigned to seven treatments with each treatment group consisting of five replicates with 15 chicks each. The results of the present study identified no significant difference in body weight of chicks fed with diets supplemented with herbal immunomodulator in the form of powder and liquid (with and without vaccine). Whereas there is significant difference observed during seventh week of the experiment in treatment (T₄) supplemented with herbal immunomodulator powder without vaccine. The results of the present study found that there is influence of herbal immunomodulator (powder and liquid) in feed consumption. During second, fourth, sixth and seventh week of experimental period, without vaccine group consumed higher feed and during first and the eighth week of experiment higher feed consumption was recorded in (T₃) supplemented with levamisole with vaccine. The mean feed conversion ratio was significantly influenced by supplementation of herbal immunomodulator in powder form without vaccine (T₄). There was significant difference in FCR during 5th, 6th and 7th week of the experimental period and non-significant difference during 3rd and 8th week of the experimental period. Non-significant difference was observed in the per cent livability of birds in all treatment groups.

Keywords: Giriraja, levamisole, immunomodulator, growth, feed intake, FCR

1. Introduction

Poultry production in India has been a means for earning livelihood for the economically distressed farmers due to its promising results in productivity from the improved backyard birds. Poultry rearing is currently the fast growing industry in National livestock sector with its benefits in the form of increased and economic production and provision of proteinaceous food [1].

Antibiotics as antimicrobial growth promoters have been widely used in the poultry feed industry. The advantages of using antibiotics as feed additives in terms of growth stimulation and improvement of feed efficiency are well documented [2]. However, the possibility of developing resistance of bacteria, the side effects of using antibiotics as growth promoters in farm animals/poultry, the loss of efficacy of antibiotics as growth stimulants and controlling an outbreak of bacterial diseases have been of concern.

The possibility of resistant bacteria and the side effects of antibiotics as growth promoters have led to the recent European Union (EU) ban on the use of most antibiotics in farm animals as growth promoters [3]. There are some important bioactive components such as alkaloids, bitters, flavonoids, bioflavonoids, glycosides, mucilage, saponins, tannins phenols, phenolic acids, guinones, coumarins, terpenoids, essential oils, lectins and polypeptides in the structures of nearly all the plants. The use of various plant materials as dietary additives may positively affect poultry health and productivity [4].

The use of natural feed additives as substitutes for antibiotic in poultry production has become an area of great interest. Medicinal plants or herbs consists of many pharmacologically active chemical compounds which have antimicrobial activity, antioxidant activity, antifungal activity, antiviral activity, anti-inflammatory effects as well as immunomodulatory properties [5].

2. Materials and Methods

The present experiment was conducted at Department of Poultry Science, Veterinary College, Bangalore during January, 2015. Five hundred and twenty five day old straight run Giriraja

chicks from a single hatch were wing banded for identification, weighed and randomly distributed to seven treatment groups in Completely Randomised Design. Each treatment had five replicates with 15 birds in each replicate. All the experimental chicks were healthy and received normal routine health care during eight weeks of the trial. The birds were provided feed and water *ad libitum*. A practical diet comprising of Yellow Maize, Soya bean meal, feed supplements and feed additives without antibiotics and coccidiostat constituted the control diet for all the seven treatment groups. The feed for the treatment group was formulated as per BIS (1994) requirements for all the nutrients except antibiotics and coccidiostat. The experimental birds in T₁ was fed with control diet without any antibiotics and coccidiostat. The birds were administered with ND and IBD vaccines. The experimental birds in T₂ were fed as in T₁ and supplemented with Levamisole powder. The experimental birds in T₃ were fed as in T₂ and administered vaccines. The experimental birds from T₄ and T₅ were fed with Herbal Immunomodulator preparation in powder form containing Mandukaparni, Yasthi madhu, Guduchi, vriddadaru, Amalaki, Nimba and etc without and with vaccines, respectively and birds from T₆ and T₇ were fed with Herbal Immunomodulator preparation in liquid form containing Himsara, Kasani, Vasaka, Guduchi, Daraksha,

Jhavuka, Shatavari etc., without and with administration of vaccines, respectively against ND and IBD.

