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Effect Of Carcass Weight On Intramuscular Fat Composition Of Red Deer (#250)

Ruben Dominguez, Cristina Pérez-Santaescolástica, Belen Gómez, Paula Borrajo, Laura Cutillas-Barreiro, Mirian Pateiro, Daniel Franco, **Jose M. Lorenzo**

Centro Tecnologico de la Carne de Galicia, San Cibrao das Viñas, Spain

Introduction

Nowadays, there is a growing consumer concern about meat consumption and intake of certain unhealthy fatty acids (Leroy and De Smet, 2019). The lipid content and their composition in meat are important components that exceeds the limits set in nutritional recommendations (Domínguez et al., 2016). Thus, deer meat can be considered a good substitute for traditional meat because of its nutritional characteristics (Serrano et al., 2019a). Different studies concluded that deer meat is characterized by low fat and cholesterol contents, whit high amounts of polyunsaturated fatty acids and high levels of protein, essential amino acids and iron (Lorenzo et al., 2019; Maggiolino et al., 2019; Serrano et al., 2019b). Thus, de main objective of the present research was evaluated the influence of carcass weight on intramuscular lipid composition of deer loin.

Methods

The study was carried out with sixty deer (*Cervus elaphus*) hunted in Spain between August 2017 and March 2018. Animals were exsanguinated, eviscerated and decapitated in the countryside and were transported in refrigerated conditions to the processing industry. Carcasses were skinned, washed with cold water and maintained in a chamber at 0–2ºC for 4 days. Animals were subdivided in "low carcass weight" (LCW) (n=30) and "high carcass weight" (HCW) (n=30). From each carcass, the *longissimus thoracis et lumborum* muscle was dissected for analysis. The intramuscular fat content was extracted and quantified according to AOCS (2005) Official Procedure. For fatty acids composition, 50 mg of extracted fat according to Bligh and Dyer (1959) procedure were transesterified and quantified using gas chromatography following the conditions proposed by Domínguez et al. (2015), while the cholesterol quantification was performed using liquid chromatography as described Domínguez et al. (2018). The effect carcass weight on IMF, cholesterol and fatty acids profile was examined using a one-way ANOVA with the IBM SPSS Statistics 21.0 (IBM Corporation, Somers, NY, USA).

Results

The intramuscular fat (IMF), cholesterol and fatty acid contents of intramuscular fat of deer meat are shown in Table 1. The mean carcass weight of LCW animals was 25.2 kg, while in HCW group was 61.7 kg. As expected, IMF content increased ($P<0.001$) as increase carcass weight, from 0.14 g/100 g to 0.54 g/100 g for LCW and HCW groups, respectively. Similar results were obtained in other studies who concluded that slaughter age and, therefore, carcass weight resulted in an increase of IMF content (Volpelli et al., 2003). Additionally, the values found in the present study agree with those reported by Lorenzo et al. (2019) who observed IMF values between 0.05 and 0.35% in deer meat. The cholesterol content presented an inverse tendency to IMF content. Animals from LCW group showed higher ($P<0.01$) contents (50 mg/100 g) than HCW (45.2 mg/100 g) deers. The increase in IMF is due to the increase in the fat globule that results in a proportional reduction of cell membranes, which is where cholesterol is mainly located. This would explain the lower cholesterol content in the animals with the highest IMF amount.

In similar way, the carcass weight also had high influence on fatty acid profile. The major fatty acids (FA) in IMF from LWC were polyunsaturated fatty acids (PUFA), followed by saturated fatty acids (SFA) and finally monounsaturated fatty acids (MUFA). In contrast, in HCW deers SFA were the most abundant FA, followed by PUFA and MUFA. Take into account these results, it seems that with the increase of both, carcass weight and IMF, increased the content of SFA and MUFA and decreased PUFA amounts. Other studies observed a significant decrease of PUFA and increase of SFA and MUFA as increase IMF (Wood et al., 2008). The IMF of both groups had high levels of essential FA as C18:2n-6 and C18:3n-3, and also presented high amount of other PUFA with great biological importance as C20:4n-6 and long-chain n-3 (EPA, DPA and DHA). However, LCW deers showed the highest values of these FA, which are very important from nutritional point of view. Similar results were obtained by Lorenzo et al. (2019), who identified the same FA in deer meat and concluded that younger animals (with low IMF) presented the highest values of all these FA. Finally, lower values of n-6/n-3 ratio were obtained for LCW than for HCW animals. Besides this, the values found in both group of animals are similar to the recommendations for human diet (n-6/n-3 < 4; FAO, 2010).

Conclusion

With the results obtained we can affirm that deer meat had low fat content. Lipid composition of intramuscular fat presented low cholesterol and high amount of FA with high biological activity. Therefore, deer meat can be ideal for a healthy diet.

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Notes

Table 1. Effect of carcass weight on intramuscular fat composition of red deer

	Carcass weight		*SEM*	*Sig.*
	Low	*High*		
Carcass weight (kg)	25.19	61.71	2.43	***
Intramuscular fat (g/100 g)	0.14	0.54	0.03	***
Cholesterol (mg/100 g)	50.06	45.21	0.91	**
Fatty acids (g/100 g FAME)				
C10:0	0.23	0.25	0.01	ns
C14:0	0.98	3.18	0.24	***
C14:1n-5	0.18	1.15	0.10	***
C15:0	0.35	0.52	0.03	**
C16:0	14.00	19.36	0.73	***
C16:1n-7	1.34	4.58	0.34	***
C17:0	0.60	0.43	0.04	*
C17:1n-7	0.22	0.16	0.01	*
C18:0	16.16	14.43	0.31	**
9t-C18:1	0.26	0.25	0.02	ns
11t-C18:1	0.63	0.61	0.05	ns
C18:1n-9	13.25	15.19	0.61	ns
C18:1n-7	1.86	2.34	0.11	*
C18:2n-6	22.78	18.04	0.70	***
C18:3n-6	0.27	0.18	0.01	***
C18:3n-3	4.02	2.33	0.22	***
C20:3n-6	1.20	0.90	0.07	*
C20:4n-6	10.94	9.08	0.41	*
C20:5n-3	3.03	1.54	0.15	***
C22:5n-6	1.96	1.73	0.07	ns
C22:5n-3	3.84	2.52	0.14	***
C22:6n-3	0.83	0.54	0.04	***
SFA	32.84	38.49	0.83	***
MUFA	16.91	23.41	0.81	***
PUFA	49.35	37.24	1.55	***
n-6	37.45	30.14	1.19	**
n-3	11.72	6.93	0.49	***
Long chain n-3	7.71	4.60	0.31	***
n-6/n-3	3.39	4.46	0.15	***

Table 1
SEM: Standard error of the mean; Sig: Significance; ns: not significant; * P<0.05; ** P<0.01; *** P<0.001; SFA: Saturated fatty acids; MUFA: Monounsaturated fatty acids; PUFA: Polyunsaturated fatty acids. Long-chain n-3: (C20:5n-3 + C22:5n-3 + C22:6n-3).

Notes