

LATEST TRENDS IN BEEF MATURATION – DRY-AGED VERSUS WET-AGED BEEF

Ralf Lautenschlaeger

International Competence Center on Meat Quality, Department of Safety and Quality of Meat, Max Rubner-Institut,
95326 Kulmbach, Germany

Abstract – There is no doubt that beef requires a period of ageing before it will reach optimum sensory scoring. Currently, traditional dry-ageing procedure seems to enjoy a renaissance, preferably with gourmet restaurants. The aim of the investigation was to find out whether there is a difference between dry- and wet-ageing from a sensory point of view. Beef *longissimus dorsi* of heifers was aged under vacuum as well as conditioned in a chilling room, and tenderness, juiciness and flavour were evaluated by an expert panel. Furthermore, shear force and colour values as well as pH value and cooking weight loss were determined. In general, single measurement data of different trials varied in a wide range. Thus it can be assumed that the meat raw material itself has highest influence. Means of the pH values ranged from 5.4 to 5.55; it increased by trend for 4 weeks and then dropped. Colour value a was determined by meat material, the b-value slightly increased for 4 weeks and subsequently fell. The L-value increased up to day 14, and then remained stable. Cooking weight loss was dependent on the type of ageing, and hardness showed a significant inverse correlation with tenderness scores. Flavour and juiciness scores were almost independent on treatments and time.

Key Words – sensory traits, physico-chemical parameters,

I. INTRODUCTION

Although dry ageing of beef had been the traditional way of beef maturation, the appearance of air-tight plastic bags in combination with ever available refrigeration facilities led to the development and application of wet-ageing of beef under vacuum. Some reasonable aspects for this development are:

- Improvement of product safety
- Saving refrigeration and transport space
- Easy handling during storage and distribution
- Increased retail yield of wet-aged beef cuts

However, currently dry-ageing of beef is enjoying a renaissance, particularly with gourmet chefs.

In principle, this emerging trend can be considered a niche compared to the amount of wet-aged beef going over the counter [1]. However, in terms of meat quality there is only little knowledge regarding the differences between wet- and dry-aged high value beef cuts.

II. MATERIALS AND METHODS

The subprimal selected for the investigations was the so-called roastbeef, which can be described as the combination of rib (including part of the forerib), short loin and sirloin, and anatomically, it corresponds to the *Musculus longissimus dorsi* between the 7th thoracic and the 6th lumbar vertebra. The samples were generally taken from heifers, and they all showed a distinctive marbling.

For each of the five replicate trials, paired *Longissimus* muscles from five carcasses were fabricated two days post-mortem. Loins were then cut transversely at the midlength so that each pair provided four half-longissimus sections.

The caudal parts were used for wet-ageing and for dry-ageing, respectively. For wet-aged beef (WAB), samples were deboned before treatment and subcutaneous fat was trimmed off; for dry-aged beef (DAB), bone-in cuts were used and no sub-cutaneous fat was trimmed prior to aging.

The cranial meat cuts were used for different microbiological investigations which will not be discussed here.

WAB was stored at a temperature of 1 ± 1 °C, and DAB was matured at 1 ± 1 °C and 90% RH with intensive air circulation. Samples were examined at day 1 and after 14, 28 and 42 days of ageing.

Physico-chemical analyses included pH value, measured with Knick portamess Typ 912 and Schott BlueLine 21pH electrode at 20 °C; hardness as Warner-Bratzler shear force (WBSF) (Instron

Model 1140; T = 20 °C); L, a and b colour values (Minolta Chroma-Meter CR300); and cooking weight loss (due to grilling) in per cent of aged raw meat.

For sensory evaluation of tenderness, juiciness and flavour, samples were enveloped in aluminium foil and heat treated with a contact grill (Silex S-162) until the core temperature reached 70 °C. The rating scores ranged between 6 for “extremely like” and 1 for “extremely poor”.

