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COMPARISON OF PSE, NORMAL AND DFD PORK LOINS AT THREE DIFFERENT STORAGE PERIODS

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Ten boneless pork loins from each of three muscle quality classifications were selected at approximately 24 h postmortem on the basis of a visual categorization of pale soft and exudative (PSE), normal (NOR) and dark firm and dry (DFD). Loins were cut into three sections, vacuum packaged and stored at 3°C until 1 d, 6 d and 11 d postmortem. Lab analysis consisted of purge loss and pH determination on the whole section. Each section was then sliced into three 2.54 cm chops for analysis of drip loss, Hunter Lab values and fat and moisture content.

The experimental design was a completely randomized design (CRD), using analysis of variance (ANOVA) to compare variables and least significant difference (LSD) for mean separation.

Results indicated there were not only effects due to the different meat quality category of pork loins, but also effects due to storage time.

INTRODUCTION

Pork muscle which exhibits the PSE condition is not only undesirable due to pale color and exudate, but also because of the reduced yield (Davis et al., 1975). DFD pork is also undesirable due to the unattractive appearance, but the additional problems related to reduced shelf-life are also prevalent (Price and Shweigert, 1987). Kaufmann et al. (1978) evaluated the shrinkage of PSE, NOR and DFD hams following 48 h of transportation and then processing. PSE hams had greater ($P<.05$) shrink during transportation, curing, and smoking as compared to NOR and DFD, while NOR hams had greater ($P<.05$) shrinkage compared to DFD hams during the same time period. Chizzolini et al. (1993) reported Hunter L and a values at 24 h postmortem to be related to the rate of pH decline and Hunter L values consistently increased from 45 min to 24 h postmortem.

Since the techniques used to evaluate PSE, NOR and DFD meat are numerous, the purpose of this study was to evaluate selected quality characteristics for PSE, NOR and DFD loins after different periods of postmortem storage.

MATERIALS AND METHODS

Thirty pork loins were selected at approximately 24 h postmortem at a commercial packing facility on the basis of a visual color score ($\leq$2.0=PSE, 2.0>NOR$\leq$4.0, $\geq$4.0=DFD). Selected loins were vacuum packaged at 1 bar, boxed, sprinkled with dry ice and transported to the MSU meats laboratory. Upon arrival, each loin was cut into three sections and the sections were weighed. Two sections were vacuum packaged at 1 bar and stored at 3°C until 6 d or 11 d postmortem. One loin section was evaluated immediately (1 d).

Due to purge loss measurement technique, purge was determined on only the 6 d and 11 d sections. On the predetermined evaluation day, each loin section was removed from the package, patted dry and reweighed. Purge represents the weight loss during the storage period. Immediately following final loin section weight determination, pH was measured with a probe style Orion model 81-63 electrode at two different locations. Prior to slicing three 2.54 cm chops, the ends of the loin sections were faced. Chop 1 was used to determine drip loss during a 24 h suspension period at 3°C. Hunter Lab values were obtained on chop 2 following a bloom period of 30 min using a Hunter Labscan 0/45 Spectrocolorimeter. Fat and moisture content on chop 3 was determined by AOAC (1990) methods.

Analysis of variance (ANOVA) using a completely randomized design was used to evaluate the fixed effects of muscle quality category and storage time as well as the interaction between the two on specific meat quality characteristics. The interactions were not discussed because the primary focus was only on the main effects. When F-tests were significant ($P<.05$), differences in meat quality category means and storage time means were separated using the least significant difference (LSD) procedure (SAS, 1985).

RESULTS AND DISCUSSION

PSE loins had higher ($P<.05$) pH and drip loss at 1 d postmortem as compared to 6 d and 11 d postmortem. The amount of purge was higher ($P<.05$) at 11 d postmortem compared to 6 d postmortem for the PSE loins. Fat content for PSE loins was higher ($P<.05$) and moisture content lower ($P<.05$) at 11 d postmortem than at 1 d and 6 d postmortem. Hunter L values were lower ($P<.05$) at 1 d postmortem as compared to 6 d and 11 d postmortem. Purge in the NOR loins was higher ($P<.05$) at 11 d postmortem as compared to 6 d postmortem and followed the same pattern as the PSE loins. NOR loins had higher ($P<.05$) drip loss at 1 d postmortem than at 6 d or 11 d postmortem. The moisture content for NOR loins at 11 d postmortem was lower ($P<.05$) than the 1 d value. Hunter L values were different ($P<.05$) between all three evaluations for NOR loins, with 11 d loins having the highest then 6 d and 1 d postmortem. The DFD loins showed no difference ($P>.05$) in purge or drip loss over the three evaluations. Fat content for DFD loins was higher ($P<.05$) at 11 d postmortem than 1 d and moisture content was lower at 11 d as compared to 1 d and 6 d postmortem. There were differences ($P<.05$) in DFD loin Hunter L values for all three evaluations, exhibiting the same pattern as the NOR loins.

