Effect of Different Pasture Plants on Carcass Yield and Some Carcass Part Weights in Free System Broiler Breeding

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Abstract: The aim of this study is to investigate the effect of different pasture contents on growth and carcass characteristics in free system poultry. Trial were made on 4 decares of clover, Bromus inermis or clover + Bromus inermis planted field in eight numbers of mobile pen that designed to be surrounded by steel wire. In trial one, 480 number of one day old male Hubbard Isa Red-JA broiler chicks were divided to 4 groups each of which further divided into 4 subgroups. The first group of broiler chickens were sent for cutting on the 42nd day and the other groups on the 84th day. At the end of the trial Carcass yields were obtained as 73, 77, 74 and 74 on days 42, 77, 76, 75, 73 and 84, respectively. The difference between day 84 carcass yields was found significant (P <0.05). The slaughter weights day 84 were found to be 1245.59, 1226.13, 1300.68, 1247.27, 1254.92 and 965.88, 929.12, 974.87, 903.96, 943.46, respectively, in the groups with the slaughter weights of 42 days (P>0.05). Carcass weight was found to be lower in all other parts than in control (P <0.05), while there was no difference in weight, edible part, neck and foot weight. As a result, although different pasture contents did not cause an early variability in slowly growing broiler chickens, live weight, cut and some carcass weight were affected in later periods.
Keywords: free system, broiler, pasture composition, carcass quality

Farklı Mera Bitkilerinin Serbest Sistem Etlik Piliç Yetiştiriciliğinde Karkas Randımanı ve Bazı Karkas Parça Ağırlıkları Üzerine Etkisi

Özet: Bu çalışmanın amacı farklı mera içeriklerinin serbest sistem (free range) tavukçulukta büyüme ve karkas özellikleri üzerine etkisini araştırmaktır. Deneme, yonca, kılçıksız brom ve kekik ekilmiş yaklaşık 4 dekar arazide, 8 adet mobil kümes içinde ve etrafı seyyar tellerle çevrili alanda gerçekleştirildi. Denemede günlük yaşta 480 adet yavaş gelişen erkek Hubbard Isa Red-JA broyler civcivler 4 ana gruba, her grup da 4 alt gruba ayrıldı. Deneme sonunda karkas randımanları 42. günde sıarasıyla % 77, 76, 75, 73 ve 84. günde sırasıyla % 73, 77, 74, 74 olarak elde edildi. 84. gün karkas randımanaları arasındaki fark önemli bulunmuştur (P<0.05). Kesim ağırlıkları 42 günde 1245.59±74.41, 1226.13±79.11, 1300.68±28.90, 1247.27±45.01, 1254.92±29.19 karkas ağırlıkları ise 965.88±80.00, 929.12±56.57, 974.87±46.63 , 903.96±27.36, 943.46±27.08 olarak gerçekleşmiş gruplar arasında fark bulunmamıştır (P>0.05). Karkas parça ağırlıkları bakımından taşlık, yenilebilir kısım, boyun ve ayak ağırlıklarında fark oluşmamıştır. Diğer tüm karkas parça ağırlıklarında kontrol grubunda deneme gruplarından daha düşük bulunmuştur (P<0.05). Sonuç olarak farklı mera içeriği, yavaş büyüyen etlik piliçlerde erken dönemde bir farklığa neden olmadığı halde, ilerleyen dönemlerde canlı ağırlık, kesim ve bazı karkas parça ağırlıklarını etkilediği gözlemlenmiştir.
Anahtar kelimeler: serbest sistem, broiler, mera kompozisyon, karkas kalitesi

