

EXAMINATION OF ON-LINE MEASURING METHODS FOR SUITABILITY FOR PREDICTING SENSORY QUALITY OF CHILLED TURKEY BREAST MUSCLES

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BACKGROUND: Meat quality deviations concerning turkey meat production are becoming a problem with growing importance. Raw turkey meat, with similar characteristics like PSE-pork, influences the sensory quality of turkey meat products in a negative way. The meat deviations are not rejected by the official poultry meat inspection, thus there is a necessity for an internal quality control in a meat plant to avoid faulty products. Till now, objective measuring methods or threshold values for this purpose are hardly available.

OBJECTIVE: It should be examined, what kind of objective, practicable chemical-physical measuring method is suitable for predicting the sensory quality and the suitability for processing of chilled turkey breast muscles (*M. pectoralis* supf.). As a prerequisite, the post-mortem glycolytic breakdown in *M. pectoralis* of turkey carcasses was investigated.

METHODS: The examinations were carried out from February to August 1993 in a German poultry slaughterhouse and meat processing plant using only male turkey carcasses of the same genetic source. In a preliminary examination, the pH-values, 6, 20, 30, 45, 60, 75, 90 minutes and 2, 3, 6, 12 and 24 hours post-mortem (p.m.) were examined in *M. pectoralis* of 119 turkey carcasses. In the main experiment, muscle core temperatures 6,45 min and 24 p.m., pH-values 6,30 min and 24 p.m., conductivity values (LF-value, Conductometer LF 191, Fa. WTW GmbH, Weilheim, Germany) 60 min and 24 p.m., Water Binding Capacity (WBC, Q-values, "Braunschweiger Gerät", Fa. Chiron, Tuttlingen, Germany) 24 p.m. and colour (L^* -, a^* -, b^* -values, Chromameter CR-300, Fa. Minolta, Japan) 24 p.m. were recorded of *M. pectoralis* of 214 turkey carcasses. The sensory quality of chilled turkey breast muscles was evaluated for 3 parameters - consistency, colour and wetness of fresh cut - and classified as "good", "acceptable" or "PSE". This was defined as the "real meat quality". The results of chemical-physical measurements and of sensory evaluation were compared to find out the best objective method for predicting the "real sensory meat quality" of turkey breast muscles.

RESULTS AND DISCUSSION:

Tab. 1: pH-values (arithmetical means \bar{x} , range R) at different times post-mortem in *M. pectoralis* (n = 119)

pH-values	\bar{x}	R
pH 6 min	6,36	0,40
pH 20 min	6,11	0,39
pH 30 min	5,96	0,44
pH 45 min	5,90	0,35
pH 60 min	5,88	0,33
pH 75 min	5,91	0,30
pH 90 min	5,88	0,34
pH 2 h	5,89	0,32
pH 3 h	5,84	0,27
pH 6 h	5,83	0,32
pH 12 h	5,82	0,33
pH 24 h	5,82	0,31

(MEIERING, 1995)

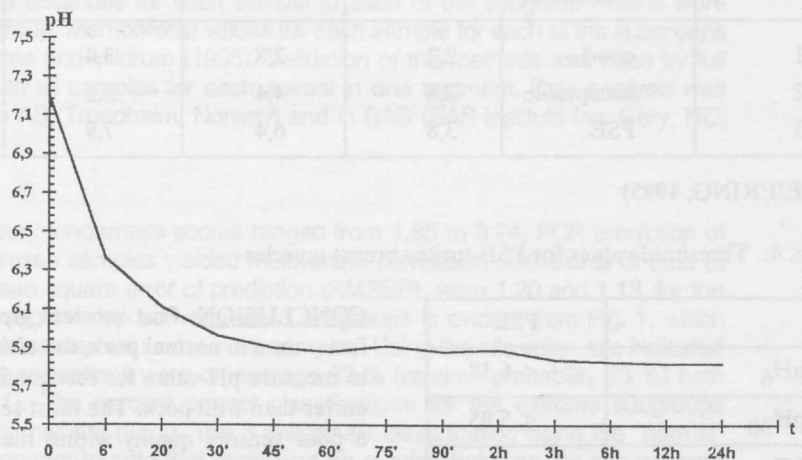


Fig. 1: pH-value development (mean) post-mortem in *M. pectoralis* of turkey carcasses (n = 119) (MEIERING, 1995)

