THE EFFECT OF TYPE OF FEED AND SLAUGHTER AGE ON THE PERFORMANCES AND CARCASS CHARACTERISTIC OF MALE ARAB CHICKEN

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ABSTRACT

An experiment was conducted to evaluate the effect of type of feed and slaughter age on the performances and carcass characteristics of male Arab chicken. Thirty six male Arab chicken of seven weeks old were divided into two groups, each group consisted of three cages with six chicken in each group. Two types of ration consisted of Ration One (Par-S + corn) containing 2904 kcal ME and 17 % CP, and Ration Two (BR II) containing 3100 kcal ME and 19% CP. The chicken were raised for seven weeks, weekly weighed, and randomly taken for slaughter at 12 and 14 week old. The data collected were performances and carcass characteristics of the chicken. The data were analyzed using analysis of variance of completely randomised design. The results showed that the chicken fed BR II consumed more protein and energy (483.7 g CP and 7868.8 kcal ME) compared to the chicken fed BR I (444.0 g CP and 7586.1 kcal ME). Besides, the chicken fed BR II produced heavier final body weight (1142.5 g) than the chicken fed with BR I (1048.6 g) ($P < 0,05$). Type of ration affected the tenderness of chicken. Slaughter age influenced carcass weight and carcass physical composition of the chicken ($P<0.05$). Slaughter age affected the physical characteristic of meat. It could be concluded that male Arab chicken fed ration containing higher CP and ME (higher feed density) consumed more protein and energy, and finally had heavier final body weight. Slaughter age influenced carcass weight, carcass physical composition and meat characteristics of the male Arab chicken.

INTRODUCTION

Trend toward the use of organic poultry production increases since conventional farming may develop health and welfare problems, the most recurrent of which are leg disorders and lameness of the broiler chicken (Castellini, 2008). Native chickens posses many advantages compared to broiler chickens such as better taste, relatively free of antibiotics and preservative, and higher adaptable to the environment. Alders and Pym (2009) stated that village poultry (local poultry) played a vital role in many poor rural households in developing countries. They were small, reproduce easily, did not need large investment and scavenge for food, they thrived on kitchen waste, broken grains, earthworms, snails, insects and vegetation. Besides, they possed little fat, pleasant flavour, preferred texture in term of meat quality. Therefore, it can be an alternative choice of broiler chickens. Native chicken has widely been raised by people to produce eggs and meat. Female native chicken produces only around 50 eggs per year. Male native chicken grows slowly and yields less meat. The cockerels of Arab chicken will often be crowing at six weeks of age. Males reach a weight of 4.5 ponds and females reach 3.5 ponds (Anonymus, 2009). Broiler chicken can be harvested at 35 five day old with body weight of approximately 2,0 kg. Arab chicken produced more eggs (± 300 eggs per year) than local chicken (Anonymous, 2002). The male Arab chicken can be raised separately to produce meat.

The success of poultry production throughout the world largely comes from the high feed efficiency of poultry compared to many other animal productions. Such efficiency is essentially due to the high feed

intake of poultry relative to their body weight. Furthermore, the potential for good feed efficiency also reinforce through continuous improvement in genetic selection (Carre *et al.*, 2008). Growth rate of chicken is differed between species and it reaches maximum at 40 days old (Hunton, 1995). Zulkifli *et al*. (2000) reported that weight gains of broiler chickens fed commercial feed (22% CP) from 1st week to 6th week were respectively as follows: 125, 202, 345,451, 385 and 299 g/bird/week.

Age at slaughtering, genetic strains (fast- and slow-growing), physical activity, and pasture intake are key factors in determining meat quality (Castellini, 2008). Different energy content of ration influenced the physical characteristics of meat such as pH, color and texture. Solomon and Lynch (1998) reported that meat of animal received high concentrate ration had pH value lower than the low concentrate ration. Farmers often feed their native chicken using any kind of feed available and by trial and error in feeding management Besides that, they often sell and or slaughter their chicken at old ages, consequently result in the low quality of meat.

Male Arab chicken is potential source of meat derived from poultry. The Arab chicken or Fayoumis fairly small active chickens that have been raised along the Nile River since times Before Crist/ BC. They are very fast maturing and pullets may start laying a small tinted (off-white) egg by 4 months of age (Anonymous, 2009).

The studies on their performances and carcass characteristics are very few. The experiment was conducted to investigate the performances and carcass characteristic of male Arab chicken which fed different type of ration.

