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Effect of Different Protein Levels for Finishing Period on Fattening Performance and Carcass Traits in Native Turkish Geese

[1]T. Sahin, [2]M. Tilki, [1]I. Kaya, [1]Yucel Unal and [1]Dilek Aksu Elmali
[1]Department of Animal Nutrition and Nutritional Disease, [2]Department of Animal Science,
Faculty of Veterinary Medicine, Kafkas University, 36300, Kars, Turkey

Abstract: This study was carried out to investigate the effect of the different protein levels on the body weight gain, feed consumption, feed efficiency and carcass traits in the finishing period in native Turkish geese. In the experiment, 10 weeks of age native Turkish geese were used. A total 48 geese were divided into three experimental groups, 16 geese for each. They were fed with the rations containing 10, 12.5 and 15% crude protein and 2900 kcal kg^{-1} metabolic energy. Body weights of the geese were found to be similar in the treatment groups 1, 2 and 3 ($p>0.05$). There is no significantly difference among the treatment groups in the cases of body weight gain. The most significant differences were observed in abdominal and intestinal fat weights among the treatment groups ($p<0.05$-0.01). Warm carcass percentage, neck, back and wing weight were determined to be significantly heavier in group 1 ($p<0.05$). Leg, back, intestinal+abdominal fat percentages were significant among the treatment groups ($p<0.05$-0.001). It was detected that high protein levels gave no advantage in finishing period in the native Turkish geese.

Key words: Different protein levels, fattening performance, native Turkish geese

INTRODUCTION

It is generally recognized that geese are fast growing birds and are originally herbivore. But accumulating data have reported that a large percentage of the weight gain is due to body weight, feathers and body fat (Stevenson, 1985). In relation with that, Summers *et al.* (1986) have investigated the protein requirements and weight gain of domestic geese. Extensive feeding schemes with or without grass usage have been studied previously (Cowan, 1980: Guy *et al*., 1996). Authors have reported the effect of energy concentration on the growth and carcass composition in geese slaughtered at an early (9 weeks) stage (Stevenson, 1985). Contrarily, others favor growth and consider at a later (17 weeks) age. The reproductive cycle of all goose breeds is highly seasonal from January-June (Guy *et al*., 1996).

In Turkey, geese are raised on grass from 3 weeks of age and fattened with only cereals before slaughter at around 17 weeks of age. Goose has been raised for a long time in Turkey, particularly in Kars, where different growing techniques are used commercially. One of the techniques used thereby is based on rearing geese on grass and grain for 4-6 weeks before the slaughter at 17 weeks age (Kirmizibayrak, 2002; Tilki and Inal, 2004a).

A few studies have been carried out to determine the body weight, slaughter and carcass traits of native Turkish geese (Kirmizibayrak, 2002; Tilki *et al*., 2005). They determined that the slaughter weight, carcass weight, carcass percentage, liver weight and abdominal + intestinal fat weigh were 3890-5134 g, 2685-3650 g, 63.0-72.1%, 62.5-76.2 g and 73-429.8 g, respectively. Like wise, Cywa-Benko *et al.* (1999) found 6236 g body weight in Koluda White geese, while Mazanowski (1999b) reported 6554, 6120, 5653, 5325 and 5433 g body weights in 5 different geese species at 17 weeks of age.

Thus, the present study aimed at investigating the protein requirement, weight gain and carcass traits of the native Turkish geese in finishing period in relation with different protein levels in the rations used during the study.

MATERIALS AND METHODS

The research was conducted on the poultry unit of the research farm of Kafkas University, Turkey. A total number of 48 male and female native Turkish geese at the age of 10 weeks were distributed in to 3 metal pens at a density of 8 male and 8 female species per pen. Pens were fitted and 0.4-0.8 m^2 floor place was allowed for each

Corresponding Author: Dr. Tarkan Sahin, Department of Animal Nutrition and Nutritional Disease, Faculty of Veterinary Medicine, Kafkas University, 36300, Kars, Turkey

animal (Ensminger, 1992). The experiment started after recording body weight at the age of 10 weeks. The geese were weighed weekly until 16 weeks of age.

