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Impact of Dietary Supplementation of Shatavari (*Asparagus racemosus*) and Ashwagandha (*Withania somnifera*) Root Powder on Performances in Broilers

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ABSTRACT

Use of antibiotics has been found to have negative effects on broiler health and its production therefore; there is a need for supplementation of herbal ingredients in broiler feed. An experiment was conducted on herbal dietary supplementation of Shatavari (*Asparagus racemosus*) and Ashwagandha (*Withania somnifera*) root powder to study its effect on growth performance in caged broilers. A total of 48 day old broiler chicks of same hatch were procured and randomly divided into four groups with three sub groups comprising of 3 chicks in each to serve as replicates T_0 (control) had standard ration as per NRC; T_1 ration was supplemented with 5g Shatavari root powder /kg feed; T_2 ration was supplemented with 5g Ashawagandha powder /kg feed and T_3 ration was supplemented with 2.5g Shatavari +2.5g Ashawagandha powder/ kg feed. The birds were reared in battery type cages under standard managemental practices from day-old to five weeks of age. Statistically analyzed data shown that the average body weight gain, final body weight, and feed intake was significantly ($p<0.05$) highest in T3 group followed by T2, T0 and T1 group. Overall FCR suggested that supplementation of these feed additives did not negatively affect the FCR of caged broiler chicks. From this study it can be concluded that caged broilers supplemented with 2.5g Shatavari + 2.5g Ashawagandha powder/ kg feed may perform well in caged conditions without having negative impact on FCR of caged broiler chicks.

HIGHLIGHTS

- We studied the effects of two herbals for their individual and in combination effect on broilers.
- Herbal supplemented groups performed better in terms of body weight gain.
- There was no adverse effect on the FCR of caged broilers.

Keywords: Ashwagandha, Broilers, Cage, Growth, Shatavari, Supplementation

Poultry production is one of the areas in livestock production with significant contribution to human food production. Poultry products in recent years become important and popular food for non-vegetarian population (Adbhai *et al.,* 2019). Chicken are widely kept in India and total population of chicken in India is estimated to be about 851.81 million (BAHS, 2019). Chicken are an important source of animal protein. Almost every age group human being prefers chicken due to its easier and economic availability together with rising demand of cheap animal protein source. Furthermore, recent two decades has witnessed a considerable advancement in nutritional technology for poultry birds thereby improving meat and egg production per kg of feed consumed by the poultry birds especially broilers (Thakur *et al.,* 2020a; Thakur *et al.,* 2020b; Nagar *et al*., 2020).

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Feed additives are commonly described as non-nutrient substances that accelerate growth, efficiency of feed utilization, beneficial for health or metabolism of the animals (Church and Pond, 1998). Use of antibiotics has negative effects on animal health and its production such as residue in tissues, withdrawal period and development of resistance in microorganism (Wadoum *et al*., 2016). Therefore, the use of antibiotic growth promoter has been banned in many countries; especially European Union has banned use of antibiotic growth promoters in 2006.

Srivastava *et al*. (2012) conducted a trial to assess the response of indigenous herbal on the growth performance of broiler chicks. The result showed a significant difference in terms of body gain, feed intake, feed conversion ratio (FCR) and performance index as compared to control. Pandey *et al.* (2013) reported that medicinal plants such as Ashwagandha (*Withania somnifera*), Shatavari (*Asparagus racemosus*) and Kapikachhu (*Mucunapruriens*) can be used as feed additives in broiler. Mihir *et al.* (2003) reported that the hemoglobin, serum glucose and protein were higher in treatment group, while serum cholesterol was not influenced by administering herbal growth promoter in broilers. Mishra and Singh (2000) reported that the effect of feeding root powder of *Withania somnifera* (Ashwagandha) improved growth rate, feed consumption, feed conversion efficiency and lowered mortality rate in broiler chicks. Chitra *et al.* (2004) evaluated the effect of Ashawagandha root with Vitamin C on growth performance in broiler quails during heat stress. Average body weight, feed conversion ratio and dressing percentage of chicks and they stated that this combination could be also used anti-stress agent. Rekhate *et al.* (2010) reported the effects on the chemical composition of treatment diets on inclusion of Shatavari root powder. Upon feeding trial, significant improvements in live body weight of broilers, protein digestion and FCE were observed on feeding diets supplemented with Shatavari root powder. Bhardwaj *et al.* (2009) evaluated the efficacy of Ashawagandha root powder in Japanese quails by supplementing in feed at 0%, 0.5%, 1% and 1.5% and concluded that 1% Ashawagandha (*Withania somnifera*) root powder significantly improved body weights and feed efficiency. Kumari *et al.* (2012) reported pronounced overall improvement in the form of increased average body weight gain and feed conversion efficiency of the birds, after inclusion of Shatavari (*Asparagus racemosus*) in the ration of broilers. Mane *et al*. (2012) reported in a study, which was conducted to evaluate the effect of a commercial herbal growth promoter (CHGP) with a combination of selective nine numbers of herbs on the performance of broiler chicken and they found that there was increased body weight, improved FCR, higher BPEL, percent livability and increased gross profit per broiler in birds offered 2% CHGP powder herbal growth promoter. Considering above discussed points, the present study was aimed with objectives to determine weekly feed consumption of caged broilers fed in individual as well as in combination of Shatavari and Ashwagandha root powder supplementation for their growth and to find out its effect on body weight gain and feed efficiency of caged broilers.

