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Use of non-antibiotic growth promoter "Grow Power" in commercial broiler diet

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Abstract

An experiment was conducted with 160, day old Cobb 500 broiler chicks to evaluate the effect of supplementation of Grow Power (GP) on the performance of broiler. The dietary treatments were control (D_1), Grow Power (D_2), Grow Power plus antibiotic (D_3) and antibiotic (D_4). At 5th week of age, the body weight of birds at different dietary treatments were 938.75, 1105.00, 1136.25, and 985.00g in the diets of D_1, D_2, D_3 and D_4, respectively. Body weight gain at 2nd, 3rd and 4th week of age were significantly ($P<0.05$) higher in GP supplemented group (D_2) and GP plus antibiotic group (D_3) than that of control (D_1) and antibiotic (D_4) groups. Feed consumption during the experimental period was 1753.75, 1938.75, 1917.50 and 1774.50g for D_1, D_2, D_3 and D_4, respectively. At 2nd and 3rd week of age, feed consumption were significantly ($p<0.05$) higher in D_3 group than the other groups including control. Significantly ($P<0.05$) better Feed Conversion Ratio (FCR) was found in D_3 (2.03) and D_2 (2.11) groups compared to D_1 (2.31) and D_4 (2.28). At 3rd, 4th and 5th week of age, the Performance Index (%) was significantly higher in D_2 than D_1 and D_4. Meat yield parameter of broilers showed significant ($P<0.05$) differences in dressing weight, feather weight, shank weight, drumstick weight, neck weight, liver weight and viscera weight. Based on the results obtained from the current study it may be concluded that the inclusion of Grow Power @ 50gm/100kg of mixed feed with or without antibiotic improved the growth of commercial broiler including their FCR and therefore, this product may be considered as an alternative of traditional antibiotic in broiler diet.

Key words: Grow Power, alternative to antibiotic, broiler performance, growth promoter

Introduction

In Bangladesh, commercial broiler and layer chicken farming has emerged during the last quarter of 20th century and then flourishes rapidly in all over the country. Proper feed formulation and their efficient utilization are the prime consideration for successful and profitable poultry farming. Without considering nutrients balance and cost effectiveness of diet, some farmers indiscriminately include different feed supplements in poultry diet to maximize the feed utilization. Since 1960s antibiotic has been using in poultry diet as one of the most readily available therapeutic agents and growth stimulants for disease prevention and better feed utilization.

Growth Promoters are now recognized in broiler industry as feed additives for faster growth and economic meat production. Growth promoters can play a vital role to shorten the time required for attaining the market weight of broiler by stimulating growth. They also improve the efficiency of feeding utilization. Addition of probiotics (protexin boost) in the diet of commercial broiler with a dose of 2g/10 liter fresh drinking water significantly increased body weight (Kabir et al. 2004). Report also suggests that the live weight of birds, weight gain and feed intake, feed conversion ratio but not mortality were significantly affected after inclusion of antibiotic growth promoter (Avilamycin and mannan oligosaccharide in broiler diets (Esecli et al. 2010). Further, the supplementation of Oligo-dextran (MHF-Y) @ 250 g/Ton is beneficial for overall improvement of the production

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performance of broilers reared under normal and stress condition (Jagtap et al. 2003).

Recently, various types of growth promoters are available in the market. Indiscriminate use of such products resulted the negative effects on animal's health and production, development of resistance in microorganisms, allergies and genotoxicity (Markovic 2005).