The rations consisted mainly of barley, corn and sunflower meal were formulated containing 10 (Group 1), 12.5 (Group 2) and 15 (Group 3)% crude protein and all with Metabolizable Energy (ME) levels of approximately 2900 kcal kg^{-1} (NRC 1994). The composition of the rations is shown in Table 1. Feed and water were offered *ad libitum* in all experimental period and feed consumption was recorded weekly. Chemical composition of feeds was analyzed by the methods of AOAC (1990). The metabolisable energy levels in the rations were calculated with the aid of the formula developed by Carpenter and Clegg (1956).

The experiment ended at the age of 16 weeks after a final weight record and the animals were ceased feeding 18-20 h before the slauhgter. They were weighted and bled and wet plucked by hand. After plucking and eviscerating, carcasses were stored 24 h at +4°C and dissected according to Jones (1984). Carcass parts (leg, breast, back, wing and neck) were assessed with skin. Abdominal fat was gathered from the abdominal membrane and around gizzard and liver. Intestinal fat was collected from mesenteries only. Data acquired were recorded for each individual bird.

Table 1: Components and nutrients of the experimental rations

	Rations		
Ingredient	1	2	3
Barley	48.00	28.40	12.00
Corn	44.00	51.00	55.00
Sun-flower meal	6.00	18.60	31.00
Limestone	1.00	1.00	1.00
Dicalcium phosphate	0.50	0.50	0.50
Salt	0.25	0.25	0.25
Vitamin premix	0.10	0.10	0.10
Mineral premix	0.15	0.15	0.15
Analysis-determined			
Protein	10.12	12.50	14.90
ME (kcal kg^{-1}*)	2892.00	2893.00	2896.00

*Calculated

General linear model was employed for the evaluation of both slaughter and carcass traits. Ration groups and sex were included in the model as fixed effects. Differences between the groups were defined by the Duncan test (SPSS 12.0).

The model below was used for the analyses of slaughter and carcass traits:

$$Y_{ijk} = \mu + a_i + b_j + e_{ijk}$$

where:

Y_{ijk} = ith ration group, jth sex.
μ = Mean.
a_i = Ration group (i = 1-3; 1: 10 %, 2: 12.5 % and 3;15 % crude protein).
b_j = Sex (k = 1-2; Male, Female).
e_{ijkl} = Error.

Feed consumption and conversion efficiency were not analyzed statistically since the group feeding was applied in the experiment.

RESULTS

The weekly body weight changes are shown in Table 2. The pattern of the body weight gain was similar in all the groups throughout experimental period (Table 3). The difference in body weight in term of the sex became statistically significant at 10-16 weeks of age ($p<0.01$-0.001). Feed consumption and conversion ratio were given in Table 4. Feed consumption was found to be 304.10, 285.07, 280.46 g and feed conversion ratios 12.75, 13.61, 12.07 g in the groups 1, 2 and 3 throughout experimental period, respectively.

Parameters in carcass quality of the geese are shown in Table 5a. Slaughter weight, head, foot, heart, liver and gizzard weights were not affected by the different protein levels ($p>0.05$). Significant differences were observed in the abdominal and intestinal fat weights at the treatment

Table 2: Effects of different protein and sex on body weights of geese (mean±std. error)

	Weeks													
	0		1		2		3		4		5		6	
Overall	3019	42.3	3226	35.8	3501	35.8	3658	38.8	3771	38.8	3875	35.7	3972	33.9
Groups	ns		ns		ns		ns		ns		ns		ns	
1	3020	77.7	3280	76.7	3552	71.9	3701	81.6	3793	84.1	3901	77.7	4022	92.2
2	3018	81.2	3227	65.9	3462	75.0	3618	87.7	3736	95.1	3830	81.2	3898	65.5
3	3019	60.3	3171	61.1	3490	64.0	3654	67.4	3785	68.1	3896	60.3	3995	79.6
Sex	ns	**	***	***	***	***	***							
Male	3096	49.5	3350	44.9	3643	41.3	3832	45.3	3972	48.6	4087	49.5	4176	50.2
Female	2942	64.1	3102	53.7	3359	56.1	3484	60.2	3570	56.7	3664	64.1	3767	49.1

ns: non significant ($p>0.05$), **: $p<0.01$, ***: $p<0.001$

Table 3: Effects of different protein and sex on daily body weight gains of geese (mean±std. error)

