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Profitability of using oleic acid in broiler diet

G.B. Das, M.E. Hossain, M.A. Hossain¹, and M. Hasanuzzaman

Department of Animal Science and Animal Nutrition, Chittagong Veterinary and Animal Sciences University, Chittagong, Bangladesh

¹Department of Dairy and Poultry Science, Chittagong Veterinary and Animal Sciences University, Chittagong, Bangladesh

Abstract

Four hundred fifty straight run day-old C & M classique broiler chicks were used in a 35 day trial to observe feed intake, efficacy and profitability in rearing broiler fed diet supplemented with oleic acid. Birds were fed three types of diet (diet containing oleic acid (T₂), diet containing refined soybean oil (T₃) and diet without oleic acid and refined soybean oil (T₁). All birds had free access to ad-libitum feeding. Results showed that, weekly average live weight gain differed significantly (P<0.05) and the mean values were 289.9, 293.4 and 273.8 g / week for T₂, T₃ and T₁ treatment groups respectively. Similarly, total feed intake differed (P<0.05) and the mean values were 2.6, 2.7 & 3.0 kg / broiler for T₂, T₃ and T₁ treatment groups, respectively. Like feed intake, feed conversion efficiency differed (P<0.05) and the mean values were 1.7, 1.8 and 2.0 for T₂, T₁ and T₁ treatment groups, respectively. Net profit of Tk / kg live weight differed (P<0.05) and the mean values were 12.4, 10.7 & 9.3 for T₂, T₃ and T₁ treatment groups, respectively. Maximum net profit was obtained from birds fed diet containing oleic (T₂) acid. It may be inferred that refined soybean oil may be replaced by oleic acid in broiler ration.

Keywords: Oleic acid, Soybean oil, Broiler, Growth, Performance, Profitability

Introduction

Oleic acid is a monounsaturated, monobasic omega-9 fatty acid derived from hydrocarbons by the equivalent oxidation of a methyl group to an alcohol, aldehyde and acid. It is one of the major components of membrane phospholipids found in various animal and vegetable sources as glycerides in most fats and oils. It occurs naturally in greater quantities than any other fatty acids. It has the formula C₁₈H₃₄O₂ (or CH₃(CH₂)₇CH=CH(CH₂)₇COOH). Its IUPAC name is octadecenoic acid and its lipid shorthand name is 18:1 cis-9. The saturated form of this acid is stearic acid. Oleic acid is pale yellow or brownish yellow oily liquid with lard-like odor, insoluble in water, soluble in ethanol. Its melting point is 13-14°C, boiling point is 360°C (760mm Hg), density is 0.895-.947 g/cm³, molecular weight is 282.5 and its manufacturing process is fat→hydrolysis→fractionation→centrifugal→separation→decoloring→drying→packaging. High concentrations of oleic acid can lower blood cholesterol levels. As a result, in poultry feed it may be used as a substitute for refined vegetable oil provided it is proved to be free of any ill effects and supports satisfactory production.

Assessing the effects of the mixtures of vegetable and animal fats, corn oil and poultry fat on the proportions of 0, 3, 6 and 9% in the elimination of broilers, Griffiths *et al.* (1977) observed that the birds fed with corn oil and poultry fat were significantly heavier than birds non-supplemented with fat. The effects of increasing inclusion levels (0, 2, 4, 6, 8 and 10%) of refined palm oil (8,000 kcal/kg ME), palm oil (8,500 kcal/kg ME), corn oil (9,000 kcal/kg ME) and poultry fat (9,000 kcal/kg ME) in diets for broiler were studied by Valencia *et al.* (1993). There were no effects of the sources of oil on weight gain and feed conversion. On the other hand, performance was proportionally better with increasing inclusion levels of the oil

sources. In the formulation of broiler diet, high level of metabolizable energy (ME) is an important factor and in most cases additional energy level is satisfied by refined soybean oil. Although metabolizable energy (ME) is very high (9500 kJ/kg) in refined soybean oil (Larber and Leclercq, 1992) but it is very expensive. Like refined soybean oil, oleic acid is also a good source of metabolizable energy. It is easily digestible, locally available, free from offensive flavor, comparatively economic and easy to mix with other feed ingredient. So, as an additional source of metabolizable energy (ME) if oleic acid is used in broiler diet it would not only minimize broiler production cost but would also play a potential role in subsidizing the price of refined soybean oil. Therefore, this research was aimed at investigating feed intake, feed efficiency and comparative profitability of rearing broiler fed diet containing oleic acid.