MATERIALS AND METHODS

Place of experiment

The present experiment entitled "effect of different levels of Shatavari (*Asparagus racemosus)* root powder and Ashwagandha (*Withania somnifera*) root powder supplementation on growth performance and feed efficiency of caged broiler" was carried out in small animal laboratory of Department of Animal Husbandry and Dairying, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj, India.

Dietary regime

A total of 48 Day old broiler chicks of same hatch were procured and randomly divided into four groups with three sub groups comprising of 3 chicks in each to serve as replicates, as per following dietary regimes:

- T_0 (control): Standard ration as per NRC
- T_1: Ration supplemented with 5g Shatavari root powder /kg feed
- T_2: Ration supplemented with 5g Ashawagandha powder /kg feed
- T_3: Ration supplemented with 2.5g Shatavari + 2.5g Ashawagandha powder/ kg feed

The birds were reared in battery type cages under standard managemental practices from day-old to five weeks of

age. Shatavari and Ashwagandha were supplemented as per dietary regimes of treatments. Broiler starter ration containing CP: 22 per cent and, ME: 2900 k.cal./kg. feed was fed (Table 1) up to three weeks of age and broiler finisher ration containing CP: 19 percent and ME: 3000 kcal/kg fed up to five weeks. The ration was fed *ad-libitum* to the birds. Initial weight of each chick was recorded on arrival and then weekly to obtain the weekly body weight gain in the chicks. The feed consumption was also recorded weekly to determine the feed conversion ratio.

Table 1: Ingredient and nutrient composition of experimental diet (%DM)

Ingredients (%)	Broiler starter (0 – 21 day)	Broiler finisher (22 – 42 days)
Corn	53.55	59.57
Soyabean meal (44 %CP	38.93	33.34
Monodibasic Phosphate	1.43	1.21
Limestone	1.35	1.38
Vegetable oil	3.84	3.51
Salt	0.41	0.43
DL- Methionine	0.207	0.214
L-Lysine- HCL	0.129	0.197
Cho line HCL (60%)	0.06	0.05
Mineral- Vitamins premix	0.01	0.01
Total	**100**	**100**

Calculated Nutrients

Crude protein %	22	20
ME, Kcal/kg	3,050	3,100
Calcium %	0.9	0.85
Available phosphorus %	0.4	0.35
Sodium %	0.2	0.21
Chloride %	0.27	0.29
Digestible Lys. %	1.15	1.07
Digestible Met. %	0.49	0.48
Digestible Met + Cys %	0.81	0.77
Digestible Thr, %	0.78	0.71
Choline, mg/kg	1,420	1,300

Housing management for day old chicks

Housing condition which promotes better growth and health is necessary for livestock and poultry (Singh *et al.,* 2020a; Singh *et al.,* 2020b; Mishra *et al.,* 2017). It is more important for poultry birds as they are more susceptible for climatic change. Before arrival of broilers chicks, the experimental pens, waterers, feeders and floor were cleaned, washed, disinfected and fumigated by using formaldehyde and potassium permanganate. Chicks were housed in battery type cages providing 0.75 sq. ft/bird space. Cages, feeders, waterers, and other equipments were properly cleaned, disinfected and sterilized before use. The waterers were disinfected with 0.02% $KMnO_4$ solution every day and water was supplied *ad lib* to the birds. One bulb of 100 watt was left on for light in each cage to maintain the temperature in the laboratory.

