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Consumer Acceptance of Pork Chops

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SUMMARY AND CONCLUSIONS

This study was designed to test the effect of the farm source of hogs on the eating acceptability of pork chops from these hogs. Eight groups of eighteen Hampshire hogs each were used in the study after it had been determined that each group had been sired by the same male. Pork chops were distributed to a consumer panel in Jefferson City, Missouri, and chops were also tested by a laboratory panel. After eating the chop, the panelist completed a rating card, scoring the chop from 0 to 9. Zero indicated a completely unsatisfactory chop, 8 to 1 indicated something less than completely acceptable, and 9 indicated a completely acceptable chop. If the chop was rated "less than 9" (less than completely acceptable) there was a list of reasons to check why the chop was not completely satisfactory.

The mean acceptance scores of source groups were significantly different at the .05 level as rated by the consumer panel and at the .01 level by the laboratory panel. Shear analysis also indicated a significant difference between source groups. Source groups 1, 2, and 7 were the consistently high ranking groups and groups 3 and 6 were consistently low. Tenderness was probably the major variant accounting for the differences in source groups, but juiciness and flavor had an effect, especially in the laboratory panel. Some of the difference found between source groups may have been caused by environmental factors or by the influence of the dams. The evidence suggests that breeding was a major factor.

Fifty-seven percent of the consumer panel and 73 percent of the laboratory panel rated their chops "less than 9." The preponderance of "less than 9" scores (less than completely acceptable), indicated that the majority of pork is not entirely satisfactory to consumers. Also, the fact that the consumer panel gave 1541 criticisms of "not tender enough," "not juicy enough," and "unsatisfactory flavor," as opposed to only 160 criticisms of "too fat," indicates additional areas where improvement must come if consumer acceptance and hence demand is to improve. The few criticisms of too fat chops does not preclude the probability that such complaints would have been much greater on a fatter cut such as the Boston Butt.

This study, as well as other studies, suggests that the majority of pork is something less than completely satisfactory to the consumer. The number of chops rated less than completely acceptable leads to the conclusion that quality in pork can be improved upon—possibly through selective breeding. However, before this is done, there is more information needed about the effect of sires on palatability.

TABLE 1
CARCASS DATA BY SOURCE GROUPS

Source Group	Number per U.S. Grade				Hot Carcass Weight (pounds)	Backfat (inches)	Length (inches)	Loin Eye Area (inches)	Four Lean Cuts (percent)
	1	2	3	Medium					
1	13	5			152.33	1.49	29.31	4.26	51.89
2	10	7	1		163.61	1.63	29.38	4.18	50.66
3	8	10			160.44	1.68	29.38	3.64	47.83
4	12	6			165.28	1.61	30.31	4.26	49.64
5	8	9		1	161.56	1.57	30.19	4.10	49.48
6	7	9	2		157.78	1.69	30.12	4.04	51.40
7	9	8	1		161.94	1.66	29.65	4.71	52.09
8	10	8			156.11	1.59	29.79	4.36	52.07

The evidence from this sample of hogs from eight farm sources indicates a significant variation in eating quality of the resulting pork chops. Since environmental variables were not controlled, it is possible that these factors contributed to this variation. However, evidence in this study suggests that the single sire used on each farm is a major factor contributing to the variation in eating satisfaction.

Future efforts to determine the factors influencing consumer satisfaction with pork should utilize a project design that will measure the effect of heredity. Information is needed as to how many sires produce progeny with palatability that is significantly above or below the average. Is there great variation among sires about the average, or is the effect of the sire limited to a rather narrow range? Do the normal variations in health, housing and diet of commercially produced hogs significantly affect palatability?

INTRODUCTION

This study was designed to test the effects of farm source of hogs on the eating characteristics of pork chops from these hogs.

In 1947, the demand for pork reached a peak and since has declined relative to beef and poultry.^{1-2*} This trend of substituting leaner beef and poultry for the fatter cuts of pork has been attributed to such factors as the reduced physical labor required in many occupations today, the development of vegetable oil as a successful substitute for lard, and the danger of continued consumption of high calorie food as pointed out by medical research. If these are the only reasons for the declining demand for pork, then the full adoption of the meat type hog by the industry would probably be a step in the right direction. It is doubtful, however, that this alone would cure the ills of the industry. The industry has been slow to accept the meat type hog and previous research leads us to believe that consumer acceptance is based not solely on leanness, but on such qualities as tenderness, flavor and juiciness.³⁻⁴ These qualities, as well as leanness, must be competitive with other meats if demand for pork is to increase.

