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Effect of Mash and Pellet Diets with Different Levels of Protein and Energy on Broiler Performance in Finisher Period

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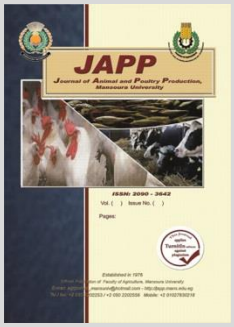

ABSTRACT

This study was investigating to examine the effect of mash and pellet diets with normal and low protein and energy levels on broilers performance in finisher period. four hundred eighty unsexed broiler chicks fed two type of (mash and pellet) diet, two protein levels (21% and 19% CP), and two energy levels (3200 and 3000 Kcal/Kg ME) in period 24 to 42 days of age. The weight gain, feed intake, feed per gain, and mortality were examined during the experimental periods (24 -42 d). after sloughed traits were measured at the end of the study (42 days) including gizzard percentage, dressing percentage, abdominal fat percentage and small intestine and their parts percentage. There were significant ($P \leq 0.05$) interactions for all parameters were examined except feed per gain, the pellet diets significantly ($P \leq 0.05$) improve feed intake, body weight, weight gain and dressing percentage on the other hand pellet diet significantly ($P \leq 0.05$), increase mortality, mash diet influence significantly ($P \leq 0.05$) weight of gizzard and small intestine and their parts. The normal protein levels significantly ($P \leq 0.05$) increased weight gain, body weight and feed intake, the energy levels did not affect statistically of all parameter.

Keywords: Mash, Pellet Diets, Protein, Broiler Performance

INTRODUCTION

Nowadays broilers manufactures, all attempts are concentrate on decrease the cost of production together with fast growth rate. The increase of feed intake was necessary for fast growth rate. Moreover, Behnke and Beyer, (2002) reported that the cost of broiler production determined by the feed consumption it was estimate about 70% of the total broiler production cost, the most important factor that could measure about to feed types (pellet, crumble, and mash) that the growth rate influenced by one of them (Jafarnejad *et al*., 2010). Generally, the diets are used in poultry farms there are three forms, crumble, pellet and Mash. Mash is ingredients similarly grinded and mixed. Mash diet have low mortality rate beside this advantage have low growth rate and also greater economical However, pellet diet is more palatable compared to mash diet and high nutritive value (Jahan *et al*., 2006).

In pellet form of diet, the birds cannot separate out of the ingredients, each small quantity of feed have same ingredients in a good balanced diet supplies. In meat production of broiler, the physical form of diets (mash and pellet) are a significant factor that effect of performance. An adjustment of the mash diet pellet system of feeding is a good alternative. It consists of useing steam condition with mechanically pressing in a small hole of mash into hard pellets or cereal. Nir *et al*., (1995) generally accepted that, an increased feed intake of the feeding pellet compared to mash, improves broiler growth rate. Also if pellets compared to mash have many benefits such as improve of feed per gain, growth performance and feed intake of broiler (Chewning, 2010; Amerah *et al*., 2008 and Nir *et al*., 1995). may be due to digestibility increasing, decreased segregation of ingredient and energy during pretension are reduction, however Behnke., (1996) reported that feeding pelleted diets is not only enough to influence growth performance of broiler also feed quality have a major factor to enhance performance. The aim of current study was to examine the effect of mash and pellet diets with normal and low protein and energy levels and interaction between them on broiler performance in finisher period.

MATERIALS AND METHODS

A total of 480 of twenty-four days old broiler chicks (Ross 308), were used the experiment designed of 2 × 2 ×2 factorial to estimate two feed types pellet and mash, two protein and energy levels in the period of 1 of October to 18 of September-2016. The chicks were brought up to Poultry farm consisting of several separated rooms with an area of (2) m^2 Chicks were distributed randomly into 32 groups 15 chicks in each pen. The chick's groups were assigned to eight treatments each have four replicates. The measurements of temperature and humidity of the farm were taken at the height of 30-40cm from the ground by special electronic tools of measuring temperature and humidity. Environmental conditions during the rearing period were provided with brooders and adequate ventilation, also light schedule as 24 hours per day of bulb lighting. The cages floors were covered by 5 cm deep dry litter. Chicks were feed with plastic chick tray feeder and plastic handing watering one day to ten days after that plastic hanging poultry feeder and automatic chicken watering system were used. Feed and water was available 24 hours per days.

