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THE SIGNIFICANCE OF ULTIMATE pH FOR PORK QUALITY

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BACKGROUND

Colour and the loss of exudate during storage are important quality attributes of pork, because they affect consumers appreciation. Pale, soft, exudative (PSE) muscle, which is associated with a rapid post mortem pH-fall, is generally considered to be the major cause of variation in these characteristics.

Using data collected from almost 2000 pigs in a study on genetic parameters of pork quality (De Vries et al., 1994), Van de Wal et al. (1995) studied the relationship of measurements made at the slaughter house (45 min and 20 h p.m.) with ultimate meat quality, as determined in the laboratory. Of the early post mortem measurements, pH_1 was best related to drip loss (r= -.39).

OBJECTIVE

To study the relationship of ultimate pH (pH_u) with ultimate meat quality characteristics, in the same material.

METHODS

The experiment was set up in cooperation with 7 Dutch breeding organisations. From each organisation a random sample of the Yorkshire sire line was evaluated for pork quality. These lines were claimed to be halothane negative, based on halothane testing. A total of 1969 pigs were slaughtered in weekly batches over a period of 14 months. Procedures associated with handling and transport were standardized.

Carcass measurements of pork quality were made at 45 min and 20 h post mortem at the slaughterhouse, whilst the M. longissimus lumborum was also sampled for assessment of meat quality at the laboratory (De Vries et al., 1994). For the purpose of this paper only data from certain laboratory measurements were used: pH_u, colour (L^*-value), drip loss during 48 h storage, water uptake of a meat homogenate after low speed centrifugation (Wierbicki et al., 1962), cooking loss (after heating to 75 °C) and Warner-Bratzler shear force value. For detailed information see De Vries et al. (1994).

RESULT AND DISCUSSION

The overall range, mean and standard deviation for each of the variables is given in Table 1. Figure 1 illustrates the frequency distribution of pH_u, in pH-classes of 0.2 units. From the table and figure it is evident that there is a large variation in the various variables.

Table 2 presents the simple correlation coëfficients between pH_u and the various variables for the whole material (n = 1969). With the exception of shear force, moderate to good correlations were found for all the variables. The correlations presented here for pH_u were considerably higher than those for pH_1, measured in the same material (van de Wal et al., 1995). In a multiple regression, pH_1 + pH_u explained 40 % of the variation in L^*-value, but this was 37 % for pH_u alone. Similarly, 40 % of the variation in drip loss was accounted for by both pH-measurements with 31 % being for pH_u alone. Thus, pH_u is of considerably more importance than the rate of pH fall in explaining the variation in meat quality.

Kauffman et al. (1993), using the same colour measuring instrument, considered samples with a L^*-value > 58 as having a pale colour and which may have an unacceptable drip loss. Table 2 presents also the correlations when these presumably PSE- (L^*-value > 58) samples were excluded from the material. In comparison with the whole material, there was little change in the magnitude of the correlations. When both PSE and DFD (pH_u > 6.0) samples were excluded the coëfficients decrease for L^*-value and cooking loss. Surprisingly, the correlation with drip loss remains of the same magnitude, whilst the correlation with water uptake is still .60. To illustrate the nature of the relationships, the mean of the various pH_u-classes of 0,2 units was simply calculated for various variables. For drip loss and water uptake these are represented in Fig. 2. Inclusion of quadratic terms in the regressions mentioned before, slightly improved the percentage explained variation by pH_1 + pH_u in L^*-value to 42 %, drip loss to 48 % and water uptake to 67 %.

CONCLUSIONS

In a halothane negative population, ultimate pH appears to explain a larger proportion of the variation in colour, waterholding and water uptake than pH_1. The exclusion of PSE samples from the material, has practically no influence on the magnitude of the relationships between pH_u and meat quality traits. Hence, ultimate pH is a quality attribute of major importance for fresh and processed meats.

REFERENCES

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Table 1. Mean, S.D. and range of the variables

	Mean	S.D.	Min.	Max.
pH_u	5.60	0.23	5.00	7.12
L^*-value	55.6	3.4	42.8	67.8
Drip loss %	4.1	2.0	0.5	12.0
Water uptake %	40.7	28.4	3.5	222.9
Cooking loss %	31.4	2.9	13.3	43.3
Shear force(N)	3.33	0.60	1.45	5.68

Fig. 1. Frequency distribution for ultimate pH

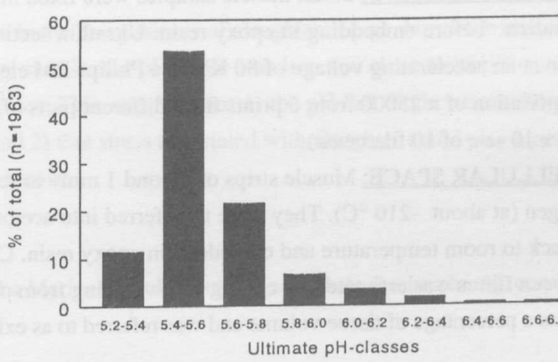

Table 2. Correlations between pH_u and various pork quality traits

	All samples	Excl. L^*>58	Excl. L^*>58 pH>6.0
L^*-value	-.61	-.61	-.43
Drip loss %	.56	-.55	-.52
Water uptake %	.81	.81	.60
Cooking loss %	.60	.64	.34
Shear force	-.38	-.44	-.18

Fig. 2. Relationship between pH_u, drip loss (circles) and water uptake (triangles). Closed symbols: whole material; open symbols: with L^* > 58 excl.