OnLine Journal of Biological Sciences 1 (8): 714-716, 2001

Effect of Soybean Oil on Finisher Period of Broiler at Hot Weather in Bangladesh

M.L. Ali, A.G. Miah, U. Salma and R. P. Chowdhury
Sylhet Government Veterinary College, Tilagor, Sylhet - 3100, Bangladesh

Abstract: Ninety Starbro broilers of one month age having an initial live weight 1150-1320 g for 15 days (finisher period) were randomly assigned to six treatment which were fed on different levels of soybean oil. In the finisher period (30th to 45th day), total live weight gain of the broilers fed 4% (920 g) and 6% (961 g) soybean oil diet were significantly higher than the broilers fed 0 (764 g), 2 (870 g), 8 (867 g) and 10% (782 g) soybean oil diets. Total feed intake was gradually decreased with increasing levels of soybean oil in the diets. Feed conversion efficiency (FCE) was gradually improved with increasing levels up to 6% of soybean oil and then decreased with above the levels (e.g. 8 and 10%) of soybean oil in the diets. Similarly, the cost benefit ratio (CBR) of T_2 (2.15) and T_3 (2.17) groups were significantly more satisfactory than the other treatment groups (T_0 = 1.92, T_1 = 2.09, T_4 = 1.97 and T_5 = 1.72). So, up to 6% soybean oil may be added in the broiler finisher diet during hot weather in Bangladesh.

Key words: Soybean oil, finisher broiler, hot weather, Bangladesh

Introduction

Broiler farming is a profitable enterprise has been increasing dramatically throughout the country. In developed countries, fat or oils as energy rich feed are available from animal sources such as tallow, lard, fish oil etc. and from plant sources such as soybean oil, safflower oil, sunflower oil, cotton seed oil, maize oil etc. In Bangladesh, there is a major problem to increase energy level especially in broiler finisher diet with conventional feed ingredients (such as maize, wheat etc.). Because of unavailability of animal fat as a rich source of energy, soybean oil is used in broiler diet. Soybean oil stimulated growth rate of chicks when included in certain types of poultry diets (Carew *et al.*, 1961). Unsaturated vegetable fat or oils are more energetic than saturated animal fat.

Oil or fat increases the energetic efficiency in two ways. It increases density of energy and it has a lower heat increment or greater net energy. Because fat or oil has 2.25 times more energy per unit weight than carbohydrate or protein but is an expensive component of diet. Live weight of a broiler increases with higher rate in its finisher period than starter period. In finisher diet, more energy must be supplied to obtain expected live weight of a broiler. If a broiler intake more energy than its requirement, then it converts feed energy to body fat. To increase the energy level in finisher diet and to obtain higher weight of a broiler, oil or fat may be used to base upon its benefits in relation to the cost. Increased energy and nutrient density of the diet and replacing carbohydrate calories with fat calories reduced feed intake almost proportionally but increased live weight gains in hot weather (Fullar, 1987). FCE, efficiency of energy and protein utilization were also improved in hot weather, and increased energy intake especially under heat stress was necessary for adequate weight gain.

No research work has yet been conducted on the effect of different levels of soybean oil in the broiler finisher diet under the hot weather in Bangladesh. Therefore the project has been under taken to study the effect of different levels of soybean oil and its suitable level in broiler finisher diet on the basis of economic benefit during the hot weather in Bangladesh.

Materials and Methods

The experiment was conducted at Youth Training Center, Tilagor, Sylhet, Bangladesh in May 2000, at 28-33° C. Ninety Starbro broilers aged 30 days having an initial live weight of 1150-1320 g were used in a 15 days (finisher period) of the experiment. The broilers randomly assigned to six treatment groups (T_0, T_1, T_2, T_3, T_4 and T_5) with six levels of soybean oil (T_0 = 0%, T_1 = 2%, T_3 = 4%, T_4 = 8% and T_5 = 10%). The ingredients and nutrient composition (according to A.O.A.C., 1984) of the diets are shown in Table 1.