Data analysis

SAS (2004) were use to analyze data (factorial-completely randomized experimental design). Moreover,

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Duncan's Multiple Range Test was use for the significance of difference between treatments means (Steel and Torrie, 1980).

Experimental diets

The feed ingredients (table 1) used for the formulation of experimental diets. The basic chemical composition of the feedstuffs analyzed by the methods described by AOAC (2002).

Table 1. show experimental diets formulation:

Ingredients	24-42 days			
	21CP**& 3200ME***	21CP& 3000ME	19CP& 3200ME	19CP& 3000ME
Protein concentrate*	5	5	5	5
Soy	29	28	24	22
Wheat	30	30	30	30
Wheat bran	0	6	0	7.5
Sunflower oil	4	2.5	3	2
Corn	30.3	26.8	36.3	31.8
Limestone	1	1	1	1
di-calcium phosphate	0.5	0.5	0.5	0.5
Salt	0.2	0.2	0.2	0.2
Nutritional composition				
Crude protein	21.00	21.00	19.00	19.00
Metabolisable energy kcal/kg	3190	3020	3200	3010
L-Lysine %	1.25	1.25	1.25	1.25
Methionine %	0.55	0.55	0.55	0.55
Calcium %	0.90	0.90	0.90	0.90
Av. phosphorus %	0.40	0.40	0.40	0.40
Methionine+cystine (%)	0.95	0.95	0.95	0.95

*** Holland (WAFI) Protein concentrate 5%: 2100 Kcal ME / Kg 40 % crude protein, % crude fiber, 5% crude fat, 2, 6.5% calcium, %3.85 lysine, 3.70 % methionine, 4% cysteine and 2.50% phosphorus. **crude protein. *** Metabolisable energy.**

Experimental design

Table 2. the experimental design in finisher period.

Treatments	Finisher period 24-42 days		
	Protein levels %	Energy levels/ Kcal/kg	Feed form
T1	21	3200	Pellet
T2	21	3000	Pellet
T3	19	3200	Pellet
T4	19	3000	Pellet
T5	21	3200	Mash
T6	21	3000	Mash
T7	19	3200	Mash
T8	19	3000	Mash

RESULTS AND DISCUSSION

Table (3) shows the effects of feed forms with normal and low levels of protein and energy and their interaction on FI, BW, WG and FCR, the interactions between them had significant ($p \geq 0.05$) were improve feed intake body Wight, weight gain generally in pellet treatments in the same time any interaction not significant ($p<0.05$) effect on FCR. The effect of main effects, pellet diet, had significantly ($P \geq 0.05$) influenced feed intake, body Wight and weight gain, on the other hand, improve FCR but not statistically. Normal protein level influence feeds intake body Wight and weight gain significantly ($P \geq 0.05$) but hasn't effect on FCR. Energy levels not significant($p<0.05$) different on any traits of study.

While the result in the current study agreed with (Munt *et al.* ,1995 and Preston *et al*., 2000) there were shown that the performance of bird fed on mash diet poor if compared to pellet diet. Also Kim and Chung (1994) shows that birds fed on the pellet diet had heavier bodyweight at the finisher period than bird fed on mash. The present study also supported by Choi *et al.*,1986 and Sinha *et al.*, (1994) was shown that the chicks fed on pellet diet increase more bodyweight also significant ($P \geq 0.05$) improve weight gain compared to those was fed on mash diet. Also Allred *et al.*,1996 and Asha R. *et al*., (1998).

