Original Research Article

Effect of Supplementation of Feed Additives in Diet on Growth Performance of Broiler Chicken

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**A B S T R A C T**

An experiment was conducted with 200 day-old broiler chicks to study the effect of supplementation of vitamin, mineral and probiotic in diet on their performance. The chicks were randomly divided in to 8 groups containing 25 chicks in each group as following treatments: T₁ (control group), T₂ (Supplivit), T₃ (Agrimin), T₄ (Biovet - YC), T₅ (Supplivit + Agrimin), T₆ (Agrimin + Biovet- YC), T₇ (Supplivit + Biovet- YC) and T₈ (Supplivit + Agrimin + Biovet- YC). Chicks fed diet without vitamin, mineral, probiotic and their combination (T₁) reflected significantly lower body weight than all supplemented groups (T₂, T₃, T₄, T₅, T₆, T₇ and T₈). The overall results of body weight gains indicated that the ration in which combination of vitamin, mineral and probiotic were supplemented (T₈) showed improvement in body in body weight gain significantly (P<0.05) than that diet without any supplemented (T₁) during experimental period. Feed intake at different weekly intervals as influenced by dietary inclusion of vitamin, mineral and probiotic revealed that this trait was not statistically different among different treatments except in third and fourth week of age. There was no significant difference in feed conversion ratio (FCR) value in the chicks fed supplemented diet during the second, third, fourth and six week of age in treatments groups. Based on the result obtained in the present study, it can be concluded that by using non-antibiotic feed additive particularly mixing of all vitamin, mineral and probiotic at recommended dose have the potential to be applied as effective substitute for getting good economical return in the broiler farming.

**Keywords**

Broiler, probiotics, mineral, vitamin, weight gain, feed intake, FCR

**Introduction**

Poultry is one of the fastest growing segments among the component of livestock sector in India. Production of agricultural crops has been growing at a rate of 1.5-2.0% per annum while poultry industry is growing at 8-15% per annum in India. The organized sector of the poultry is contributing nearly 70% of the total output and the rest 30% by the unorganized sector. About 66.7% of the total output from poultry is realized from the poultry meat sector and only 33.3% from egg production. Feed is a major input which accounts 75% of the production cost in broiler economics (Saiyed et al., 2015). Hence, it is imperative to give due attention to proper utilization of feed without adversely affecting the growth or production performance of broilers (Kokje, 1999). The margin of profit from broiler is reducing due to continuous increase in cost of quality poultry feed ingredients, therefore different types of commercial growth promoter have been tried to enhance the weight gain and to improve feed conversion efficiency.
Materials and Methods

Two hundred (200) day-old broiler chicks were procured and reared at Instructional Livestock Farm Centre of Bihar Veterinary College, Patna. Chicks were weighed individually, numbered with aluminium wing band and divided randomly into eight treatment groups having 25 chicks in each viz. T1 (Control), T2 (Supplivit premix (Vitamin) @ 25 g/quintal of feed), T3 (Agrimin (Mineral) @ 1kg/quintal of feed), T4 (Biovet-YC (Probiotic) @ 50 g/quintal of feed), T5 (Supplivit premix @ 25 g + Agrimin @ 1 kg per quintal of feed), T6 (Agrimin @ 1 kg + Biovet- YC @50 g per quintal of feed), T7 (Supplivit premix @ 25 g + Biovet-YC 50 g per quintal of feed) and T8 (Supplivit premix @ 25 g + Biovet-YC @ 50g per quintal of feed). The standard management conditions and vaccination schedule were followed for all the birds maintained under deep litter system of management. The experimental data pertaining to different traits such as body weight at weekly interval and daily feed consumption were recorded. The experimental data obtained during the study with respect to different parameters were subjected to statistical analysis in completely randomized design (CRD) with simple analysis of variance (ANOVA) technique following the procedure of Snedecor and Cochran (2004).