All young broilers were leg banded at first day of experiment. Fresh and dried rice husk was used as litter of about 7.0 cm depth. Required floor space @ 930 cm^2/ broiler), feeders and waterers were properly provided. The formulated feed with different levels of soybean oil and fresh water were supplied three times daily exposed to continuous 23 h light throughout the experimental period. They were vaccinated against New Castle Disease at fourth day of age followed by booster does at 21st day and Gumboro vaccine were introduced at 12th day of age. Live weight of broilers was taken at every five days interval, feed consumption, and house temperature recorded daily. The comparative cost benefit ratios were also calculated among all treatment groups on only feed cost and weight gain basis. The broilers were sold @ 75 Tk. Kg^{-1} live weight at the local market of Sylhet. The data were analyzed with Randomized Complete Block Design (RCBD) by the method of Steel and Torrie (1980). Least significant differences (LSD) was used to compare the treatment means for different parameters.

Results and Discussion

Live weight: The live weight of broilers fed on 0 and 10% soybean oil containing diets were significantly ($P<0.01$) lower than the broilers fed 2, 4, 6 and 8% soybean oil diet (Table 2). The growth performance of T_1 (2% soybean oil) group (870 g) were almost similar to T_4 (8% soybean oil) group (867 g) but significantly lower than T_2 (4% soybean oil) and T_3 (6% soybean oil) groups of broiler. Highest gain was observed in T_3 group (961 g) of broilers. Live weight gain of the broilers (T_2) fed on 4% soybean oil was significantly higher than the other treatment groups (T_0, T_1, T_4 and T_5) but lower than the T_3 group of broilers fed 6% soybean oil diet. Nitsan *et al.* (1997) observed that addition of 3% soybean oil in the diet improved live weight gain (6.9%) significantly ($P<0.05$) than the diet 0% soybean oil. They also observed higher (but not significantly) live weight gain (3.4%) in group of broilers fed on 6% soybean oil than 3% soybean oil added diet. Franco *et al.* (1996) stated that inclusion of soybean oil (3%) in the diet improved live weight gain significantly ($P<0.05$) of broilers during 22-49 days of age. Live weight gain of the broilers fed 6% animal-vegetable fat added diet containing all

Table 1: Ingredient composition, price and chemical composition of different experimental diets

Ingredients	Price (Tk.Kg^{-1})	Amount (%)					
		T_0	T_1	T_2	T_3	T_4	T_5
Maize	9.00	65.00	62.50	60.20	57.50	55.00	52.50
Soybean meal	15.00	20.00	20.50	20.80	21.50	22.00	22.50
Rice polish	7.00	5.00	5.00	5.00	5.00	5.00	5.00
Provimi*	40.00	7.50	7.50	7.50	7.50	7.50	7.50
Soybean oil	38.00	0.00	2.00	4.00	6.00	8.00	10.00
Oyster shell	5.00	2.00	2.00	2.00	2.00	2.00	2.00
Common salt	6.00	0.50	0.50	0.50	0.50	0.50	0.50
Total		100.00	100.00	100.00	100.00	100.0	100.00
Total price (Tk. Kg^{-1})		12.33	12.94	13.53	14.40	14.47	15.38
Nutrient composition**							
ME (K cal Kg^{-1})		2974.00	3080.00	3186.00	3290.00	3394.00	3500.00
CP (%)		19.50	19.40	19.30	19.50	19.50	19.50
Ca (%)		1.50	1.49	1.49	1.49	1.49	1.49
P (%)		0.59	0.58	0.58	0.59	0.59	0.59

Nutrients	Amount
Protein (%)	50.00
Fat (%)	11.00
Fiber (%)	3.50
Ash (%)	28.50
Calcium (%)	8.50
Magnesium (%)	0.20
Available phosphorus (%)	4.30
Sodium (%)	1.60
Chloride (%)	1.30
Lysine (%)	2.75
Threonine (%)	1.65
Methionine (%)	2.25
Meth + Cys (%)	2.80
Metabolizable energy (K cal Kg^{-1})	2850

* Provimi is a protein concentrate for broiler, which was made by "Media International" a company of Netherlands.
** Calculated from the manual of Selected Topics in Animal Nutrition by Close and Menke (1976).

