EFFECT OF LEAN YIELD GRADING SYSTEM ON PORK PALATABILITY.

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SUMMARY

The objectives of the study were to determine the effects of lean yield class and carcass weight as used in the Canadian Hog Grading system, on palatability characteristics and consumer acceptance of loin pork chops. Chops from 108 commercial hog carcasses, representing three fat levels and three weight levels, were evaluated by four trained panels. Each panel evaluated three replicates of all treatments (36 animals). A consumer panel of 105 evaluated chops for liking of flavour, juiciness, tenderness and overall acceptability. Animal variation had greater affect on palatability than either fat or weight level. Juiciness affected overall acceptance less than either tenderness or flavour. Too tender pork had an adverse effect on acceptability. Low fat levels did not reduce palatability for this group of Canadian consumers.

INTRODUCTION

According to Statistics Canada data consumption of red meat has declined, accompanied by an increase in consumption of poultry (Stewart and Robbins 1986). Pork consumption has decreased to 27.9 kg/person from a peak of 31.3 kg/person in 1980. Changes in animal composition have occurred over the past 10 years (Jones 1986). The total output from the pork lean carcass has increased by 11.9%, due to a 9.6% increase in carcass weight and a 2.3% decrease in fat content.

The current Canadian Hog Grading System was implemented in 1986. Lean depth, loin fat and carcass weight are explicit factors in determining the index value assigned to a hog carcass, allowing greater focus on producing leaner meat. The objectives of this study were to examine the palatability characteristics of fresh loin pork chops selected from pork carcasses varying by lean yield class and carcass weight. A second objective was to determine the relationship between leanness and consumer acceptability of the loin chops.

EXPERIMENTAL METHODS

Pork Sample Selection.

Loins from 108 commercial hog carcasses representing three yield classes consisting of three fat levels (25.4, 35.4, and 45.6 mm) from three weight groups (65-69, 75-79, and 90-94 kg) were selected. Chops were cut 2 cm thick, trimmed to 6 mm external fat, vacuum packed, and frozen at -20°C until evaluated. Four chops centering on the 14th rib were used for evaluation.

Sample Preparation.

AMSA (1978) guidelines for cooking pork chops were followed. Thawed chops oven broiled to an internal temperature of 70°C. Panelists were presented with 1.2 cm cubes, in coded covered containers for evaluation at room temperature.

Trained Panel.

The QDA method of Stone et al. (1974) and a 10 cm graphic scale was used. Panels of 9 judges were selected from a group of experienced judges. Training sessions were used to develop criteria and descriptive terms to be evaluated (Table 1). A split-plot design was used. Three replicate animals for each treatment were included in a panel and four panels were required to evaluate all the test animals. Most assessors participated in more than one panel but assessor composition varied over panels.

Consumer Panel.

A consumer panel of 105 panelists was conducted. Pork chops were rated on a 9-point hedonic scale for liking of flavour, tenderness, juiciness and overall acceptability. Each panelist attended three sessions and evaluated three samples per session. The replicate loins were

Table 1. Descriptive terms used by the trained panel.

Attribute	Left anchor	Right anchor
Softness	very firm	very soft
Tenderness	very firm	very tender
Initial juiciness	very dry	very juicy
Juiciness	very dry	very juicy
Residual tissue	very much	very little
Flavour	weaky meaty	strong meaty
Off-flavour	strong	no off-flavour
Mouth coating	very much	very little

Table 2. Mean[1] scores for tenderness attributes for trained panel.

