Comparison of Product Yield for Entire and Castrate pigs based on CT-scanning

Niels Christian Kjaersgaard[1] and Marchen Hviid[1]

[1]Danish Meat Research Institute, Measuring Systems, Maglegaardsvej 2, DK 4000 Roskilde, Denmark

Abstract – Within the European Union there is an intention to stop with surgical castration of pigs from 2018. A possible scenario therefore is that up to 50% of the slaughtered pigs within a few years can be Entire males. Previous research from 1995 showed that boars in general had larger fore-ends and smaller middles and legs than young sows and castrates. However, the populations, feeding and management have changed since then. Our newly performed tests show that there still is a significant difference in product yields for the fore-end and for the bacon product in middle. In some tests there were found a significant difference in product yields for the middles and legs as well. The significant difference for the middles might primarily be due to smaller yields for backs for castrates than entire males. The yield difference for the bellies was not significant.

Key Words: entire males, carcass yield,

I. INTRODUCTION

Within the European Union there is an intend to stop with surgical castration of pigs from 2018. A possible scenario therefore is that up to 50% of the slaughtered pigs in Europe within a short period of time can be entire males.

In order to be able to analyze the consequences of such scenarios it is important to know if yields from entire males are different from castrates. Previous research from 1995 [1] showed that entire males in general had larger fore-ends, smaller middles and legs. The populations of pigs slaughtered, slaughter weight, management and feeding has changed since then. Whether or not there still is a difference in yields between entire males and castrates is analyzed in this project.

II. MATERIALS AND METHODS

Entire males slaughtered at a commercial abattoir were selected due to slaughter weight and grading lean meat percent at the day of slaughter. It was aimed at that the number of carcasses in each sample group should be representative for the Danish production of entire males, table 1. All in all this was accomplished. The range for the LMP was 52-65 and 62-97 kg for the slaughter weight.

Table 1 Number of carcasses in each sample group

		LMP			
		≤ 57.9	58.0 - 59.9	60.0 - 81.9	≥ 62.0
Slaughter weight	≤ 76.9	1	3	4	4
	77.0 - 80.9	2	4	6	2
	81.0 - 84.9	1	4	6	2
	≥ 85.0	3	4	3	2

The day after slaughter the left sides of the carcasses were prepared identically before scanning according to the EU recommendation (except for leaving the hind foot on the carcass). Each sample was scanned the day after slaughter when the carcass temperature was 5-7° C. The scanning was performed using the following protocol settings: Standard reconstruction, 140 kV, 80 mA, 0.9x0.9x10 mm^3 voxel size, axial scanning.

DMRI and the Danish slaughterhouses had already a database with a considerable number of young sows and castrates CT-scanned in the same way. These carcasses also come from studies carried out at commercial abattoirs. All the CT-scanned castrates were divided into the same 16 sample groups as for the entire male based on the measured LMP and slaughter weight. From each sample group a number of carcasses are randomly chosen in accordance with Table 1.

The previous CT-scanned young sows and castrates were not chosen only to be representative for the Danish population, but out of other considerations. Furthermore, the Danish

populations of young sows, castrates and entire males will not have the same distribution according to weight and LMP, but in this investigation we want to compare to equal sub samples from the two genders.

In order to verify that the 51 carcasses from entire males and castrates are comparable the "true" LMP based on CT-scans [2] has be found for each of the two sub samples. The average LMP based on CT scans for the 51 carcasses is 59.9 for the castrates and 60.0 for the entire males.

Using the software PigClassWeb as described in [3] the CT-scanned carcasses are cut virtually to the commercial cuts of the primal joints. The cuts are similar to ESS-Food standard 1201, 1301 and 1601+1801 [5]. The virtual cuts makes it possible to use the same carcass an unlimited number of times for different products and the cuts will always be "ideal". If it is desired to trim the back bacon to 8mm of fat, it will actually be trimmed to 8mm. This cannot be performed by a slaughter as he cannot look inside the product.

III. RESULTS AND DISCUSSION

The virtual product yields are based on weight of meat, fat and bone estimated from PigClasWeb. The yields have been normalized so that the sum of the primaries for each half carcass equals 36 kg.