The glycolysis in *M. pectoralis* of turkey carcasses was finished in most cases within 60 min p.m. (Fig. 1). The average ultimate pH-value was 5,88. The greatest range of variance was found 30 min p.m. (Tab. 1). Therefore this time should be the most suitable pH-measuring time to detect carcasses with an accelerated postmortal glycogen breakdown. These results also reveal, that glycolysis in turkey breast muscle occurs much more rapid than in red meat muscles, whereas the ultimate pH is relatively high.

The comparison between the chemical-physical methods and the sensory evaluation lead to the following results: pH-values 6 and 30 min p.m., conductivity-values LF 60 min and 24 h p.m. and Q-values (WBC) 24 h p.m. are suitable for detection of turkey breast muscles with a low sensory quality. Arranging these parameters according to their reliability for prediction results in the following sequence:

$$pH_{30min} > LF_{24h} > pH_{6min} > LF_{60min} > Q_{24h}$$

Thus, pH₃₀ is the most suitable measuring parameter to recognize turkey carcasses with a deviating meat quality in the slaughter line (Tab. 2). After carcass chilling, an effective selection of PSE-like meat is possible by conductivity measurements (LF-value) 24 h p.m. (Tab. 3).

Tab. 2: pH₃₀-values of different sensory quality groups

group	sensory evaluation	x _{min}	x _{0,25}	\tilde{x}	x _{0,75}	x _{max}
1	good	5,87	6,06	6,15	6,27	6,61
2	acceptable	5,76	5,85	5,92	6,01	6,26
3	PSE	5,55	5,72	5,76	5,82	6,08

x_{min} = minimum,
x_{0,25} = 1. quartil,
 \tilde{x} = median,
x_{0,75} = 3. quartil
x_{max} = maximum

(MEIERING, 1995)

The differences between the sensory groups 1 and 2, 1 and 3 as well as 2 and 3 were highly significant (U-test, p < 0.001) for pH₆, LF₆₀, LF₂₄ and Q₂₄-values. On account of the distribution of the values, limits for normal and PSE-turkey meat could be calculated (Tab. 4). Corresponding results concerning pH-limits were reported by SOSNICKI and WILSON (1991).

Tab. 3: LF₂₄-values (conductivity) of different sensory quality groups

group	sensory evaluation	x _{min}	x _{0,25}	\tilde{x}	x _{0,75}	x _{max}
1	good	2,2	2,8	3,4	4,1	11,2
2	acceptable	2,8	4,4	5,5	6,3	9,5
3	PSE	3,8	6,4	7,9	9,4	12,3

x_{min} = minimum,
x_{0,25} = 1. quartil,
 \tilde{x} = median,
x_{0,75} = 3. quartil
x_{max} = maximum

(MEIERING, 1995)

Tab. 4: Threshold values for PSE-turkey breast muscles

	PSE
pH ₆	< 6,18
pH ₃₀	≤ 5,85
LF ₆₀	≥ 5,6
LF ₂₄	≥ 6,3
Q ₂₄ (WBC)	≤ 0,52

(MEIERING, 1995)

CONCLUSION: Post mortem glycogen breakdown in normal turkey breast muscle is faster than in normal pork, the ultimate pH-value is higher. Therefore, the right moment to measure pH-value for recognizing an accelerated glycogen breakdown (PSE-meat) is earlier than with pork. The most reliable method for detecting turkey breast muscle with a poor sensory quality within the slaughter line is a pH-measurement at 30min post mortem. In the chilling chain, a method with a comparable reliability is the conductivity-measurement at 24hours post mortem.

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