MATERIALS AND METHODS

Materials

Materials used in the experiment were male Arab chickens and commercial feed of Par-S and corn and BR II rations. The chicken were seven weeks old. Par-S+corn was the first type of ration (Ration One), containing 2904 kcal ME and 17% CP. The ratio of energy and protein of the Ration One was 171. BR II was the second type of ration (Ration Two) containing 3100 kcal ME and 19% CP. The ratio of energy and protein of the Ration Two was 163.

The pen used in the experiment had an area of 6 x 1 m and the floor was covered with litter. The pen was divided by metal wire into six cages of 1 x 1 m. The cages were equipped with feed container, water drinker, and lamps. Balance of Ohaus was used to weigh the feed waste and balance of Lion for weighing the chicken.

Methods

Thirty six male Arab chickens of 7 weeks old were randomly divided into two treatments (type of feed). Each treatment contained three (3) replications and there were six chicken in each replication. The chickens of the first treatment were fed Par-S + corn (BR I, Ration One) and the chicken of second treatment received BR II (Ration Two). Nutritional contents of the rations are presented in Table 1.

Feed was given twice a day at 08.00 and 15.00 to the male Arab chickens. The chickens were kept for 7 weeks. They were given vaccine New Castle Diseace orally though drinking water. The chickens were weekly weighed, whereas the feed given and feed left were daily weighed during the experiment. The data collected during the experiment were feed, protein and energy consumptions, body weight, weight gain, and feed conversion ratio (FCR).

The chickens were taken randomly from each group at 12 and 14 weeks old and slaughtered according to halal method to determine the carcass weight, carcass percentage and carcass physical composition (weight and percentage of carcass parts). Carcass parts consisted of breast, thigh, drumstick, wing and back. Samples of meat were taken from the breast part of carcass (*Pectoralis superficialis*) (Soeparno, 1998) for the determination of physical characteristics of meat such as pH (Bouton *et al.*, 1971), Water Holding Capacity/WHC (Hamm, 1964 cit. Soeparno, 1998), cooking loss and tenderness (Bouton *et al*., 1971).

Completely Randomized Design was used in this experiment. The data collected were analysed using analysis of variance. Any differences between means were funther analysed using Duncan New Multiple Range Test.

RESULTS AND DISCUSSION

Performances of Arab chicken

Feed, protein and energy consumptions of male

Table 1. Nutritonal content of Ration One (Par-S + corn) and Ration Two (BR II)

Component	Par-S [2)]	Corn	Ration One[1)]	BRII (Ration Two) [2]
Moisture (%)	12.0	14.0	13.0	12.0
Crude protein (%)	19.0	9.0	17.0	19.0
Metabolizable Energy (kcal / kg)	2800.0	3320.0	2904.0	3100.0
Crude fat (%)	4.0	4.0	4.0	4.0
Crude fiber (%)	5.5	2.0	4.8	5.0
Mineral (%)	7.0	3.3	6.2	6.5
Calcium (%)	1.0	0.2	0.8	1.0
Phosphorous (%)	0.8	0.3	0.6	0.8
Coccidiostat	+		+	+
Antibiotics	+		+	+

Note: [1)]. Ration A was the mixture of Par-S and corn with the ratio of 4:1
[2)]. Feed mill factory of PT JAPFA COMFEED INDONESIA.

Arab chicken are presented in Tables 2, 3 and 4, respectively. Results of statistical analysis showed that type of feed influenced the feed consumtion of the chicken ($P<0.05$). The chickens fed Par-S+corn consumed more feed amounting to 2710.30 g than the chicken fed BR II (2548.17 g) during the experiment ($P< 0.05$). Although, the feed consumption of the chickens fed Par-S+corn was higher, the chickens significantly consumed less protein (460. 75 g) compared to the chickens fed BR II (488.70 g). This was due to the nutritional content of ration Par-S+corn that contained less protein and energy (17 % CP, and 2904 kcal ME) than ration BR II that contained 19% CP and 3100 kcal ME. Male Arab chicken stopped eating when they have already met the need of energy, therefore the energy intake of both groups of chicken did not differ significantly. This results were in agreement with the study of Marks and Pesti (1984), that reported that the increase of protein and energy of feed tended to decrease feed consumption. Leeson *et al.* (1992) also reported that an increase of energy and protein in ration caused lower feed consumption. The balance of energy and protein affected the amount of feed consumed by male Arab chicken. Ration two had narrower balance of energy to protein (163) than the ration one (171).

