

## Effects of Different Breeding Systems on the Slaughter and Carcass Characteristics and Taste Criteria of Pheasants (*Phasianus colchicus*)

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**Abstract:** This study was conducted with the purpose of determining the effects of different breeding systems on the slaughter and carcass characteristics and taste criteria of pheasants bred under intensive conditions. With the comparison of the values concerning slaughter and carcass characteristics determined with the slaughter of 16 weeks old pheasants in terms of breeding systems and gender while significant differences were determined in favor of cage system in terms of carcass weights, weights of wings, breasts and edible internal organs and rates of wings and breasts ( $p < 0.05$ ) in terms of gender significant differences were determined in favor of male pheasants in terms of live weight, carcass weight and head, leg, internal organs, edible internal organs, wings and breast weights ( $p < 0.05$ ). Significant differences were also found in terms of taste and general level of liking between the meats of pheasants bred with free range and cage systems but cooked in the same way ( $p < 0.05$ ). In general, the meats of the pheasants bred with free range system were liked more than those of the pheasants bred with cage system.

**Key words:** Pheasant, breeding systems, slaughter and carcass characteristics, taste criteria, wings

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### INTRODUCTION

Pheasants are one of the bigger species of game birds and can be bred under intensive conditions. Pheasant meat has a different taste, aroma and texture than these of other fowls. Being a rare game animal, the meat of pheasants is more expensive than the meats of other livestock.

Pheasant meat is consumed with admiration particularly in Europe due to the facts that it is lean, has low level of cholesterol and is considered delicious with a unique taste and aroma (Sarica *et al.*, 1995). It has always found its special place on the tables of rulers and in feasts. Due to the low fat rate and low level of cholesterol, pheasant meat is also preferred by those following a diet. The most ideal pheasant species for breeding with meat production purposes is Ring-Necked Pheasant (*Phasianus colchicus*) (Nowland, 2007).

The main objective in ring-necked pheasant breeding for meat production purpose is to produce fowls with high quality and high weight carcass. As for breeding for game purposes, it is essential to produce light weight fowls capable of flying well. Accordingly, it is reported that the pheasants to be used as broodstock should be selected

in line with the purposes of breeding (Cetin and Kirikci, 2000). In breeding for meat production purpose, it is recommended that the live weight of ring-necked pheasants to be at least 900 g for females and 1200 g for males (Nowland, 2007).

Accommodation conditions in intensive pheasant breeding are similar to those required for breeding other fowls. However, it is well known that pheasants can be bred in both free range outdoor and closed cages (Sarica *et al.*, 1995; Cetin and Kirikci, 2000; Esen *et al.*, 2010). Breeding adult pheasants is possible in both outdoor and closed coops in flocks or in breeding cages. The way how breeding will be made depends on the preference of the breeders and the state and size of the shelter. While in some studies (Mantovani *et al.*, 1993; Cetin *et al.*, 1997; Tepeli *et al.*, 2002; Kirikci *et al.*, 2003; Ozbey *et al.*, 2011) individual breeding cages and coops were used to breed pheasants, some researchers (Mashaly *et al.*, 1983; Bates *et al.*, 1987) bred pheasants in flocks with varying male-female ratios and in outdoor coops with natural lighting. Kirikci *et al.* (2003) on the other hand, bred pheasants in free flock system. Nowland (2007) reported that keeping records in breeding flocks bred in breeding cages easier and more reliable than

breeding in flocks yet on the other hand flock management is easier and less labor is needed in breeding in flocks. It is also reported that with the use of breeding cages, male pheasants do not fight each other for expanding their harems and therefore a higher rate of fertilization is obtained with less egg losses (Cetin and Kirikci, 2000).

At the end of pheasant fattening, approximate carcass yield between 75 and 80% and approximate carcass weight of 1 kg can be obtained (Cetin *et al.*, 1997; Marsico and Vonghia, 1991; Sarica and Karacay, 1994). Sarica and Karacay (1994) determined the ratios of legs, breast and wings to carcass as 30.58, 35.51 and 10.65%, respectively while Cetin *et al.* (1997) found the same ratios as 26.76, 33.97 and 11.35%.

