The Journal of Poultry Science, 45: 287–291, 2008
http://www.jstage.jst.go.jp/browse/jpsa
doi:10.2141/jpsa.45.287

≪Research Note≫

Effect of Different Growth Promoters on Growth and Meat Yield of Broilers

Mohammad D. Hossain[1], Sayed M. Bulbul[1], Masahide Nishibori[2] and Mohammad A. Islam[2,3]

[1] Department of Poultry Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh
[2] Department of Bioresource Science, Graduate School of Biosphere Science, Hiroshima University, Higashi-Hiroshima 739–8528, Japan
[3] Department of Animal Science, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh

A total of 180 day-old straight run Arbor Acre broiler chicks were fed *ad libitum* diets without or with growth promoters such as, flavomycin, surmax (avilamycin), genex and availa-Z/M at 65mg, 100 mg, 2 g and 1 g per kg respectively, up to 42 days of age to evaluate the efficacy of different growth promoters and recommend a suitable growth promoter in broiler diet. The results indicated that live weight and feed conversion ratio differed significantly ($P<0.01$), and it was observed that surmax group was the best performer among the dietary groups. The study also reveals that antibiotic groups (flavomycin and surmax) were better in terms of growth and meat yield compared to the non-antibiotic groups (genex and availa-Z/M). Livability was apparently higher in surmax group (100%) compared to other groups. Profitability ($/kg broiler) was found 0.225 (Tk.15.21), 0.269 (Tk.18.28), 0.309 (Tk.21.01), 0.242 (Tk.16.44) and 0.231(Tk.15.68) in control, flavomycin, surmax, genex and availa-Z/M groups, respectively. Dressed yield and breast meat of broiler were increased in surmax groups. Abdominal fat in female was increased ($P<0.05$).

Key words: broiler, growth, growth promoters, meat, profitability

J. Poult. Sci., 45: 287–291, 2008

Introduction

Broiler production is an important part of commercial poultry enterprise which can provide maximum return with a minimum expense. Broiler is the most efficient live machinery for quick return of quality meat in the shortest possible period. Broiler industries are providing a large part of increasing demand for animal protein, cash income and creating employment opportunities. Peoples from different corners are coming to make broiler business with a profitable venture. Broiler industry needs fast growing broiler chicks which are capable of converting diet into meat with a great efficient. As we know that about 60–70% of the total production cost is the diet cost. That's why commercial poultry producer are trying in different approaches for better growth and economic broiler meat production. Of the different means for reducing feed conversion ratio varieties of growth promoters as feed additive are using in poultry industry for faster growth and economic meat production which also reduce time required for attaining the market weight (Bunyan *et al.,* 1997; Griffin, 1980). Growth promoters have the positive response in respects to broiler growth (Milligan *et al.,* 1955; Dash *et al.,* 1992; Denli *et al.,* 2003a). Addition of antibiotics as feed additive in the diet of broilers improved weight gain, diet intake, and reduced feed conversion ratio (Ahsan-ul-Haq-Gilari *et al.,* 1991). Recently, non-antibiotic growth promoters like amino acids, enzymes, organic acids are using alone or in combination. Addition of salkil (propionic acid, ammonium propionate, ammonium formate, formic acid) in the diet of broiler reduced mortality, improved weight gain, and reduced feed conversion ratio (Hyden *et al.,* 1989). But no work has been done in Bangladesh to compare the relative efficiency of growth promoters in poultry diets. So the present study was undertaken to know the efficacy of suitable growth promoter out of the available growth promoters in the market for poultry production.