Results and Discussion

Body Weight Gain

The results of experiment on average body weight gain of broiler chicken at weekly interval as influenced by addition of vitamins, minerals and probiotics is given in Table-1. The body weight gain during first week of growth was not significantly influenced by vitamin, mineral and probiotic supplementation, either singly or other combinations with each other. The average body weight gain ranged from 77.36±1.72 g. to 77.85±2.21g during first week of growth. There was not any significant (P<0.05) effect of vitamin, mineral and probiotic supplementation on body weight gain during the second week of age. The body weight gain during third week of age was significantly (P<0.05) influenced by dietary treatments. The maximum body weight gain was observed in T8 group supplemented with a combination of vitamins, minerals and probiotic (360.61±1.99 g). The difference of this group (T8), however, was not significant from the other supplementation groups. While the body weight gain of control group was significantly lower from T8 group (P<0.05) but statistically similar to other supplementation groups. Chicks fed diet without supplementation reflected numerically lower body weight gain than all supplemented groups.

Results indicated that vitamins, minerals, probiotics and their combination supplementation could produce beneficial effect in weight gain during this phase of growth. During fourth week of age, maximum body weight gain 382.76 g was recorded in combination of vitamin and mineral incorporated group (T3) which was significantly higher (P<0.05) from all other groups. The average body weight gain during fourth week of experimentation ranged from 299.47±1.72 g to 382.76±1.80 g and was significantly (P<0.05) influenced by dietary treatments. The vitamin, mineral, probiotic and their combination supplemented groups in general showed significantly (P<0.05) higher body weight gains than the control group (T1) during fifth week of age. Among groups, combination of vitamin and mineral group (T5) showed higher body weight gain than the chicks fed
with their supplemented combination group. The average body weight gain during this
period were ranged from 332.83±1.61 g to 391.72±1.54 g and was significant (P<0.05)
influenced by dietary treatments. The patterns of improvement in weight gain of
chicks were almost similar as was observed in fifth week of growth. The vitamin,
mineral and probiotic and their combination supplemented groups in general showed
significantly (P<0.05) higher body weight gains than the control group (T₁). Among
supplemented groups, combination of vitamin, mineral and probiotic incorporated
group (T₈) showed the higher body weight gain than the chicks fed with vitamin,
mineral and probiotic supplemented groups.

Further, the overall results of body weight gains indicated that the ration in which
vitamin, mineral and probiotic combination was supplemented (T₈) showed
improvement in body weight gain significantly (P<0.05) than the diet with vitamin
supplementation (T₂) during third, fourth and sixth week of age only during
experimental period. The results of present study in respect of probiotic are also in
accordance with the findings of Maiorka et al., (2002) and Pervez and Sajid (2011) who
reported that supplementation of feed additives resulted in improvement in body
weight gain of broiler chicks as compared to those fed on basal diet only.

This action might be due to live micro-
organisms mainly lactic acid bacteria and
spore forming organisms present in
gastrointestinal tract of broiler chicken,
minerals, vitamins and its synergistic effect
which help in the establishment of intestinal
microbial population which are beneficial
for the proper growth in broiler chicken.
However, the present findings did not agree
with the findings of Iyayi and Davies
(2005), Pierce et al., (2006) and
Abdelrahman (2013) who reported that
supplementation of probiotic did not show
effect on body weight gain in broiler
chicken. The differences in the results might
be due to differences in the strain of
probiotic, dose of probiotic, type of chicks
used in the experiment and the
environmental factors. Similar results in
respect of use of feed additives and
probiotics on body weight gain in poultry
also have been reported by various workers
Asmita et al., (2001), Marina et al., (2006),
Avci et al., (2007), Cakir et al., (2008),
Ocak et al., (2009) and Punchbuddhe et al.,
(2010).

Feed Consumption

The data on average weekly feed intake of
broiler chicken as influenced by dietary
inclusion of vitamin, mineral and probiotic
is given in Table-2. The mean weekly feed
intake revealed that the dietary inclusion of
vitamins, minerals and probiotic either alone
or in combinations at different levels had no
significant (P<0.05) effect during first and
second week of age.