The quality of ration was determined by the energy and protein in it. The lower the energy content of ration would increase the feed consumption (Wahju, 2004). Since Ration One contained lower energy than Ration Two, the male Arab chicken consumed more feed to fulfil their need.

Age of the chicken affected significantly the feed consumption as well as protein and energy consumptions ($P<0.05$). As the chicken grew older and increased in their size and their weight, the need of ration also increased. At the beginning of the experiment the chicken (eight week old) only consumed 313.72 g/bird/week (44.82 g/bird/day), whereas at the end of experiment (14 week old) the feed consumption was 408.75 g/bird/week (58.39 g/bird/day). Lesson and Summers (1980) reported that young chicken needed higher protein and then gradually decrease along with the age of the chicken.

Since the feed consumption increased during the experiment, the protein and energy consumption of the chicken also increased significantly. The need of protein and energy became higher from week to week. The protein and energy intakes of the male Arab chicken at eight week old were 56.50 g/bird/week (8.07 g/bird/day) and 942.60 kcal/bird/week (136.44 kcal/bird/day) respectively, furthermore, the intakes at 14 week old were 73.43 g/bird/day (10.49 g/bird/day) and 1225.73 kcal/bird/week (175.10 kcal/bird/day), respectively. According to Scanes *et al.* (2004) many factors influenced the protein consumption of chicken such as strains, protein concentration in ration, the availability of amino acids and growth rate.

Age of male Arab chicken significantly influenced

Table 2. Feed Consumption of Male Arab Chicken (g/ bird / week)

Type of feed	Age (week)							Total *
	8	9	10	11	12	13	14	
Par-S + Corn	305.0	337.4	400.0	416.25	429.15	400.0	422.5	2710.30
BR II	322.43	348.9	368.6	368.33	376.1	368.8	395.0	2548.17
Mean	313.72 a	343.15 b	384.3 c	392.29 c	402.63 c	384.40c	408.75c	

Note: a, b, c Row means with different superscript are significantly different (P < 0, 05)
* Significant at P < 0, 05

Table 3. Protein Consumption of Male Arab Chicken (g/ bird / week)

Type of feed	Age (week)							Total (g)*
	8	9	10	11	12	13	14	
Par-S + Corn	51.8	57.4	68.0	70.75	72.95	68.0	71.85	460.75
BR II	61.2	66.2	70.0	69.9	71.4	70.0	75.00	483.70
Mean	56.5a	61.8 a	69.0b	70.33 b	72.18 b	69.0b	73.43 b	

Note: a, b Row means with different superscript are significantly different (P < 0, 05)
* Significant at P < 0, 05

Table 4. Energy Consumption of Male Arab Chicken (kcal / bird / week)

Type of feed	Age (week)							Total
	8	9	10	11	12	13	14	
Par-S + Corn	885.7	979.85	1161.6	1208.8	1246.3	1161.6	1226.95	7870.8
BR II	999.5	1081.5	1142.7	1141.8	1135.7	1143.1	1224.5	7868.8
Mean	942.6 a	1030.7 b	1152.2 c	1175.3 c	1191.0c	1152.35c	1225.7 c	

Note: a, b, c Row means with different superscript are significantly different (P < 0, 05)

the feed, protein and energy consumptions. The consumptions increased along as the age and the body weight of the chicken increased. The effect of age on the consumption was due to the growth rate and the increase of body weight. As the chicken grew older, the body weight increased, and eventually the feed consumption increased as well. North (1984) also stated that feed consumption would increase as the age and the body weight of chicken increased. The final body weights of the male Arab chicken fed with Par-S+corn was not difference with the male Arab chicken fed with BR II. However, the chicken fed BR II tended to have higher final body (1142. 5 g) than the chicken fed with Par-S + corn (1026.5 g) (Table 5). The higher energy and protein content of ration would resulted in the heavier body weight of

the chicken.

The weight gain of the male Arab chicken from the beginning of experiment till the end of experiment was ranged from 87.5 g/bird/week (12.5g/bird/day) up to 129.5 g/bird/week (18.5 g/bird/day) (Table 6). then the weight gain was lower at the following week. Busye *et al.* (1996) stated that the growth rate of chicken was fast at the beginning of the age from hatched up to 6 week old. It was getting slower and at 12 week old the growth rate reduced.

