



# Effect of Feeding Corn Gluten Meal in Feed Ration on Growth Performance of Commercial Broiler Chicken

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## ABSTRACT

**Background:** The productivity and profitability of commercial broiler largely depend on nutrition and growth performance and, therefore, this industry requires high quality protein sources, such as corn gluten meal (CGM). Many studies have been conducted on protein quality changes and other nutritional characteristics of CGM in several countries. Corn gluten meal contains around 60% CP and is a byproduct of wet milling of corn, most of which is used for manufacture of high fructose corn syrup and corn flour. Being high in crude protein, it is often compared to animal protein ingredients during feed formulation. Thus, this study was intended to evaluate the effect of feeding corn gluten meal in feed ration on growth performance of commercial broiler chicken.

**Methods:** A feeding trial was conducted in the year 2018 with an objective to assess the effect of feeding corn gluten meals (CGM) in broiler chicken. Six hundred broiler chickens (day old) were randomly allotted to three groups, comprising of fifty broiler chickens in each treatment group with four replicates. The group-I (T<sub>1</sub>) broiler chicken were fed with composite diet containing 5% corn gluten meal where as group-II (T<sub>2</sub>) received composite diets comprising of CGM 10%. The group-III (T<sub>3</sub>) served as control group with normal broiler diet. The experimental period lasted for six weeks. Weekly body weight and feed consumption were measured in each group.

**Result:** Diet composite of 10% of corn gluten meal had significantly ( $P \leq 0.05$ ) higher weight gain, lower feed intake and improved FCR than T<sub>1</sub> and T<sub>3</sub> group. CGM supplementation can be ideally improved broiler weight gain, feed consumption and FCR.

**Key words:** Broiler, Composite diet, Corn gluten meal, FCR, Weight gain.

## INTRODUCTION

Corn gluten meal contains around 60% CP and is a byproduct of wet milling of corn, most of which is used for manufacture of high fructose corn syrup and corn flour. Being high in crude protein, it is often compared to animal protein ingredients during feed formulation. The protein is merely a concentration of the original corn protein compound brought about by removal of the starch in the endosperm. Protein from corn gluten meal is composed mainly of zein (68%), glutelin (27%) and small amounts of globulins (1.2%) (Cha *et al.*, 2000). Gluten meal is also very high in Xanthophylls pigments (up to 300 mg/g) and is a very common ingredient where there is a need to pigment poultry products using much more than 10%. CGM causes visible increase in pigmentation of broilers and egg yolks (Leeson and Summer, 2005). It is, also, rich in Methionine (Sasse and Baker, 1973), but, its Arginine, lysine and tryptophan contents are rather low (Peter *et al.*, 2000). Poultry industry in India needs high quality protein sources, such as CGM. Many studies have been conducted on protein quality changes and other nutritional characteristics of CGM in several countries (Sasse and Baker 1973; Peter *et al.* 2000; Kim *et al.* 2012). The nutrient profile of Corn gluten meal shown in (Table 1).

The trail was carried out with objectives to study the body weight gain and FCR of broiler chicken supplemented with CGM based diet. This trail would be helpful for feed technologist in formulating feed for profitable broiler farming.

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## MATERIALS AND METHODS

An experimental trail was conducted during the year 2018 at Central Poultry Development Organization and Training Institute, Bangalore, Karnataka, India to evaluate the effect of partial replacing corn gluten meal in the diet of commercial broiler on growth performance, feed conversion ratio and feed consumption. Six hundred broiler chickens (day old)

**Table 1:** Nutrient profile of corn gluten meal.

Proximate principles	Proximate values
CP (%)	60
ME (Kcal/kg)	3750
EE (%)	2.51
CF (%)	2.48
Methionine (%)	1.61
Lysine (%)	0.90
Threonine (%)	1.70

Leeson and summer (2005).