3. Statistical Analysis

Data pertaining to various parameters obtained during the trial was analyzed statistically by ANOVA using SPSS 20 statistical software. Differences between the means were tested using Duncan's Multiple Range Test at $P < 0.05$.

4. Results

4.1. Body weight

There was no significant difference observed during first and second week of experimental period. During third week of experimental period significant difference was observed in T₂ group (380.89±6.12) and lower body weight observed in T₇ group (360.69±2.36). During 4th week of experimental period significant difference in body weight was observed in T₄ (597.87±4.37) group and lower body weight observed in T₇ (563.08 ±5.06) (Table 1). During 5th and 6th week there was no significant difference observed. In 7th week of experimental period there was significant difference was observed in T₄ (1216.78±9.85) group when compared to T₅ group (1168.55±20.22). During 8th week of experimental period there was significant difference was observed (Table 2).

Table 1: Effect of herbal immunomodulator and levamisole on cumulative body weight (g) during starter period

Treatment		Week			
		I	II	III	IV
T ₁	Control	112.89±3.86	208.71 ±1.61	367.07±6.99 ^{ab}	583.72±4.65 ^{abc}
T ₂	Control + levamisole without vaccine	117.22±3.40	210.09±3.37	380.89±6.12 ^a	584.49 ±5.34 ^{abc}
T ₃	Control + levamisole with vaccine	116.01±1.2	213.85 ±1.07	368.33 ±3.63 ^{ab}	588.17 ±6.06 ^{ab}
T ₄	Control + HIM powder without vaccine	114.33±1.70	209.09 ±1.30	375.16±5.61 ^{ab}	597.87±4.37 ^a
T ₅	Control + HIM powder with vaccine	114.20 ±3.44	207.51±2.95	366.57±6.87 ^{ab}	569.64 ±14.63 ^{bc}
T ₆	Control + HIM liquid without vaccine	115.13±3.29	212.99 ±3.09	374.88 ±6.50 ^{ab}	574.79±7.17 ^{abc}
T ₇	Control + HIM liquid with vaccine	108.81 ±1.76	208.03±1.16	360.69±2.36 ^b	563.08 ±5.06 ^c

Means with common superscript within column do not differ significantly ($P \leq 0.05$)

Table 2: Effect of herbal immunomodulator and levamisole on cumulative body weight (g) during finisher period

Treatment		Week			
		V	VI	VII	VIII
T ₁	Control	769.31±11.22 ^a	964.23 ±5.67	1198.62 ±5.77 ^{ab}	1440.37±11.25
T ₂	Control + levamisole without vaccine	748.11±12.13 ^{abc}	971.37 ±9.29	1200.21±16.14 ^{ab}	1465.97 ±27.45
T ₃	Control + levamisole with vaccine	751.58±14.72 ^{abc}	975.30 ±24.40	1204.77±13.13 ^{ab}	1482.72±23.92
T ₄	Control + HIM powder without vaccine	719.64±7.16 ^{bc}	957.55 ±8.26	1216.78±9.85 ^a	1465.77 ±28.86
T ₅	Control + HIM powder with vaccine	717.93 ±10.40 ^c	964.21±9.07	1168.55±20.22 ^b	1432.13 ±19.18
T ₆	Control + HIM liquid without vaccine	755.87±12.10 ^{ab}	970.13±15.38	1208.48±16.80 ^{ab}	1458.22 ±18.02
T ₇	Control + HIM liquid with vaccine	738.60±11.85 ^{abc}	962.99 ±7.39	1181.50±12.47 ^{ab}	1421.36 ±14.91

Means with common superscript within column do not differ significantly ($P \leq 0.05$)

4.2. Feed consumption

The statistical analysis revealed significant ($P \leq 0.05$) differences among various treatment groups during all the weeks of experiment except first and third week. At the end of second week of age, the highest feed consumption (236.61 g) was observed in herbal immunomodulator liquid without vaccine supplemented group (T₆) and the lowest feed consumption (219.18 g) was observed in group supplemented with herbal immunomodulator liquid with vaccine (T₇). At the end of fourth week of age, the highest feed consumption (982.08 g) was observed in herbal immunomodulator liquid without vaccine supplemented group (T₆) and the lowest feed consumption (924.03 g) was observed in group supplemented with levamisole with vaccine (T₃) (Table 3).