Materials and Methods

Four hundred fifty straight run one day old C & M classique broiler chicks were used in a 35 day trial at Chittagong Government Veterinary College farm to carry out this experiment. The experiment was conducted following completely randomized design (C.R.D). The chicks were randomly distributed in three treatment groups having three replications per treatment. Each replication had 50 birds. A bamboo house (30 x 15 x 9 cft) was constructed for rearing broiler. The house was covered with corrugated sheet. One and half feet of the sidewall from floor was made of bamboo and the remaining portion was made of wire net to facilitate proper ventilation. The floor of the house was made of bamboo splits. The house was divided by wire net into nine compartments according to design of experiment. Three rations (designated as T₂, T₃ and T₁) were formulated using the locally available ingredients where T₂ was fortified with oleic acid, T₃ with refined soybean oil and T₁ served as control group. These rations were supplied to three groups of birds randomly. The detailed composition of rations is given in Table 1. The chemical composition of oleic acid and refined soybean oil is shown in Table 2. The birds were provided with dry mash throughout the whole experimental period. The chicks were brooded in respective pens at a temperature of 35^o C -32.2^o C during 1st week, 32.2^o C -29.4^o C during the second week and 29.4^o C -26.6^o C during the third week with the help of fluorescent lamps for maintaining proper temperature during brooding. The birds were vaccinated against New castle (ND-clone) and Gumboro (D-78) disease on the 4th and 10th day followed by a booster dose on 20th and 25th day. Feed intake and mortality of chicks under different treatments and replications were recorded daily. The feed ingredients used in formulating experimental diets were analyzed to determine their proximate components as per AOAC (1980). The fatty acid was analyzed by the technique of gas chromatography (GC) that revolutionized the study of lipids by making it possible to determine the complete fatty acids composition of a lipid in a very short time. For this purpose, the fatty acid components of lipids are converted to simplest convenient volatile derivative, usually methyl esters, although other esters may be preferred for specific purpose. The data were analyzed statistically by using 'F' test (Gomez and Gomez, 1984).

Results and Discussion

The effects of feeding crude soybean oil sediment compared with refined soybean oil to broilers on feed intake, weight gain and feed conversion ratio are shown in Table 3. The Table shows that total feed intake differed ($P < 0.05$) and the mean values were 2.6, 2.7 & 3.0 kg for T₂, T₃ and T₁ treatment groups, respectively. Feed intake was maximum (3.0 kg/bird) in birds fed diet without oleic acid and refined soybean oil (T₁) and minimum (2.6 kg / bird) in birds fed diet containing oleic acid (T₂). Female broilers fed diets containing two different forms of canola oil showed better growth rate when compared to females fed diets containing

tallow and acidulated soybean oil soapstock. This observation confirmed the advantage of using vegetable oils instead of tallow and acidulated soybean oil soapstock as energy sources for birds. The better growth rates were a result from the higher percentage of long chain fatty acids and higher contents of triglycerides (Thacker *et al.*, 1994).

Table 1. Ingredient composition of the diets

Feed Ingredients	Diet containing oleic acid (T ₂)		Diet containing refined soybean oil (T ₃)		Diet without oleic acid and refined soybean oil (T ₁)	
	Starter (0-21days)	Finisher (22-35 days)	Starter (0-21days)	Finisher (22-35 days)	Starter feed (0-21days)	Finisher (22-35 days)
Maize	55.0	58.5	55.0	58.5	57.0	60.5
Rice polish	11.0	11.0	11.0	11.0	11.0	11.0
Soybean meal	23.0	20.0	23.0	20.0	23.0	20.0
Meat and bone meal	7.5	7.0	7.5	7.0	7.5	7.0
Oleic acid	2.0	2.0	-	-	-	-
Refined soybean oil	-	-	2.0	2.0	-	-
Di-calcium phosphate	1.15	1.15	1.15	1.15	1.15	1.15
Common Salt	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.1	0.1	0.1	0.1	0.1	0.1
Total	100	100	100	100	100	100

Table 2. Chemical composition of oleic acid and refined soybean oil (g/100g)

Parameter	Oleic acid	Refined soybean oil
Moisture	0.0	0.0
Crude Protein	-	-
Ether extract	21.0	100.0
Total Ash	-	-
Free fatty acid	0.5	-
Oleic acid	79.0	-
Ca	-	-
P	-	-
Toxin	-	-

Table 3. Cost of diets

Treatment group	Type of diet		
	Starter (0-2 wk.)	Finisher (3-5 wk.)	Average
Diet containing oleic acid (T ₂)	12.6 (Tk. / kg)	12.3 (Tk. / kg)	12.5
Diet containing refined soybean oil (T ₃)	13.3 (Tk. / kg)	13.1 (Tk. / kg)	13.2
Diet without oleic acid and refined soybean oil (T ₁ treated as control group)	12.4 (Tk. / kg)	12.2 (Tk. / kg)	12.3

Scaife *et al.* (1994) fed female broilers with rations containing different sources of lipids (beef tallow, soybean oil, canola oil, marine fish oil or a mixture of these oils) and observed that live weight was significantly higher when soybean oil was used. Birds fed with canola oil also showed higher intake and higher weight. Birds fed beef tallow had the poorest conversion rate.