Received: May 12, 2008, Accepted: July 25, 2008
Correspondence: Dr. M.A. Islam, Department of Bioresource Science, Graduate School of Biosphere Science, Hiroshima University, Higashi-Hiroshima 739–8528, Japan.
(E-mail: aminul_dgvc@yahoo.com)

Materials and Methods

The experiment was carried out at Bangladesh Agricultural University poultry farm in Bangladesh from 12th March to 22nd April, 2001. One hundred eighty straight run Arbor Acre broiler chicks were collected from "Poultry Development Project", Department of Poultry Science, Bangladesh Agricultural University, Mymensingh, Bangladesh and distributed in five dietary treatment groups; control (D_1), Diet with Flavomycin (D_2), Diet with Surmax (D_3), Diet with Genex (D_4) and Diet with

Table 1. **Composition of growth promoters**

Growth promoters	Contents	Manufacturer
a) Flavomycin; D_2	One kg of flavomycin contains 80 g flavophospholipol	Hoechst Roussel Vet. Pvt. Ltd., India
b) Surmax; D_3	Each 1kg Surmax contains 100 g Avilamycin	Elanco Animal Health, USA
c) Genex; D_4	Blend of volatile fatty acids and their ammonium salts, essentials oils and plant extract on a silicate carrier	Optivite International Ltd., UK
d) Availa-Z/M; D_5	Zn-4%, Manganese (Mn)-4%, Aspartic-1.14%, Threonine-0.83%, Isoleocine-0.82%, Glutamic acid-2.0%, Proline-1.71%, Glycine-1.54%, Alanine-0.89%, Cystine-0.84%, Valine- 1.25%, Methionine- 0.13%, Leucine- 1.37%, Tyrosine-0.48%, Phenylalanine-0.83%, Histidine-0.20%, Lysine-0.35%, Argine-1.15%, Total amino acid = 17.58%	Zinpro Animal Nutrition, Zinpro Corporation, USA

Table 2. **Composition of the experimental diet**

Feed ingredients	Amount (kg) in 100 kg mixed diet	
	Broiler starter diet (0–28 days of age)	Broiler finisher diet (29–42 days of age)
Maize (Crushed)	57.0	60.0
Rice polish	11.5	13.0
Soybean meal	21.0	18.0
Protein concentrate (LNB)	8.0	5.0
Meat and bone meal	2.0	2.0
Soybean oil	—	1.5
Common salt	0.5	0.5
Total	100.0	100.0
Calculated composition:		
Metabolizable energy (Kcal/kg)	3071.00	3207.00
Crude protein (%)	22.97	20.10
Calcium (%)	1.22	0.90
Av. Phosphorus (%)	0.59	0.54
Lysine (%)	1.16	0.94
Methionine (%)	0.43	0.36
Tryptophane (%)	0.23	0.20

* Rena-broiler vitamin-mineral Premix. Each 2.5 kg contain Vitamin A 12000,000 IU; vitamin D3 2,000,000 IU; Vitamin E 23 gm; vitamin K 2 gm; Vitamin B_1 1.5 gm; Vitamin B_2 5 gm; Vitamin B_6 4 gm; nicotinic acid 30 gm; Calcium-D-Pantothenet 8 gm; Vitamin B_{12} 10 mg; Folic acid 0.50 gm; Biotin 40 mg; Cobalt 0.25 gm; Copper 6 gm; Ferric 24 gm; Iodine 0.60 gm; Manganese 48 gm; Zinc 40 gm Selenium 120 mg; D-L-Methionine 50 gm; L-Lysine 30 gm; Calcium 679.58 gm., Source: Renata Agrovet Limited, Dhaka, Bangladesh.
Protein concentrate (LNB): Manufactured by LNB International Feed B.V., Raaduisplein 1, 5388 GM, Nistelrode, Holland
Source of Coccidiostat (DOT): Arifs (Bangladesh) Limited, 18 Rajuk (DIT) Avenue, (7th Floor), Lal Bhaban, Motijheel C/A, Dhaka, Bangladesh.
Vitamin-mineral premix and coccidiostat (DOT) (0.05 kg/100 kg diet) were added with mixed diet.

Availa-Z/M (D_5) having 3 replications in each. Each dietary treatment group consists of 36 chicks distributed in 3 replicated pens with 12 chicks in each, to investigate the effect of different growth promoters on growth, profitability and meat yield of broilers. The doses of growth promoters were used in the test diets as per recommendation of the manufacturer like Flavomycin- 6.5 g/100 kg diet, Surmax (Avilamycin)- 10 g/100 kg diet, Genex- 200 g/100 kg diet, Availa-Z/M- 100 g/100 kg diet.

