THE INFLUENCE OF CHILLING METHOD ON GLYCOLYTIC CHANGES AND PORK MEAT QUALITY

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Introduction

Chilling rate influences the rate of glycolytic changes in meat tissue after slaughter and has an effect on pork meat quality (Bendall and Swatland 1988, Maribo *et al.* 1998, Josell *et al.* 2003).

The objective of this experiment was assessment of the impact of chilling method (conventional vs. fast) on the changes of glycolytic potential, glycogen and lactate concentration and meat quality of stress resistant fatteners.

Material and methods

The investigations covered 30 stress resistant (Landrace x Yorkshire)x Duroc fatteners. The animals were kept under the same environmental conditions and fed a full bath feed. The animals were slaughtered 2-4 hours after transportation using electrical stunning method and recumbent bleeding out (Midas system, Inarco). The right half-carcasses were chilled conventionally (4ºC 24h) and the left half-carcasses in three-phase chilling tunnel (-10ºC - 15 min, -15ºC - 25 min and -5ºC - 40 min. with air velocity 3m/s). The following meat quality characteristics were determined: pH of meat measured directly in *longissimus lumborum* (LL) muscle (45 minutes, 2, 3, 24 and 48 hours after slaughter) using pH-Master apparatus produced by Draminski., electrical conductivity (EC) evaluated in 45 minutes, 2, 3, 24 and 48 hours *post mortem* using LF-Star apparatus (Matthaüs -Germany), R_1 indicator expressed as IMP/ATP ratio at 45 minutes *post mortem* according to Honikel and Fischer (1977), meat lightness (L*) measured in 24 and 48 hours after slaughter Minolta CR-310 Chroma Meter in CIE L*a*b* system, water holding capacity (WHC) according to Grau and Hamm (1952) with Pohja and Niniivaara (1957) modification, drip loss determined in 48, 96 and 144 hours *post mortem* according to Prange *et al.* (1977), liquid loss from chops packed in modified atmosphere (MAP) and vaccum packed (VAC) and cooking loss (Baryłko-Pikielna 1975). The RYR1 genotypes were established according to Fujii *et al.* (1991). At 45 minutes, 3, 24 and 48 hours *post mortem*, samples from LL muscle were collected into the tubes with 0.5M PCA for determination of glycogen (Darympale and Hamm, 1973) and lactate (Bergmeyer, 1974). On the basis of them the glycolytic potential (GP) was calculated according to formula proposed by Monin and Sellier (1985). The data were analysed using one-way analysis of variance in orthogonal scheme. The significance of differences between means was calculated using Duncan's test.

Results and Discussion

The lean meat content of investigated fatteners was 57.29±2.9% at average hot carcass weight 84.53±6.34kg. The influence of chilling method (conventional vs. three-phase tunnel chilling) on glycolytic potential, glycogen content and lactate accumulation was shown on Fig. 1, 2 and 3. We shown, that slower decomposition of glycogen (to 48 hours after slaughter) and accumulation of lactate (confirmed statistically at 24 and 48 hours *post mortem* were caused by inhibited rate of glycolytic changes in fast chilling half-carcasses. In consequence, no difference in amount of glycolytic potential at 24 and 48 hours after slaughter for fast chilled carcasses was stated (Fig. 1, 2 and 3). Hammelman *et al.* (2003) showed that glycolytic potential and glycogen content decrease while lactate amount increased with time *post mortem* (from 1 min. to 24 hours after slaughter).
The slower ate of glycolytic changes in fast chilling half-carcasses influenced pH fall of *longissimus lumborum* muscle (Fig. 4). The meat from accelerated chilled half-carcasses characterised slower pH drop (statistically confirmed at 3 and 24 hours *post mortem*) to 48 hours after slaughter. The slower rate of pH fall in fast vs. slow chilled carcasses in the investigations of Maribo *et al.* 1998 and Josell *et al.*2003 was noted.
In ours investigation, the influence of chilling method on R_1 indicator, electrical conductivity and meat lightness was not stated. Also, the effect of chilling method on WHC, drip loss and fluid loss from vaccum and MAP packed chops, was not statistically confirmed.
Milligan *et al.* (1998), Josell *et al.* (2003) and Hambrecht *et al.* (2003) showed no effect of accelerated or conventional chilling on drip loss.
I the ours investigations, we only confirm statistically profitable effect of fast chilling on cooking loss (23.29 vs. 26.32 respectively).

Fig.1 The influence of chilling method on

Fig.2 The influence of chilling method on

glycolytic potential of LL muscle

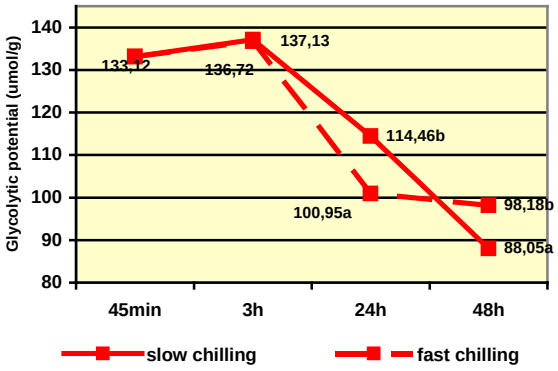


Fig.3 The influence of chilling method on lactate concentraion in LL muscle

glycogen content in LL muscle

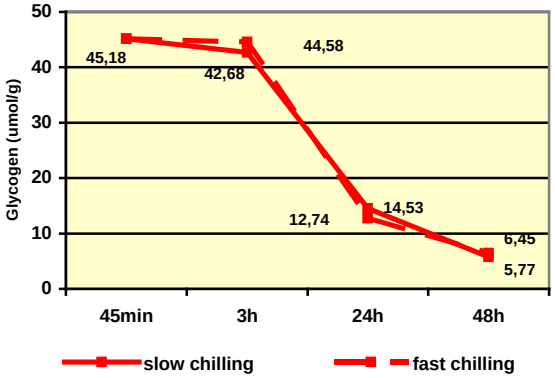
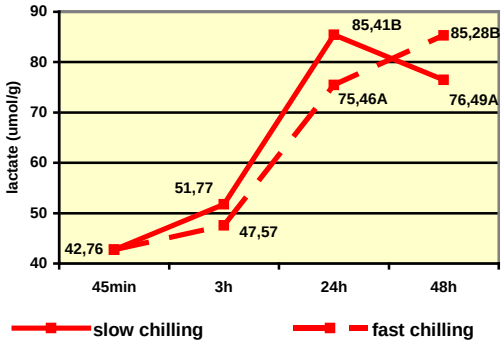
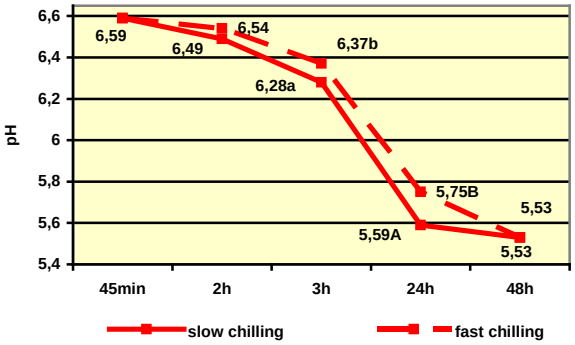


Fig.4 The pH as the function of time in LL muscle from fast and slow chilled carcasses





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