In present study, weekly average live weight did not differ significantly ($P>0.05$). Although weekly average live weight (g / wk) did not differ significantly ($P>0.05$) irrespective of all dietary treatment levels but weekly average live weight gain differed ($P<0.05$) and the mean values were 289.9, 293.42 & 273.8 g / wk for T_2 , T_3 and T_1 treatment groups respectively. Live weight gain was maximum (293.4 g / wk) in birds fed diet with refined soybean oil (T_3) and minimum (273.4 g / wk) in birds fed diet without oleic acid & refined soybean oil (T_1). This result indicates that the effect of refined soybean oil is better than oleic acid for live weight gain in broiler.

In present study, feed conversion efficiency differed significantly ($P<0.05$). Most superior feed conversion ratio (1.73) was obtained from birds fed diet containing oleic acid (T_2) and comparatively poor feed conversion ratio (2.02) was obtained from birds fed diet without oleic acid and refined soybean oil (T_1).

The cost benefit analysis is given Table in 4. Net profit expressed in Tk/kg live weight differed ($P<0.05$) and the mean values were 12.5, 10.7 & 9.3 for T_2 , T_3 and T_1 treatment groups respectively. Maximum net profit (12.4 Tk. / kg) was obtained from birds fed diet containing oleic acid (T_2) and minimum net profit (9.31 Tk. / kg) was obtained from birds fed diet without oleic acid and refined soybean oil (T_1). The cost benefit ratios also differ significantly ($P<0.05$). The highest cost benefit ratio was found in the control (T_1) group and the lowest figure obtained in T_2 group which contributed significantly ($P<0.05$) higher profit. Mortality rate of broiler chicks in treatment T_2 , T_3 and T_1 were 3.5%, 2.5% and 5.5%, respectively. No outbreak of infectious diseases were found through out the whole experimental period.

Table 4. Broiler performance (Cost benefit analyses)

Parameter	Treatment			Level of significance
	Diet with oleic acid (T_2)	Diet with refined soybean oil (T_3)	Diet without oleic acid & refined soybean oil (T_1)	
Weekly average live weight / broiler (g)	669.3	683.1	654.6	NS
Weekly average live weight / broiler at 5 th wk (g)	1.5	1.5	1.5	NS
Weekly average live weight gain / broiler (g)	289.9 ^a	293.4 ^a	273.8 ^b	*
Total feed intake / broiler (kg)	2.6 ^a	2.7 ^b	3.1 ^c	*
FCR value	1.7 ^a	1.8 ^a	2.0 ^b	*
Feed cost / kg live wt. (Tk)	12.4 ^a	13.2 ^a	12.3 ^b	*
¹ Other cost / broiler (Tk)	27.0	27.0	27.0	NS
Total production cost / broiler (Tk)	59.3	62.8	64.5	NS
Market price / kg live weight (Tk)	52.0	52.0	52.0	NS
Total income / broiler (Tk)	78.0	79.0	78.5	NS
Net profit / kg live weight (Tk)	12.4 ^a	10.7 ^b	9.3 ^c	*
Cost Benefit Ratios	3.2 ^c	3.9 ^b	4.6 ^a	*

¹Other costs include Chick cost, vaccine cost, medicine cost, labor cost, litter cost and transport cost.

Conclusion

From the observation it may be concluded that broiler fed the diet containing oleic acid attributed higher performance supporting higher profit with better feed efficiency than that the feeds provided with the birds. Therefore, it may be inferred that refined soybean oil may be replaced by oleic acid in broiler ration for profitable broiler business. Replacement of refined soybean oil in broiler diet by oleic acid is lucrative.

References

- AOAC. 1980. Official Methods of Analysis. 13th ed. Association of Official Analytical Chemists, Washington, D.C.
- Gomez, A.K. and Gomez, A.A. 1984. Statistical Procedures for Agricultural Research. 2nd edn., John Wiley & Sons: 95-109.
- Griffiths, L., Lesson, S. and Summers, J.D. 1977. Influence of energy system and level of various fat sources on performance and carcass composition of broilers. *Poult. Sci.*, 56:1018-1026.
- Larbier, M. and Leclercq, B. 1992. Nutrition and Feeding of Poultry. In Raw Materials Employed for Poultry Production. Nottingham University Press, Loughborough, Leicestershire, pp.276
- Scaife, J.R., Moyo, J., Galbraith, H., Michie, W. and Campbell, V. 1994. Effect of different dietary supplemental fats and oils on the tissue fatty acid composition and growth of female broilers. *Br. Poult. Sci.*, 35:107-118.
- Thacker, P.A., Campbell, G.L. and Xuy. 1994. Composition and nutritive value of acidulated fatty acids, degummed canola oil and tallow as energy sources for starting broiler chicks. *Anim. Feed Technol.*, 46:251-260.
- Valencia, M.E., Watkins, S.E., Waldroup, A.L. and Waldroup, P.W. 1993. Utilization of crude and refined palm and palm kernel oils in broiler diets. *Poult. Sci.*, 72:2200-2215.