Whose reported was more growth rate recorded in broiler chicks when fed on pellet diet than other fed on mash diet form, increase body weight or growth rate may refer to one or more of this reason (Behnke,K.C., 1994) feed wastage reduction, limited feed choosing, decreased ingredient separation, pathogenic organisms are demolition, thermal degradation of protein and starch, increase palatability. Increase feed intake is one of the main factors to success poultry production noticeable advantage of pellet diet if one pellet grain compared to mash diet about three times more. Yo. *et al*., (1997) was reported that feeding pellet two times shorter than mash feeding. Means, chickens fed pellet a significantly quickly eating amount feed consume per minutes than when compared to eating mash diet, also has been established by Choi *et al*., (1986) which reported that feeding pellet increase feed intake compared to mash, which improved the broiler growth rate. Also feeding pellet improved feed conversion ratios by about seven percent and feed intake about sixteen percent Petterson *et al.*, (1991). Similar results were obtaining by Bolton and Blair (1977) which reported that ten percent greater feed intake by using pellet fed pellet diet. Also, similar results were received by Asha Rajini *et al.*, (1998) were founded that the pellet diet had a greater feed efficiency over the mash diet. More over Howlider and Rose (1992) found that pelleting improve feed per gain about 6%. In the current study, data shows feed forms not influence feed per gain this result may refer to use cold water in condition process instead of use steam condition to agglomeration pellet because if use heat steam increase starch digestion thus increase the feed per gain (Behnke,K.C., 1994).The result in current study also observed that birds fed normal CP diets more weights as compared to with other low CP diets The findings of this study were in close agreement with Leeson *et al*., (1996) who found that depressed the growth of broilers if use low protein diets, they also reported significant difference in body weight gains normal CP compared to low CP. Finally, the normal or low levels of energy not influence and performance parameter in current study Leeson *et al*., (1991) agree with the result of current study was reported that different energy levels in the diets not influence growth rate and body weight gain.

Table (4) demonstrates the effects of feed forms with normal and low levels of protein and energy and their interaction on dressing percentage, gizzard percentage, abdominal fat percentage, and mortality rate of broiler chicken. The interaction between feed form, energy and protein had significant ($p<0.05$) different in gizzard

percentage, dressing percentage, abdominal fat percentage and mortality rate. The effect of main effect for pellet diet recorded significant (P<0.05) increase dressing percentage and mortality rate (71.45 and 8.22) compared to (68.85 and 0.00) in mash diet respectively on the other hand mash diets significant (P<0.05) increase gizzard percentage (1.46) compared to pellet diet (1.06). Feed form did not effect on abdominal fat. Second main effect was protein levels, normal protein levels significant (P<0.05) increase dressing percentage and mortality (71.47 and 5.38) compared to low protein level (68.83 and 2.84) respectively however low protein levels significant (P<0.05) increase abdominal fat percentage (1.06) compared to (0.75) in normal protein levels also different protein levels did not affect on gizzard percentage. The final main effect of its energy levels shows all data energy levels had different between them but not statistically influenced. All data were obtained in the current study do not have any contrary with most of the researcher who worked in this field, Shafiee *et al*., (2006) obtained same result who found that the abdominal fat was significant (P<0.05) heavier in broiler fed pellet diets than in the broilers fed mash diets. Feeding a mash diet in the finisher period also increases the weights of the gizzard and digestive tract compared to a pelleted diet. These results in my study demonstrated that birds do not completely develop their digestive tract when offered wholly processed feeds. Munt *et al*., (1995) and Engberg *et al*., (2002) also reported that in broilers consume mash diets the gizzard weight was greater than birds consume pellet diet. many studies have reported that coarsely grinding diets make greater gizzard development in birds (Hetland and Svihus, 2001 and Engberg *et al*., 2002). A mash diet, in particular, one that is coarsely ground according to the birdlife stage for example in starter period feed particles are fine after that medium then coarsely grinded, large particle tends to remain longer in the gizzard, thus the mechanically stimulate of this organ is increasing (Hetland and Svihus, 2001 and Engberg *et al*., 2002). It has been suggested that pellet diets have fine particle size so that they do not require grinding in the gizzard so that its function of the gizzard as transit organ. Yo, *et al.* (1997) was reported that the pellet diet two times shorter than mash diet (amount of feed consume per minute). The increase rest mean low energy use for activity, which can be used for production. In broiler bird the fact that one pellet piece equal about three time more of mash fed therefor for consume same amount of mash spend more energy for eating, more rest for eating pellet will allow them to transfer more energy for growth. The disadvantage of the increased rest is that birds consume pellets are fat deposition more than birds consume a mash diet. Nowadays there has been more concern about eating meat have excess fat deposition in broilers.