Table 5. Body Weight of Male Arab Chicken (g / bird)

Type of feed	Age (week)							
	7	8	9	10	11	12	13	14
Par-S + Corn	362.5	467.9	542.0	664.5	749.0	850.0	930.0	1026.5
BR II	373.1	551.4	615.8	752.6	843.3	936.0	1052.0	1142.5
Mean	367.8[a]	509.65[b]	578.9[c]	708.55[d]	796,15 [e]	893.0[f]	991.0 [g]	1084.55[l]

Note: a, b, c, d, e, f, g, h, Row means with different superscript are significantly different (P < 0, 05)

Type of feed did not influenced the weight gain of Arab chicken. Similar to the body weight, the weight gain of the chicken fed BR II tended to have higher final body (769.1 g) than the chicken fed with Par-S + corn (695.5 g) (Table 6). Rahimi and Hassanzadeh (2007) reported that the higher protein content of the feed could result in the higher thyroxin and higher plasma growth hormon levels and subsequently improved the performance of broiler chicken. Kartikasari *et al.* (2004) also reported that high protein consumption would produce heavier body weight, since to achieve maximum chicken growth rate largely depend on the availability of protein.

The age of chicken influenced the weight gain ($P < 0.05$). The weight gain was significantly higher at the first until the third week of experiment, and

The feed conversion ratio (FCR) is presented in Table 7. FCR of male Arab chicken did not differ between ration Par-S+corn and BR II. However, Arab chicken fed with BR II ration had lower FCR (3.31) than the chicken fed with Par-S+corn (3.91). FCR reflected the physiological ability of chicken in utilized all the nutrients for the growth and the less the FCR meant that the amount of ration used to produce one kg of meat was less as well (Wahju, 2004 and Scanes *et al.* 2004).

Ration containing lower energy and protein content resulted in the higher FCR than ration containing higher energy and protein content. Therefore, the consumption of protein by the chicken was lower as well. Studies of Lee (1987) also reported that ration with low energy produced less body weight and lower

Table 6. Weight Gain of Male Arab Chicken (g/ bird)

Type of feed	Age (week)							Total
	8	9	10	11	12	13	14	
Par-S + Corn	105.4	74.1	122.5	84.5	101.0	80.0	128.0	695.5
BR II	138.1	104.5	136.8	90.6	92.6	109.3	97.2	769.1
Mean	121.75[b]	89.3 [a]	129.65[b]	87.55 [a]	96.8[a]	94.65 [a]	112.6[a]	

Note: a, b, Row means with different superscript are significantly different (P < 0, 05)

Table 7. Feed Coversion Ratio of Male Arab Chicken

Type of feed	Age (week)							Final FCR
	8	9	10	11	12	13	14	
Par-S + Corn	2.89	4.55	3.27	4.93	4.25	5.0	3.3	3.91
BR II	2.33	3.34	2.69	4.07	4.06	3.37	4.06	3.31
Mean	2.61 ^{a}	3.95 ^{bc}	2.98 ^{b}	4.5 ^{c}	4.16 ^{c}	4.19 ^{c}	3.68 ^{c}	

Note: a, b, c Row means with different superscript are significantly different (P < 0, 05)

feed efficiency. The age of chicken influenced the FCR (P < 0.05). FCR of the chicken was relatively low at the 8 – 10 week old, afterward it was higher. It could happen since the feed consumption of the male Arab chicken was increased significantly at 10 week old, however starting at 11 week old, the weight gain of the chicken was relatively similar.

Carcass and Meat Characteristics

The weight of carcass, carcass parts and their percentages of male Arab chicken are presented in Table 8 and Table 9, respectively. The results of statistical analysis showed that type of ration did not influence the weight of carcass and its parts of male Arab chicken. However, BR II ration gave higher weight of carcass and its parts than the other ration. Slaughtered ages affected the carcass weight and its parts (P < 0.05). The average carcass weight of male Arab chicken slaughtered at 12 week and 14 weeks old were 569.25 g/bird and 662.65 g/bird (P< 0.05). Breast was the heaviest part of the male Arab chicken hat could reach 203.24 g at the age of 14 weeks old.

The results of statistical analysis showed that type of feed did not influence the weight of carcass, carcass parts and their percentages of the male Arab chicken. Age of the chicken significantly affected the weight of carcass and carcass parts. All parts of carcass increased when the chicken became 14 weeks (P < 0.05). The heaviest part of chicken were the breasts of male Arab chicken, they were 142.8 g and 174.8 g at 12 and 14 weeks old respectively.

The results of the experiment showed that type of ration did not influence the percentages of carcass and its ration of the male Arab chicken. The average percentages of carcass of male Arab chicken fed with Par-S+corn was 62.77% compare to BR II of 62.11%. Sudaryati and Maryanto (1989) also reported that local pullet chicken had 63.2% of carcass percentage.