Because of giving concern over the transmission and proliferation of resistant bacteria via the food chain, the European Union in 2006 banned antibiotic growth promoters to be used as additives in poultry (Castanon 2007). The antibacterial growth promoters have been under scrutiny for many years and therefore the products have been removed from the market in many countries (Ratcliff 2000). Such increased concern compelled the researchers to explore the utility of other effective non-antibiotic growth promoters. The focus of alternative strategies has been taken to prevent the proliferation of pathogenic bacteria. Scientific evidence exists that herbs and plant extracts stimulate growth of beneficial bacteria and minimize pathogenic bacteria activity in the gastrointestinal tract of poultry (Harborne 1998). The Nicoli-Herb is a non-antibiotic growth promoters derived from the nature repository herbs, spices or other medicinal plants, that inhibits the proliferation of pathogens (*E. coli, Salmonellam sp. and Mycoplasma sp.*). Inclusion of non-antibiotic growth promoters in bird's diets increased villi length in the chicken gut, resulting better growth performance of birds through proper absorption of nutrients (Francois and Michel, 1968). (Gholap et al. 2009) further reported that the prebiotic (MOS) and BMD can be used in the diets as growth promoters for better production performance of commercial broilers in terms of growth, FCR and economics of production.

One such product presently available in the market is Grow Power, a non-antibiotic growth promoter, may be considered for inclusion in poultry diets. Chemically, the product is a combination of amino acids, chealated minerals, electrolytes and trace elements, which is the non-antibiotic form that have the quality to optimize the nutritional value of other feed proteins, maximizes the production yields and minimizes the quality variation in the flock. The present study was therefore undertaken to observe the effects of Grow Power on the performance of commercial broilers with or without antibiotics and to evaluate whether the product could be used as an alternative to traditional harmful antibiotic growth promoters.

Materials and methods

The experiment was conducted at Bangladesh Agricultural University Poultry Farm, Mymensingh with 160, day old Cobb 500 broiler chicks for a period of 35 days. An open sided shed type house was selected for the experiment. One room, an area of 20'×20', was partitioned into 16 pens of equal size. A service area was running along the middle of the pens for routine monitoring the birds and supplying feed, water, litter materials, vaccination and to perform all other management practices. Sun dried rice husk litter materials were spread on the floor of each pens with an approximate depth of 3 cm. The chicks were equally and randomly divided and distributed in to four dietary treatments having four replications in each treatment. A total number of 10 chicks were put in each replication. This experiment was followed into two periods, starter (0-15 days), and grower (16-35 days). The dietary treatments were control (D_1), Grow Power (D_2), Grow Power plus antibiotic (D_3) and antibiotic only (D_4). In all cases, feeds were offered to the bird *ad-libitum.* The nutrient requirements (ME, CP, Ca, P, Lysine, Methionine, and Tryptophen) were satisfied as recommended for Cobb 500 commercial broiler.

All the feed ingredients used in present experiment were collected from the local market. The Grow Power was collected from Genesis Vet, Dhaka, Bangladesh and included in the diet as per manufacturer's recommendation (50g/100kg of mixed feed). A total of eight diets, four starters and four growers, were formulated based on the experimental treatments as described before. Table 1 shows the composition of feed ingredients in control diets fed to broilers during starter and grower periods.

Table 1. Composition of the basal diet

Feed ingredients	Amount (kg/100 kg of mixed feed)	
	Starter (0-15 days)	Grower (16-35 days)
Maize	54.00	55.00
Soybean meal	20.00	19.00
Rice polish	14.00	15.00
•Protein concentrate	6.00	6.00
Di-calcium phosphate (DCP)	5.50	4.50
••Megavit$_{ws}$	0.30	0.30
Soybean oil	0.50	0.50
Common salt	0.50	0.50
Methionine	0.10	0.10
Total	100	100

•Protein concentrate (Jasoprot): contains CP(60%), moisture max.7%, CF max. 20, CF 4%, ash max.21%, Ca min. 4.75%, Ca max. 5.80%, P min. 2.40%, Arginine 4.05%, Isoleucine 1.72%, Lysine 3.20%, Cystine 1.96%, Phenylalanine/Tyrosine 4.19%, Tryptophen 0.49%, Leucine 4.26%, Histidine 1.20%, Methionine 2.35%, Phenylalanine 2.21%, Threonine 2.61%, Total ME(kcal/kg) 3230

••Megavit$_{ws}$: Vitamins available in Megavit$_{ws}$ (Each kg contains) are Vitamin A120,000,000IU, Vitamin D$_3$26,500,000IU , Vitamin E 22.0gm Vitamin K$_3$17.5gm, Vitamin B$_1$12.5gm, Vitamin B$_2$35.0gm, Vitamin B$_6$12.5gm, Vitamin B$_{12}$25.0mg, Vitamin B$_3$22.0gm, Vitamin B$_5$18.5gm, Vitamin B$_9$1.2gm, Vitamin C320.0gm

