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A Comparative Effect of Mash and Pellet Feed with Different Pelleting Temperature on Blood Metabolites, Carcass Characteristics and Broiler Performance

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ABSTRACT

This study was conducted to evaluate the effects of feeding mash versus pellet with different thermal process on blood metabolites, carcass characteristics and broiler performance. 192 (one-day) Cobb broiler chicks were used in a completely randomized design with 4 experimental groups (diets) and 4 replicates of ten chicks each (totally 16 pens). The experimental treatment groups consisted of mash diet (control) and three experimental diets pelleted with temperatures of 72, 82 and 92 ◦C. Results indicated that effects of different temperatures of thermal process had a significant effect on feed intake in 1-42 days period ($P<0.05$). The process effect was significant on body weight gain between treatment groups only in starter period ($P<0.05$). Thermal processes of diets improved feed conversion in starter period ($P<0.05$). In total period, the process of 82 ◦C improved feed conversion in broiler chickens. Percentages of carcass traits including breast, thigh, gizzard and stomach, liver and gallbladder, intestines, heart and digestive system weren't different among experimental groups ($P>0.05$). Effect of the process on serum glucose, cholesterol, HDL, LDL and enzyme concentrations of aspartate aminotransferase (AST) and alanine aminotransferase (ALT) wasn't significant at 49 days ($P>0.05$).

Key words: Thermal process**,** Pellet**,** Performance, Broiler

Introduction

The benefits of feeding pellets have been widely cited throughout past and current literature, leading to the continued utilization of such diets over mash. Pellets have been shown to improve feed conversion by reduced ingredient segregation, increased palatability and decreased energy used during feed consumption (Briggs et al., 1999). High quality pellets are associated with more reliable flow into storage soils, increased bulk density and decreased spillage (Aarseth, 2004). An essential part of the thermo mechanical process is the addition of moist heat (steam) to mash feed through a process known as conditioning. Moritz et al (2002) reported that moisture addition increases pellet mill production rate, pellet quality and also improves broiler performance (Moritz et al., 2002). Pelleting temperature has effects on feed throughput and possibly pellets quality. Bedford et al. (2002) claimed broiler weight gain and feed: gain was deteriorated significantly with increasing temperature (Bedford et al., 2002).

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The present study was conducted to determine the effects of mash and pelleting (at different temperatures) on blood metabolites, carcass traits and broiler performance.

Materials and Methods

One hundred and ninety two day-old mixed sexed broiler chicks (Cobb 500) were used in a completely randomize design with 4 treatments and 4 replicates. Experimental treatments included: Mash form and three experimental diets pelleted with temperature of 72°C, 82°C and 92°C, respectively. Blood metabolites and carcass characteristics were measured in 49 day of age. Chicken body weight and feed intake were recorded each week to calculate weight gain and feed conversion. Table 1 shows the composition of the experimental diets. All the diets were made up with essential ingredients such that they supplied the required nutrients of the birds recommended by NRC (1994).

Results and Discussion

The effect of different diet form and temperature on broiler performance was showed in Table 2. Results indicated that effects of thermal process in 72°C had a significant increase feed intake in comparison to 82°C in 1-49 day of age ($P<0.05$). Body weight gain and feed conversion ratio (FCR) of broiler were significantly improved in broilers which were fed with pellet (in all temperature process) in comparison to mash form in starter period ($P<0.05$). In total period, the process of 82 °C significantly improved FCR in broiler chickens, too. One of the main reasons of the improvement of broiler body weight gain in pellet group is that the enzyme system of broiler in early stage of rearing is incomplete and pellet feeding may help to break-down *disulfide-bonds* and increase digestion process. The process of 82 °C pelleting may destruct diet pathogens and cause improvement of FCR (Allred et al., 1957). The effect of different diet form and temperature on broiler carcass characterized was showed in Table 3. Experimental treatments had no significant effect on carcass, breast, thigh, liver, gizzard, heart and intestine percent weight ($P>0.05$). These findings agree (except in gizzard weight) with the results of a study conducted by Ahmed et al. (2013). The effect of different diet form and temperature on blood metabolites was showed in Table 4. Effect of the feed form and different pellet process had no significant effect on serum glucose, cholesterol, HDL, LDL and enzyme concentrations of aspartate aminotransferase (AST) and alanine aminotransferase (ALT) at 49 days ($P>0.05$).

Table 1: Composition of experimental diets of broiler chickens.