However, there was numerical difference
among different treatment groups. During
third week, the average weekly feed intake
revealed significant difference (P<0.05)
among the treatment groups. The highest
feed consumption (772.07±10.01 g) was
recorded in the chicks fed diet supplemented
with probiotic (T₄) which was significantly
higher (P<0.05) than T₂ and T₇ which
consumed 670.34±10.10 g and 710.53±8.42
g; respectively. It is pertinent to note that the
birds of vitamin supplemented diet group
(T₂) evidenced a lowest feed consumption
(670.34±10.10 g) closely followed by the
chicks of control group (T₁) i.e. 682.97±7.33
g. Vitamin supplemented diet (T₂) registered
significantly (P<0.05) lower values than
control groups (T₁) which were comparable.
Values with same superscripts in a row did not differ significantly (P<0.05).

### Table 1
Average body weight gain (g) of broiler chicks at various ages supplemented with different feed additives

<table>
<thead>
<tr>
<th>Age (week)</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T&lt;sub&gt;1&lt;/sub&gt;</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>77.36 ±1.72</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>125.90&lt;sup&gt;a&lt;/sup&gt; ±1.57</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>299.06&lt;sup&gt;ab&lt;/sup&gt; ±2.60</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>299.47&lt;sup&gt;a&lt;/sup&gt; ±1.72</td>
</tr>
<tr>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>302.25&lt;sup&gt;a&lt;/sup&gt; ±1.72</td>
</tr>
<tr>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>332.83&lt;sup&gt;a&lt;/sup&gt; ±1.61</td>
</tr>
</tbody>
</table>

Table 2 Average weekly feed consumption by broiler chicks at various ages supplemented with different feed additives

<table>
<thead>
<tr>
<th>Age (week)</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T&lt;sub&gt;1&lt;/sub&gt;</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>118.39 ±8.97</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>230.73 ±8.94</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>682.97&lt;sup&gt;ab&lt;/sup&gt; ±7.33</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>575.43&lt;sup&gt;a&lt;/sup&gt; ±8.55</td>
</tr>
<tr>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>846.20&lt;sup&gt;cd&lt;/sup&gt; ±13.82</td>
</tr>
<tr>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>1165.43&lt;sup&gt;c&lt;/sup&gt; ±11.25</td>
</tr>
</tbody>
</table>

Value with same superscripts in a row did not differ significantly (P<0.05).
Table 3 Average feed conversion ratio of boiler chicks at various ages supplemented with different feed additives

<table>
<thead>
<tr>
<th>Age (week)</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T₁</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>1.52&lt;sup&gt;ab&lt;/sup&gt; ±0.08</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>1.84 ±0.03</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>2.28 ±0.02</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>1.92 ±0.01</td>
</tr>
<tr>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>2.79 ±0.03</td>
</tr>
<tr>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>3.50 ±0.15</td>
</tr>
<tr>
<td>Overall</td>
<td>2.31 ±0.22</td>
</tr>
</tbody>
</table>

Value with same superscripts in a row did not differ significantly (P<0.05).

Chicks fed diet containing vitamin and probiotic (T₄) though showed a marginally higher values (772.07±10.01 g) than vitamin, mineral and probiotic supplemented diet group T₈ i.e. 709.74±8.82 g but where statistically similar.

The average weekly feed intake during the fourth week of age showed that there was no significant (P<0.05) difference among treatment groups during the fourth week of age. During fifth week of age, the chicks given T₈ treatment group had significantly (P<0.05) lower feed intake than other treatment groups. The birds fed diet with be combination of vitamin, mineral and probiotic (T₈) recorded lowest feed intake (714.49±13.92 g). Chicks fed diet supplemented with combination of vitamin, mineral and probiotic (T₈) showed significantly (P<0.05) lower feed consumption than the other supplemented combination treatment groups and control group. Result indicated that the chicks fed diets supplemented with combination of vitamin, mineral and probiotic (T₈) lesser feed in comparison to control group (T¹) and other combination treatment groups. The higher feed consumption was recorded in combination of vitamin and mineral supplemented group T₃ (870.73±13.74 g) than control group T₁ (846.20±13.82 g). During sixth week of age, there was no Statistical no significant difference (P<0.05) in feed consumption among different treatment groups.