At the end of fifth week of age, the highest feed consumption (1422.42 g) was observed in control (T₁) and the lowest feed consumption (1285.85 g) was observed in herbal

immunomodulator powder without vaccine supplemented group (T₄). At the end of sixth week of age, the highest feed consumption (2017.07 g) was observed in herbal immunomodulator liquid without vaccine supplemented group (T₆) and the lowest feed consumption (1900.58 g) was observed in herbal immunomodulator powder without vaccine supplemented group (T₄). At the end of seventh week of age, the highest feed consumption (2630.72 g) was observed in herbal immunomodulator liquid without vaccine supplemented group (T₆) and the lowest feed consumption (2494.59 g) was observed in herbal immunomodulator powder with vaccine supplemented group (T₅). At the end of eighth week of age, the highest feed consumption (3385.61 g) was observed in levamisole without vaccine supplemented group (T₂) and the lowest feed consumption (3227.97g) was observed in herbal immunomodulator powder with vaccine supplemented group (T₅) (Table 4).

Table 3: Effect of herbal immunomodulator and levamisole on feed consumption (g) during starter period.

Treatment		Week			
		I	II	III	IV
T ₁	Control	59.23 ±4.32	221.09±2.87 ^b	490.61 ±8.56	972.24 ±15.51 ^a
T ₂	Control + levamisole without vaccine	66.70 ±2.51	224.76 ±0.24 ^b	493.05±6.47	973.04 ±12.52 ^a
T ₃	Control + levamisole with vaccine	57.75 ±2.65	224.35 ±3.42 ^b	481.06±6.66	924.03 ±12.98 ^b
T ₄	Control + HIM powder without vaccine	62.65±3.31	224.89 ±0.11 ^b	497.85±9.19	956.14 ±11.60 ^{ab}
T ₅	Control + HIM powder with vaccine	60.37 ±5.05	219.83 ±3.24 ^b	498.97±5.76	955.60 ±16.96 ^{ab}
T ₆	Control + HIM liquid without vaccine	66.60 ±5.37	236.61±7.28 ^a	497.05 ±9.58	982.08 ±6.51 ^a
T ₇	Control + HIM liquid with vaccine	58.67±4.77	219.18 ±2.76 ^b	479.27 ±2.56	951.93±11.16 ^{ab}

Means with common superscript within column do not differ significantly ($P \leq 0.05$)

Table 4: Effect of herbal immunomodulator and levamisole on feed consumption (g) during finisher period

Treatment		Week			
		V	VI	VII	VIII
T ₁	Control	1422.42 ±21.98 ^a	2005.00±21.71 ^{ab}	2541.08±17.98 ^{ab}	3229.60±34.06 ^b
T ₂	Control+ levamisole without vaccine	1381.73±13.24 ^{ab}	1969.15±22.85 ^{abc}	2623.69±24.61 ^a	3385.61±28.70 ^a
T ₃	Control+ levamisole with vaccine	1344.35±21.18 ^{bcd}	1950.70±40.16 ^{abc}	2548.93±19.93 ^{ab}	3247.06±47.39 ^{ab}
T ₄	Control+ HIM powder without vaccine	1285.85 ±16.33 ^d	1900.58 ±17.08 ^c	2533.54±27.21 ^{ab}	3278.95±39.45 ^{ab}
T ₅	Control+ HIM powder with vaccine	1304.97±27.11 ^{cd}	1918.92±45.46 ^{bc}	2494.59±54.25 ^b	3227.97±76.09 ^b
T ₆	Control+ HIM liquid without vaccine	1416.81±4.72 ^a	2017.07±11.39 ^a	2630.72±31.65 ^a	3354.73±52.67 ^{ab}
T ₇	Control+ HIM liquid with vaccine	1358.08±29.00 ^{abc}	1953.31±23.46 ^{abc}	2530.82±32.38 ^{ab}	3249.52±33.13 ^{ab}