A prerequisite for an improvement in quality is a knowledge of the factors which affect quality. Extensive research has been done at this station as well as several others in an attempt to isolate the factors which influence palatability and consumer acceptance of pork. Naumann and others, in 1958, studied the effects of retailing selected lean pork cuts as opposed to regular pork cuts in several Kansas City stores.⁵ He found that consumers generally preferred the leaner pork, but when the lean cuts were priced four cents per pound above the regular cuts they sold about evenly.

In an attempt to predict consumer acceptance of pork from hogs slaughtered at lighter weights, Zobrisky and Hatesohl did similar studies in 1958.⁶⁻⁷ Hogs were divided into three weight classes, 125 pounds, 165 pounds, and 205 pounds, and consumers rated meat from all three classes as to eating qualities. No significant difference was found in mean acceptability ratings between weight

*Numbers refer to references in the back.

classes. The 125 pound class was criticised less frequently for being too fat, but received more criticisms than the other groups for being too small.

Marbling and firmness have long been accepted as indicators of tenderness, juiciness and flavor in meat. In 1960, Volk studied the effects of marbling and firmness on consumer acceptance of pork chops.⁸ He found no relationship between consumer acceptance and firmness, and only a slight relationship between consumer acceptance and marbling. On the basis of Volk's study it appears that marbling and firmness, the long time predictors of palatability, bear only a slight relationship to consumer acceptability.

It, therefore, seems pertinent to search in other directions for the factors which affect quality in pork.

Enfield and Whatley recently studied the heritability of carcass length, backfat, and loin lean area in hogs and as might be expected, they found all three traits moderately heritable in the range of 0.4 to 0.6.⁹ These observable physical factors have been believed heritable for some time, but what of the eating qualities of the progeny? Are qualities such as tenderness, flavor and juiciness also affected by heredity?

EXPERIMENTAL PROCEDURE

Materials

The pork chops used for the consumer and laboratory panels were taken from paired center loin sections. The loins were from eight farm source groups of eighteen hogs each. All hogs from each farm were sired by one Hampshire boar. The Hampshire boars were unrelated. The one hundred forty-four hogs were slaughtered by a commercial packer in Kansas City. Standard backfat and carcass length measurements were taken at the packing plant. The paired loins were scored and processed in the University Meat Technology Laboratories.

The loins were scored subjectively for marbling and firmness of lean. Marbling was scored by using U.S.D.A. pictorial marbling standards, Firmness was scored on a six point scale. A rating of 1 indicated very firm muscling and 6 indicated very soft muscling. The sirloin end of the loin was removed just anterior to the ilium and the blade end was removed anterior to the eighth thoracic vertebra. The loins were frozen at -17°F and cut into chops seven-sixteenths of an inch thick. The chops were numbered, coded, and packaged in four chop household packages. The one and one-half inch shear chop included the eighth thoracic vertebra. Chops for the laboratory panel were identical in thickness to those used for the consumer panel and were immediately posterior to the shear chop.

Panels and Procedure

The consumer panel consisted of 168 families recruited from a probability sample of Jefferson City, Missouri, a small industrial city with a population of approximately 30,000. Business, low income, and Negro areas were excluded and

the city was divided into areas comparable to city blocks. The blocks were selected using a table of random numbers and every second household was interviewed in the selected block. Eligibility requirements for households were:

1. Housewife under 60 years of age and having at least an eighth grade education
2. Husband and wife fairly regular consumers of pork
3. A minimum family income of \$200 per month
4. Family had not lived on farm in the past two years and raised none of their own meat
5. None of the family worked or had worked as a meat cutter or meat salesman.

If the household met the requirements and was willing to cooperate, four pork chops were delivered once a week for a period of six weeks.

It was possible to learn something of the socio-economic make-up of the consumer panel from information obtained from each of the cooperating families. Forty-five percent of the panel had attended college, 50 percent had a family income of more than \$700 per month, and 14 percent had an income of less than \$400 per month (Table 2). Twenty-two percent of the panel was less than 30 years of age and 30 percent was over 45.