	Fat Level (mm)			Weight Level (Kg)		
Attributes	25.4	35.4	45.6	65-69	75-79	90-94
Panel 1						
Softness	5.65a[2]	5.69a	5.55a	5.59a	6.08a	5.23a
Tenderness	6.01a	5.66a	5.46a	5.68a	6.09a	5.35a
Res. Tissue	6.71a	6.90a	6.53a	6.90a	7.26a	5.99a
Panel 2						
Softness	5.48a	6.62a	7.03a	6.22ab	6.91a	6.00b
Tenderness	5.78a	6.74a	7.02a	6.18a	7.17a	6.20a
Res. Tissue	6.95a	7.70a	8.02a	7.31a	8.13a	7.22a
Panel 3						
Softness	4.75a	5.90a	6.03a	5.32a	5.76a	5.60a
Tenderness	5.49a	6.10a	6.42a	5.60a	6.36a	6.05a
Res. Tissue	6.10a	6.65a	6.80a	6.18a	6.94a	6.43a
Panel 4						
Softness	5.66a	6.22a	6.67a	6.30a	6.48a	5.76a
Tenderness	5.76a	6.33a	6.78a	6.40a	6.60a	5.88a
Res. Tissue	6.22a	6.65a	6.62a	6.36a	6.90a	6.23a

[1] n = 81
[2] within either fat or weight in a row means not followed by the same letter are significantly different P<0.05

Table 3. Mean[1] scores for juiciness attributes for trained panel.

Attributes	Fat Level (mm) 25.4	35.4	45.6	Weight Level (Kg) 65-69	75-79	90-94
Panel 1						
Initial juiciness	6.20a[2]	6.03a	5.45a	6.23a	6.07a	5.38a
Juiciness	6.73a	6.79a	6.05a	6.82a	6.62a	6.13a
Mouthcoating	7.42a	7.32a	7.73a	7.74a	7.54a	7.18a
Panel 2						
Initial juiciness	5.71a	6.69a	6.88a	6.12a	7.11a	6.05a
Juiciness	6.26a	6.98a	7.36a	6.71a	7.35a	6.54a
Mouthcoating	7.77a	8.02a	7.92a	7.74a	7.99a	7.99a
Panel 3						
Initial juiciness	5.18a	5.34a	5.81a	5.39a	5.52a	5.42a
Juiciness	5.52a	5.70a	6.20a	5.80a	5.84a	5.77a
Mouthcoating	7.11a	7.08a	6.93a	6.94a	6.97a	7.22a
Panel 4						
Initial juiciness	5.27b	6.47a	7.07a	6.67a	6.66a	5.49a
Juiciness	5.69b	6.80a	7.41a	7.04a	6.91a	5.92a
Mouthcoating	7.33a	6.94a	6.70a	6.90a	6.81a	7.26a

[1] n = 81
[2] within either fat or weight in a row means not followed by the same letter are significantly different P<0.05

Table 4. Mean[1] scores for flavour attributes for trained panel

Attributes	Fat Level (mm) 25.4	35.4	45.6	Weight Level (kg) 65-69	75-79	90-94
Panel 1						
Flavour	6.15a[2]	6.30a	6.55a	6.30ab	6.67a	6.04b
Off-flavour	8.11a	8.26a	8.23a	8.33a	8.37a	7.91a
Panel 2						
Flavour	6.54a	7.36a	6.99a	6.51a	7.28a	7.10a
Off-flavour	7.95b	8.52a	8.59a	8.05a	8.57a	8.43a
Panel 3						
Flavour	6.42a	6.35a	5.61a	6.37a	6.33a	5.65a
Off-flavour	8.31a	8.45a	8.16a	8.24a	8.44a	8.23a
Panel 4						
Flavour	6.48a	6.68a	6.58a	6.78a	6.81a	6.16a
Off-flavour	8.60a	8.78a	8.68a	8.79a	8.69a	8.58a

[1] n = 81
[2] within either fat or weight in a row means not followed by the same letter are significantly different P<0.05

Table 5. Mean[1] scores for consumer panel

Attribute	Fat Level (mm) 25.4	35.4	45.6	Weight Level (Kg) 65-69	75-79	90-94
Flavour	6.19a[2]	6.15a	6.11a	6.07a	6.11a	6.27a
Tenderness	6.40a	6.13ab	5.92b	6.17ab	5.98b	6.31a
Juiciness	3.76b	4.02ab	4.32a	4.19a	4.12a	3.81b
Overall acceptability	6.33a	6.14ab	6.04b	6.10a	6.07a	6.34a

[1] n = 315 9 = like extremely
[2] means within fat or weight on a row not followed by the same letter are significantly different P<0.05

pooled for this evaluation. An incomplete block design was used for analysis.