Means with common superscript within column do not differ significantly ($P \leq 0.05$)

4.3 Feed conversion ratio

Analysis of variance revealed significant difference ($P \leq 0.05$) in mean FCR values among various treatment groups when compared with control group during 4th, 5th, 6th and 7th week and non-significant from first to 3rd week and on 8th week.

At first, second and third week of age, statistical analysis revealed no significant difference ($P > 0.05$) among various treatment groups. At fourth week of age, the mean values of FCR was better (1.57) in levamisole with vaccine supplemented group (T₃) and poor FCR (1.70) was observed in HIM liquid without vaccine supplemented group (T₆) (Table 5).

At fifth week of age, the mean values of FCR was better (1.78) in herbal immunomodulator powder without vaccine supplemented group (T₄) and significantly comparable with

poor feed efficiency (1.87) observed in herbal immunomodulator liquid without vaccine supplemented group (T₆). At sixth week of age, the mean values of FCR ranged from 1.98 in herbal immunomodulator powder without vaccine supplemented group (T₄) to 2.08 in herbal immunomodulator liquid without vaccine supplemented group (T₇). At seventh week of age, the mean values of FCR ranged from 2.08 in herbal immunomodulator powder without vaccine supplemented group (T₄) and in (T₅) to 2.18 in levamisole without vaccine supplemented group (T₂). The feed efficiency values at eighth week of age ranged from 2.19 in levamisole with vaccine supplemented group (T₃) to 2.31 in levamisole without vaccine supplemented group (T₂). The feed conversion ratios were statistically insignificant among different treatment groups (Table 6).

Table 5: Effect of herbal immunomodulator and levamisole on feed conversion ratio during starter period

Treatment		Week			
		I	II	III	IV
T ₁	Control	0.52 ±0.03	1.06 ±0.01	1.34±0.03262	1.67±0.03 ^{ab}
T ₂	Control+ levamisole without vaccine	0.57 ±0.02	1.07 ±0.02	1.29±0.00587	1.66 ±0.02 ^{ab}
T ₃	Control+ levamisole with vaccine	0.50±0.02	1.05±0.02	1.30±0.00767	1.57 ±0.01 ^c
T ₄	Control+ HIM powder without vaccine	0.55 ±0.04	1.07 ±0.01	1.33±0.02515	1.59 ±0.01 ^{bc}
T ₅	Control+ HIM powder with vaccine	0.53±0.03	1.06 ±0.02	1.36±0.02144	1.68±0.02 ^a
T ₆	Control+ HIM liquid without vaccine	0.58±0.05	1.11 ±0.03	1.33±0.03955	1.71±0.02 ^a
T ₇	Control+ HIM liquid with vaccine	0.54±0.04	1.05 ±0.02	1.33±0.00686	1.69 ±0.03 ^a

Means with common superscript within column do not differ significantly ($P \leq 0.05$)

Table 6: Effect of herbal immunomodulator and levamisole on feed conversion ratio during finisher period.