III. RESULTS AND DISCUSSION

Most of the individual data of one parameter varied in a relatively wide range. Thus, in principle, it can be drawn from the investigations conducted within this research project that there might be a noticeable influence of the individual properties of the meat raw material on the quality parameters such as sensory traits, hardness and colour. The determining properties of beef raw material include gender and breed, husbandry and composition of feed, animal transport and slaughter conditions. Smith *et al.* [2] and Laster *et al.* [3] reported that consumer panellists found significant grade effects for palatability traits, but did not find differences between steaks from dry- versus wet-aged treatments, which basically agrees with what was found with these examinations.

The most important quality criteria of aged beef are tenderness, juiciness and flavour. The results revealed that tenderness increased significantly within the first 14 days of ageing, followed by an only sound further tenderisation. Rating scores for DAB were similar to that of WAB (Fig. 1).

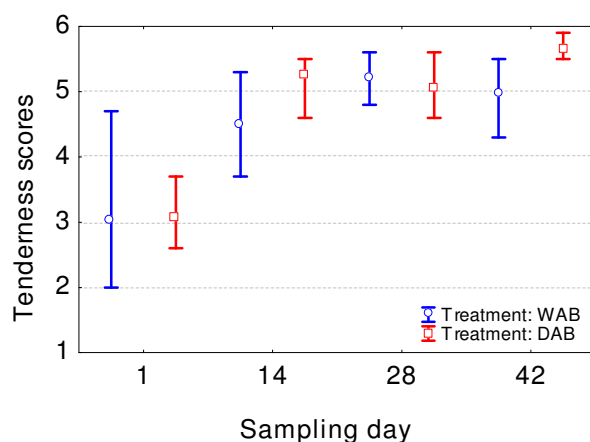


Figure 1. Effect of ageing period on tenderness of wet-aged beef (WAB) and dry-aged beef (DAB)

These tenderness scores well correspond to WBSF values (Fig. 2) that decreased most progressively during the first two weeks of treatment.

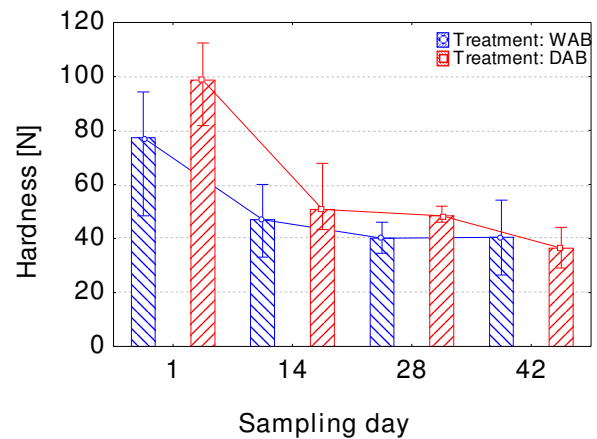


Figure 2. Effect of ageing period on hardness of wet-aged beef (WAB) and dry-aged beef (DAB)

The WBSF value significantly decreases within the first 14 days of ageing, where DAB shows the highest difference with a decrease from 97 to 53 N (– 45%); from day 14 to 42, a slight but steady decrease was seen, and finally, the WBSF value of WAB was similar to that of DAB.

These findings are similar to the results published by Warren and Kastner [4] who stated that after 11 days of ageing, tenderness scores of beef were significantly higher than for unaged cuts, and that the method of aging – vacuum or dry – did not differ in tenderness. George [5] concluded from her investigations as follows: “Dry-aging periods of 14 to 28 d appeared to be effective in producing the desired results of this process, but there does not appear to be a magical threshold where sufficient time is required beyond 14 d to truly call this beef ‘dry-aged’ from a performance standpoint.”

Flavour and juiciness scores were found to be almost independent on treatments and period of ageing. Although DAB samples tend to be rated higher than WAB samples, significant differences between treatments cannot be seen due to the wide spread of single measurement data. According to Warren and Kastner [4], wet-aged beef has a sour and strong bloody/serumy flavour, whereas dry-aged beef has a beefy, brown roasted flavour that is considered desirable. These flavour attributes are confirmed by the descriptions of the panellists

of this project. George [5] also did not see any significant differences for flavour, tenderness, juiciness, and desirability between different ageing protocols applied to sirloin steaks. Parrish et al. [6] reported that there were no differences in flavour intensity and like in dependence on ageing treatment. With respect to the sensory assessment of aged beef in general, Platter et al. [7] found that most important to the consumer is tenderness followed firstly by flavour and secondly by juiciness, which underpins the research results of all cited authors as well as that of the own investigations.