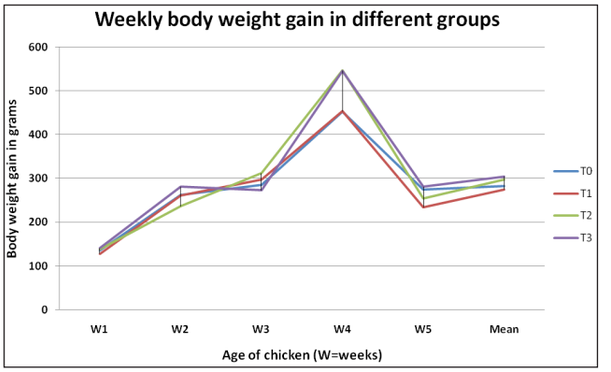

Fig. 1: Average weekly body weight gain of caged broilers on diet Supplemented with different level of Shatavari and Ashwagandha root powder

Feed consumption

The daily feed consumption of each group was estimated as differences between the total quantity of feed offered and quantity of feed left over during 24 hours period. Feed consumptions recorded were added together for seven days of the week and was considered as weekly feed consumption.

Live weight gain

The growth rate of the birds is reflected through the weekly live weight gain. Individual body weight of the birds from each group was taken at weekly interval, starting from the day old stage. The birds were weighted during morning hours before feeding. Electronic weighing balance with a least count of 0.5g was utilized for weekly

weighing of body weight of chicks as well as the amount of feed supplied and consumed by the chicks. However, the separate weighing scales were used for weighing. The average weekly weight gain of the birds of the different groups was calculated by subtracting the previous week average weight of the group of the birds from the present weekly average weight of the group of birds. During start of the experimentation, the weights of day old chicks were statistically similar.

Day old chicks

In general, the body weight of day old chicks ranged from 40.66 – 48.66g. The body weight of day old chicks in different treatments viz. T_0, T_1, T_2 and T_3 ranged from 41.33 – 48.66, 40.66 – 47.33, 42.66 – 46.66, 47.33 – 42.66 g. respectively. The different mean body weight of day old chicks in different treatments viz. T_0, T_1, T_2 and T was 44.33, 44.66, 44.66 and 45.00 g respectively. The differences in the body weight of day old broiler chicks between different groups (treatment) were found non-significant. From the perusal of the data on the body weight f day old chicks randomly distributed in different treatments**,** it was observed that irrespective of treatment the body weight of day old chicks in general ranged from 40.66 – 48.66g. The highest mean body weight of day old chicks was recorded in T_3 (45.00), and followed by T_2 (44.66), T_1 (45.66), T_0 (44.33). The differences in those values between the treatments were found to be non-significant. It indicates that random distribution of chicks into different treatment was proper and unbiased.

Feed conversion ratio (FCR)

The amount of feed consumed per unit gain (feed conversion ratio) was calculated as the ratio of feed consumed to weight gain (Maurya *et al*., 2016) during the experimental period feed consumption and weight gain for each week worked out for each treatment separately.

FCR = Quantity of feed consumed (g) in week / Gain in body weight (g) in week

Relative growth rate (RGR)

RGR was calculated using the method utilized by Amer *et al.* (2020)

$RGR\% = \{(W2 – W1)/ (W1 + W2)/2\}*100$

STATISTICAL ANALYSIS

Data on various parameters were recorded, tabulated on subjected to statistical analysis by comparing Analysis of variance (ANOVA) as per Snedecar and Cocharan (1994). Microsoft Excel 2007 software was used for meticulous statistical analysis and graphical representation of the all the data.