Other six treatment diets (3 starters and 3 growers) were formulated in the same manner with the inclusion of Grow Power (D_2), Grow Power plus antibiotic (D_3), and only antibiotic (D_4). Chemical composition of feed ingredients (DM basis) was calculated based on the NRC (1994) and Wiseman (1987). Jasoprot is a trade name of protein concentrate imported by Jayson Agrovet Ltd, Dhaka, Bangladesh. Megavit$_{ws}$ manufactured by the NOVERTIS Bangladesh limited which is a unique combination of feed grade water soluble multi-vitamin premix. Recommended dose for poultry as 1g Megavit$_{ws}$/5 litre water was followed. After weighing according to requirement, maize, soybean meal were grinded by a grinding machine. All feed ingredients were mixed thoroughly by a mini feed mixer at BAU poultry farm and subsequently stored in plastic containers.

Fresh and dried rice husk collected from local rice meal was used as litter material with a depth 3 cm. The size of each pen was 2'×6' where 10 birds (one replicate) were maintained and therefore calculated space given for each bird was 1.2 sq ft. For brooding, a 200 watt electric bulb was hanged in each pen (area 2'×6') for 10 birds. It was hanged just above the bird's level at the center of each pen. Brooding temperature was kept 32°C at the beginning of the first week and decreased gradually in subsequent week until the temperature adjusted to ambient temperature. The broilers were exposed to a continuous lighting of 23 hours and a dark of 1 hour in each 24 hours of photoperiod throughout the experimental period. To minimize the transportation and handling stresses, electrolytes and glucose were supplied to the chicks through drinking water. Feed and fresh drinking water were supplied *ad libitum* to the experimental birds throughout the experimental period in all dietary treatments twice daily, once in the morning and again in the afternoon. For the first 7 days feed was given on the newspaper and water was supplied in round waterer. After 7 days one trough feeder and one round waterer were provided for each replicate pen. Feeder and waterer were not kept empty at the whole trial period. The birds were vaccinated against Newcastle Disease (Ranikhet) and Infectious Bursal Disease (Gumboro). At 4th day Baby Chick Ranikhet Disease Vaccine (BCRD) and at 14th day Gumboro vaccine applied to the birds. Proper hygiene and sanitation programs were followed during the experimental period.

Body weights of chicks were recorded initially and then weekly for each replication. The average body weight gain of birds in each replication was calculated by deducting the initial body weight from the final body weight. Feed consumption was recorded by deducting refusal from the supplied feed divided by the number of birds at the end of each week per replication. Daily/weekly feed intake, feed conversion ratio, performance index and percent mortality was calculated using the recommended formula. Temperature of the house was recorded 3 times in a day throughout the experimental period.

At the end of experiment, a total of 48 broilers, 3 from each replication showing average body size were selected and slaughtered for processing following the procedure of Jones (1984). Feeder and drinker were withdrawn from the pens 12 hours prior to harvest the birds to facilitate

emptying the gut and reduce contamination of the carcass. After complete bleeding, the slaughtered birds were immersed in hot water (approximately 50°C to 55°C) for 2 minutes in order to loosen feathers from the carcasses. Final processing was performed by removing the head, shank, viscera, oil gland, kidneys and lunges of the carcasses. Heart and liver were removed from the remaining viscera by cutting them loose. The gizzard was removed by cutting it loose in front of the proventriculus and then cutting both incoming and outgoing tracts. Then it was split open with knife, emptied, washed and the lining was removed by hand. Data recorded for dressing quality were live weight, blood weight, feather weight, shank weight, head weight, dressed weight, abdominal fat weight, gizzard weight, viscera weight, drumstick weight, neck weight and heart weight.