	Weeks											
	1		2		3		4		5		6	
Overall	29.5	2.78	39.3	2.59	22.3	2.13	16.1	1.68	15.6	2.38	13.0	2.21
Groups	ns		ns		ns		ns		ns		ns	
1	37.1	4.62	38.8	5.01	21.3	3.28	13.0	2.89	15.4	4.71	17.3	4.16
2	29.8	4.16	33.5	4.17	22.2	4.26	16.8	3.47	15.7	4.43	9.7	2.43
3	21.7	6.08	45.6	3.96	23.4	3.76	18.5	2.67	15.8	3.71	14.2	2.97
Sex	*		ns		*		*		ns		ns	
Male	36.3	3.61	41.8	3.94	26.9	2.93	19.9	2.84	17.9	4.12	12.8	3.10
Female	22.8	4.39	36.8	3.37	17.7	2.89	12.4	1.77	13.4	2.59	14.7	3.05

ns: non significant (p>0.05), *: p<0.05

Table 4: Feed consumption and feed conversion ratio of the geese

	Weeks													
	1		2		3		4		5		6		Overall	
Groups	FC	FCR	FC	FCR	FC	FCR	FC	FCR	FC	FCR	FC	FCR	FC	FCR
1	356.38	9.59	341.53	8.79	293.96	13.79	264.73	20.30	274.46	17.81	293.54	16.90	304.10	12.75
2	313.30	10.51	328.04	9.77	280.04	12.59	232.28	13.76	273.21	17.39	283.52	29.14	285.07	13.61
3	330.54	15.23	319.49	7.00	271.47	11.59	244.38	13.15	260.63	16.40	256.24	18.05	280.46	12.07

Table 5a: Effects of different protein and sex on slaughter and carcass traits of the geese, g (mean±std. error)

	Slaughter weight		Head		Foot		Heart		Liver		Gizzard		Abdominal fat		Intestinal fat		Abdominal+ intestinal fat	
Overall	3974	33.5	134.4	1.59	106.7	1.42	26.0	0.57	93.2	2.92	131.8	2.68	181.5	6.02	132.0	6.10	313.5	8.52
Groups	ns		ns		ns		ns		ns		ns		*		**		***	
1	4028	89.6	134.8	2.71	110.3	3.52	27.2	1.15	91.7	7.19	125.4	2.69	205.1	14.13a	152.2	10.98a	357.4	20.08a
2	3898	65.5	135.7	3.32	106.4	1.25	24.4	0.64	87.0	3.12	134.4	4.59	170.7	9.10b	139.2	11.60a	309.9	14.14b
3	3995	79.6	132.7	2.22	103.3	1.79	26.5	1.15	101.0	5.32	135.6	5.95	168.6	10.75b	104.6	8.99b	273.2	14.65b
Sex	**		ns		ns		*		ns		ns		*		ns		*	
Male	4176	50.2	134.9	2.70	107.3	2.43	27.2	0.90	98.9	4.97	130.2	3.83	195.9	11.49	140.0	9.09	336.0	16.52
Female	3771	47.9	133.9	1.71	106.1	1.49	24.9	0.73	87.6	3.80	133.3	3.82	167.0	6.87	124.0	9.64	291.0	11.92

a, b: Differences between values having different letters in the same line are statistically significant (p<0.05), ns: non significant (p>0.05), *: p<0.05, **: p<0.01, ***: p<0.001

Table 5b: Effects of different protein and sex on slaughter and carcass traits of the geese, g (mean±std. error)