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INTRODUCTION

Although there are many advantages of intensive system such as live weight gain and feed efficiency of broiler chickens, different systems are sought for improve and also eliminate the life span, heart health, immunity related deaths, skeletal and foot defects (1,2). Especially, chicken meat which is produced in alternative production systems (free and organic) is rich about unsaturated fatty acids that offered at a higher price on the grounds (3,4 5). Meat quality is influenced by many factors such as genotype, production system and season in broiler chicken breeding (6,7). Poultry meat is a valuable protein source in human nutrition when considering the composition. Feeding rules of organic farming cause slowing down the growth rate and also preventing the occurrence of metabolic disorders. When comparing the slow, medium-fast and fast-growing genotypes, slow-growing chickens were found to have higher feed intake and yield but lower feed efficiency and flesh yield (8,9). Van Horne et al. (10) also reported that in slow-growing closed poultry breeding systems were better than fast-growing poultry breeding systems because of the high walking performance and lower mortality rates of the chickens. As a result, it was concluded that the welfare of these chickens is higher. Using of slow-growing and also long cutting age in organic system increased movement of the chicks and hence it causes less skeletal problems. Because, opening field access and physical activity increase bone (tibia) strength and cause thickening of meat color (11). There are many conflicting results of traditionally broiler chicken breeding system in pasture when compared the other systems. It was reported that lower feed conversion and higher cutting weights were detected in conventionally produced chickens than free-breeding broilers (12,13,14). In contrast, the same results were reported from broilers with free pasture access by other researchers (15,16). It was found that the feed intake was higher in free-breeding system than traditional broiler breeding system (13). In addition, the stomach of free-circulation broilers were found higher than the others. It could be a result of conventional broiler diet materials (17). Besides, when compared the performance, feed consumption was positively affected. Higher feed and slaughter weights were detected from broilers who have feed access than without feed access broilers (18) that were grown on pasture. There was no difference in body weight, growth performance and benefiting of feed in broilers who live on pasture (18). It has also been shown that there is no effect of the free circulating system in terms of the same features (9,19). Another aspect of the performance that should be assessed is whether the carcass and internal organ weights are influenced by the production system. Although, there were generally no differences in organ weights (20), weights of stony, lung, and kidney were found higher in closed-system of broilers than free breeding system. When the meat quality is assessed, it is reported that conventional production has no effect on broiler carcass nutrient composition (19) but low oil content in freewheeling broilers. Other findings have shown that some nutrient properties will not be affected depend on independent of the production system (12,14,17,21). In contrast, a comparative study was done about conventional, organic and free circulating systems and results of study showed that in the organic and free-breeding system, breast meat contained lower humidity but higher protein content (22). Similar studies have also showed that chestnut meat of free breeding broilers contains much more dry matter and protein than conventionally produced broilers (23). There are many different reports on the meat quality of broilers in the literature; for this reason, more researches should be done to reveal the effects of this alternative production system. These conflicting results may be due to different pasture, working time, feeding or seasonality. For this reason, the aim of this study is to determine the effects of pasture on feed quantity and utilization rate, body weight, feed conversion, internal organ weights and meat quality of the broilers.

Slowly growing breeds have been developed as an alternative to the fast breeding breeds in conventional broiler production that can reach a cut weight of 2.2-2.5 kg in 80-120 days. Different static and mobile hencoops are used for free breeding (7). Static coops are less preferred because they can not be used in different areas. Mobile poultry is taken to different places according to the pasture situation so broilers can be fed better. At the same time, in the fields where alfalfa is planted, it must be watered for the growing of the growl and the drying of the shrubs. While mobile hencoop allows, there is no such thing in static hencoops. Animals consume more roughage in free breeding and It has been also reported that animals consume roughage when is given limited concentrate corm (18). By the way, it allows to animals free movement, such as twitching, to feed a variety of plant species with various insects and worms. The broilers spend the vast majority of on the outside to seek and feed roughage and insects. Except eating stone, they also make bath povder under sunlight (5). Broilers who graze on high quality pastures can cover up to 20% of the total ration from high quality roughage. However, this consumption varies depending on the age, the race of the broilers and the quality of the pastures. Broilers who graze on normal pastures can provide up to 5-20% of total ration (18). The most important point of the pasture management for the animals is the plants that are young and vegetative. The digestibility of older plants is lower than young leafy plants. Long-chain unsaturated fatty acids such as omega-3 fatty acids have been found in high concentrations in products (meat and eggs) which obtained from chickens fed in the pasture. In multi-leaf plants such as alfalfa is rich in unsaturated fatty acids.

MATERIAL AND METHODS

The project was carried out in Hümeyra Özgen Research and Application Farm in Selcuk University Veterinary Faculty. Clover (Bromus inermis), clover + unbranched bromine and also thyme (Origanum vulgare L.) were planted to test area for feeding each subgroup.

Feeding Material

First of all, ration was prepaired for broiler chicks. The feedstuffs were obtained from the market and prepared in a special feed factory. The broilers were fed with starter broiler feeds as ME of 2900 kcal and an HP of 23% during the first 4 weeks. Nutrient content of the rations was prepared taking into account the nutrient levels determined by NRC (1994) used in the experiments. In addition, lysine amino acid addition was performed to fix the needing of broiler chickens. After 28 days, broilers were picked up to mobile poultry and fed with 3200 kcal of ME and 20% of HP until day 84. Likewise, the ration food content was prepared taking into account the nutrient levels determined by NRC (1994) used in the experiments. Before the chicks arrived, one mobile house was prepared. Feeders and syringes were passed through by the eye, and the osmolality and the degree were set. The heaters mounted on the wall of the mobile clusters and temparature was set as 35 ° C.