Another important criterion for the consumer is the cooking weight loss of the meat during roasting. With DAB, means show a slight but steady decrease in dependence on the ageing period, while there is an alternating cooking loss with WAB. The latter shows nearly no drip loss during ageing in the vacuum package (Fig. 3). Thus, the cooking loss of WAB is mainly determined by the individual water holding capacity of the meat raw material.

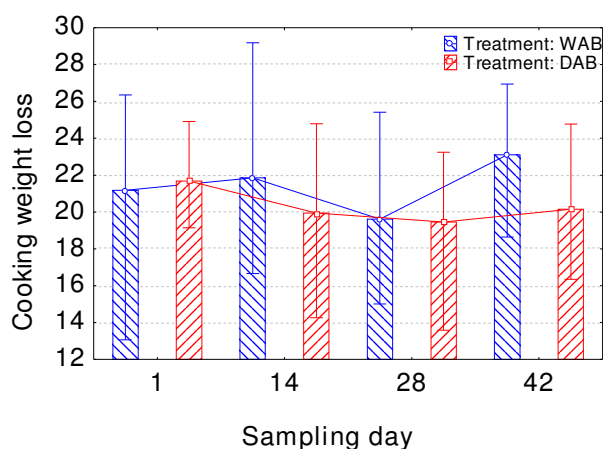


Figure 3. Effect of ageing period on cooking weight loss of wet-aged beef (WAB) and dry-aged beef (DAB)

In addition to sensory properties and cooking weight loss, pH and colour values of the dry- and wet-aged beef cuts were analysed in dependence on the ageing period.

The individual pH values vary in wide range; pH increases by trend between day 1 and day 28 of treatment. Afterwards, all the treatments share a slight decrease of mean pH values.

The colour value L shows a wide spread of single measurement data. Its mean values are lowest for fresh meat at day 1 whereas from day 14, means deviate and in tendency increase, respectively, between value 36 and 38 independent on treatment and independent on storage period.

The a-value of DAB – 21 to 23 – is obviously higher compared to WAB (between 17 and 19), and the ageing period has hardly an effect. It is assumed that the a-value is mainly determined by myoglobin content of the individual piece of meat. With means ranging between 8 and 10, the b-value was found to be highest with DAB. Mean b-values of WAB varied between 5 and 8. There is a considerable to slight increase during the first 4 weeks of ageing, however, from day 28 the b-value is dropping. The development of the b-value is almost independent on the type of ageing.

Finally, it should be mentioned that meanwhile there is an alternative treatment procedure which combines the advantages of dry- and wet-ageing using a bag highly permeable to water vapour [8, 9]. While increasing the yield after drying compared to traditional dry-ageing, the sour taste typical for wet-aged beef can be prevented.

IV. CONCLUSION

M. longissimus dorsi of heifers was subject to different ageing treatments – wet- and dry-ageing for an ageing period of 42 days.

In general, the individual measurement data of different trials varied in a wide range. Thus it can be assumed that the meat raw material itself has the highest influence on the sensory quality of beef subprimals.

The means of the pH value ranged from 5.4 to 5.55; they increased by trend for 4 weeks, and afterwards they dropped.

Colour value a was mainly affected by the meat material; the b-value slightly increased for 4 weeks, and then fell. The L-value increased up to day 14, and afterwards it remained stable.

Cooking weight loss showed a slight but steady decrease for DAB, while WAB was characterised by high variation independent on ageing period.

WBSF value had the highest decrease within the first 2 weeks of ageing, but there were only weak differences in dependence on treatment after 6 weeks.

With regard to the sensory properties, tenderness scores showed a significant inverse correlation with hardness (WBSF value). Flavour and juiciness scores were almost independent on treatments and time.

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