	Warm carcass		Cold carcass		Neck		Leg		Chest		Back		Wing		Warm carcass percentage		Cold carcass percentage	
Overall	2680.6	27.24	2619.6	27.36	249.0	3.21	661.6	7.56	773.6	8.38	569.7	9.65	365.5	4.00	67.4	0.39	65.9	0.38
Groups	ns		ns		*		ns		ns		*		*		*		ns	
1	2758.5	58.91	2695.6	59.41	262.1	9.30a	660.9	10.06	784.0	18.82	607.8	18.81a	380.6	9.77a	68.5	0.42a	66.9	0.39
2	2642.5	52.83	2580.9	53.14	242.1	4.47b	668.1	14.26	764.6	19.21	545.6	12.92b	360.3	8.12b	67.7	0.66ab	66.1	0.64
3	2640.7	60.25	2582.5	60.15	242.8	5.08b	655.9	17.60	772.1	16.18	555.9	24.18b	355.6	4.10b	66.1	0.81b	64.6	0.80
Sex	***		***		***		**		***		***		**		ns		ns	
Male	2808.0	44.44	2747.5	44.42	263.1	6.43	685.8	11.77	815.8	13.09	606.2	16.01	376.4	6.73	67.2	0.63	65.7	0.62
Female	2553.2	34.33	2491.8	34.54	235.0	2.55	637.5	8.94	731.4	10.38	533.3	13.16	354.5	5.66	67.7	0.48	66.0	0.46

a, b: Differences between values having different letters in the same line are statistically significant (p<0.05), ns: non significant (p>0.05), *: p<0.05, **: p<0.01, ***: p<0.001

Table 6: Effects of different protein and sex on slaughter and carcass traits of the geese, % (mean±std. error)

	Neck		Leg		Chest		Back		Wing		Abdominal fat		Intestinal fat		Abdominal+ intestinal fat	
Overall	9.5	0.09	25.2	0.13	29.5	0.16	21.6	0.21	13.9	0.11	6.7	0.21	4.9	0.22	11.6	0.29
Groups	ns		***		ns		*		ns		ns		*		**	
1	9.7	0.19	24.5	0.28b	29.0	0.33	22.5	0.31a	14.1	0.13	7.4	0.45	5.4	0.35a	12.8	0.57a
2	9.4	0.15	25.8	0.10a	29.6	0.27	21.1	0.19b	13.9	0.21	6.4	0.31	5.2	0.42a	11.7	0.46ab
3	9.4	0.11	25.4	0.29a	29.9	0.19	21.4	0.54b	13.8	0.25	6.3	0.35	3.9	0.35b	10.3	0.51b
Sex	ns		*		ns		ns		*		ns		ns		ns	
Male	9.5	0.14	24.9	0.28	29.7	0.23	22.0	0.35	13.7	0.16	6.9	0.37	4.9	0.32	11.9	0.52
Female	9.4	0.11	25.5	0.13	29.3	0.23	21.3	0.29	14.2	0.16	6.5	0.25	4.8	0.35	11.3	0.41

a-b: Differences between values having different letters in the same line are statistically significant (p<0.05), ns: non significant (p>0.05), *: p<0.05, **: p<0.01, ***: p<0.001

groups ($p<0.05$-0.01). The mean weight levels of carcass characteristics were presented in Table 5b. Warm carcass percentage, neck, back and wing weights in the Group 1 were determined to be significantly heavier than those in the other groups ($p<0.05$). Table 6 displayed the carcass characteristics as percentage. Leg, back, intestinal+ abdominal fat percentages were statistically significant among the treatment groups ($p<0.05$-0.001).

DISCUSSION

In the present study, geese were fed with the rations based on different protein levels. Body weight has increased moderately from 10 weeks of age to 16 weeks of age. Body weights of the geese that received 10.0, 12.5 and 15.0% of protein were not significantly different at slaughter among the treatment groups. Body weights of the animals at 16 weeks of age were similar to those reported previously and were usually between 4.0-5.3 kg at slaughter (Kirchgeβner *et al*., 1997; Tilki and Inal, 2004b). But male geese were significantly heavier than female geese at all weeks. This emphasizes the essenties of determining the sex at the beginning of the fattening. Hence, body weight of fattened geese varies according to genotype, sex, age and feeding technique. Body weights found in this study for males and females, were lower than the reported values (Tilki *et al*., 2005) for native Turkish geese and for most European originated geese reported by Kirchgeβner *et al*. (1997) and Cywa-Benko *et al*. (1999).