Table 2: Performance of broiler finisher fed on different levels of soybean oil

Parameter	Experimental diets with different levels of soybean oil						SEM	Level of Sig.
	T_0 (0%)	T_1 (2%)	T_2 (4%)	T_3 (6%)	T_4 (8%)	T_5 (10%)		
Initial live wt. (g)	1212±19	1214±25	1214±16	1212±23	1214±21	1215±16	-	NS
Final live wt. (g)	1976^{a}±14	2084^{c}±17	2134^{d}±16	2173^{e}±18	2081^{c}±16	2049^{b}±16	9	**
Live wt. gain (g/15 d)	764^{a}±8	870^{b}±27	920^{c}±20	961^{d}±26	867^{b}±25	782^{a}±19	14	**
Feed intake (g/15 d)	2423^{a}±14	2418^{a}±28	2367^{ab}±29	2311^{b}±31	2285^{bc}±27	2222^{c}±23	33	**
FCE	3.17^{a}±0.03	2.76^{bc}±0.07	2.57^{cd}±0.05	2.41^{d}±0.07	2.64^{bcd}±0.08	2.84^{b}±0.07	0.13	**
CBR	1.92^{a}±0.02	2.09^{b}±0.06	2.15^{c}±0.04	2.17^{c}±0.06	1.97^{a}±0.06	1.72^{d}±0.04	0.03	*

FCE = Feed conversion efficiency, CBR = Cost benefit ratio
Means with different superscripts are differed significantly ($P<0.05$)
NS = Non Significant, * ($P<0.05$) and ** ($P<0.01$)

levels(0, 10 & 20%) of sunflower meal was significantly ($P<0.01$) higher than the broilers fed without animal-vegetable fat (Zatari and Sell, 1990). Campos *et al.* (1987) found although there were no significant differences among the groups of broiler but weight gain increases with increasing amount of fat (1.25, 2.50 and 3.75%) in the diet. However, Tawfik and Yo (1989) observed increasing dietary energy concentration at constant protein level did not affect on live weight gain. Above 6% soybean oil containing diet decreased the live weight gain of broilers, might be due to the higher ratio of protein and energy (Table 2). Kubena *et al.* (1972) reported that at high temperature, high-energy diet gave increased live weight where there was simultaneous increasing of protein. The excess energy intake per kg live weight in 8 and 10% soybean oil diet was perhaps deposited in the abdominal cavity. Whitehead (1986) indicated that availability of energy for deposition owing to excess energy intake increase fatness in finisher period of broiler. Live weight increased smoothly with higher rate were observed (from 30 to 45 days old) in broilers fed 6% (T_3), 4% (T_2) and 2% (T_1) soybean oil containing diet than the broilers fed 0 soybean oil or even 8% (T_4) and 10% (T_5) soybean oil containing diet (Fig. 1).

Feed intake: Total feed intake of finisher period (30th to 45th days old) of the broilers fed 10% soybean oil diet was significantly ($P<0.01$) lower than the broilers fed 0 (T_0), 2 (T_1), 4 (T_2), 6 (T_3) and 8% (T_4) soybean oil diet. Total feed intake (g) at the period of T_0 (2423), T_1 (2418) and T_2 (2367) diet groups significantly higher than T_3 (2311), T_4 (2285) and

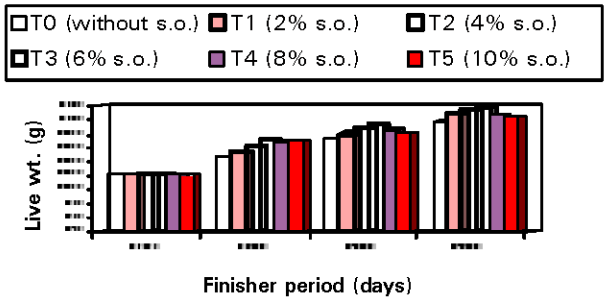

Fig. 1: Effect of different levels of soybean oil on live weight change at Finisher period of broiler

T_5 (2222) diet groups, but there was no significant differences among T_0, T_1 and T_2. On the other hand, there was significant difference between T_3 and T_5 which did not differ from T_4 group. Total feed intake at finisher period was gradually decreased with increased levels of soybean oil. The decreased feed intake was probably due to the increased energy in the diet, which was also supported by the other researchers (Franco *et al.*, 1995; Butala *et al.*, 1989 and Tawfic and Yo, 1989.

