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The Effect of Sodium Betonites on Economic Value of Broiler Chickens Diet

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Abstract: This study was conducted to evaluate economic value of Sodium Bentonite (SB) originated from mines of Khorasan Province of Iran in broiler chickens diets. About 288 days old Ross strain broiler chickens were allocated to 6 experimental diets with 4 replications in a completely randomized design. Treatments were 0, 0.75, 1.5, 2.25, 3, 3.75% of sodium bentonite that used as top-dress. A basal diet was formulated according to NRC recommendations for starter (0-21 days) and grower (22-42 days) periods. The results showed that sodium bentonite had no significant effects on feed intake, feed conversion ratio, cost of 1 kg feed and cost of 1 kg meat production ($p>0.05$).

Key words: Sodium bentonite, economical value, broiler chickens, chicken diet, mortality rate, Iran

INTRODUCTION

The major problem in the most regions of the word is the availability and the cost of feed ingredients for broiler production. The escalating rates of poultry feeds and medicines, high prices of day old chicks and high mortality rate have increased the cost of inputs thus lowering the profit margins nutritive feed additives to lower the cost of production. Bentonite is a feed additive has been used successfully in poultry feeds without any harmful effect (Olver, 1998; Southern *et al*., 1994). Bentonite is a clay mineral with strong colloidal properties that absorb water rapidly those results in swelling and increase in volume. For many years, bentonite has been used as a binder in the feed industry and pharmaceutical preparations (Grosicki, 2008).

The Bentonite used in the feed, slows the passage rate of the digestive system contents and enable the animal to better utilize the feed nutrients. Bentonite is tri-layered aluminium silicate having sodium or calcium as its exchangeable cation. The sodium form is the best and hydration of the mineral results in a five-fold increase in weight.

During this change, the aluminum silicate layers become separated and water is attracted to their ionic surfaces creating a 12-15 fold increase in volume. The ingredients of Bentonite are SiO_2, 66%; Al_2O_3, 16.3%; H_2O (Crystal), 60%; Fe_2O_3, 3.3%; Na_2O, 2.6%; CaO, 1.8%; MgO, 1.5%; K_2O, 0.48%; TiO_2, 0.12% (Salari *et al*., 2006).

The objective of this study was to evaluate the effect of inclusion SB in diet on performance and the economic value of broiler chickens.

MATERIALS AND METHODS

The study involved 288 broiler chickens (1 day old, Ross) that randomly allocated to 6 experiment treatments that consisted of for replicates of 12 birds. The birds were fed a balanced commercial broiler ration *ad libitum* for a period of 6 weeks. Treatments were 0, 0.75, 1.5, 2.25, 3 and 3.75% of SB that used as top-dress for starter (0-21 days)

Table 1: Chemical composition of basal diet

Ingredient	Starter diet	Diet grower
Corn (%)	59.00	63.00
Sodium bentonite (%)	0.00	0.00
Soybean meal (%)	32.03	27.79
Fish meal (%)	3.00	2.50
Oil (%)	1.81	3.25
DCP (%)	1.50	0.90
Oyster (%)	1.50	1.55
Vit. and min. Premix (%)	0.50	0.50
Common salt (%)	0.40	0.32
DL-Methionine (%)	0.20	0.10
L-Lysine (%)	0.07	0.09
Calculated composition		
ME (Kcal kg^{-1})	2950.00	3100.00
Protein (%)	21.20	19.37
Calcium (%)	1.10	0.96
Phosphorous (%)	0.50	0.37
Lysine (%)	1.26	1.14
Met+Cys (%)	0.91	0.76

DCP = Di-calcium phosphate; ME = Metabolizable energy; Vit and Min.= Vitamin and Mineral

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and grower (22-42 days) periods. Diets were formulated according to NRC recommendations. At the end of the experiment weight gain feed consumption and Feed Conversion Ratio (FCR) were calculated.

Base of economic value was the cost of 1 kg broiler meat at the end of experiment, thus the economic evaluation was performed according to amounts of feed consumption and its cost and weight of chickens and its cost; the cost of 1 kg feed and 1 kg broiler meat at the end of experiment was calculated. Sodium Betonites originated from mines of Khorasan Province of Iran (Table 1).

All data were analyzed using the GLM procedure of SAS. Significant differences among treatments were identified by Duncan multiple range tests.