Table 3. shows the effects of feed forms, protein and energy levels on feed intake, weight gain, body weight and FCR of broiler chicken during the finisher period (24 to 42 of age).

Treatment	Protein %	Energy levels / Kcal/kg	Feed form	Finisher			
				feed intake (g-bird)	Weight gain (g-bird)	Body weight (g-bird)	FCR(g-g)
T1	21	3200	Pellet	2788.48±62.25abc	1827.95±40.42ab	2920.00±52.28a	1.528±0.051a
T2	21	3000	Pellet	2876.93±32.72a	1940.00±40.19a	2940.00±29.44a	1.484±0.029a
T3	19	3200	Pellet	2681.35±112.25ab	1814.09±63.59ab	2830.00±86.99ab	1.477±0.019a
T4	19	3000	Pellet	2802.72±66.54ab	1875.90±45.50ab	2860.00±47.61ab	1.496±0.048a
T5	21	3200	Mash	2638.29±89.35c	1746.13±16.85b	2770.00±23.81bc	1.511±0.045a
T6	21	3000	Mash	2644.43±63.26c	1694.77±38.33cd	2640.00±56.57d	1.561±0.023a
T7	19	3200	Mash	2615.45±28.83c	1664.09±98.67d	2655.00±100.13cd	1.586±0.081a
T8	19	3000	Mash	2656.13±35.30bc	1672.72±20.66d	2600.00±0.00d	1.589±0.031a
Main effect							
pellet diameter:							
Pellet				2746.27±45.24a	1832.05±20.11a	2865.00±60.22a	1.50±0.03a
Mash				2679.69±40.16a	1726.87±35.23b	2688.75±32.11b	1.56±0.04a
Protein levels:							
21%				2778.15±35.40a	1832.66±46.65a	2840.00±40.21a	1.52±0.05a
19%				2647.81±50.30b	1724.26±52.22b	2713.75±58.44b	1.54±0.04a
Energy levels:							
3200				2722.00±20.22a	1795.51±61.11a	2737.50±45.66a	1.54±0.06a
3000				2703.95±32.43a	1763.41±50.30a	2816.25±56.32a	1.52±0.05a
P value							
Feed form				0.035	0.014	0.0003	NS
Protein levels				0.011	0.010	0.006	NS
Energy levels				NS	NS	NS	NS

(Mean ± SEM) a, b, c, d Means; the same letters in one column are significantly differ at (p<0.05); NS, not significantly; SEM, Standard error of mean.

It is unfavorable for both consumers and producers consequently the consumption of excess fat has been involved in a number of health problems. In the current study, the percentage of abdominal fat was not statistically increased in the pellet diets group (0.95 %) in comparison to that in the mash group (0.85%). However, Naderinejad *et al.* (2016) and Sarvestani *et al.* (2006) indicated that increasing abdominal fat percentage in birds fed pellet diets was due to the increasing available energy for broilers. In birds especially in broiler the extra energy in diet is deposited as abdominal fat (Lopez and Leeson 2008). High mortality in current study it may cause by high

metabolizable energy in diets as a results show that broilers fed pellet don't require same energy compared to fed mash, thus more metabolizable energy in diet have revers effect on normal body physiology and health or may pellet feed decrease intestine PH, then infected by E. coli infection after causes ascites for thus, Julian, R. J., and M. Goryo.,(1990) reported that incidence of ascites syndrome in broilers fed pellet diet increased mortality rate, therefore, some type of ascites makes by E. coli observed that infection plays an important role in the production of ascites in the field that use pellet fed. In conclusion, it is clear that broiler feeding pellets in the finisher period improves feed intake, weight gain and body weight on the other hand, increase mortality. Also, the mash diet improves the gizzard percentage. Use normal levels of the protein content of the diet influence most of the chicken's performance, the energy levels not effect of ant traits were tested.

