

# GRASS-BASED ORGANIC BEEF FOR SUSTAINABLE EATING

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## I. INTRODUCTION

Currently dairy bull calves born in organic herds are typically raised and fattened under conventional production conditions. Only a minor proportion is raised as organic steers, a production where high feed resources are needed per kg product. Hence meat from steer production has a high impact regarding nutrient losses and climate. This is a challenge to the fundamental organic values and principles. Thus, there is a demand for finding more sustainable solutions to produce organic rosé veal and beef of a quality requested by the consumer. In the present project (GrOBEat) we approach this in two pillars. In the present project "GrOBEat" the aim is to develop a new innovative food chain based on a production system, where three well-characterised beef products are produced. By utilizing late weaning of the calves and producing slaughter animals at three ages, the GrOBEat system needs less feed per kg live weight gain compared to traditional organic steers of more than two years. Hereby the nutrient losses (N and P) and green house gas emissions become lower per kg meat produced. In addition we test if quality can replace quantity when it comes to food consumption [1,2,3] and thereby health-optimize meat consumption, facilitating an overall lower meat intake, without compromising human well-being. Together with a higher animal welfare and high quality beef, this leads to lower consumption of beef at each meal due to an earlier sensory satisfaction. In the present abstract the meat characteristics and sensory profiling of two of these three products (rosé veal and young steers) are presented.

## II. MATERIALS AND METHODS

Thirty-two Holstein dairy bull calves, castrated 3 weeks old, were raised in a nurse cow system, with two calves per nurse cow on pasture until the age of approximately 200 days, before they were housed, weaned and fed a grass-based total mixed ration. At 8 months (mo), the best 16 calves were slaughtered, and the meat analysed for technological and sensory quality. The remaining 16 calves were raised for further 8 mo on a grass-based feeding until slaughtered from pasture at 16 mo and sampled and analysed as the 8 mo animals. The meat was compared with reference meat sampled from conventional bull calves slaughtered 9.5 mo old under the Danish concept (Danish Rosé Veal). Twenty-four hours postmortem the *M. longissimus lumborum* (LL) was removed and pH, colour (Minolta) and intramuscular fat (acid hydrolysis and Soxhlet extraction) were measured. The LL was aged additional 9 days before freezing and later used for a sensory profiling by a trained sensory panel (ISO 4121:2003 and ISO 13299:2016) after preparing the LL as steaks to 63°C.

## III. RESULTS AND DISCUSSION

The rosé veal product from the calves with the best growth rate during the 200 days with nurse cow, and 45 days on a grass-based total mixed ratio was comparable to the meat from the reference bull calves, except for a lower pH and a higher score for meat flavour and tenderness (Table 1). On the other

hand, the young steers slaughtered at the age of 16 mo differed from the reference bull calves both in colour traits, with darker more red meat, and more intramuscular fat, and the meat was characterised with a more intense meat aroma and flavour (Table 1). Some of the reference bull calves showed a tendency for high pH, however even when removing these outliers from the dataset, the young steers were still characterized with more meat aroma and flavour, and by having more tender meat. The results suggest that even in an organic production system based on grass-feeding it is possible to optimize meat quality, and thus possible stimulate to a changed eating behaviour of consumers where an intense flavour and tender meat will result in earlier sensory satisfaction.

Table 1. Meat characteristics and sensory profile of *M.longissimus lumborum* from organic rosé veal and young steers in comparison with conventional young bull calves.

	Rosé veal	Reference bull	P-value	Young steer	Reference bull	P-value
Number of animals	16	10		16	12	
Age at slaughter, mo	8	9.5		16	9.5	
Carcass weight, kg	180	211	0.001	258	215	0.001
pH	5.62	5.80	0.024	5.48	5.83	0.001
Colour						
L*	38.8	39.0	0.869	33.6	36.3	0.001
a*	18.1	18.2	0.885	20.5	16.6	0.001
b*	7.27	7.04	0.634	7.03	5.61	0.001
Intra muscular fat, %	2.25	2.04	0.575	3.07	2.03	0.019
Meat aroma <sup>a</sup>	9.48	8.90	0.092	9.24	8.07	0.009
Pink colour	8.51	7.68	0.142	7.55	7.67	0.872
Meat flavour	9.13	8.34	0.028	9.80	8.01	0.001
Tenderness	8.49	6.05	0.041	8.66	6.81	0.108
Juiciness	10.5	9.86	0.250	9.95	9.02	0.206

<sup>a</sup>Sensory profiling of *M. Longissimus lumborum* done on an unstructured scale from 0-15.

#### IV. CONCLUSION

The production system (GrOBEat) tested herein with the use of nurse cows and grass-based feed for production of organic rosé veal and young steers can deliver high quality rosé veal and low marbled beef. The products are characterised with intense meat aroma and flavour which could lead to a sensory satisfaction that holds the potential to be used as a strategy to limit intake because the consumers become earlier satisfied.

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