*SUPERCHILL!*

Study of ice crystal formation in beef

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Meat consumption is controversial due to the juxtaposition of meat high nutritional value and its high environmental impact. Such impact could be reduced through alternative approaches able to extend meat product shelf life maintaining high quality levels. Superchilling technology represents a unique possibility to preserve fresh food as demonstrated in fishery products (Kaale and Eikevik, 2014). However, to fully exploit the advantages of superchilling, on-line non-destructive approaches need to be developed for its monitoring. The potentiality of NIR capability in studying ice formation in superchilling relied on the difference in light absorption between liquid and solid water.

In these preliminary experiments, NIR spectroscopy has been applied to study ice formation and content in beef samples. In detail, 5 cubes of beef round steaks (6 x 6 x6 cm) were treated in a chamber with air at -18°C (speed of 1.3 m/s) and monitored by MicroNIR and thermal camera acquiring data every 2 minutes up to 280 minutes.

The NIR spectra show a systematic shift in the water peaks with increasing ice fraction, i.e. a displacement of the absorption bands from 980 to 1020 nm and from 1200 to 1250 nm. The data were explored by PCA showing a PC1 trend following the theoretical curve of freezing (Rahman et al., 2009) and the temperature recorded by thermal camera, thus revealing the capability to follow the crystallisation process in the superchilling of beef. Further studies will be carried out to implement NIR technology in tailored superchilling protocols for different meat cuts.

**Keywords:** superchilling, crystallisation process, MicroNIR, beef

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