Feed conversion efficiency (FCE): At the finisher period, the broilers of T_3 groups converted feed to meat most efficiently. The FCE of T_0 group was significantly ($P < 0.01$) lower than the other treatment (Table 2). The FCE of the broilers fed 4 and 6% soybean oil diet were significantly ($P < 0.05$) more satisfactory than the broilers fed specially 2 and 10% soybean oil diet. Feed conversion efficiency were increased with increased the level of soybean oil up to 6% but with higher level (*e.g.* 8 and 10%), the FCE were decreased. Zatari and Sell (1990) also observed that 6% animal-vegetable fat improved ($P < 0.01$) feed efficiency. Franco *et al.* (1996) and Nitsan *et al.* (1997) stated that FCE were significantly ($P < 0.05$) improved with addition of 3% soybean oil in the diet. In case of above 6% soybean oil diet, the cause of poor FCE was due to the decreased live weight gain with increasing level (8 and 10%) of soybean oil in the diet. A poorer FCE obtained may possibly be attributed to poorer utilization of ingested energy.

Livability: During 15 days (30th to 45th day of age), only two broilers from T_5 and T_4 group were dead might be due to over intake of soybean oil and excess fat deposition.

Cost benefit ratio (CBR): Cost benefit ratios of T_2 and T_3 groups were significantly ($P < 0.05$) better than other treatment (T_0 T_1, T_4 and T_5) groups (Table 2). Between the two groups, the CBR of T_3 group was better (but $P > 0.05$) than T_2 group. The CBR was lowest in T_5 group of broilers though they fed the diet containing higher level (10%) of soybean oil. Addition of 4-6% soybean oil was more beneficial than other above levels (8 and 10%) of soybean oil. The diets containing 8 and 10% soybean oil were not beneficial . Nitsan *et al.* (1997) stated that the addition of soybean oil (3%) in the diet were more beneficial.

It is concluded that the live weight gain, feed conversion ratio and cost benefit ratio were better in the broilers (finisher) fed diet containing 4 and 6% soybean oil. According to the above findings and based on economic benefit, up to 6% of soybean oil may be added in the broiler finisher diet during the hot weather in Bangladesh.

References

A.O.A.C., 1984. Official Methods of Analysis. 14th Edn. Association of Official Analytical Chemists, Washington, *DC.*

Butala, V.G., S. Rajgopal and N.V. Patil, 1989. Performance of White Leghorn cockerels fed on deoiled rice bran and its supplementation with graded levels of tallow. Poultry abstracts, 16: 1395

Campos, J., J.J. Montilla and R. Vargas, 1987. Effect of adding animal fat to diets based on paddy rice for fattening chickens. Poultry abstracts, 16: 268

Carew,L.B., M.C. JR. Nasheim and F.W. Hill, 1961. An in vitro method for determine the availability of soybean oil in unextracted soybean products for the chicks. Poultry Sci., 41: 1962

Close, W. and K.H. Menke, 1976. Manual of "Selected Topics in Animal Nutrition" is cooperation with steingass, Hand Troscher, A. pp: 64-70

Franco, S.G., O.M. Junqueira, L.M. Fedalto and A.C. Paulillo, 1995. Effects of feeding programs and the addition of oil, in different phases, on the development of broiler chickens. Revista-do-Setor-de-Ciencias-Agrarias, 14: 95-102

Franco, S.G., O.M. Junqueira, L.M. Fedalto and A.C. Paulillo, 1996. Effect of different feeding programs with or without soybean oil in one or many phases on performance of broiler chickens. Revista-do-Setor-de-Ciencias-Agrarias, 15: 197-205

Fullar, H., 1987. Feeding poultry under heat stress conditions using fats and full fat soybeans. Poultry Review. P: 11

Kubena, L.F., J.W. Deaton, F.N. Reece, J.D. May and T.H. Vardaman, 1972. The influence of temperature and sex on the amino acid requirements of the broiler. Poultry Sci., 51: 1391-1396

Nitsan, Z., A. Dvorin, Z. Zoref and S. Mokady, 1997. Effect of added soybean oil and dietary energy on metabolizable and net energy of broiler diets. British Poultry Sci., 38: 101-106

Steel, R. G. D. and J. H. Torrie, 1980. Principles and procedures of statistics, McGrow Hill Book Company. New York.

Tawfik, E.S. and T. Yo, 1989. Influence of dietary energy density on feed intake, feed efficiency and weight gain of broilers. Poultry Abstracts, 16: 757

Whitehead, C.C., 1986. Nutritional factors influence fat in poultry. Feed stuffs. January 20, P: 31-41

Zatari, I.M. and J.L. Sell, 1990. Sunflower meal as a component of fat supplemented diets for broiler chickens. Poultry abstracts, 17: 563