Broiler starter and finisher diets were prepared as Table 2, using locally available feed ingredients. Vitamin-mineral premix and coccidiostat (DOT) (0.05 kg/100 kg diet) were added with the whole diet. The diet was then divided into 5 equal treatment groups as using the above mentioned amount of growth promoters with diet D_2, D_3, D_4 and D_5, and D_1 was kept without growth promoter (i.e. control diet). The birds were fed *ad libitum* with a stocking density of 900 cm^2 per bird. The birds were exposed to lighting of 23½ h and a dark period of 30 min for 24 h. The birds were reared on rice husk littered floor management system. Brooding temperature was kept at 35℃ in the first week of age and it was decreased gradually by

Table 3. **Growth performances of broiler fed on diet with different growth promoters at 42 days of age**

Parameters	Diet (D)					SED /LSD value and level of significance
	D_1 (Control)	D_2	D_3	D_4	D_5	
Day-old weight (g/broiler)	42.11	42.03	42.19	42.76	42.39	0.77 NS
Body weight (g/broiler)	1323.20^{b}	1420.07^{a}	1449.86^{a}	1369.95^{ab}	1354.22^{ab}	105.41**
Body weight gain (g/broiler)	1281.09^{b}	1378.04^{a}	1407.67^{a}	1327.19^{ab}	1311.83^{ab}	105.41**
Diet intake (g/broiler)	3175.79^{ab}	3160.66^{ab}	3200.67^{a}	3189.44^{ab}	3117.52^{b}	72.89*
FCR (Diet intake/body weight gain)	2.48^{a}	2.29^{b}	2.27^{b}	2.40^{ab}	2.38^{ab}	0.182**
Livability (%)	94.45	94.45	100.00	97.22	94.50	4.65 NS
Production cost (Tk/kg live broiler)	52.79	49.72	46.99	51.56	52.32	1.96 NS
Profitability (Tk/kg live broiler)	15.21	18.28	21.01	16.44	15.68	1.96 NS

* Similar superscript in the row did not differ significantly, NS, $P>0.05$; *, $P<0.05$; **, $P<0.01$.
Sale (Tk/kg broiler) = 68/=, Labour cost (Tk/day/labour) = 50/=.
D_1 = control diet, D_2 = diet with flavomycin, D_3 = diet with surmax, D_4 = diet with genex and D_5 = diet with availa-Z/M.

2.78℃ in each subsequent week until they were adjusted to normal environmental temperature of the house. The birds were vaccinated against Gumboro, Ranikhet, and Infectious bronchitis. Body weight and diet intake (g/bird) were recorded at the end of experiment for each replication. Mortality was recorded when occurred. Cost of production was estimated by considering for chicks, diet, labour, vaccine, litter, growth promoters, mortality and miscellaneous cost. All types of cost were calculated on the basis of market price at the time of investigation. At the end of experiment a total of 30 broilers having 2 broilers (male and female) in each replication were slaughtered and recorded meat yield. Before slaughtering, the birds were starved for 12 h. The recorded dressing yield parameters were such as weight of whole body, blood, feather, shank, head, dressing, viscera, giblet, abdominal fat and breast meat.

Statistical Analysis

The recorded data were analysed using MSTAT statistical computer package program in accordance with the principles of CRD (Steel and Torrie, 1980). Least significant difference (LSD) was performed to compare variation among treatments means where ANOVA showed significant differences.

Results and Discussion

Growth and Profitability of Broilers

The results of live weight, diet intake, feed conversion ratio (FCR), livability and profitability are presented in the Table 3. Day-old weights of chicks were similar among the diets ($P>0.05$). The difference of live weight and FCR were highly significant ($P<0.01$) among different dietary groups (Table 3). The highest live weight and lower feed conversion ratio (FCR) were found in D_3 group, the lowest in control (D_1) group, and the intermediate in D_4 and D_5 groups. But there was no significant difference between D_2 and D_3 for live weight and FCR. Similarly FCR and live weight did not differ significantly between D_4 and D_5. The highest diet intake was found in D_3 group (Table 3). However, diet intake was differed significantly among the diets D_1, D_2 and D_4. Livability and cost of production did not differ significantly among the different dietary groups ($P>0.05$). The difference of profitability was not significant but apparently profitability was highest in surmax group (D_3) and the lowest in D_1 (control group).