were randomly allotted to three groups, comprising of fifty broiler chickens in each treatment group with four replicates. They were placed in a commercial brooder at 33-34°C and given ad lib access to a standard chick starter and finisher feeds and provided water throughout the day in all period of the experiment. The initial room temperature was 33.5°C and this was reduced by 1°C at 2-day intervals to 24°C. The LED blue light with the light intensity of 10 lux provided throughout the experimental period. Basal diet was formulated using maize, soybean meal, de-oiled rice bran (DORB), corn gluten meal (CGM) and feed additives. The broiler starter and finisher rations were formulated as per BIS (2007). Starter mash was fed from day one to 21 days and finisher mash from 22 to 42 days. Ingredient and nutrient composition of experimental diets are given in (Table 2). The group-I (T<sub>1</sub>) Broiler chickens were fed with composite diet containing 5% CGM where as group-II (T<sub>2</sub>) received composite diets comprising of 10% CGM. The group-III (T<sub>3</sub>) served as control group with normal broiler diet. The experimental period lasted for six weeks; Weekly body weight and feed consumption were measured in each group.

#### Statistical analysis method

The descriptive statistics for productive traits were analyzed using SPSS version 16.0. ANOVA one way was carried out to study the effect of feeding CGM in feed on growth performance and feed intake of commercial broiler chicken.

The following parameters were studied during the trial:

#### Body weight

The body weights (grams) of individual bird were recorded from 0<sup>th</sup> day of age to till forty two days of age to monitor the pattern of body weight gain. The weighing of the birds was done in the early hours of the day before feeding by using digital weighing balance during the experimental period. The weights recorded were pooled and the data were analyzed.

#### Feed consumption

The average feed consumption (in grams) of each group was recorded from 0<sup>th</sup> day of age to till forty two days of age to monitor the pattern of feed consumption. The weighing of the left over feed was done in the early hours of the day

before feeding by using digital weighing balance during the experimental period. The weights recorded were pooled and the data were analyzed.

#### Feed conversion ratio

The cumulative FCR for the T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> (control group) were calculated with the mathematical formula:

$$\text{Feed conversion ratio (FCR)} = \frac{\text{Total quantity of feed consumed per bird in Kg}}{\text{Mean body weight gain in Kg}}$$

## RESULTS AND DISCUSSION

Effect of inclusion of CGM in feed of commercial broilers on average body weight, body weight gain, feed consumption and FCR of three groups are given in (Table 3, 4 and 5).

#### Average body weight

On 7<sup>th</sup> day, the average body weight (in grams) of T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> groups were 175.50, 178.50 and 170.00 (Table 3), respectively. Whereas, the average body weight (in grams) at 14<sup>th</sup> day of T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> groups were 460.25, 466.75 and 429.50, respectively. There is significant increase (P<0.05) in average body weight of T<sub>2</sub> group over T<sub>1</sub> and control group on replacement of 10 per cent corn gluten meal for the period 7<sup>th</sup> and 14<sup>th</sup> day. On 21<sup>st</sup> day, the average body weight (in grams) of T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> groups were 856.50, 854.00 and 800.00 (Table 3), respectively. There is significant increase (P<0.05) in average body weight of T<sub>1</sub> group over T<sub>2</sub> and control group on replacement of 05 per cent corn gluten meal. Whereas, the average body weight (in grams) at 28<sup>th</sup> day of T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> groups were 1443.25, 1474.50 and 1387.00, respectively. There is significant increase (P<0.05) in average body weight of T<sub>2</sub> group over T<sub>1</sub> and control group on replacement of 10 per cent corn gluten meal. On 35<sup>th</sup> day, the average body weight (in grams) of T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> groups were 2032.75, 2074.25 and 1883.75 (Table 3), respectively. Whereas, the average body weight (in grams) at 42<sup>nd</sup> day of T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> groups were 2623.75, 2720.50 and 2452.50, respectively. There is significant increase (P<0.05) in average body weight of T<sub>2</sub> group over T<sub>1</sub> and control group on replacement of 10 per cent corn gluten meal for the period 35<sup>th</sup> and 42<sup>nd</sup> day. In this experiment, increasing of CGM content in the diets had positive effect on weekly body weight gain. The result of the present study are in agreement with Sayedi and Ali. (2014) but Ismail *et al.* (2005) reported that increasing dietary CGM beyond 9% have no effect on broiler chicks' growth performance and weight gain reduced a little with increasing the CGM supplementation in diets. In previous studies, Waldroup (2000) studied that CGM could be included in broiler diets without impairing performance at rates of 10%. In more recent studies that have evaluated the use of high levels of CGM in broilers diets, supplementation with liquid and dried CGM products had no negative effect on growth performance compared to control diets (Koreleski, 2003).