Kirchgeβner *et al*. (1997) reported significant body weight development between 12 and 16 weeks of age. This study found that the barley group did not gain significant body weight during this period as compared to those of the other groups. Although the other groups in that study had higher body weights, they were not statistically significant, as compared to that of the barley group. Similarly, our results indicated that there was no significant difference in term of the body weight among the groups fed on different protein levels. The results of that study and ours clearly indicated that high protein levels gave no advantage on the body weight in finishing period.

Group 2 and 3 had similar feed consumption whereas Group 1 had a slightly higher feed consumption, which is probably due to the lower ration protein level in the ration of this group. Feed conversion ratios were approximately similar among the treatment groups. The different protein level of rations had no effect on the feed conversion ratio. Daily feed consumption and conversion ratios were found to be higher than those reported by Tilki and Inal (2004a), but were similar to the values by Kirchgeβner (1997).

Diet composition had various effects on carcass parameters. There were not statistically significant differences on the slaughter and carcass traits among the treatment groups (Table 5a). Slaughter and heart weights in male geese were higher than those in females. Mean values of the slaughter weight, head, foot and heart were lower than those reported by Tilki and Inal (2004b), but those of the liver and gizzard weight were similar to the results of these reports. As far as the data on the liver were concerned, our study was in agreement with the report of Kirchgeβner *et al*. (1997), indicating non-significant effect of the protein level on liver weight.

Abdominal and intestinal fat weights were higher in Group 1. Therefore, it might be concluded that the diet with the higher level of the ME/HP caused to greater fatness. Hrouz (1988) also reported that abdominal and intestinal fat weights increased by the 16 weeks of age. Our results were in similar with those of Guy *et al*. (1996), who determined that concentrate diet may lead to significant fat. The results of intestinal and abdominal fat weights in this study were similar to the values reported by Hrouz (1988) and Tilki and Inal (2004b). However, they were higher than those reported by Tilki *et al*. (2005) on native Turkish geese. Differences between the results of these studies might be because of the rations, genotypes and age of slaughter. In general, abdominal and intestinal fat percentages were found to be higher than those found in other studies (Fortin *et al*., 1983; Cave *et al*., 1994).

Analysis of dietary treatment effects has shown that the ration influences certain body compositions of animals. This means that individual organs grow until reaching their functional optimal size. Sex is also an important factor influencing body composition, especially periods of fattening. This is in agreement with the report of (Hrouz, 1988). Effects of sex on the present carcass traits were found to be lower than those reported by Tilki *et al*. (2005) for native Turkish geese. Carcass weight parameters were found to be lower than those reported by Cywa-Benko (1999). On the other hand, these values were similar to those reported by Fortin *et al*. (1983) for different geese genotypes. Carcass percentage data were higher than those reported by Cave *et al*. (1994) for Emden geese and they were similar with those of Grunder *et al*. (1991).

The percentage yield of neck, chest and wing did not vary among the treatment groups. However, females had slightly higher leg and wing yield percentage than males did. Wing percentage was similar, but neck percentage was higher than the reported value by Tilki and Inal (2004b). The results of leg percentage in this study were higher than those reported by Mazanowski (1999a) and Tilki *et al*. (2005), were similar to those reported by Mazanowski and Smalec (1998).

CONCLUSION

In general, it might be concluded that, in terms of weight gain, geese will respond more to increasing dietary energy levels than increasing dietary protein. Additionally, differences among the carcass parts might be the results of the different diets, genotypes, slaughter ages and dissection methods. It was also detected that long term fattening was not suitable for the finishing geese because of the generation of excess fat deposition. The results hereby also clearly indicated that high protein levels gave no advantage in finishing period. Protein needs are to be met on relatively low protein rations as long as feed consumption is high.

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