RESULTS AND DISCUSSION

Trained Panel.

Analysis of variance determined that some differences existed between the four panels so separate analyses were conducted. Analysis of variance for each of the four panels indicated a strong animal to animal variation. A significant ($P < 0.05$) Rep effect attributed to animal differences was obtained in 19 out of the possible 36 treatment effects. These were more evident in the weight interactions (17 Wt x Rep interactions significant $P < 0.05$ and 25 significant ($P < 0.05$) Fat x Wt x Rep interactions). Softness, tenderness, initial juiciness and juiciness attributes were more effected than flavour attributes.

No significant main effects for fat level were obtained for the tenderness attributes and only one for weight level (Table 2). Chops from the heaviest carcasses were rated as softer than those from the intermediate by Panel 2. No significant weight level effects were obtained for juiciness attributes and only Panel 4 found the 25.4 mm fat level less juicy than the higher fat levels (Table 3). One significant effect of fat on flavour attributes was obtained and that was by Panel 2 for off-flavour, 25.4 mm fat had less off-flavour (Table 4). One significant effect of weight on flavour attributes was found by Panel 1 where the 90-94 kg weight level had less flavour than the 75-79 kg level. Because the split-plot design evaluated all fat levels at one sitting and kept the weight level constant the main effects of fat level were calculated using differences between the three sub-units in a unit. Split-plot error term used was MS of Rep x Fat x Wt. This was also applied to the Fat x Wt interaction. The main effects of weight level were calculated using the unit totals of MS of Rep x Wt. Thus the main effects of weight were less precisely estimated than those of Fat and Fat x Wt. Accuracy was gained in comparing the fat levels systematically rather than randomly. Systematic examination of means for individual animals indicated that animals contributing to the Rep effect were randomly distributed over all fat and weight levels. However more of these animals fell in the 90-94 kg weight level and the 25.4 mm fat level. Examination of notes made on the chops before cooking showed that there was no relationship to PSE pork, visible marbling, or lack of visible marbling, with these animals.

Consumer Panel.

Means for consumer panel evaluation for degree of liking for flavour, tenderness, juiciness and overall acceptability

are shown in Table 5. Effect of fat or weight was not significant for flavour, and overall acceptability was not affected by weight. Liking of tenderness was affected by both fat ($P < 0.01$) and weight ($P < 0.05$). The 45.6 mm fat level was liked least for tenderness but the 75-79 kg weight level was liked least. Panelists' comments suggested the pork was too soft and trained panel scores indicated increased softness and tenderness with increase in fat level. Liking for juiciness was affected by both fat level and weight level. Liking for juiciness increased with fat level but decreased for the 90-94 kg weight level. Trained panel scores indicated an increase in juiciness with an increase in fat level. The consumer panel rated samples from the 45.6 mm fat level less for overall acceptability than those from the 25.4 mm level ($P < 0.05$). These data suggest that juiciness is less important than tenderness in determining overall acceptability of cooked pork.

Examination of distribution of hedonic ratings for individual treatments showed that the two treatments exhibiting the most scores (34.3 and 30.5%) in the like range of the scale for juiciness contained the least in that range for overall acceptability (62.9 and 55.2%).

CONCLUSIONS

Animal to animal variation appears to have a greater effect on palatability than does either fat or weight level. These data suggest that juiciness is a less important contributor to overall acceptance and that the pork can be too tender. The data also supports the premise that lower fat content does not reduce pork palatability, at least as far as this group of Canadian consumers was concerned.

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