Animal Material

One daily 480 slow-growing male Hubbard Isa Red-JA broiler chicks were purchased from Ankara for using in the research.. Male Hubbard Isa Red-J broiler chicks were weighed one by one and was placed in to the mobile clusters. Firstly, sugary water were given to broilers. Approximately 2 hours later, meat chick powder feeds which had been prepared before were placed on feeders (table chick). Broilers were fed with these prepared rations in

the mobile poultry for 0-14 days. At the 14th day, male Hubbard Isa Red-JA chicks were weighed and feed consumption were determined.

Experimentation

Each group consisted of 4 main groups and also 4 subgroups. Group 1 control group and groups 2 (Clover), 3 (Bromus İnermis) and 4 (Clover and Bromus İnermis) were designed as trial groups. The first group was fed as a control group only in closed mobile poultry. The second group was fed with concentrated feeds, clover and thyme. Besides, the third group was fed with concentrated, blanched bromine and thyme. The fourth group was fed with concentrated feed, clover, unbranched bromine and thyme. The first 4 subgroups (as control group) were grown only in closed mobile poultry. The mobile poultry (5-6; 7-8; 9-10 and 11-12) was placed horizontally in the cultivated areas located in the second and third groups. In the last group, the mobile poultry (13-14 and 15-16) were placed vertically for consuming both alfalfa and hemp-free bromine and thyme by broilers. Each mobile poultry was divided into two sections (totaling 16 sub-groups). In the experiment, totally 480 chicks and so 30 broiler chicks were used in each subgroup. Broiler chickens were placed in subgroups approximately two square meters for 15 animals to per m2. It allowed to growth of coarse feeds in trial sites. Mobile clusters which were used for groups 2, 3 and 4 were replaced once a month. In the control group, only the broilers fed in the poultry were cut at the end of the 6th week (42th day) and the other groups were cut at the end of the 12th week (84th day). Cold carcass weights of broiler chickens were determined after had drained and suspended in cold water and then allowed to stand at + 4° C for 12 hours after wet cutting and hand intaking followed by cutting and bleeding. Cold carcasses are shredded according to TSE chopping technique. The weight of the obtained carcass pieces was calculated as the ratio of each carcass piece to the carcass weight. Slaughter weights, carcass yields and carcass fragments (Head weight, Foot weight, Wing weight, Back, Chest weight, Neck weight, Edible) were weighed with 0.1 g precision scales.

RESULTS

The carcass yields were determined as 73, 77, 74, 74 (%) in 42 days and 73, 77, 74 and 73 (%) in 84 days in the groups, respectively. The highest carcass yield was obtained in the lowest control and alfalfa + claybrom groups when it was applied in the alfalfa group. There was no difference in the organ weights between the groups.

Table 1. Hot Carcass ratio in all experiments (%)

	Grup 1	**Grup 2**	**Grup 3**	**Grup 4**	**Total**
Trial 1 42. gün	77±0.03-	76±0.01-	75±0.03-	73±0.02-	75±0.01
Trial 2 84. gün	73±0.02b	77±0.01a	74±0.01 ab	73±0.02b	74±0.01

In same line, - : $p>0.05$, a,b: $p<0.05$

Table 2. Carcass part weights (g) obtained from Trial 1 for 42 days

Carcass fragments Weights (g)	1 (Control)	2 (Clover)	3 (B. İnermis)	4 (Clover+. B.inermis)	Total
Slaughter	1245.59±74.41	1226.13±79.11	1300.68±28.90	1247.27±45.01	1254.92±29.19
Carcass	965.88±80.00	929.12±56.57	974.87±46.63	903.96±27.36	943.46±27.08
Foot	37.37±1.64	38.16±2.31	40.33±0.89	40.46±0.52	39.08±0.76
Foot	62.51±8.02	58.91±2.22	66.91±7.31	59.75±2.73	62.02±2.77
Thigh	231.23±25.29	251.60±15.50	256.25±12.12	236.87±9.95	243.99±8.18
Wing	116.81±11.40	98.13±8.44	114.86±7.71	98.72±5.34	107.13±4.33
Back	134.04±10.93	109.06±8.94	138.01±15.31	110.26±5.88	122.84±5.67
Chest	305.28±23.15	304.04±26.09	291.87±30.25	299.01±14.55	300.05±11.54
Neck	55.09±7.33	44.29±2.92	55.65±4.69	39.68±4.47	48.68±2.72
Edible	67.17±6.88	68.02±4.07	66.72±4.71	68.41±2.67	67.58±2.30
Inedible	92.77±10.89	87.96±8.23	104.49±11.88	86.61±3.77	92.96±4.57
Gizzard	56.25±5.15	53.99±3.77	51.50±3.01	51.00±1.60	53.19±1.76