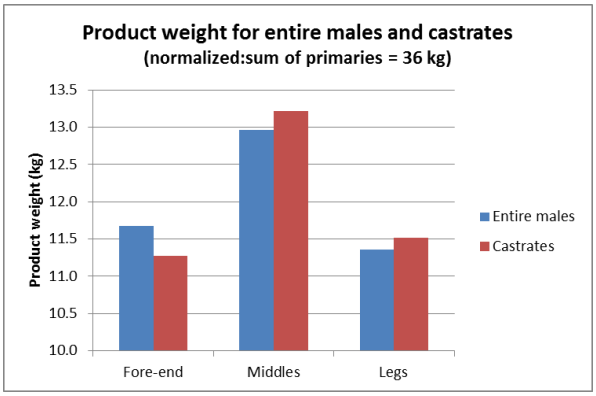

Figure 1. Product weights for primaries

A t-test with $\alpha = 0.05$ has been performed and shows that yields of the fore-end, middles and legs are significantly different for castrates and entire males. Average weights and p-values for primaries can be seen in Table 2.

Table 2. Average (kg) and p-values for primaries

Product	Castrates (kg)	Entire male (kg)	Diff. (kg)	p-value
Fore-ends	11.27	11.68	+0.41	0.0002
Middles	13.21	12.97	- 0.25	0.030
Legs	11.52	11.36	- 0.16	0.014

It can be seen that the average yield for fore-ends are larger for Entire males (0.41 kg) and smaller for middles and legs (0.25 kg and 0.16 kg respectively).

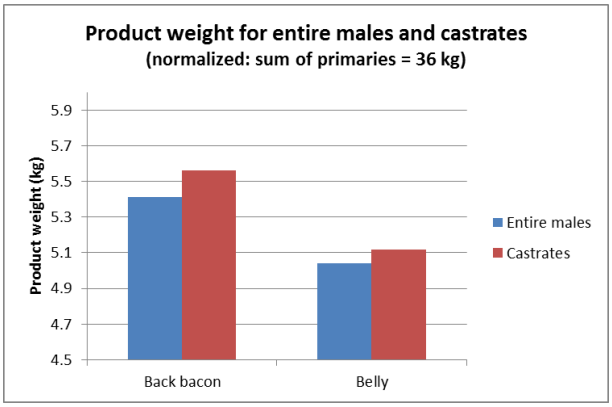

Figure 2. Product weights for untrimmed backs and bellies

The t-test in Table 3 shows that only the back has a significant difference in yields for castrates and boars. The average yield for an untrimmed 18 cm back is 0.15 kg smaller for entire males than for castrates. The difference in yields for the belly is not significant.

Table 3 Average (kg) and p-values for primaries

Product	Castrates (kg)	Entire males (kg)	Diff. (kg)	p-value
Back18 untrimmed	5.56	5.41	- 0.15	0.012
Belly	5.12	5.04	- 0.08	0.294

The above findings are in line with expectations based on results of previous research [4].

The same test has been reproduced 10 times randomly selecting different sample groups.

Table 3. P-value for differences in yields for entire males and castrates

Test	Fore-ends	Middles	Legs	Back bacon
1	0.000	0.030	0.014	0.012
2	0.006	0.067	0.092	0.003
3	0.007	0.215	0.015	0.041
4	0.000	0.046	0.002	0.016
5	0.000	0.010	0.052	0.008
6	0.011	0.135	0.168	0.041
7	0.000	0.019	0.021	0.002
8	0.001	0.073	0.025	0.004
9	0.000	0.040	0.010	0.007
10	0.015	0.119	0.103	0.035
11	0.001	0.129	0.004	0.016

In Table 3 the p-value for differences in yields for entire males and castrates can be seen for the 11 tests performed. In each test there was a significant difference in the yields for both the fore-ends and the back bacon for castrates and entire males. In 7 of the 11 tests there was a significant difference in yields for the ham for castrates and entire males. For middles there was a significant difference in 5 of the 11 tests.

IV. CONCLUSION

The tests documents that there is a significant difference in yields for the fore-end for entire males and castrates. This was demonstrated in each of the 11 tests performed. Entire males have a larger fore-end than castrates.

In some cases (depending on the samples chosen) there is a significant difference in yields for legs and middles as well. That there in some cases are significant differences in yields for the middles is primarily due to that entire males have smaller yields for backs than castrates. In each of the 11 tests performed there was a significant difference in yields for the back bacon product for entire males and castrates.

ACKNOWLEDGEMENTS

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