The differences of live weight and FCR for antibiotic and non-antibiotic groups were also highly significant ($P<0.01$) (Table 4) for antibiotic growth promoter groups produced heavier broiler, and reduced feed conversion ratio. But no difference was found for diet intake between antibiotic and non-antibiotic group ($P>0.05$) (Table 4). Antibiotic group was significantly ($P<0.01$) better than the non-antibiotic group for FCR (Table 4).

Surmax group of growth promoters produced 9.6% heavier broiler compared to control group diet, which was coincided with the report of Valadirova *et al.* (1997) who found 10–15% higher body weight for whole finding period. Live weight of broiler was increased in the diet of flavomycin and surmax group consistent with the findings of Ahsan-ul-Haq-Gilari *et al.* (1991), Dash *et al.* (1992), Denli *et al.* (2003b) and Palic *et al.* (1998) who observed significantly higher body weight due to using flavomycin and surmax in broiler diet, but contradicted with Gunal *et al.* (2006), they found no effect of flavomycin or genex group on live weight. Because they supplemented higher amount of flavomycin (0.1% = 100 g/100 kg) than the present study (6.5 g/100 kg) which decreased the total intestinal microbial flora count may be the reason for no growth promoting action in chicken. Antibiotic growth promoters were significantly ($P<0.01$) better compared to the non-antibiotic growth promoters, contradicted with Proudfoot *et al.* (1991) who found no growth promoting action as Gunal *et al.* (2006) in chicken but supported with the findings of Denli *et al.* (2003b). Among the group of growth promoters, surmax was found to be the highest for diet intake of broilers. The study was supported by Ahsan-ul-Haq-Gilar *et al.* (1991) and Denli *et al.* (2003b), who found that addition of antibiotic as feed additives improved feed intake of broiler. Improved

Table 4. **Growth performances of broiler for antibiotic and non-antibiotic growth promoter groups at 42 days of age**

Parameters	Antibiotic (Flavomycin + Surmax)	Non-antibiotic groups (Genex + Availa-Z/M)	Level of significance
Body weight (g/broiler)	1434.97	1362.08	**
Body weight gain (g/broiler)	1392.86	1319.51	**
Diet intake (g/broiler)	3180.66	3153.49	NS
FCR (Diet intake/body weight gain)	2.28	2.39	**
Livability (%)	97.22	95.84	NS

NS, $P>0.05$; **, $P<0.01$.

Table 5. **Meat yield of broilers fed on diet with different growth promoters at 42 days of age**