For 14, 16 and 18 weeks old pheasants, Tepeli reported 877.00, 918.00 and 1058.00 g mean live weights, 74.75, 77.15 and 74.54% carcass yield and determined the ratios of breasts and legs to carcass as 34.18, 28.34, 34.74, 27.66, 34.23 and 27.34%, respectively. Cetin *et al.* (1997) found the mean live weights of pheasants slaughtered at the 18th week to be 926.00 g in general, 1058.00 g for male pheasants and 794.00 g for female pheasants. The researchers found carcass weight and carcass yield as 737.55 g and 79.7% in general, 836.9 g and 79.03% for male and 638.2 g and 80.37% for female pheasants. Ratios of breast and legs to carcass were found out to be 34.00 and 27.57% for male pheasants and 34.39 and 27.18% for female pheasants. It was reported that there is a significant difference between the two genders in terms of all carcass part weights of the slaughtered pheasants.

## MATERIALS AND METHODS

The materials of the study were constituted by the chicks obtained from Ring-Necked Pheasants (*P. colchicus*) bred in the Livestock Research and Implementation Unit of Firat University Faculty of Veterinary Science.

Chicks obtained from the incubator were weighted and put into brooders. After 2 weeks in brooders, chicks were separated to two groups in order to be bred in free range and cage systems. In free range system 30 male and 60 females were put as a flock to a 60 m<sup>2</sup> area with wood dust ground while in cage system the chicks were bred in three cages of 5×4×1.5 m dimensions and with a male-female ratio of 10:20.

After separating the chicks into groups, the necessary arrangements for having 16 h of light and 8 h of dark throughout the period of the study was carried out. In the 1st 4 weeks the chicks were fed with turkey starter

feed (28 crude protein and 3100 ME kcal kg<sup>-1</sup>) while after the 1st 4 weeks until the time of slaughter they were fed with turkey grower feed (23 Crude Protein and 3000 ME kcal kg<sup>-1</sup>) on *ad libitum* basis. In order to examine slaughter and carcass properties of pheasants, a total of 20 pheasants as 5 male and 5 female pheasants from each group were slaughtered.

Heads of the weighted alive pheasants were cut in between atlas and axis and the cut heads were weighted. After depluming the slaughtered pheasants also the feet were cut from joint and weighted. In order to determine carcass weights, internal organs were removed and both the carcass and internal organs were weighted. Also, in order to determine the weight of edible internal organs, heart, liver and gizzard were weighted together. After the determination of carcass weights in order to determine wing, leg and breast, weights wings were cut from art. humeri, legs were cut from art. coxae joint and the breasts were cut from the chests. Carcass dissection and measurements were carried out with the method reported by Jones (1984).

After the slaughter in the 16th week, carcass, weights of carcass sections and the weights of the edible internal organs were measured with a 0.1 g sensitive electronic balance. Hot carcass yield and slaughter rates were calculated with the following equation (Akbay, 1985):

### Hot carcass yield:

$$\frac{\text{Carcass weight (g)}}{\text{Slaughter weight (g)}} \times 100$$

### Rate of sections:

$$\frac{\text{Carcass section (g)}}{\text{Carcass weight (g)}} \times 100$$

In order to conduct sensory analysis, after the dissection and weighting processes of carcasses, breast and leg parts of all carcasses from free range and cage groups were cooked on separate trays in an oven at 200°C. Meats from the cooked breast and legs were sorted to plates numbered in the same way. The 10 female and 10 male panelists between the ages of 20 and 45 were asked to conduct sensory analysis. At 15:00 o' clock after lunch, the participants of the panel were explained how they will grade the samples and the criteria they are required to pay attention to. After tasting pheasant meats served in separate and numbered plates, the meats were graded from 1-10 via the distributed grading forms by writing down plate numbers and assessing the meat by means of

looks, color, smell, chewiness, taste and general liking quality factors (Kurtcan and Gonul, 1987; Tekinsen and Keles, 1994; Wood, 1989).

Statistical evaluation of the data obtained from the research was performed via SPSS 11.5 Program and significance control of the differences between the groups in terms of slaughter and carcass characteristics and sensory analysis values was assessed through t-test. On the other hand, the significance control of the difference between the groups in terms of carcass rates was calculated with  $\chi^2$ -test (Ozdamar, 1999; SPSS Inc., 2001).