Treatment		Week			
		V	VI	VII	VIII
T ₁	Control	1.85±0.02 ^{ab}	2.07 ±0.02 ^a	2.12±0.02 ^{ab}	2.24 ±0.03
T ₂	Control + levamisole without vaccine	1.84±0.02 ^{ab}	2.02±0.02 ^{ab}	2.18 ±0.03 ^a	2.31 ±0.04
T ₃	Control + levamisole with vaccine	1.79±0.01 ^b	2.00 ±0.03 ^{ab}	2.11 ±0.02 ^{ab}	2.19 ±0.03
T ₄	Control + HIM powder without vaccine	1.7867±0.01 ^b	1.98 ±0.00 ^b	2.08 ±0.01 ^b	2.23 ±0.03
T ₅	Control + HIM powder with vaccine	1.82±0.01 ^{ab}	1.98 ±0.03 ^b	2.13 ±0.03 ^{ab}	2.25 ±0.04
T ₆	Control + HIM liquid without vaccine	1.88±0.03 ^a	2.08 ±0.03 ^a	2.17±0.04 ^{ab}	2.30 ±0.05
T ₇	Control + HIM liquid with vaccine	1.84±0.03 ^{ab}	2.02±0.03 ^{ab}	2.14±0.03 ^{ab}	2.28 ±0.04

Means bearing at least one common superscript column wise does not differ significantly ($P \leq 0.05$).

4.4 Survivability

The percentage livability of birds under different treatments was statistically non-significant ($P>0.05$). During the first week of age there was no mortality recorded in all treatment groups supplemented with herbal immunomodulator powder

and liquid (with and without vaccine) and levamisole (with and without vaccine). During 2nd, 3rd, 4th, 5th, 6th, 7th and 8th week of experimental period per cent of survivability was 97.33 to 98.67 observed (Table 7 and 8).

Table 7: Effect of herbal immunomodulator and levamisole on weekly Survivability in Giriraja birds

Treatment	I week	II week	III week	IV week
T ₁ Control	100.00±0.00	100.00±0.00	100.00±0.00	97.33±2.67
T ₂ Control + levamisole without vaccine	100.00±0.00	100.00±0.00	100.00±0.00	100.00±0.00
T ₃ Control + levamisole with vaccine	100.00±0.00	98.67±1.33	98.67±1.33	98.67±1.33
T ₄ Control + HIM powder without vaccine	100.00±0.00	100.00±0.00	97.33±2.67	100.00±0.00
T ₅ Control + HIM powder with vaccine	100.00±0.00	100.00±0.00	100.00±0.00	100.00±0.00
T ₆ Control + HIM liquid without vaccine	100.00±0.00	100.00±0.00	100.00±0.00	100.00±0.00
T ₇ Control + HIM liquid with vaccine	100.00±0.00	100.00±0.00	100.00±0.00	100.00±0.00

Means with common superscript within column do not differ significantly ($P<0.05$)

Table 8: Effect of herbal immunomodulator and levamisole on weekly Survivability in Giriraja birds

Treatment	V week	VI week	VII week	VIII week
T ₁ Control	100.00±0.00	100.00±0.00	100.00±0.00	100.00±0.00
T ₂ Control + levamisole without vaccine	100.00±0.00	100.00±0.00	100.00±0.00	100.00±0.00
T ₃ Control + levamisole with vaccine	98.67±1.33	97.33±1.63	98.67±1.33	98.67±1.33
T ₄ Control + HIM powder without vaccine	98.67±1.33	98.67±1.33	98.67±1.33	98.67±1.33
T ₅ Control + HIM powder with vaccine	100.00±0.00	100.00±0.00	100.00±0.00	100.00±0.00
T ₆ Control + HIM liquid without vaccine	100.00±0.00	100.00±0.00	98.67±1.33	98.67±1.33
T ₇ Control + HIM liquid with vaccine	100.00±0.00	98.67±1.33	97.33±1.63	98.67±2.98

Means with common superscript within column do not differ significantly ($P<0.05$)

5. Discussion

5.1 Body weight

The results of the present study indicated that addition of herbal immunomodulators and levamisole supplemented along with control rations exhibited significant ($P>0.05$) effect on body weight of birds only during fifth week of experimental period and non-significantly different in all treatment groups in the rest of the weeks.