All recorded and calculated data generated from this experiment were entered in Microsoft Excel worksheet, organized and processed for analysis of variance in a Completely Randomized Design (CRD) with the help of Statistical Analysis System (SAS, 1998). Duncan's Multiple Range Test (DMRT) was computed to compare the differences among the treatment means.

Result and Discussion

Effect of four different diets containing various levels of Grow Power on body weight of broilers is shown in Table 1. The live body weight of broilers fed different levels of Grow Power did not show any significant ($p<0.05$) difference at 1st week of their age. Body weight of broilers at 2nd, 3rd, 4th and 5th weeks were significantly higher ($P<0.05$) in Grow Power (D_2) and Grow Power plus antibiotic (D_3) groups than that of control (D_1) and antibiotic (D_4). However, significant difference were not observe at 5th week either between D_1 and D_4 or between D_2 and D_3 groups. Previous reports suggest that the commercial boiler fed on the probiotic-containing diets gained significantly more weight than that of birds fed diet without probiotic during young ages and the improvements were comparable with the birds fed on the diet containing the antibiotic growth promoter (Priyahkarage *et. al.*, 2003). This result is almost similar to the result of present study, where commercial broilers were fed a non-antibiotic growth promoter namely Grow Power. The significant improvement in body weight was found with broilers fed either Grow Power or Grow Power plus antibiotic might be because of the nutrients contents of Grow Power.

Table 1. The body weight (g)±standard deviation of broilers fed different diets

Age (wk)	Diets			
	D_1	D_2	D_3	D_4
Initial	41.75±0.50	41.75±0.5	41.00±0.81	41.75±0.50
1st wk	128.00±1.82	130.00±7.07	129.00±4.54	129.50±4.20
2nd wk	251.25^{d}±6.29	300.00^{b}±12.24	331.25^{a}±7.50	285.00^{c}±10.80
3rd wk	425.00^{d}±10.80	505.00^{b}±9.12	560.00^{a}±12.24	450.00^{c}±15.81
4th wk	646.25^{d}±4.78	755.00^{b}±9.12	810.00^{a}±12.24	685.00^{c}±15.81
5th wk	938.75^{b}±13.76	1105.0^{a}±41.43	1136.3^{a}±37.05	985.00^{b}±46.72

Means with different superscripts within the same row differed significantly ($p<0.05$)

Effect of four different diets on body weight gain of broilers is shown in Table 2. The body weight gain of broilers fed on four treatment diets did not show any significant differences from day old to 1st week of age. No significance difference in body weight gain was also observed between the Grow Power plus antibiotic groups (D_2 and D_3) or control and antibiotic groups (D_1 and D_4). However, their body weight gain at 2nd, 3rd and 4th week of age after supplementation of Grow Power (D_2) or Grow Power plus antibiotic (D_3) were significantly ($p<0.05$) higher than the control (D_1) and antibiotic (D_4) groups. Gunal et al. (2006) fed probiotic and organic acid or the combination of both to commercial broilers and found beneficial effects on their growth performance at 6th week of age. Several studies were also demonstrated that the supplementation of probiotic or organic acid or the combination of both to broiler diets increased the growth performance, decreased mortality and reduces other management problems (Runho et al. 1997; Jin et al. 1998). In general, treatment of birds with probiotic, prebiotic, acidifiers or even organic acid significantly increased ileum and jejunum villus height in the intestine (Santin et al. 2001; Samanya and Yamaguchi 2002) and because of the increased villus height birds could absorb nutrients better than the non-treated birds, resulting better performances in growth and

production. In the present study, it is likely that the inclusion of Grow Power, the non-antibiotic growth promoter, in broiler diet could increase nutrients absorption in their intestine, may be because of improving villus height in the gut.

