MJAVL
Manas Journal of Agriculture Veterinary and Life Sciences
ISSN 1694-7932 | e-ISSN 1694-7932
*Volume 9 (Issue 1) (2019) Pages 30-34*

# Effects of Restricted Feed on Carcass Traits in Slow Growing Free Range Broilers

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**ABSTRACT**

The study was carried out to see the effects of carcass traits on slow growing broilers in free range system. In the experiment, 480 slow-growing male Hubbard Isa Red-J broiler chicks with 28th days age were divided into 4 main groups and 4 subgroups in each main group. In the experiment, feed was given ad libitum to the control group (group 1). 2th, 3th and 4th groups were fed %75, %50, %25 of food consumed by control group. The chicks in the experimental groups were released to the pasture between at 7:00 - 19:00. Chicks in the experimental groups were fed with alfalfa, unbranched bromine and thyme grass on free range area. At 42 and 84th days, 128 chicks taken randomly and equally from each group were slaughtered to examine carcass traits. In terms of most of carcass traits; even though similar results were seen between %75 restricted groups and control group in 42th, significant differences were sharpened among control and treatment groups in 84th day. It can be concluded from this study that carcass traits of slow growing chickens were affected by feed restriction especially at 84th slaughter age.

**ARTICLE INFO**

***Research article***
*Received: 30.04.2019*
*Accepted: 24.09.2019*

***Keywords:***

*Broiler, Free range, restricted feeding, carcass quality, carcass weight*

## INTRODUCTION

Feeding regimen affects growth performance of broilers due to change the function of enzymes of protein digestion (Susbilla et al., 2003). Restricted feeding leads to less fat accumulation when reached the slaughter age in broilers (Santoso et al., 1993). This may be due to low lipogenesis (Rosebrough et al., 1986), delays in the development of adipocytes (March & Hansen, 1977), low energy intake (Plavnik & Hurwitz 1985; Urdaneta-Rincon & Leeson, 2002). At the same time, the reduced feed reduces the use of feed (Santoso et al., 1993; Plavnik & Hurwitz 1985; Urdaneta-Rincon & Leeson, 2002; Ipek et al., 2009) and decreases the mortality (Santoso et al., 1993).

Demand for free range broilers has been getting more popular with high market prices (Yenilmez & Emine, 2016). Free range is an alternative method of poultry breeding which doesn't meet the organic poultry standarts. In this system broilers stay outside in grassland during the day and are put inside in midnight (Yenilmez & Emine, 2016). It is more preferable than conventional method due to the fact that free range broilers are able to grow up in natural habitat (Husak et al., 2008) and their meat quality is better though (Wang et al., 2009). Broilers with outdoor access are affected by many factors such as temperature, fotoperiod which can't be controlled and can be inherently variable. They have also access to forages, insects, worms and the other nutrients from the soils. But their growth performance and feed efficiency of broilers with outdoor housing were worse than the ones with indoor housing due to uncontrollable environmental factors and increasing activity (Wang et al., 2009; Fanatico et al., 2005; Fanatico et al., 2008; Dou et al., 2009), which causing less abdominal fat (Dou et al., 2009).

Normally, conventional broilers which are able to reach market age at 42 days age have been used for meat production. But they were known to be developed for indoor/entansive production (Fanatico et al., 2008). Upcoming trends towards slow growing chickens may be feasible in organic or free range poultry. Slow growing broilers were reported to reach market age at approximately 81 days of age. Even though they showed worse growth performance and feed efficiencey, they were also known to show more foraging activity and their body conformations were more sutitable for outdoor raising to compare fast growing types. They were reported to have clear advantages in terms of lower mortality rate and leg disorders (Fanatico et al., 2008). Slow growing broilers have lower breast meat yield, higher wing yields longer legs and drumstick muscles (Fanatico et

al., 2005; Fanatico et al., 2008; Fanatico et al., 2008; Mikulski et al., 2011). Their carcass weight were found to be lesser than fast growing broilers.
Feeding procedure is one of the factors affecting pasture use (Koçer et al., 2018). The aim of this study was to evaluate the effect of different amount of restricted feeding on carcass traits of slow growing broiler.