During first three weeks of age there was non-significant difference in the body weight in the treatment group supplemented with herbal immunomodulator liquid and powder (with and without vaccine). The results of the present study are in agreement with the findings of the, [6] fed broilers with *Aloe vera* powder (0.1% and 0.2%) and *Curcuma longa* powder (0.1% and 0.2%) and a mixture of these two powders, and reported there was no significant difference in body weight gain, except for the first week of the treatment.

The results of the present study are in disagreement with the result of [7] who reported that there was improvement in body weight of broilers achieved with 5 g/kg thyme which could be attributed to its positive effect on nutrient digestibility.

At the end of seventh week the highest body weight was found in treatment group supplemented with herbal immunomodulator powder without vaccine (T₄). The results are in line with the findings of the [8] who studied that feeding of the three extracts Mushrooms (*Lentinus edodes* (LenE) and *Tremella fuciformis* (TreE), and a herb, *Astragalus membranaceus* (AstE), LenE appeared to be a potential growth promoter in broilers.

5.2 Feed consumption

The cumulative values of feed intake in treatment group supplemented with herbal immunomodulator powder and liquid (with and without vaccine) and levamisole powder (with and without vaccine) revealed that there is significant difference among the various treatment groups during all the weeks of experiment except first and third week.

The results of the present study found that at the end of first and third week of experiment there was non-significant difference among different immunomodulator supplemented groups and also comparable with control. The present results are in accordance with the findings of [9] who studied during the starter period of birds fed diets containing flavomycin, cumin and peppermint. They observed that feed intake and FCR did not differ between dietary treatments and control.

In the present study during 4th, 6th and 7th week of the experimental period there is significantly higher feed consumption in treatment groups supplemented with herbal immunomodulator (liquid) without vaccine group (T₆). The present results are in agreement with the findings of [10] who found that the inclusion of Neem leaves powder resulted in an increase in total feed intake by 5.7%. The control group was more prone to parasite infections compared with Neem treated groups. Neem works as a growth promoter by killing parasites that hinder the growth of animal.

5.3 Feed conversion ratio

The mean value of feed conversion ratio as influenced by feeding herbal immunomodulator both in powder and liquid (with and without vaccine) and Levamisole powder (with and without vaccine) in Giriraja birds from week one to eighth week of age revealed significant difference ($P<0.05$) in mean FCR values among various treatment groups when compared to control group during 4th, 5th, 6th and 7th week and non-significant from first to 3rd week and on 8th week.

The findings are in agreement the findings of [11] who observed significant ($P<0.01$) improvement in feed efficiency of broilers with the supplementation of poly herbal preparations containing Tulsi as an integral part of composition.

The present study results are contrary with the findings of [12] who stated that garlic supplementation at the levels of 1.5, 3 and 4.5 per cent in Ross X Ross male broilers diet for 21 days had no effect on feed conversion ratio.

5.4 Survivability

The results of the study revealed non-significant difference in the livability of Giriraja birds under different treatment groups supplemented with herbal immunomodulator powder and liquid (with and without vaccine) and levamisole powder (with and without vaccine) during 56 days of experimental period.

During the period of 0-4 week of age better livability was observed in different treatment groups. The results of the present study are in agreement with the findings of [13] who found that there was no mortality up to 35 days of age in broilers, when turmeric was used at 0.5 per cent level in broiler diet and less mortality was observed @ 0.1% inclusion.

6. Conclusion

The results of the present study found that there is influence of herbal immunomodulator (powder and liquid) in feed consumption. During second, fourth, sixth and seventh week of experimental period, without vaccine group consumed higher feed and during first and the eighth week of experiment higher feed consumption was recorded in (T₃) supplemented with levamisole with vaccine. The mean feed conversion ratio was significantly influenced by supplementation of herbal immunomodulator in powder form without vaccine (T₄). There was significant difference in FCR during 5th, 6th and 7th week of the experimental period and non-significant difference during 3rd and 8th week of the experimental period. Non-significant difference was observed in the per cent livability of birds in all treatment groups.

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