RESULTS AND DISCUSSION

The effects of addition of sodium bentonite on economic value of broiler chickens are shown in Table 2. The cost of kg feed and meat had no significant difference between diets in starter, grower and whole period of experiment. During in starter (0-21 day), grower (21-42 day) phase and whole period (0-42 day) of experimental diets had no significant effect on Feed Intake (FI) and Feed Conversion Ratio (FCR) ($p>0.05$). The lowest FCR (2.21 vs. 2.27, diet 6 and control, respectively) at the grower phase was belonged to diet 6 (3.75% SB) ($p>0.05$). The chipset meat was for diets 6 (6953 Rial kg^{-1} meat productions). At the grower phase diet 6 (3.75% SB) had the lowest FI (2674.87 vs. 2773.96, diet 6 and control, respectively) ($p>0.05$).

The results of feed consumption are in contrast with the findings of Van Ke (1976), Blair *et al*. (1986), Hebert *et al*. (1986) and Pasha *et al*. (2008) who used different levels of Bentonite to the diet of broilers and reported higher feed consumption in chicks. The depressing trend in the feed consumption at higher levels of SB was in agreement with the results of Sellers *et al*. (1980).

The results of Tauqir and Nawaz showed that supplementation 1% (low level) SB improved weight gain and feed consumption and efficiency. Although there was no significant effect on these factors at 2, 3 and 4% SB (high levels) and with an increase in SB, weight gain and feed intake decreased.

The better results by addition of SB at low levels may be due to the decreased flow rate of digesta and ultimately greater absorption of nutrients. The adverse or nugatory effects of SB on feed intake and performance at high levels may be referred to the nature of the SB which absorbs more water and decrease the digesta flow rate (Quisenberry, 1967).

During present experiment experimental diets had no significant effect on FCR ($p>0.05$). In literatures lack effect of SB on FCR has been reported (Sellers *et al*., 1980; Esmeralda and Ginzales, 1991; Southern *et al*., 1994) where weight gain in chickens given low energy diets was not affected by Bentonite this was attributed to the interaction of SB with low energy. In contrast, increased FCR in birds fed on rations supplemented with SB has been reported (Almquist *et al*., 1967; Van Ke, 1976).

In agreement with Tauqir and Nawaz SB had no significant effects on cost of feed and meat production.

Table 2: Economic evaluation: the Effects of date pits as feed ingredient of broiler chickens on cost of feed and meat

	Diet (% DP kg^{-1} DM of diets)						
Parameters	1 (control)	2 (0.75% SB)	3 (1.5% SB)	4 (2.25% SB)	5 (3% SB)	6 (3.75% SB)	SEM*
Starter							
C_f (Rial[1])	3752.00	3761.00	3770.00	3779.00	3788.00	3797.00	3.2000
FI (g)	882.80	937.00	911.36	730.49	904.74	851.90	26.9800
FCR	1.52	1.54	1.53	1.55	1.56	1.53	0.0083
C_m (Rial)	5712.90	5811.20	5768.60	5886.30	5919.20	5838.40	32.6800
Grower							
C_f (Rial)	3564.00	3573.00	3582.00	3591.00	3600.00	3609.00	3.2000
FI (g)	2773.96^{ab}	2828.12^{ab}	2750.11^{ab}	2874.31^{a}	2801.34^{ab}	2674.87^{b}	24.2500
FCR	2.27	2.35	2.29	2.23	2.28	2.21	0.0190
C_m (Rial)	8091.10	8424.20	8203.60	8035.70	8208.80	8003.80	67.8400
Total							
C_f(Rial)	3658.00	3667.00	3676.00	3685.00	3694.00	3703.00	3.2000
FI (g)	3656.00	3765.00	3661.00	3604.00	3706.00	3526.00	40.5800
FCR	1.89	1.95	1.91	1.89	1.92	1.87	0.0110
C_m (Rial)	6937.10	7155.90	7021.80	6992.90	7097.70	6953.00	42.0300

DP = Date Pits; 1$ = 10052 Rial; FI = Feed Intake; FCR = Feed Conversion Ratio; C_f = The cost of 1kg feed; C_m = The cost of 1kg meat production; SEM = Standard Error of Means

CONCLUSION

The use of SB in broiler diets hah no significant effect on their performance and economic value and had no adverse effects on them. As SB in a general binder and has beneficial effects on decrease adverse and infectious microorganisms like *E. coli*, salmonella and so on they may pollute the bed egg and carcass of the birds which are dangerous for human health. Therefore although SB was not useful for performance and economical purpose but may be proper from this aspect that need more future study.

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