## MATERIAL and METHOD

The project was carried out at Konya, Turkey (37°52'16.9" N 32°29'4.7" E). All procedures in the study were approved by Ethics Committee of Selcuk University Veterinary Faculty (2014/15).
The experiment was conducted in a field with approximately 5 decares. The field was planted with clover, clover-free bromine (Bromus inermis), clover + clover-free bromine and thyme (Origanum vulgare L.) for each subgroup. After planting, the field was irrigated twice a day by sprinkler system depending on the temperature.
The broilers were raised in mobile poultry pens (polyurethane) roof and outer cover of which consists of galvanized static painted sandwich panel were used. Areas around each group were 9 x 9 m sizes. Each mobile poultry pens were divided into 2 sections with 1 m high wires and tulles up to the ceiling. Thus the size of each compartment was 4.5 m² (2.25 x 2 m ). The base of pens (40 x 60, 2 mm thick) were covered with 2 cm thick pleymite material. Beside the front and rear main doors; there were also two entrances which was openable and closeable from the sides so that broilers able to access pasture easily. Two rows of automatic nipple systems was placed inside and a plastic water tank of 300 liters was placed on the top of the mobile pens for inside watering of broilers. The bottom of the mobile pens were covered with sawdust approximately 5 cm thick. Moisture and ambient temperature of mobile pens were adjusted and monitored daily. Plate-shaped table feeder were used for chicks. As chicks grew up, they were changed as hanging feeders.
To prevent subgroup mixing; the mobile pens were surrounded by wires (1.5 m length, 1.5 m high). Area of mobile pens for each group were 81 m² (9 x 9 m) sizes and surrounded by wire plates to prevent mixing of groups. 72 m² of areas were planted alfalfa or clover-free bromine and the remaining parts were planted thyme. Total experimental area of farm were covered with 3.30 m long wires and canopies to prevent from other wild animals and predators.
Before the experiment, all parts of mobile poultry, outside area, feeders, water bottles were disinfected with ozone. 500 slow-growing male Hubbard Isa Red-JA broiler chicks were used in the study. The Experimental lasted between 3th October and 20th December 20, 2015. The chicks were raised in 2 mobile pens in first 28th day and fed ad libitum. On the 28th day, 480 chicks were distributed to subgroups each of which consisted of 30 chicks.
The broilers were fed with starter broiler feeds during the first 4 weeks and then finisher broiler feeds till at the end of the experiment (Table 1, 2). Methionine and lysine-producing amino acids were added to meet the needs of the animals.

**Table 1.** Composition of rations used in the experiments, %

| Ingredients, | PERIOD | |
|---|---|---|
| | 1-28. between days | 28-84. between days |
| Corn | 55.99 | 55.13 |
| Corn gluten, 43% CP | 6,10 | 6.10 |
| Soybean Meal, 48% CP | 26,10 | 13.67 |
| Whole Fat Soybean | - | 9.80 |
| Sunflower Meal, 36% CP | 5.75 | 5.85 |
| Fish flour, 64% CP | 1.10 | 1.10 |
| Vegetable oil | 1.10 | 4.00 |
| DCP | 1.90 | 2.00 |
| Limestone | 1.30 | 1.30 |
| Salt | 0.25 | 0.25 |
| Mineral mix[1] | 0.10 | 0.10 |
| Vitamin mix[2] | 0.25 | 0.25 |
| Coccidiostats | 0.05 | 0.05 |
| DL-Methionine | - | 0.20 |
| Lysine | 0.01 | 0.20 |

[1] Per 2.5 kg of vitamin premix contains 3.6 mg vitamin A, 0.05 mg vitamin D3, 30 mg vitamin E, 3 mg vitamin K3, 3 mg vitamin B1, 6 mg vitamin B2, 5 mg vitamin B6, 0.015 mg vitamin B12, 25 mg niacin, 0.04 mg biotin, 8 mg karotenoid, 1 mg folic acid, 300 mg choline chloride, 50 mg vitamin C.
[2] Per kg of mineral premix contains 80 mg Mn, 35 mg Fe, 50 mg Zn, 5 mg Cu, 2 mg I, 0.4 mg Co, 0.15 mg Se.