At 1 d postmortem, DFD loins had higher ($P<.05$) pH values and lower ($P<.05$) drip loss compared to PSE and NOR loins. Hunter L and b values at 1 d postmortem differed ($P<.05$) among the PSE, NOR and DFD loins, with PSE loins having the highest values, then NOR loins and DFD loins. The PSE and NOR loins at 1 d postmortem had lower ($P<.05$) hunter a values than DFD loins. At 6 d postmortem, all three quality categories were different ($P<.05$) with respect to pH, with DFD loins > NOR loins > PSE loins. Moreover, DFD loins had less ($P<.05$) drip loss than PSE and NOR loins at 6 d postmortem. The fat content at 6 d postmortem was higher ($P<.05$) for the PSE loins than for DFD loins, while DFD loin moisture content was higher ($P<.05$) at 6 d postmortem compared to PSE and NOR loins. Hunter L and b values at 6 d postmortem were different ($P<.05$) among the PSE, NOR and DFD loins, with DFD loins having the lowest values then NOR loins and PSE loins. Purge at 11 d postmortem was different ($P<.05$) between all three quality categories, with DFD loins being < NOR loins

< PSE loins. The PSE loins had higher fat content at 11 d postmortem than did DFD loins, while moisture content for PSE loins was lower ($P<.05$) than both the DFD and NOR loins. This inverse relationship of moisture and fat should not be misunderstood as differences in intramuscular fat between the quality categories since differences in fat only occurred at 6 d and 11 d. This corresponds to well defined moisture losses in the different categories. Hunter L and b values at 11 d postmortem were different ($P<.05$) among quality categories and followed the same pattern as Hunter L and b values at 1 d and 6 d postmortem.

The primary focus of the study was the evaluation of differences in quality characteristics after different storage times. The results indicate that as storage time increased, differences between the quality categories increased or became negligible.

TABLE 1. VARIABLE MEANS BY LOIN GROUP OVER DIFFERENT STORAGE TIMES.

							Hunter		
Loin	Day	pH	Purge%	Drip%	Moist%	Fat%	L	a	b
PSE	1	5.66^{aE}	0	4.19^{aD}	73.37^{aE}	3.28^{bD}	52.48^{bD}	4.98^{aE}	13.18^{aD}
PSE	6	5.34^{bD}	5.51^{bD}	1.46^{bD}	73.17^{aE}	3.15^{bD}	54.59^{aD}	5.49^{aD}	13.55^{aD}
PSE	11	5.41^{bF}	9.05^{aD}	$.45^{bD}$	71.68^{bE}	3.82^{aD}	56.00^{aD}	5.09^{aD}	13.29^{aD}
N	1	5.77^{aE}	0	2.53^{aD}	74.04^{aDE}	2.85^{aD}	47.24^{cE}	5.22^{aE}	11.69^{bE}
N	6	5.70^{aE}	3.94^{bDE}	1.24^{bD}	73.66^{abE}	3.08^{aDE}	49.51^{bE}	4.39^{bE}	12.17^{aE}
N	11	5.59^{bE}	5.81^{aE}	$.68^{bD}$	73.40^{bD}	3.14^{aDE}	51.35^{aE}	4.78^{abD}	11.72^{bE}
DFD	1	6.16^{abD}	0	$.68^{aE}$	74.85^{aD}	2.27^{bD}	40.69^{cF}	5.94^{aD}	9.59^{bF}
DFD	6	6.25^{aF}	2.02^{aE}	$.51^{aE}$	74.87^{aD}	2.47^{abE}	42.26^{bF}	5.80^{aD}	10.28^{aF}
DFD	11	6.11^{bD}	2.55^{aF}	$.46^{aD}$	74.31^{bD}	2.63^{aE}	44.63^{aF}	4.87^{bD}	9.40^{bF}

a,b,c - means of storage date variables within a loin group over time with different superscripts are different ($P<.05$).
D,E,F - means of loin group variables within a storage date with different superscripts are different ($P<.05$).

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