RESULTS AND DISCUSSION

Feed Intake in Broiler

Average weekly gain in weight (g) of broilers in different treatment groups

The data regarding average weekly gain in weight per broilers randomly distributed into control (T_0) and three different treatments (T_1, T_2, T_3). Average body gain in weight of broiler at first, second, third, fourth and fifth week of age ranged from 120.67 – 143.00, 214.00 – 301.33, 249.33 – 353.33, 360.67-610.00 and 143.34 – 333.34 g respectively as presented in fig. 1. At first week of age the average highest gain in weight of broilers was recorded in T_3 (140.42g) and followed by T_2 (138.17g), T_0 (135.17g), T_1 (127.84g). At second weeks of age the average highest gain in weight of broilers was recorded in T_3 (281.09g) and followed by T_0 (262.67g), T_1 (260.58g), T_2 (236.67g). At third weeks of age the average highest gain in weight of broilers was recorded in T_2 (311.84g) and followed by T_1 (297.33g), T_0 (285.66g), T_3 (272.83g). At fourth weeks of age the average highest gain in weight of broilers was recorded in T_2 (546.67g) and followed by T_3 (545.67g), T_1 (453.92g), T_0 (452.84g). At fifth weeks of age the average highest gain in weight of broilers was recorded in T_3 (280.84 g) and followed by T_0 (274.00g), T_2 (254.00g), T_1 (234.67g). Irrespective of weekly the mean average gain in weight per broiler at first, second, third, fourth and fifth week of age was 135.40, 260.25, 291.91, 493.02 and 260.87 g respectively. Irrespective of treatment the mean average gain in weight of broiler in T_0, T_1, T_2 and T_3 was 282.06, 274.86, 297.47 and 304.17. The differences in the gain in weight of broilers, both due to treatment and week were found significant ($p<0.05$).

From the perusal of data on weekly average gain in weight of broilers after five week of age, it may be noted that

mean gain in weight per broilers, irrespective of weekly at one, two, three, four and five week of age was 135.40, 260.25, 291.91, 493.02 and 260.87 g. respectively. When treatment wise gain in weight of broilers was recorded the highest weekly gain in weight was observed in T_3 (304.17g) followed by T_2 (297.47g), T_0 (282.06g) and T_1 (274.86g). Broilers of T_3 registered significantly highest gain in weight (304.17g) to compared control and T_1. However the gain in weight of T_3 was found that at par with the gain in weight of broilers in T_2. The differences in these values of treatment were found significant, which is indicated there was a significant effect of treatment on growth gain in weight of broiler. Similar results were reported by Niwas *et al*. (2013) and Srivastava *et al*. (2012). Pandey *et al.* (2013) reported that medicinal plants such as Ashwagandha (*Withania somnifera*), Shatavari (*Asparagus racemosus*) and kapikachhu (*Mucuna pruriens*) can be used as feed additives in broiler. Mishra and Singh (2000) reported that the effect of feeding root powder of *Withania somnifera* (Ashwagandha) improved growth rate, feed consumption, feed conversion efficiency and lowered mortality rate in broiler chicks. Bhardwaj *et al.* (2009) evaluated the efficacy of Ashawagandha root powder in Japanese quails by supplementing in feed at 0%, 0.5%, 1% and 1.5% and concluded that 1% Ashawagandha (*Withania somnifera*) root powder significantly improved body weights and feed efficiency.

Average weekly FCR of broilers of different treatment (kg. feed/ kg. of weight)

The data regarding average feed conversion ratio (FCR) per broilers randomly distributed into control (T_0) three different treatments (T_1, T_2, T_3) are presented in Table 2 and overall growth performance in Table 3.

At first week of age the best FCR per broilers was recorded in T_0 (1.08) and followed by T_1 (1.07), T_3 (1.03), T_2 (1.02) kg. At second weeks of age the best FCR per broilers was recorded in T_2 (2.01) and followed by T_0 (1.87), T_1 (1.86), T_3 (1.82) kg. At third weeks of age the best FCR per broilers was recorded in T_3 (2.05) and followed by T_2 (1.98), T_0 (1.93), T_1 (1.83) kg. At fourth weeks of age the best FCR per broilers was recorded in T_1 (1.88) and followed by T_0 (1.86), T_3 (1.60), T_2 (1.51) kg. At fifth weeks of age the best FCR per broilers was recorded in T_2 (2.10) and followed by T_1 (2.07), T_0 (1.92),

Table 2: FCR of caged broilers under different groups

Parameter	T0 (n=12)	T1 (n=12)	T2 (n=12)	T3 (n=12)	SEM (±)	Significance level
FCR 1	1.08^{cd}	1.07^{bcd}	1.02^{ab}	1.03^{abc}	0.01	S
FCR 2	1.87	1.86	2.01	1.82	0.05	NS
FCR 3	1.93	1.83	1.98	2.05	0.11	NS
FCR 4	1.86	1.88	1.51	1.60	0.11	NS
FCR 5	1.92	2.07	2.10	1.90	0.14	NS
Overall FCR	1.73	1.74	1.72	1.68	0.05	NS

Note: NS-Non significant (p>0.05); S- Significant (p<0.05); n = number of chicks.