The age of slaughtering affected the percentages

Table 8. The weight of Carcass and Its Parts of Carcass of Male Arab Chicken (g)

Variable	Age (week)			
	12		14	
	Par-S + corn	BR II	Par-S + corn	BR II
Whole carcass	541.8 ^{a}	596.7 ^{a}	634.3 ^{b}	691.0 ^{b}
Breast	134.37 ^{c}	157.58 ^{c}	181.46 ^{d}	203.24 ^{d}
Thigh	101.69 ^{e}	111.21 ^{e}	123.84 ^{f}	132.05 ^{f}
Drumstick	108.13 ^{g}	115.54 ^{g}	134.72 ^{h}	143.39 ^{h}
Wing	87.75 ^{i}	98.89 ^{i}	113.94 ^{j}	122.5 ^{j}

Note: a, b, c, d, e, f, g, h, i, j Row means with different superscript are significantly different (P < 0, 05)

of carcass of male Arab chicken (P < 0.05). Carcass percentage of male Arab chicken decreased when the chicken slaughtered at older age (14 weeks). The average carcass percentage of male Arab chicken slaughtered at 12 week old was 63.75%, whereas at 14 week old it was only 61.1%. According to Mountney (1981), nutritive content of feed, strain and slaughter age influenced the carcass percentage. Although carcass percentages decreased significantly at older ages, the percentages of some parts of male Arab chicken increased significantly such as breast, thigh, and wing, whereas drumstick of the male Arab chicken was not different significantly between the 12 and 14 week old.

Physical Characteristics of Meat

Physical characteristics of meat of male Arab chicken fed different type of feed and slaughtered at 12 and 14 weeks old are presented at Table 10. The type of feed affected the tenderness of meat of male Arab chicken (P<0.05), but it did not influence ph, WHC and CL of meat of male Arab chicken. Ration of Par-S+corn resulted in tenderer meat of male Arab chicken than ration BR II. Soeparno (1998) stated that physical characteristics of meat were influenced by the feed given to the chicken.

Slaughter age influenced significantly physical characteristics of meat of male Arab chicken (P<0.05). The meat of male Arab chicken slaughtered at 12 week old had lower pH values and percentages of CL, but it had higher WHC than the meat of male Arab chicken slaughtered at 14 weeks old. Meat was tenderer at the slaughter age of 12 weeks old. Physical characteristics of meat were influenced by many factors including the age of the chicken (Soeparno, 1998).

Table 9. Percentage of Carcass and Carcass Parts of Male Arab Chicken Slaughtered at 12 and 14 Week Old (%)

Variable	Age (week)			
	12		14	
	Par-S + corn	BR II	Par-S + corn	BR II
Whole carcass	63.75 ^{a}	63.75 ^{a}	61.69 ^{b}	60.48 ^{b}
Breast	24.8 ^{c}	26.4 ^{c}	28.6 ^{d}	29.4 ^{d}
Thigh	18.8 ^{e}	18.6 ^{e}	19.5 ^{f}	19.1 ^{f}
Drumstick ^{ns}	20.0	19.4	21.2	20.8
Wing	16.2 ^{g}	16.6 ^{g}	18.9 ^{h}	17.7 ^{h}

Note: a, b, c, d, e, f, g, h, Row means with different superscript are significantly different (P < 0, 05)

Table 10. Physical Characteristics of Meat of Male Arab Chicken

Variable	Age (week)			
	12		14	
	Par-S + corn	BR II	Par-S + corn	BR II
pH	5.49 ^{a}	5.44 ^{a}	6.34 ^{c}	5.81 ^{b}
WHC (%)	24.17 ^{d}	24.27 ^{d}	16.20 ^{e}	21.28 ^{e}
CL (%)	9.92 ^{f}	10.43 ^{f}	15.63 ^{g}	15.21 ^{g}
Tenderness (kg/cm^2)	1.55 ^{h}	1.74 ^{j}	1.61 ^{i}	1.69 ^{i}

Note: a, b, c, d, e, f, g, h, i, j Row means with different superscript are significantly different (P < 0, 05) ; WHC : water holding capacity , CL: cooking loss

CONCLUSION

It could be concluded that male Arab chicken fed containing higher CP and ME (higher feed density) consumed more protein and energy, and finally they had heavier final body weight. Furthermore, slaughter age (12 and 14 weeks) influenced carcass weight, carcass physical composition and meat characteristics of the male Arab chicken.

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