In same line, - : p>0.05, a,b: p<0.05

Table 3. Carcass weight obtained from Trial 2 for 84 days

Carcass fragments Weights (g)	1 (Control)	2 (Clover)	3 (B. İnermis)	4 (Clover+. B.inermis)	Total
Slaughter	2865.25±228.75b	3503.79±86.46a	3329.88±76.86a	3333.25±121.81a	3258.04±79.78
Carcass	2088.38±191.92b	2698.63±54.07a	2466.75±75.42a	2422.88±96.41 ab	2419.16±67.98
Foot	67.25±3.98b	72.63±2.57ab	81.63±3.78a	74.75±1.62 ab	74.06±1.75
Foot	112.13±6.05-	125.63±2.16-	125.63±4.33-	120.13±3.75 -	120.88±2.27
Thigh	633.13±59.10b	786.13±18.34a	727.38±26.63ab	660.00±64.81ab	701.66±24.66
Wing	235.25±20.32b	306.00±7.83a	286.13±15.67a	289.75±10.86a	279.28±8.36
Back	253.50±27.69b	379.25±16.27a	318.38±16.40a	325.38±20.04a	319.13±12.66
Chest	741.75±80.26b	1002.13±34.20a	915.88±36.91a	912.13±39.31a	892.97±29.69
Neck	93.88±9.70 -	82.13±4.43-	84.13±6.68-	91.75±5.61-	87.97±3.39
Edible	113.50±6.93 -	124.88±4.19-	117.25±3.58-	125.88±7.13-	120.38±2.86
Inedible	215.13±21.82b	162.25±7.98b	205.88±12.88ab	191.88±16.62ab	193.78±8.27
Gizzard	17.38±0.95-	18.13±0.79-	17.63±0.92-	18.00±1.12-	17.78±0.44

In same line, - : p>0.05, a,b: p<0.05

DISCUSSION AND CONCLUSION

In this study, carcass values and ratios were determined in broiler chicks who fed with different plant compositions (free range). The broiler chicks were slaught on the 42nd day in the control group and the the other groups on the 84th day. Cutting weights (gr) were determined as 1245.6, 1226.1, 1300.7 and 1247.3; and also hot carcass efficiency (%) was found as 76.63, 75.75, 75.00, 72.75 (p> 0.05) in Day 42 (Table 1). The weights of the thing, Chest and wings were determined as 231.23, 251.60, 256.25 and 236.87g; 305.28, 304.04, 291.87 and 299.01 g; 116.81, 98.13, 114.86 and 98.72 g in the days of 42 in the experiment 1, respectively (Table 2). As a result of the 84th day of the experiment, the same values were observed as 633.13, 786.13, 727.38 and 660.00 g, 741.75, 1002.13, 915.88, and 912.13;