Ingredients (%)	Starter (1-14 days)	Grower (15-28 days)	Finisher (29-42)
Corn	48.17	47.12	42.07
Wheat	5	9.6	19
Soybean Meal	34.9	29.6	25.2
Wheat Starch	5	6	6
Soybean Oil	1.7	2.5	2.8
Pellet Binder	0.6	0.6	0.6
Dicalcium Phosphate	1.85	1.85	1.63
$CaCO_3$	1.24	1.21	1.15
Vit. Mi. Premix	0.6	0.6	0.6
Salt	0.3	0.3	0.25
$NaHCO_3$	0.2	0.21	0.16
Lys	0.11	0.16	0.2
Met	0.23	0.15	0.24
Multi Enzyme	0.05	0.05	0.05
Coccidiostat	0.05	0.05	0.05
Total	100	100	100
Chemical Composition			

ME (Kcal/Kg)	2900	3000	3050
CP (%)	20.38	18.5	17.3
Ca (%)	0.98	0.89	0.86
Available P (%)	0.49	0.48	0.43

1Vitamin premix provides the following (per kg of diet): vitamin A, 5,500 IU; vitamin D3 1,100 IU; vitamin E, 10 IU; riboflavin, 4.4 mg; vitamin B12, 12 mg; nicotinic acid, 44 mg; menadione, 1.1 mg; biotin, 0.11 mg; thiamine, 2.2 mg; and ethoxyquin, 125 mg.

Table 2: Growth performance in broiler chickens fed the experimental diets

Parameters	T1	T2	T3	T4
Body weight gain g/day/bird				
Days 1-14	223±7.2^{b}	277±6.2^{a}	280±7.2^{a}	273±6.2^{a}
Days 15-28	573±27.0	598±23.3	553±27.0	572±23.3
Days 29-42	996±42.9	977±37.1	1144±42/9	1058±37.1
Days 1-42	1782±38.9	1852±33.7	1933±38.9	1888±33.7
Feed intake, g/day/bird				
Days 1-14	431±2.7	420±2.4	422±2.7	424±2.4
Days 15-28	1110±10.8	1111±9.4	1080±10.8	1106±9.4
Days 29-42	1944±38.5	2065±33.3	2012±38.5	2065±33.3
Days 1-42	3463±41.9^{ab}	3596±36.2^{a}	3430±41.9^{b}	3561±36.2^{ab}
FCR, Feed intake/weight gain				
Days 1-14	1.93±0.05^{a}	1.52±0.04^{b}	1.51±0.05^{b}	1.55±0.04^{b}
Days 15-28	1.94±0.09	1.86±0.08	1.97±0.09	1.96±0.08
Days 29-42	1.95±09	1/95±0.09	2.12±0.07	1.98±0.07
Days 1-42	1.94±0.04^{a}	1.94±0.03^{a}	1.77±0.04^{b}	1.89±0.03^{ab}

T1: Mash diet, T2: Pellet in 72 ˚C, T3: Pellet in 82 ˚C, T4: Pellet in 92 ˚C

Means in each column followed by the same letters are not significantly different at 0.05.

X±SEM

Table 3: Carcass characterized in broiler chickens fed the experimental diets

Parameters	T1	T2	T3	T4
Carcass yield	60.6±1.1	59.1±0.9	60.1±1.1	59.4±0.9
Brest	34.0±0.3	32.9±1.2	33.6±1.3	30.8±1.2
Tight	34.2±0.9	33.5±0.7	35.1±0.9	35.7±1.2
Liver	2.46±0.2	2.51±0.1	2.38±1.2	2.30±0.1
Gizzard	2.29±0.1	1.98±0.1	2.1±0.1	1.75±0.1
Heart	0.59±0.04	0.65±0.03	0.67±0.04	0.65±0.03

T1: Mash diet, T2: Pellet in 72 ˚C, T3: Pellet in 82 ˚C, T4: Pellet in 92 ˚C

Means in each column followed by the same letters are not significantly different at 0.05.

X±SEM

Table 4: Blood parameters in broiler chickens fed the experimental diets

Parameters	T1	T2	T3	T4
Glucose (mg/dl)	256±8.6	272±7.4	268±10.57	269±7.764
Cholesterol (mg/dl)	125±4.3	139±4.8	129±3.1	135±5.2
Triglyceride (mg/dl)	54.3±8.0	82.6±11.0	60.1±9.3	70.0±9.9
HDL (mg/dl)	67.2±3.3	71.3±4.1	66.0±3.9	68.3±3.9
LDL (mg/dl)	47.5±4.7	51.4±4.5	51.3±3.50	50.7±5.91
AST (IU/L)	285±11.60	322±22.12	276±8.817	305±24.55
ALT(IU/L)	22.4±1.856	22.3±1.93	16.0±1.91	35.0±13.8

T1: Mash diet, T2: Pellet in 72 ˚C, T3: Pellet in 82 ˚C, T4: Pellet in 92 ˚C

Means in each column followed by the same letters are not significantly different at 0.05.

X±SEM

Conclusion

It seems fed form (mash and pellet) and different temperature process couldn't effect on blood metabolites and change there is most depend on diet composition. The process of 82 ˚C in pelleting diet improved feed conversion; therefore, it seems that, this temperature could be suggested as appropriate temperature in pelleting process of broiler's diets.

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