**RESULTS AND DISCUSSION**

Slaughter and carcass characteristics of the slaughtered pheasants and the percentage and weight values of carcass sections are presented in Table 1. The mean live weights of general, male and female slaughtered pheasants were determined to be respectively, 966.57, 1051.00 and 881.42 g for free range system and 999.87, 1082.45 and 916.78 g for cage system. Carcass weights and carcass yields for the same order were found out to be 723.68 and 75.42%, 784.19 g and 74.83%, 663.45 g and 75.7% for free range system and 766.68 g and 76.57%, 814.69 g and 75.45%, 710.23 g and 77.69% for cage system. For male and female pheasants, the ratios of breasts and legs as the important parts of the carcass to the total carcass were found out to be 32.64, 27.49 and 31.12, 26.40% for free range system and 37.93, 27.85 35.63 and 27.86% for cage system.

Significant differences in favor of cage system were determined between the breeding systems in terms of

carcass weights, edible internal organ, wing and breast weights and wing and breast rates ( $p < 0.05$ ). The differences between male and female pheasants in terms of live weights, carcass weights, head, feet, internal organ, edible internal organ, leg, wing and breast weights were determined to be significant and in favor of male pheasants ( $p < 0.05$ ).

Results of the sensory analysis test arranged for evaluating consumers' opinion on the quality criteria of pheasant meat such as color, smell and taste are presented in Table 2. Significant differences were also found in terms of taste and general level of liking between the meats of pheasants bred with free range and cage systems but cooked in the same way ( $p < 0.05$ ). In general, the meats of the pheasants bred with free system were liked more than those of the pheasants bred with cage system.

With the comparison of the values concerning slaughter and carcass characteristics determined with the slaughter of 16 weeks old pheasants in terms of breeding systems and gender while significant differences were determined in favor of cage system in terms of carcass weights, weights of wings, breasts and edible internal organs and rates of wings and breasts ( $p < 0.05$ ), in terms of gender significant differences were determined in favor of male pheasants in terms of live weight, carcass weight and head, leg, internal organs, edible internal organs, wings and breast weights ( $p < 0.05$ ).

Although, being similar to the carcass yield values, Tepeli reported for 14, 16 and 18 weeks as 74.75, 77.15 and 74.54%, the carcass yields obtained from the slaughtered pheasants in the present study were

**Table 1: Slaughter and carcass characteristics of pheasants**

Characteristics	Breeding system						BSP	SP
	Free range system ( $\bar{X} \pm S_{\bar{X}}$ )			Cage system ( $\bar{X} \pm S_{\bar{X}}$ )				
	Female (n:5)	Male (n:5)	General (n:10)	Female (n:5)	Male (n:5)	General (n:10)		
Live weight (g)	881.42±12.35	1051.18±13.21	966.57±12.36	916.78±14.81	1082.45±13.57	999.87±12.49	-	*
Carcass weight (g)	663.54±11.36	784.19±12.36	723.68±11.62	710.23±12.62	814.69±13.05	766.57±12.36	*	*
Head weight (g)	33.46±48.00	39.27±0.760	36.35±0.630	34.81±083.0	43.36±1.040	38.75±0.710	-	*
Feet weight (g)	21.53±0.370	26.18±0.480	24.38±0.430	22.73±0.520	28.25±0.570	25.56±0.560	-	*
Internal organ weight (g)	72.36±3.650	93.46±4.270	82.75±3.870	76.37±3.680	97.49±4.190	86.84±3.890	-	*
Edible internal organ weight (g)	45.28±2.140	56.73±2.780	50.85±2.460	51.53±2.410	60.53±3.160	55.14±2.680	*	*
Leg weight (g)	175.47±5.350	216.36±6.240	195.74±5.760	198.34±5.890	227.56±6.730	221.84±6.650	-	*
Wing weight (g)	68.24±3.120	87.52±3.410	77.25±3.250	85.91±3.640	103.23±4.240	94.36±3.850	*	*
Breast weight (g)	206.42±5.610	256.73±6.180	231.56±5.650	253.55±6.530	284.72±6.830	268.62±6.640	*	*
Carcass yields (%)	75.87±0.490	74.83±0.560	75.42±0.530	77.69±0.610	75.42±0.580	76.57±0.590	-	-
Head (%)	4.98±0.070	4.94±0.060	4.96±0.070	4.78±0.060	5.18±0.100	4.84±0.080	-	-
Feet (%)	3.19±0.050	3.28±0.070	3.25±0.060	3.06±0.050	3.39±0.080	3.23±0.060	-	-
Internal organ (%)	10.87±0.350	11.93±0.420	11.47±0.390	10.83±0.290	11.86±0.460	11.36±0.370	-	-
Edible internal organ (%)	6.75±0.080	7.13±0.090	6.87±0.080	7.17±0.090	7.37±0.110	7.27±0.100	-	-
Leg (%)	26.40±0.480	27.49±0.520	26.93±0.500	27.86±0.630	27.85±0.710	27.85±0.670	-	-
Wing (%)	10.28±0.340	11.12±0.410	10.67±0.370	11.95±0.460	12.61±0.530	12.32±0.490	*	-
Breast (%)	31.12±0.520	32.64±0.580	31.73±0.550	35.63±0.610	34.93±0.560	35.35±0.580	*	-