Variable	Sex (S)	Dietary Treatments (D)						SED/LSD value and level of Significance		
		D_1 (control)	D_2 (flavomycin)	D_3 (surmax)	D_4 (genex)	D_5 (availa Z/M)	Mean	D	S	D×S
Dressing (%)	M	65.09	66.56	66.54	65.10	64.87	65.66	3.49*	0.43NS	0.965NS
Blood meal (%)	F	64.65	66.02	66.48	65.89	64.10	65.43			
	Mean	64.87	66.29	66.51	65.55	64.48	65.54			
	M	5.50	6.15	4.75	5.90	6.59	5.78	0.479NS	0.30NS	0.678NS
Feather meal (%)	F	5.72	6.02	4.96	6.10	5.38	5.64			
	Mean	5.61	6.09	4.85	6.00	5.98	5.71			
	M	5.02	5.82	5.35	5.37	4.98	5.31	0.366NS	0.053NS	0.517NS
Shank weight (%)	F	5.53	5.14	5.40	4.95	4.84	5.18			
	Mean	5.28	5.48	5.38	5.16	4.91	5.24			
	M	2.57	2.27	2.48	2.35	2.48	2.43	0.10NS	0.275*	0.141NS
Head weight (%)	F	2.21	2.11	2.20	2.22	2.11	2.17			
	Mean	2.39	2.19	2.34	2.29	2.29	2.30			
	M	2.96	3.19	3.05	3.17	3.28	3.13	0.106NS	0.067NS	0.151NS
Giblet weight (%)	F	3.03	3.16	2.98	2.97	2.91	3.01			
	Mean	3.00	3.18	3.01	3.07	3.09	3.07			
	M	5.89	5.86	5.72	6.22	5.91	5.92	0.215NS	0.136NS	0.304NS
Viscera weight (%)	F	5.61	5.39	5.75	6.18	5.63	5.71			
	Mean	5.75	5.62	5.74	6.20	5.77	5.82			
	M	8.81	8.72	7.87	7.63	8.65	8.33	0.385NS	0.244NS	0.545NS
Abdominal fat (%)	F	8.36	7.98	8.29	8.29	8.39	8.24			
	Mean	8.59	8.35	8.08	7.96	8.47	8.29			
	M	1.06	1.15	1.05	1.06	1.07	1.08	0.148NS	0.408*	0.209NS
Breast meat (%)	F	1.35	1.20	1.34	1.45	1.36	1.34			
	Mean	1.20	1.18	1.19	1.25	1.22	1.21			
	M	9.27	10.26	10.82	9.90	9.36	9.92	1.445**	0.179NS	0.40NS
	F	9.83	10.05	10.05	9.48	8.90	9.66			
	Mean	9.55	10.15	10.43	9.69	9.13	9.79			

NS-Non-significant ($P>0.05$), **, $P<0.01$, *, $P<0.05$, M-Male, F- Female.

feed conversion of broiler fed on diet with antibiotic group of growth promoters like surmax and flavomycin in the current study coincides with the findings of Denli *et al.* (2003b), Jamroz *et al.* (1995), Palic *et al.* (1998) and Valadirova *et al.* (1997), they found the better feed conversion due to using of antibiotic growth promoters but the present study disagreed with the report of the Albino *et al.* (2006) and Proudfoot *et al.* (1991) who concluded broiler may be raised without growth promoters. But optimum amount of growth promoter (recommended by manufacturer) may effect positively on broiler growth performance. Although the livability was statistically

similar among the dietary groups, the livability was apparently higher in surmax group. This study was contradicted with the findings of Palic *et al.* (1998), they reported the superior livability in flavomycin group but supported with the findings of Albino *et al.* (2006). Reduced production cost and increased profitability in different growth promoters group were found in the present study, supported with the findings of, Jayaprasad and Probakaran (1994), Mandal *et al.* (1994) and Raj (1994), they reported that growth promoters were economically beneficial. Proudfoot *et al.* (1991) showed that growth promoter had no economic importance on broiler which was disagreed with the present findings.

Dressing Yield

Dressing yield (%) and breast meat (%) were differed significantly ($P<0.05$) and ($P<0.01$) among the diets respectively (Table 5). The highest dressing yield (%) and breast meat (%) were found in surmax group (D_3). Shank weight (%) was significantly ($P<0.05$) higher in male than the female. The other meat yield traits were not differed significantly ($P>0.05$) among the groups. Interaction effect between growth promoters and sex was found to be statistically non-significant ($P>0.05$).

Surmax group improved dressing yield percentage. The increased dressing yield in surmax group may possibly be explained by increasing live weight. It is partially agreed with Sapra and Mehta (1990), who reported that edible meat as a percentage of body weight was increased for adding growth promoters. But it is supported by Albino *et al.* (2006), Denli *et al.* (2003a and 2003b), they found increased carcass yield and decreased abdominal fat.

In conclusion, the present study reveals that addition of different growth promoters may be beneficial and worthy for broiler production. The most economic and efficient growth promoter was found to be surmax (avilamycin) followed by flavomycin, genex and availa-Z/M. Antibiotic growth promoters group was comparatively better performer in terms of live weight, FCR, livability, profitability and meat yield traits. However, more studies are needed to confirm this findings and farmer should be withdrawn growth promoter from the ration before minimum one week of marketing to avoid some adverse effect on human health.