235.25, 306.00, 286.13 and 289.75 g, respectively. The carcass ratios were shown in Table 1. Despite the use of slower growing breeds in free breeding, several studies have been carried out using them in fast breeding races. In a study (7), fast-growing races were found to have higher live weight gains, higher feed utilization rates and higher breast meat than slow-breeding races. In addition, it is reported that the slow-growing races have higher living power and leg weight but lower mortality. Slowly growing races have been found to be better adapted to the free breeding system because of have long feeding period and more encounter rate with roughage in the environment. It has been reported that the broilers who fed with coarse feeds in the posture have yellower skin and meat color but lower fat rate. Połtowicz and Doktor (24) have been experimentied a trial with a fast growing broilers for 42-day. In another study, the broilers were fed in the poultry house (inside) and the posture (outside). At the end of the study, live weight and feed utilization rates were found as 1770 g and 1.94 kg in the group 1 and 1640 g, 1.99 kg in the group 2, respectively. Broilers were fed by Fanatico (25) with the same ration in the closed poultry for 4 weeks and then started to feed both in the inside and outside for 8 weeks after the 29th day. As a result, it was reported that the broilers consumed a total of 7258 g feed and also 2496 kg carcass were obtained including neck, heart and liver. In another study (25), the broilers were released into the pastures after feeding for 21 days in the poultry house. Then the animals were fed once or twice a day for 56 days. Although, there was no statistically significant difference between the groups. It was determined that live weights of broilers were changed between 2610 and 3160 g and carcass weights were found approximately 2270 g. In a study, broilers were fed with 21.63% crude protein and 3000 kcal ME until the 35th day. From day 36 to day 112, broilers fed with 19.07% crude protein and 3100 kcal ME were separated into two groups (14 Wang et al. 2009). While the first group was fed only in the inside, the second group was fed both in the inside and outside. At the end of research, only 1611,5 g live weight was obtained from the group 1 and 1419,4 g from group 2 ($p<0.05$). Although, there was no statistically significant difference between groups in terms of chest, butt and wing weight ($p>0.05$), abdominal fat weight was found significantly lower in the mixed breeding system($p<0.05$). At the end of the study, in addition to the concentrated diet showed a statistically significant decrease in live weight. This result was found similar with study of Ponte et al. (18). Chickens were grazed in the fields where alfalfa, unbranched bromine and thyme was planted. The clover is very important plant for animal feding strategies. In addition to being a quality coarse source for bovine feeding, it has been dried and incorporated into various concentrated feed compositions. There are various studies about alfalfa. Oatmeal has also been added to rations for taste and flavor to poultry products recently. There is no study about unbranched bromine and its relation with blood parameters and performance which is a new product for animal feeding. However, it has been reported that unbranched bromine was used for the formation of artificial chicken pastures (26), detailed results of the studies about unbranched bromine were not found. Cutting weights (g) of 42nd (Table 2) and 84th day (Table 3) of the trial were detected as 1225,09, 1203.88, 909.32 and 636.38g; 2145.00, 2203.13, 1843.13 and 1518.13g. Besides, the experimental groups were significantly lower than the control group on 84th day ($P <0.05$). Hot carcass yields (%) were determined as 76.63, 75.75, 75.00, 72.75 and 70.63, 72.38, 70.75, 70.63 ($P> 0.05$). The buttocks and chest weights were obtained from the groups as 673.13, 485.00, 411.88 and 333.13; 856.88, 596.88, 437.50 and 355.00 g, respectively. There was a statistically significant decreases were observed in the amounts of buttocks and breast meat with live weights obtained from with the decrease of the mixed feed given to broiler chicks ($p <0.05$). It was showed that concentrated feeding is very important for broiler chickens. The effects of underfloor ground system, semi-open navigation free system and navigation free system on carcass characteristics and meat quality of slowly growing broilers were investigated ($P <0.05$). The effect of the growing system on the carcass yield, butt rate and wing ratio was

found to be significant in the slowly growing Hubbard Isa Red-JA genotype. It was found that the effects on the ratio of chest, back and neck was not important (P> 0.05) (27). It was shown similarity with the findings which were obtained in this study in terms of carcass yield. Ward et al. (28) informed that the broiler chicks fed on closed poultry at 40 days of age had higher live weight than free circulating poultry. In this study, closed system (1.94 vs. 1.28 kg) was found as 1245.59 g in 42 days and 1254.92 g in free circulation environment. While there was no difference between the groups at 42th days, the difference may have been due to the use of the rapid genotype of the broiler in the other study. Similar findings have been reported by other investigators (29,30,31,32) Similarly, Pavlovski et al. (33) found that the cut weight (1820 g) was higher than the free circulation (1670 g) when the closed system was used. In a survey conducted by Poltowicz and Doctor (23), it was reported that broiler chickens had 1640 kg live weight of as a result of feeding in the pasture and they had reached 1770 g live weight as a result of feeding in the poultry. In this study, Although there was no difference in body weight carcass yield and organ weight in the 42 day period, the experimental groups were higher than the control group in terms of all these characteristics at the end of 84 days. As a result, there was no difference between the carcass fractions in all experimental groups in the first 42 days of the experiment (p> 0.05). However, the parts and cut weights were higher than the control group in 84th day (P <0.05).

It was understood that chickens had higher cutting weights and carcass fragments in free-moving than the closed system, but there was not found any effects of different pasture plants. Using different plant composition in the findings obtained from the research, the live weight, cut and carcass weights are found better than the control group and the broiler chickens reach higher cutting and carcass weight within the same period. While different pasture contents did not produce any obvious difference; live weight, cutting and some carcass weights were found higher in clover and bromine group than control and mixed (clover and bromine) pasture group.

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