### Feed consumption

The average feed consumption (in grams) at the age of 42 days were recorded 4712, 4680 and 4760 for T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> group (Table 4), respectively. Feed consumption of broilers was significantly affected (P<0.05) due to supplementation of corn gluten meal in different proportions. This could be due to the imbalance amino acids especially lysine, methionine etc. content in the consumed feed which results in transmission of signals to satiety centre in brain, which leads to lower feed intake (Harper 1964). Peng *et al.* (1972) demonstrated that amino acid imbalance can reduce the consumption of lysine as the first limiting amino acid in broiler which causes a lower feed intake and reduce the broiler chicks' performance. However, in the present experiment, CGM containing diets were enriched or fortified with synthetic amino acids to reduce the effect of amino acid imbalance. The results of the present findings were partially agreement with the findings of Chamruspollert *et al.* (2002) who reported that the supplementation of the corn gluten meal will decrease the feed intake. However on contrary to Rose *et al.*

(2003) reported a significant increase in feed intake when broiler chicks were fed on diet containing 10% CGM.

### Feed conversion ratio

The FCR (Table 5) for the T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were calculated with the mathematical formula and recorded 1.795, 1.720 and 1.940, respectively at the end of the trial. Exceptionally, there is significant influence (P<0.05) in average FCR (1.720) of T<sub>2</sub> group over T<sub>1</sub> and T<sub>3</sub> control group on replacement of 10 per cent corn gluten meal in commercial feed of Broilers. The results of the present study are in agreement with Seyedi and Ali. (2014) who reported that there was remarkable improvement for FCR was observed in broilers chicks fed all levels of CGM during rearing weeks. The similar study conducted by Silva *et al.* (2003) who observed positive effect of CGM supplementation and reported that Feed Conversion Ratio improved with increasing supplementation of Corn gluten meal (Koreleski, 2003). However, in contrary to Ismail *et al.* (2005) reported that negative effect on FCR on supplementation with more than 9 per cent of CGM in commercial feed for broilers. Sayedi and Ali (2014)

**Table 2:** Composition (%) of experimental diets (0-42 days).

Ingredients (%)	0-3 weeks (Starter)			4-6 weeks (finisher)		
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
Corn maize	54	54	54	60	60	60
Soybean meal	30	25	35	17.5	17.5	30
Corn gluten meal	05	10	-	10	10	-
DORB	7.5	7.5	7.5	08	08	7.5
Mineral mix	2.5	2.5	2.5	2.5	2.5	2.5
Salt	0.5	0.5	0.5	0.5	0.5	0.5
Vitamin mix	0.5	0.5	0.5	0.5	0.5	0.5
Total						
<b>Chemical composition</b>						
Moisture (%)	90.2	90.5	91.2	90.8	90.6	90.3
CP (%)	22.18	22.93	22.15	20.15	20.15	20.5
EE (%)	3.5	3.5	3.8	4.0	4.0	3.25
CF (%)	3.42	3.40	3.8	3.8	3.8	3.6
ME (Kcal/kg)	2910	2940	2908	2953	2953	2950

\*Mineral mixture: Contains calcium-32%, phosphorus-6%, copper 100 ppm, cobalt-60 ppm, manganese-2700 ppm, iodine-100 ppm, zinc-2600 ppm, iron-0.1%. \*\*Vit.AB2 D3 K: Per gram contains Vit. A-82, 500 IU, D3 -12,000 IU, B2 -50 mg and K-10 mg. \*\*\*B-complex: per gram contains Vit B1 -4 mg, B6 -8 mg, B12-40 mg, E-20 mg, Niacin-60 mg and calcium panthothenate-12.5.