Acknowledgments

The authors are grateful to Poultry Development Project, Department of Poultry Science, Bangladesh Agricultural University, Mymensingh, Bangladesh to provide broiler chicks and other assistance for conducting the research work.

References

Ahsan-ul-Haq- Gilari AH, Ahmed N, Aslam SM and Tahir M. Comparative efficiency of various feed additives in broiler chicks. Sarhad Journal of Agriculture, 7: 33–38. 1991.

Albino LFT, Feres FA, Dionizio MA, Rostagno HS, Junior JGdeV, Carvalho DCdeO, Gomes PC and Costa CHR. Use of mannaoligosaccharid based probiotic in the broiler diets. Revista Brasileira de Zootecnia, vol.35 no.3 Vicosa May/June. 2006.

Bunyan JL, Jeferies J, Sayers R, Gulliver A L and Colemon K. Antimicrobial substances and chick growth promotion: The growth promoting activities of antimicrobial substances included fifty two used either in therapy or as dietary additives. British Poultry Science, 18: 283–294. 1977.

Dash PK, Verma SVS, Mahapatra CM and Gopal R. Response of broilers to certain performance promoters. Indian Journal of Poultry Science, 27: 113–115. 1992.

Denli M, Celik K and Okan F. Comparative effect of feeding diets containing flavomycin, bioteksin-L and dry yeast (saccharomyces cerevisiae) on broiler performance. Journal of Applied Animal Research, 23: 139–144. 2003a.

Denli M, Okan F and Celik K. Effect of dietary probiotic, organic acid and antibiotic supplementations to diets on broiler performance and carcass yield. Pakistan Journal of Nutrition, 2 (2): 96–98. 2003b.

Griffin RM. The response of cage reared cockerels to dietary medication with growth promoters. Poultry Science, 59: 412–416. 1980.

Gunal M, Yayli G, Kaya O, Karahan N and Sulak O. The effects of Antibiotic Growth Promoter, Probiotic or Organic Acid Supplementation on Performance, Intestinal Microflora and Tissue of Broilers. International Journal of Poultry Science, 5: 149–155. 2006.

Hyden MG, Biol C and Biol MI. Salmonella in the poultry industry. Turkish Poultry Fair, Istanbul. 1989.

Jamroz D, Skorupinska J, Orda J, Wiliczkiewicz A and Kirchgessner M. Effect of availamycin (Maxus) and roxazyme supplementation on broiler performance. Archiv-für-Geflugelkunde, 59: 228–223. 1995.

Jayaprasad JA and Prabakaram R. Effect of some growth promoters on broiler performance. Indian Journal of Poultry Science, 29: 81. 1994.

Mandal SK, Biswas TK and Mandal L. Efficiency of different growth promoters on the performance of broilers. Indian Journal of Poultry Science, 29: 13–17. 1994.

Milligan JL, Wilke HL and Bathke M. Arsonic acid in commercial broiler rations. Poultry Science, 34: 794–799. 1955.

Palic T, Stankovic G and Novakovic Z. Effect of simultaneous application of sacox and flavomycin preparations on broiler performance and health. Zivanarstvo, 33: 211–214. 1998.

Proudfoot FG, Jakson ED, Hulan HW and Salisbury CDC. Arsailic acid as a growth promoter for chicken broilers when administrated via either the feed or drinking water. Canadian Journal of Animal Science, 71: 221–226. 1991.

Raj T. Effect of feeding stenorol and amprol on weight gain and feed efficiency in broilers. Poultry Advisor, 17(3): 43–45. 1984.

Sapra KI and Mehta RK. A comparative study on addition of livol (herbal growth promoter) and some chemical growth promoters in the diet of broiler chicks. Indian Journal of Animal Production and Management, 6: 115–118. 1990.

Steel RGD. and Torrie, JH. Principles of procedures of statistics. A Biometrical Approach. McGraw Hill. New York. 1980.

Valadirova L, Sourdjiisda S, Dakova T and Dilow P. Nutritive effect of avilamycin supplementation to chicken broiler mixes. Zhivotnov-dni-Nauki, 34: 49–52. 1997.