

Summary of results

Salmon fillets and rib steak of pork were superchilled at two levels (10% ice and 20% ice), with refrigerated and frozen samples as references. Temperature and ice content was determined by traditional calorimetric method and new sensor technologies (NIR). Microbiological and biochemical analyses were carried out in order to compare how different superchilling levels and storage conditions affect the quality. Mass spectrometry (MS-) based methods were tested in order to achieve more detailed information of which reactions that take place at different storage conditions.

Superchilling extended the storage life of salmon fillets and rib steak of pork with 4-5 and 26 days, respectively. For salmon, the drip loss was lowest in the refrigerated samples, while no difference in drip loss between the storage groups was observed for pork. There are indications that some protein denaturation may have taken place in the salmon superchilled with the highest level of ice. For pork, the refrigerated samples lost more dry matter in the drip than the superchilled samples. Superchilling seems to reduce the exoprotease activity in pork muscle.

The MS-analyses had revealed differences between samples (salmon/pork and refrigerated/superchilled). The MS-based methods seems to be promising as a tool to study protein degradation both during superchilled and chilled storage, and may also be a valuable tool to study changes occurring during other processing methods. The study showed that the shift in the water peak at increasing temperature is visible in the transfection NIR spectra with 20nm resolution. NIR spectra measured by the scanner contained quantitative information about water and how it was structured; ice or water.

Superchilled products were more suitable for automatic handling with needle gripper than products with temperatures above freezing point. Superchilling made the products more rigid than products with temperature above freezing point. Higher forces were needed to split or damage the muscle fibres. 20 days durability of superchilled products will lead to no products getting to old before it is used to fulfil an order. Overall production is also higher with superchilling than without. Without superchilling, 1 219 216kg is sold as whole carcasses, with superchilling the number is 657 170kg.

Mobile NMR spectrometer can be used for rapid fat measurements in both salmon fillets and packaged pork pieces. The mean fat content in the salmon fillets was 19.6 ± 1.0 %. A quantitative image of the fat distribution in the Norwegian Quality Cut of a salmon fillet was produced. For the pork samples the mean fat content was 4.7 ± 0.6 %. The measurement time was 11 sec/sample, though a significant improvement in speed (~ 1.5 sec/sample) could be achieved using a larger magnet giving a possibility of on-line implementation. The mobile NMR technology is portable and can be applied to wide variety of muscle foods.

In tests with RFID technology in combination with temperature sensors, the readability due to location of ID tags in load carriers and total reading distance was studied. The results showed that the technology has required stability and functionality in order to be utilized for industrial tests.