**Table 3:** Effect of feeding corn gluten meal on average body weight (mean± SE) in commercial broilers.

Age	Average body weight (g)		
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
0 <sup>th</sup> day	40.87±0.23 <sup>c</sup>	40.87±0.51 <sup>b</sup>	41.25±0.32 <sup>a</sup>
7 <sup>th</sup> day	175.50±1.75 <sup>c</sup>	178.50±0.64 <sup>a</sup>	170.00±1.05 <sup>b</sup>
14 <sup>th</sup> day	460.25±9.21 <sup>b</sup>	466.75±6.02 <sup>a</sup>	429.50±3.44 <sup>c</sup>
21 <sup>th</sup> day	856.50±22.37 <sup>a</sup>	854.00±11.96 <sup>b</sup>	800.00±9.20 <sup>c</sup>
28 <sup>th</sup> day	1443.25±11.90 <sup>b</sup>	1474.50±7.90 <sup>a</sup>	1387±5.09 <sup>c</sup>
35 <sup>th</sup> day	2032.75±31.69 <sup>b</sup>	2074.25±13.73 <sup>a</sup>	1883.75±4.90 <sup>c</sup>
42 <sup>nd</sup> day	2623.75±35.20 <sup>b</sup>	2720.50±35.93 <sup>a</sup>	2452.50±42.56 <sup>c</sup>

The means bearing different superscripts in rows differ significantly\* (P<0.05).

**Table 4:** Effect of feeding corn gluten meal on feed consumption grams/bird/week (mean± SE) in commercial broilers.

Age	Feed consumption (g)		
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
7 <sup>th</sup> day	142±2.76 <sup>a</sup>	143±2.84 <sup>b</sup>	144±2.80 <sup>c</sup>
14 <sup>th</sup> day	469±2.56 <sup>b</sup>	467±3.84 <sup>a</sup>	471±1.67 <sup>c</sup>
21 <sup>th</sup> day	1086±9.48 <sup>b</sup>	1078±7.14 <sup>a</sup>	1101±6.84 <sup>c</sup>
28 <sup>th</sup> day	1981±7.41 <sup>b</sup>	1971±15.54 <sup>a</sup>	1986±15.41 <sup>c</sup>
35 <sup>th</sup> day	3412±17.89 <sup>b</sup>	3316±15.81 <sup>a</sup>	3483±20.44 <sup>c</sup>
42 <sup>nd</sup> day	4712±13.96 <sup>b</sup>	4680±18.92 <sup>a</sup>	4760±19.33 <sup>c</sup>

The means bearing different superscripts in rows differ significantly\* (P<0.05).

**Table 5:** Effect of feeding corn gluten meal on FCR (mean± SE) in commercial broilers.

Age	FCR		
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
7 <sup>th</sup> day	0.809±0.03 <sup>a</sup>	0.817±0.04 <sup>b</sup>	0.847±0.01 <sup>c</sup>
14 <sup>th</sup> day	0.981±0.04 <sup>b</sup>	0.999±0.03 <sup>c</sup>	0.911±0.03 <sup>a</sup>
21 <sup>th</sup> day	1.267±0.05 <sup>b</sup>	1.262±0.01 <sup>a</sup>	1.376±0.04 <sup>c</sup>
28 <sup>th</sup> day	1.372±0.06 <sup>b</sup>	1.336±0.01 <sup>a</sup>	1.432±0.03 <sup>c</sup>
35 <sup>th</sup> day	1.678±0.08 <sup>b</sup>	1.598±0.01 <sup>a</sup>	1.848±0.05 <sup>c</sup>
42 <sup>nd</sup> day	1.795±0.07 <sup>b</sup>	1.720±0.02 <sup>a</sup>	1.940±0.04 <sup>c</sup>

The means bearing different superscripts in rows differ significantly\* (P<0.05).

concluded that diet supplementation with 12 per cent CGM showed the lowest feed intake among the experimental groups which results the lowest FCR in the commercial broilers and this result in contrast with result of Peter *et al.* (2000).

## CONCLUSION

The study concluded that 10% CGM in feed of commercial broiler chickens can be ideally improved broiler weight gain, feed consumption and FCR. The findings of the study would be helpful for feed technologist in formulating feed for profitable broiler farming.

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