Table 2. The body weight gain (g/wk)±standard deviation of broilers fed different diets

Age (wk)	Diets			
	D_1	D_2	D_3	D_4
1st wk	86.25±1.52	88.25±6.84	87.75±3.86	87.75±4.11
2nd wk	123.25^{d}±5.73	170.00^{b}±5.77	202.25^{a}±3.20	155.50^{c}±8.22
3rd wk	173.75^{c}±10.30	205.00^{b}±4.08	228.75^{a}±6.29	165.00^{c}±5.77
4th wk	221.25^{c}±7.50	250.00^{a}±4.08	250.00^{a}±5.77	235.00^{b}±4.08
5th wk	292.50±9.50	325.00±51.63	326.25±24.95	300.00±37.63

Means with different superscripts within the same row differed significantly (p<0.05)

Table 3 shows the results of feed consumption after supplementation with or without Grow Power. No significant difference was observed in feed consumption of broilers among all dietary groups at 1st week of age. However, at 2nd and 3rd week of age, feed consumption were significantly (p<0.05) higher after supplementation of Grow Power with antibiotic (D_3). Lowest feed consumption was found in antibiotic group (D_4). Almost similar result was obtained by Priyahkarage et al. (2003) who fed probiotic in commercial broilers. No significant differences in feed consumption were also observed in four dietary treatment groups at 4th and 5th week of age which could be attributed to interaction of Grow Power and antibiotic. The feed consumption on all diets increased linearly with the advance of age.

Table 3. The feed consumption (g/wk)±standard deviation of broilers fed on four different diets

Age (wk)	Diets			
	D_1	D_2	D_3	D_4
1st wk	119.75±3.50	117.25±8.88	117.75±3.40	113.75±3.86
2nd wk	191.25^{c}±19.60	251.50^{b}±11.44	291.25^{a}±16.45	233.25^{b}±20.50
3rd wk	300.25^{bc}±23.05	338.25^{ab}±16.89	368.75^{a}±40.63	272.25^{c}±14.97
4th wk	466.25±17.11	492.50±21.62	477.25±23.09	476.75±15.56
5th wk	676.25±37.40	739.25±87.01	662.50±60.90	678.50±28.85

Means with different superscripts within the same row differed significantly (p<0.05)

Effect of four different diets on feed conversion of broilers is shown in Table 4. During the 1st, 2nd and 3rd week of age, no significant (p>0.05) differences in feed conversion ratio were found among all dietary treatment groups. However, at 4th and 5th week of age, the FCR values were better in Grow Power (D_2) and Grow Power plus antibiotic (D_3) groups. The exact reason(s) of efficient feed utilization in groups D_2 and D_3 is not clear; however, it may be possible that the same of the nutrients in Grow Power (silymarine, tricholin, citrate, inositol, biotin) functions to mobilize the fat in liver through repairing liver cells and regenerating new ones.

Table 4. Feed conversion ratio±standard deviation of broilers fed different diets

Age (wk)	Diets			
	D_1	D_2	D_3	D_4
1st wk	1.39±0.021	1.33±0.031	1.30±0.08	1.30±0.07
2nd wk	1.55±0.102	1.48±0.035	1.44±0.07	1.50±0.09
3rd wk	1.73±0.062	1.65±0.06	1.61±0.14	1.65±0.09
4th wk	2.10^{a}±0.056	1.97^{b}±0.08	1.91^{b}±0.09	2.03^{ab}±0.07
5th wk	2.31^{a}±0.063	2.11b^{c}±0.06	2.03^{c}±0.07	2.28^{ab}±0.21

Means with different superscripts within the same row differed significantly (p<0.05)

Effect of four different diets on performance index (%) of broilers is shown in Table 5. Performance index (%) of broilers fed on four different treatment diets did not show significant (P<0.05) differences in 1st week of age but at 2nd, 3rd, 4th and 5th weeks were significantly (P<0.01) different among the four different groups and the Performance index (%) was significantly (P<0.01) higher in Grow Power plus antibiotic group (D_3) than other groups.