Table 4. Show the effect of feed form, energy and protein and their interaction on dressing percentage, gizzard, abdominal fat and mortality of broiler chicken at day 42 of age.

treatment	Gizzard%	abdominal fat%	dressing percentage	Mortality%
T1	1.11±0.08cd	0.91±0.16b	71.64±0.73ab	12.42±2.16a
T2	1.10±0.104cd	0.99±0.17a	74.32±0.31a	9.09±0.00ab
T3	1.02±0.168cd	0.97±0.19a	72.81±1.05ab	6.82±2.27bc
T4	0.91±0.15d	1.13±0.19a	71.04±0.64bc	4.54±2.62cd
T5	1.31±0.12abc	0.63±0.034c	70.76±0.68bc	0.00±0.00d
T6	1.51±0.04ab	0.66±0.15c	69.14±0.41bcd	0.00±0.00d
T7	1.56±0.10a	0.89±0.07bc	68.61±0.71cd	0.00±0.00d
T8	1.49±0.15ab	0.70±0.14c	66.87±2.07d	0.00±0.00d
main effect				
pellet diameter:				
pellet	1.06±0.15b	0.95±0.19a	71.45±0.71a	8.22±2.00a
mash	1.46±0.11a	0.85±0.16a	68.85±0.80b	0.00±0.00b
protein levels:				
normal levels	1.28±0.12a	0.75±0.14b	71.47±0.75a	5.38±1.58a
low levels	1.25±0.17a	1.06±0.12a	68.83±0.72b	2.84±2.25b
energy levels:				
normal levels	1.28±0.08a	1.00±0.15a	70.34±0.74a	4.81±1.50a
low levels	1.25±0.10a	0.80±0.10a	69.95±0.66a	3.41±2.60a
p value				
feed form	0.0001	NS	0.002	0.0001
protein levels	NS	0.005	0.002	0.023
energy levels	NS	NS	NS	NS

(Mean ± SEM) a, b, c, d Means; the same letters in one column are significantly differ at (p<0.05); NS, not significantly; SEM, Standard error of mean.

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تاثير استخدام علف الاقراص و العلف المجروش مع مستويات مختلفة من الطاقة و البروتين على الاداء الانتاجي لفروج اللحم في الفترة الناهية

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اجرية هذة التجربة لدراسة تاثير نوعين من العلف(أقراص و مجروش) مع استخدام مستوى مختلف من البروتين و الطاقة لاداء الانتاجي فروج اللحم في فترة الناهي. يربى 480 افراخ لحم غير مجنس باستخدام نوعين من العلف (علف مجروش و علف الاقراص) و مستويين من الطاقة (3000 و 3200 ك.ك/كغم)طاقة ممثلة و كذلك مستوسين من البروتين (21و 19%) ,من المدة 24 الى 42 يوم من العمر. تم اخذ قياسات زيادة وزنية ، استهلاك العلف ، كفاءة تحويل العلف كذلك نسبة الهلاكات كانت خلال التجربة (24-42 يوم)، وكانت قياسات الذبيحة ،تم تسجيلها في نهاية التجربة (42 يومًا) بما في ذلك وزن القانصة ، ونسبة التصافي ، والدهون البطن ، ووزن الأمعاء الدقيقة وأجزائها. كانت هناك تداخلات ملحوضة لجميع المعاملات التي تم اختبارها باستثناء كفاءةتحويل العلف ، وتم تحسين علف الاقراص استهلاك العلف ووزن الجسم وزيادة الوزن ونسبة التصافي بشكل معنوي (P> 0.05)من ناحية أخرى ، زاد معدل الهلاكات بشكل معنوي (P> 0.05)، يؤثر علف المجروش بشكل ملحوض (P> 0.05على وزن القانصة والأمعاء الدقيقة وأجزائها. مستويات البروتين المرتفعة بشكل معنوي (P> 0.05) زادت من وزن الجسم وزيادة الوزن و استهلاك العلف.