**Table 2.** Nutrient content of rations and feeds used in the experiments

| | 1-28th. days | 28-84th days | Alfalfa | Spelled Bromine |
|---|---|---|---|---|
| ME, kcal/kg* | 2910 | 3190 | - | - |
| Crude protein, % | 23.06 | 20.36 | 24.16 | 16.41 |
| Dry matter, % | 91.29 | 91.84 | 17.00 | 20.34 |
| Ash, % | 5.67 | 5.38 | 13.20 | 11.81 |
| Crude fibre, % | 5.54 | 5.80 | 21.38 | 29.18 |
| Ether extract, % | 8.27 | 9.76 | 1.99 | 2.94 |

*Obtained by calculation.

Experimental groups were designed as 4 groups each of which consisted of 2 subgroups. 1st group was determined as control group in which chicks were fed ad-libitum and not free range access. As for experimental groups; the amount of feed given to chicks were based on the amount of feed consumed by contol group. So 2st, 3th, 4th groups fed %75 , %50, %25 ad libitum (Table 3). When mortality was seen in any each group, the quantities of concentrated feeds were adjusted according to the number again. Fresh coarse feeds (alfalfa, roasted bromine and thyme) were left in the mobile pens for easier feed access. The control group was terminated on the 42nd day of the experiment. However, at other times of the experiment, a certain number of broiler chickens continued to be fed as a control group in order to detect feed consumption of broiler chickens and to determine feeds to be given to experimental groups. The feed consumption of broiler chicks fed in the control group was calculated weekly. At the Experimental, the control group was terminated on the 42nd day and the other groups on the 84th day. But a certain number of broilers from control groups were continued to be fed in order to determine the amount of feed given to experimental groups.

At 42th and 84th day, totally 128 chicks taken randomly and equally from each subgroup were weighted individually and then killed by manual exsanguination after 10 h feed withdrawal. After plucked and eviscrerated; hot carcass weight were determined. Then carcass were seperated into small parts (buttock, wing, back vb…) and each edible and non-edible parts were weighted.

**Statistical Analyzes**: At the end of the experiment, variance analysis was used to calculate the statistics of live weight, slaughter weight, carcass weight and piece weight from the groups. The Duncan test was used to demonstrate the differences between the groups. Chi square analysis was used to determine the variability of percentile expressions such as carcass yield.

## RESULTS

The data obtained from slaughter house on the 42nd and 84th days of the experiment were presented on the tables. On the 42nd and 84th days of the experiment, a total of 128 animals, with equal number of animals, were slaughtered and hot carcass, breast and wing weights were determined together with hot carcass yields (Table 4). Slaughter weights (g) and hot carcass yields (%) at the 42nd and 80th days in the Experimental were 1225.1, 1203.9, 909.3 and 636.4 g; 70.63, 72.38, 70.75, 70.63 and 3145.00, 1843.13, 1518.13 g; 77.88, 75.00, 71.13 and 77.88 respectively (Table 5 and Table 6).

**Table 4**. The Hot Carcass Ratio in all experiments %

| | **Grup 1** | **Grup 2** | **Grup 3** | **Grup 4** | **Genel** |
|---|---|---|---|---|---|
| **42. days** | 71±0.01- | 72±0.01- | 71±0.01- | 71±0.01- | 71±0.01 |
| **84. days** | 78±0.01 a | 75±0.01 a | 71±0.02 b | 78±0.01 a | 75±0.01 |

Experiment 1 Group 1, 2, 3, 4: Control, 75%, 50%, 25%, respectively, refer to Concentrate feed Difference between groups with different letters (a, b, c)