The results of present study are in accordance with the findings of Szezerbiska et al., (2000), Asmita et al., (2001), Sar, et al., (2003), Arslan and Saatchi (2004), Elangovan et al., (2004) and Sakhawat et al., (2005) who reported that supplementation of feed additives did not show significant effect on feed consumption. However, the present findings did not agree with the findings of Marina et al., (2006), Punchbuddhe et al., (2010), Saied et al., (2011) and Abdelrahman (2013) who reported that supplementation of feed additives showed significant effect. The differences in results might be due to differences in the feed ingredients added in the feed additives used in the experiment, type of chicks and the environmental factors.
Feed Conversion Ratio

The true yardstick of the measurement of nutritive value of feeding stuff is described in the performance of chicks in term of their productivity. The results of performance trait i.e. the value of Feed Conversion Ratio (FCR) during different phases of growth are presented in Table-3. The results of weekly feed conversion ratio values showed that the dietary inclusion of vitamin, mineral and probiotic had significant (P<0.05) effect only during the first week of age and in the remaining weeks the values were statistically comparable among treatments. From the results of first week of growth, it appears that the ratio of feed conversion was minimum (1.45±0.15) in group T₈, indicating the efficiency of utilization of feed in rations supplemented with combination of vitamin, mineral and probiotic (T₈) was superior to that of probiotic supplementation group (T₄), mineral and probiotic supplementation group (T₆), vitamin supplementation group (T₂), mineral supplementation group (T₃), vitamin and mineral supplementation group (T₇), and control group (T₁). Out of these eight groups, vitamin supplemented group (T₂) proved to be least efficient with a value of 1.60±0.08 followed by T₄ (1.47±0.03), T₆ (1.50±0.04), T₃ (1.54±0.03), T₅ (1.56±0.41), T₇ (1.58±0.02) and T₂ (1.60±0.02); respectively.

During fifth week of age, the feed conversion ratio was best for T₈ group diet supplemented with vitamin, mineral and probiotic. Diet supplemented with vitamin (T₂ group) had lower feed intake than control group T₁. According to the data, it may be seen that a significantly (P<0.05) lower feed conversion ratio (1.91±0.01) was exhibited in the birds of T₈ group, containing combination of the vitamin, mineral and probiotic followed by the chicks of group T₂ (2.52±0.00) i.e. vitamin supplemented diets, exhibited significant variation within the groups. Diets with combination of vitamin, mineral and probiotic group (T₈) and vitamin and probiotic supplemented group (T₇) and mineral, probiotic supplemented group (T₆), registered significantly (P<0.05) lower value of feed conversion ratio as compared to control group (T₁). Vitamin, mineral and probiotic supplemented group (T₈) showed significantly (P<0.05) lower feed conversion ratio value than control group (T₁), thereby reflecting better feed of utilization.

Results of feed conversion ratio (FCR) indicated that there was improvement in the efficiency of feed utilization when the diets were supplemented with vitamin, mineral and probiotic. The present findings revealed that probiotic, mineral and vitamin in combination or alone as feed additive had better impact on nutrient utilization and its conversion into soft and hard body tissues as compared to control. Similar findings in respect of use of feed additives and probiotics on feed conversion ratio in poultry also have been reported by various workers like Maiorka et al., (2002), Shinde et al., (2005), Iyayi and Davies (2005), Pakhira and Samanta (2006), Paryad and Mahmoudi (2008), Bozkurt (2008), Cakir et al., (2008), Shareef and Dabbagh (2009), Pervez and Sajid (2011), Mehmet and Ayhan (2012), Amer and Khan (2012) and Ogunwole et al., (2012). In general, the feed consumption and feed conversion ratio under supplemented with different feed additives was observed to be better than control group.

Based on the result obtained in the present study, it can be concluded that the response of feed additive alone and combination of feed additives reflected by change in body
weight gain during growth period was significantly better than that of control in deep litter system of management in poultry. The diet of birds supplemented with feed additives and their combination of feed additive resulted in better growth efficiency in broiler chicks. So, use of non-antibiotic feed additive particularly mixing of all vitamin, mineral and probiotic at recommended dose have the potential to be applied as effective substitute for getting good economical return in the broiler farming.

References