\* $p < 0.05$ ;  $p > 0.05$ ; S: Sexuality, BS: Breeding System

Table 2: Sensory analysis test (n:20)

Characteristics	Breeding system ( $\bar{x} \pm s_{\bar{x}}$ )		p-value
	Free range system	Cage system	
Appearance	8.47±0.36	7.26±0.39	-
Color	8.82±0.41	8.74±0.43	-
Smell	7.74±0.43	8.12±0.45	-
Chewiness	8.62±0.39	8.84±0.42	-
Taste	9.34±0.47	7.67±0.45	*
General level of liking	8.86±0.35	7.46±0.37	*

\*p<0.05; p>0.05

lower than those reported by Sarica and Karacay (1994) for 14 weeks fattened male, female and general pheasants as 78.06, 78.05 and 78.5% and by Cetin *et al.* (1997) for 18 weeks old pheasants as 79.03, 80.37 and 79.70%. Obtained leg, wing and breast rates were found out to be similar to those reported by Sarica and Karacay (1994) and Cetin *et al.* (1997).

In general, the values obtained in the study are in line with the data available in the literature and it is considered the partial differences may have resulted from factors that have effects on the weight of carcass and carcass sections such as age, gender, feeding, concentration of population and lighting (Akabay, 1985; Baeza, 2004; Ozen, 1989; Saylam *et al.*, 1996).

It was determined that the meats of pheasants bred in free range system were superior than that of pheasants bred in cage system in terms of sensory characteristics and a significant difference was observed particularly in taste and general liking characteristics (p<0.05). Taste and quality of the meat is affected by the fat accumulation in muscles. The effects of the fats accumulated in muscles and in between of muscle fibres on the softness, taste and therefore quality of the meat vary (Akabay, 1985; Tekinsen and Keles, 1994; Baeza, 2004; Ozen, 1989; Saylam *et al.*, 1996). It is considered that due to the high movement capability of pheasants bred in free range systems fat accumulation under the skin is lower, fat is evenly distributed within the muscles and the taste provided by the fat distributed to the muscle and in between muscle fibres is higher (marbling) while due to the restricted movement of pheasants bred in cage systems fat is accumulated under the skin and removed from the meat together with the skin which leads to a lower taste quality (Akabay, 1985; Tekinsen and Keles, 1994; Baeza, 2004; Ozen, 1989; Saylam *et al.*, 1996). In terms of carcass weights, carcass yields and the ratios of carcass sections, cage system was determined to be more advantageous than free range system while male pheasants were determined to be superior to female pheasants. In general, the meats of the pheasants bred with free system were liked more than those of the pheasants bred with cage system.

## CONCLUSION

This study was conducted with the purpose of determining the effects of different breeding systems on the slaughter and carcass characteristics and taste criteria of pheasants bred under intensive conditions.

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