**Table 5**. Carcass weight of 42 days obtained from Experimental G.

| | **Control** | | | **%75** | | | **%50** | | | **%25** | | | **General** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Slaughter weight | 1225.09 | ± | 39.33 **a** | 1203.88 | ± | 49.03**a** | 909.32 | ± | 40.84**b** | 636.38 | ± | 31.95**c** | 993.67 | ± | 47.43 |
| Carcass weight | 864.75 | ± | 27.60 **a** | 873.25 | ± | 39.13**a** | 644.88 | ± | 34.11 **b** | 447.88 | ± | 19.04**c** | 707.69 | ± | 34.81 |
| Head weight | 39.25 | ± | 1.13**a** | 40.50 | ± | 2.13**a** | 34.50 | ± | 1.66**b** | 28.88 | ± | 1.41**c** | 35.78 | ± | 1.13 |
| Foot weight | 59.13 | ± | 3.04**a** | 54.75 | ± | 1.94**a** | 45.88 | ± | 1.37**b** | 35.88 | ± | 1.78**c** | 48.91 | ± | 1.89 |
| Buttock weight | 246.00 | ± | 7.78**a** | 248.50 | ± | 9.84**a** | 186.88 | ± | 9.01**b** | 130.63 | ± | 5.91**c** | 203.00 | ± | 9.56 |
| Wing weight | 109.75 | ± | 2.48**a** | 106.13 | ± | 4.10**a** | 84.63 | ± | 3.71**b** | 64.13 | ± | 3.35**c** | 91.16 | ± | 3.68 |
| Back | 112.88 | ± | 8.48**a** | 104.38 | ± | 6.57**a** | 72.75 | ± | 4.61**b** | 52.38 | ± | 2.88**c** | 85.59 | ± | 5.22 |
| Chest weight | 275.38 | ± | 10.63**a** | 298.75 | ± | 15.98**a** | 216.50 | ± | 13.66**b** | 138.00 | ± | 7.09**c** | 232.16 | ± | 12.59 |
| Neck weight | 48.25 | ± | 3.16**a** | 48.63 | ± | 3.73**a** | 31.88 | ± | 2.41**b** | 24.13 | ± | 1.43**b** | 38.22 | ± | 2.32 |
| Edible | 41.63 | ± | 2.48**a** | 38.13 | ± | 2.16**a** | 29.50 | ± | 1.89**b** | 18.00 | ± | 0.96**c** | 31.81 | ± | 1.88 |
| Non-edible | 103.75 | ± | 7.71**a** | 79.13 | ± | 4.19**b** | 64.13 | ± | 5.16**bc** | 51.38 | ± | 4.96**c** | 74.59 | ± | 4.42 |
| Gizzard | 30.88 | ± | 1.57**a** | 28.75 | ± | 3.45**ab** | 22.75 | ± | 2.23**bc** | 20.63 | ± | 1.32**c** | 25.75 | ± | 1.33 |

Difference between groups with different letters (a, b, c) in the same line (P <0.05), -; Indicates no difference between groups

**Table 6**. Carcass weight of 84 days obtained from Experimental G.

| | Kontrol | | | %75 | | | %50 | | | %25 | | | General | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Slaughter weight | 3145.00 | ± | 134.46 **a** | 2203.13 | ± | 311.73 **b** | 1843.13 | ± | 242.09 **b** | 1518.13 | ± | 243.55 **b** | 2177.34 | ± | 158.51 |
| Carcass weight | 2443.75 | ± | 98.31 **a** | 1721.88 | ± | 252.64 **b** | 1398.13 | ± | 200.94 **bc** | 1104.38 | ± | 195.99 **c** | 1667.03 | ± | 128.93 |
| Head weight | 69.38 | ± | 3.05 **a** | 56.25 | ± | 2.63 **b** | 50.00 | ± | 4.63 **b** | 52.50 | ± | 5.51 **b** | 57.03 | ± | 2.37 |
| Foot weight | 110.63 | ± | 4.06 **a** | 91.25 | ± | 8.95 **ab** | 86.25 | ± | 7.54 **b** | 76.88 | ± | 9.68 **b** | 91.25 | ± | 4.34 |
| Buttock weight | 673.13 | ± | 21.98 **a** | 485.00 | ± | 70.36 **b** | 411.88 | ± | 59.04 **b** | 333.13 | ± | 58.49 **b** | 475.78 | ± | 34.76 |
| Wing weight | 268.75 | ± | 12.13 **a** | 223.75 | ± | 26.11 **ab** | 175.00 | ± | 22.12 **bc** | 139.38 | ± | 22.27 **c** | 201.72 | ± | 13.40 |
| Back | 363.75 | ± | 29.88 **a** | 203.75 | ± | 35.42 **b** | 180.00 | ± | 38.96 **b** | 126.88 | ± | 21.23 **b** | 218.59 | ± | 22.00 |
| Chest weight | 856.88 | ± | 32.33 **a** | 596.88 | ± | 101.70 **b** | 437.50 | ± | 62.61 **bc** | 355.00 | ± | 75.44 **c** | 561.56 | ± | 48.65 |
| Neck weight | 151.88 | ± | 8.23 **a** | 109.38 | ± | 17.12 **b** | 91.88 | ± | 14.85 **bc** | 65.63 | ± | 11.78 **c** | 104.69 | ± | 8.51 |
| Edible | 75.63 | ± | 3.95 **a** | 53.75 | ± | 6.93 **b** | 45.63 | ± | 6.16 **bc** | 35.63 | ± | 5.46 **c** | 52.66 | ± | 3.80 |
| Non-edible | 176.88 | ± | 18.37 **a** | 122.50 | ± | 13.98 **b** | 107.50 | ± | 6.75 **b** | 113.13 | ± | 10.52 **b** | 130.00 | ± | 7.97 |
| Gizzard | 53.75 | ± | 4.41 - | 49.38 | ± | 2.58 - | 56.25 | ± | 4.60 - | 48.75 | ± | 4.60- | 52.03 | ± | 2.04 |