Table 5. Performance index (%)±SD of broilers fed on four different diets

Age (wk)	Diets			
	D_1	D_2	D_3	D_4
1st wk	9.20±0.05	9.77±0.61	9.95±0.73	9.99±0.85
2ndwk	16.24^{c}±0.86	20.29^{b}±1.05	23.04^{a}±1.17	19.05^{b}±1.39
3rd wk	24.57^{c}±0.83	30.64^{b}±1.66	34.97^{a}±2.91	27.35^{c}±2.16
4th wk	30.67^{d}±0.84	38.38^{b}±2.10	42.48^{a}±2.22	33.78^{c}±1.76
5th wk	40.65^{b}±0.94	52.38^{a}±1.95	56.01^{a}±2.34	43.56^{b}±5.95

SD, standard error; Means with different superscripts within the same row differed significantly (p<0.05)

Meat yield characteristics of broilers on four different diets are presented in Table 6. The results indicate that there was no significant ($p>0.05$) differences among four diets for the percentages of blood weight, head weight, abdominal fat weight, heart weight and gizzard weight. On the other hand, feather weight, shank weight, drumstick weight, neck weight liver weight and viscera weight were significantly ($p<0.05$) higher in Grow Power (D_2) group than antibiotic (D_4) and control (D_1) groups. Research findings suggest that a variety of factors such as bacteriocins, antibiotics, lactic acid and peroxides are produced after inclusion of non-antibiotic feed additives in the diets. These substances help the colonisation of intestinal mucosa by probiotic bacteria by preventing the attachment of pathogens, and hence competition for attachment sites. In broilers, bacteria of the genus Enterococcus produce bacteriocin substances which have an inhibitory effect on pathogenic Clostridium and Listeria spp. (Shin et al. 2008). The results of significant improvement of these meat yield parameter after supplementation of Grow Power or Grow Power plus antibiotic groups may be due to the inhibitory effect of GP on the pathogenic bacteria, resulting higher body weight gain and better feed utilization in birds of that particular groups.

Table 6. The meat yield characteristics of broilers fed on four different diets

Variable	Diets			
	D_1	D_2	D_3	D_4
LW (g)	938.75^{b}±13.7	1105^{a}±41.43	136.25^{a}±37.05	985^{b}±46.7
BW (%)	2.54±0.03	3.13±0.02	3.14±0.03	3.05±0.04
FW (%)	6.46^{d}±0.05	8.64^{b}±0.03	8.96^{a}±0.04	8.46^{c}±0.03
SW (%)	4.32^{c}±0.02	4.07^{a}±0.02	4.42^{b}±0.01	4.34^{c}±0.03
HW (%)	3.62±0.02	3.67±0.04	3.66±0.03	3.65±0.07
DW (%)	4.18^{c}±0.06	5.35^{a}±0.05	5.76^{a}±0.09	4.86^{b}±0.34
NW (%)	1.92^{c}±0.11	3.20^{a}±0.07	3.30^{a}±0.10	2.51^{b}±0.11
HRW (%)	0.75±0.54	0.66±0.05	0.56±0.07	0.70±0.12
LW (%)	2.84^{b}±0.08	2.57^{c}±0.08	3.04^{a}±0.11	2.95^{ab}±0.06
AFW (%)	0.95±0.04	1.01±0.02	1.16±0.07	1.07±0.07
VW (%)	9.31^{a}±0.03	8.04^{c}±0.08	8.08^{bc}±0.07	8.17^{b}±0.07
DR (%)	61.74^{c}±0.54	62.96^{ab}±0.07	63.18^{a}±0.31	62.51^{b}±0.34
GW (%)	2.61±0.12	2.62±0.22	2.42±0.08	2.55±0.06

LW, live weight; BW, blood weight; FW, feather weight; SW, shank weight; HW, head weight; DM, Drumstick weight; NW, neck weight; HRW, heart weight; LW, liver weight; AFW, abdominal fat weight; VW, Viscera weight; DR, dressing; GW, Gizzard weight; Means with different superscripts within the same row differed significantly ($p<0.05$)

Conclusion

Based on the results of present study it can be concluded that the inclusion of Grow Power in mixed feed with or without antibiotic improved the growth of broiler and their feed conversion ratio. This product may be successfully used as nutritional tools in commercial broiler for the promotion of growth and modulation of intestinal microflora. Since the inclusion of traditional antibiotic in the diet of poultry has deleterious effect on the consumer's health, it can be recommended to consider alternative non-antibiotic growth promoters like Grow Power for the growth of broiler.

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