Table 3: Performance of broiler chicken in different groups

Parameters	T0 (n=12)	T1 (n=12)	T2 (n=12)	T3 (n=12)	SEM (±)	Significance level
Initial Weight(g)	44.33	44.66	44.66	45.00	1.07	NS
Final Weight (g)	1454.66^{bcd}	1419.00^{cd}	1532.00^{bc}	1565.83^{ab}	27.10	S
Weight Gain (g)	1410.33^{bcd}	1374.34^{cd}	1487.34^{bc}	1520.83^{ab}	10.05	S
Feed Intake (g)	2537.57^{bcd}	2455.00^{cd}	2574.16^{bc}	2601.99^{ab}	17.07	S
Mean FCR	1.73	1.74	1.72	1.68	0.05	NS
RGR %	188.17	187.79	188.67	188.83	4.32	NS

Note: NS- Non significant (p>0.05); S- Significant (p<0.05); n- number of chicks.

T_3 (1.90). Irrespective of weekly the mean average FCR per broiler in first, second, third, fourth and fifth week of age was 1.05, 1.89, 1.94, 1.71 and 1.99 kg respectively. Irrespective of treatment the mean FCR per broiler in T_0, T_1, T_2 and T_3 was 1.73, 1.74, 1.72 and 1.68 kg respectively. The differences in the mean feed conversion ratio in broiler, due to treatment were found non- significant. From the perusal of data on weekly average feed conversion ratio per broiler contained, It may be observed that the mean average FCR per broilers, irrespective of weekly at one, two, three, four and five week of age was 1.05, 1.89, 1.94, 1.71 and 1.99 kg respectively. These results were expected. Regarding the influence of treatment on weekly FCR per broiler was observed that mean FCR of different treatments were T_0 (1.73), T_1 (1.74), T_2 (1.72) and T_3 (1.68). The differences in these values of treatment were found non significant, which indicated that there was significant effect on feed conversion ratio of broiler. The result of above observation is similar to Niwas *et al*. (2013) and Srivastava *et al*. (2012). Pandey *et al.* (2013) reported that medicinal plants such as Ashwagandha (*Withania somnifera*), Shatavari (*Asparagus racemosus*) and Kapikachhu (*Mucuna pruriens*) can be used as feed additives in broiler. Mishra and Singh (2000) reported that the effect of feeding root powder of *Withania somnifera* (Ashwagandha) improved growth rate, feed consumption, feed conversion efficiency and lowered mortality rate in broiler chicks. Bhardwaj *et al.* (2009) evaluated the efficacy of Ashawagandha root powder in Japanese quails by supplementing in feed at 0%, 0.5%, 1% and 1.5% and concluded that 1% Ashawagandha (*Withania somnifera*) root powder significantly improved body weights and feed efficiency. Similar results were investigated by Yadav *et al*. (2018) in case of colored chickens.

CONCLUSION

Use of antibiotics has been found to have negative effects on broiler health and its production therefore; there is a need for supplementation of herbal ingredients in broiler feed. This study showed that body weight gain in broiler chicks on weekly basis is significantly improved in supplemented groups. However, body weight gain was better in group of chicks which were supplemented with combined feed additives. Overall FCR suggested that supplementation of these feed additive did not negatively affect the FCR of caged broiler chicks. From this study it can be concluded that caged broilers supplemented with 2.5g Shatavari + 2.5g Ashawagandha powder/ kg feed may perform well in caged conditions without having negative impact on FCR of caged broiler chicks. Herbal additives such as Ashwagandha and Shatavari powder may be added in caged broiler feeds for better body weight gain and there remains scope for future researches to know about the effect of Ashwagandha and Shatavari powder on blood, immunity levels, and muscular attributes of caged broilers.

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