Difference between groups with different letters (a, b, c) in the same line (P <0.05), -; Indicates no difference between groups

Buttocks and chest weights were 275.38, 298.75, 216.50 and 138.00 g and breast weights were 275.38, 298.75, 216.50 and 138.00 g respectively in the 42nd day of the study. The same values were obtained on days 84th, 673.13, 485.00, 411.88 and 333.13 g; 856.88, 596.88, 437.50 and 355.00 g, respectively.
Weights of buttocks were 246.00, 248.50, 186.88 and 130.63, respectively, in 42th days while they were 673.13, 485.00, 411.88 and 333.13 g, respectively. Chest weights were 275.38, 298.75, 216.50 and 138.00 g, respectively, on the same days; 856.88, 596.88, 437.50 and 355.00 g, respectively (p <0.05) (Table 5 and Table 6).
Slaughter weights were found to be 1225.09, 1203.88, 909.32 and 636.38 g in 42 days of the experiment and slaughter weights of 84 days were 3145.00, 2203.13, 1843.13 and 1518.13 g. The hot carcass yields (%) were determined as 76.63, 75.75, 75.00, 72.75 and 70.63, 72.38, 70.75, 70.63 (P> 0.405) (Table 4).

## DISCUSSION

Carcass ratio was determined to be similar among all groups at both 42th and 84th of age except for %50 group at 84th of age group which was lower. The average carcass ratio at the end of the study was higher than the other results reported in the literatures which could be attributed to diffent genotypes used in the studies (Wang et al., 2009; Fanatico et al., 2005).
Similar differences were reported between C and %75 groups in terms of slaughter weights at 42th days of age while all groups while slaughter weight of all treatment groups showing similar results with each other were found to be lower than control groups at 84th days of age. In the study by Urdaneta-Rincon and Leeson (Urdaneta-Rincon & Leeson, 2002) were mentioned that both slaughter weight of broilers were decreased with increasing the amount of feed restriction rate.
Restricted feeding groups weren't able to consume food as much as the ad libitum one. This condition reflected the carcass performance of broilers. At 42 days of age, control group and %75 group were found to be similar results for most of carcass traits (weights of carcass, head, leg, hindlimb, back, breast, edible) while significant decreases was observed in %50 and %25 groups. But when it came to 84th days of age, total carcass and breast weights decreased depending on the amount of feed restriction rate. As for carcass parts such as head, hindlimb, back, non-edible weights; treatment groups which were lower than control group showed similar results. Causes of obtaining best results for control groups might have been attributed to not only feed restriction but also chilly weather seen in autumn. Average carcass weight obtained in the study was much higher than the results of Fanatico, Pillai et al. (Fanatico et al., 2008) which might be attributed to genotype differences. Koçer et al. (2018) were investigated the meal feeding effect on carcass traits and they didn't find any significant relationship.

## CONCLUSION

Carcass traits of slow growing chickens were affected by restricted feeding. Different amount of feed restriction in broilers didn't have significant effects in terms of some carcass traits such as carcass weight while some carcass traits were decreased in %50 percent of feed restriction. Even though carcaFurther researches should be done to see exact efficiency of feed

restriction by examining other parameters of broiler performance and carrying out not only in autumn but also in all climate conditions.

**Acknowledgement**
This study was supported by TUBİTAK (Project Number: 114O753) and Selcuk University Veterinary Faculty Hümeyra Özgen Research and Application Farm Center.

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