TABLE 2
EDUCATION, AGE AND INCOME OF CONSUMER PANEL

	Number	Percent
Education		
Attended College	76	45
No College	92	55
Age		
Below 30	38	22
30 - 45	80	48
Above 45	50	30
Income		
Less than \$400 per month	23	14
\$400 - \$700	61	36
More than \$700	84	50

In addition to the consumer panel, a laboratory panel was conducted at the Home Economics laboratory. The panel consisted of 12 trained judges. The panel met for 18 days and during this period each judge tasted chops from each of the 144 hogs. One hog from each of the eight source groups was tested each day. The testing sequence of hogs within source groups was selected at random. The tasting sequence within a day was randomized for the first day and then rotated systematically for the succeeding days.

All chops for the laboratory panel were cooked for ten minutes on a grill preheated to 300°F. The chops were served immediately after removal from the grill. In the consumer panel, the panelist was free to cook the chops as desired. However, 71 percent of the chops used by the consumer panel were prepared using some type of moist heat, as opposed to 29 percent prepared with a dry heat method of cooking.

The shear chops were defrosted to an internal temperature of 38°F and cooked in 300°F deep fat to an internal temperature of 155°F. One-half inch cores were taken from the lateral, central and medial portions of the *longissimus dorsi* muscle. Each core was sheared three times: a total of nine shear readings per shear chop.

Each household received a package of four pork chops each week for six weeks. Each week the chops eaten by the husband and wife were from two different hogs in different source groups. Although the chops were from different hogs, they were from the same position on the loin throughout the six week period for both husband and wife. This was to prevent undue variation in ratings due to varying size of chops from different positions on the loin. A small metal ring was placed around the bone of those chops consumed by the husband in order to distinguish them from those consumed by the wife. As soon as the chops were eaten, both husband and wife rated the chops on a card provided for the purpose. The card contained a nine point scale, with a rating of 9 being a completely satisfactory pork chop (Figure 1).

SOURCE GROUP DIFFERENCES

Consumer Panel

A Nested design was used to test the differences in mean scores of source groups as rated by the consumer panel. Results of the analysis of variance indicate a difference in mean ratings of sire groups at the .05 level of significance (Table 3). There was no significant difference among hogs within source groups, indicating more variation of ratings between source groups than within groups. Note that the variation of loin means was considerable (Table 3). The significant difference was caused by source group 6, which had a significantly lower mean score than groups 4, 7, and 2.

Laboratory Panel

The Nested design was also used to test differences in mean scores of source groups as rated by the laboratory panel. Results (Table 4) show a significant difference between source groups at the .01 level. Also, there is a significant difference between hogs within source groups at the .01 level. Thus, in the laboratory panel, there was significant variation of scores within groups as well as between groups. In this panel, groups 1, 7, and 2 have significantly higher mean scores than the other groups.

FIGURE 1

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Chops without rings are for the wife. Please fill out schedule during or immediately after the meal.

DIRECTIONS FOR USING RATING SCALE: Please rate these chops on the basis of eating characteristics. Please ignore size and thickness in making your ratings.

1. Number 9 is the top rating. Chops given this rating should have everything that you expect from pork chops.
2. Ratings 8-1 indicate decreasing levels of acceptance.
3. "0" indicates that the chops were completely unacceptable.

	<u>Circle One Number</u>	<u>If you rated chops less than 9, please check reasons why:</u>
Entirely satisfactory, these are the kind of chops I like to eat.	9	<input type="checkbox"/> Not tender enough
	8	<input type="checkbox"/> Not juicy enough
Chops rated in this range are acceptable but they are not en- tirely satisfactory - the poorer the chop the lower the rating	7	<input type="checkbox"/> Lacked flavor
	6	<input type="checkbox"/> Poor flavor
	5	<input type="checkbox"/> Very unpleasant flavor
	4	<input type="checkbox"/> Too fat
	3	<input type="checkbox"/> Too lean
	2	<input type="checkbox"/> Cooked overdone and dry
	1	<input type="checkbox"/> Appearance
Not acceptable	0	<input type="checkbox"/> Other
		How cooked? (Please check one)
		<input type="checkbox"/> Moist heat (liquid added or lid on)
	<input type="checkbox"/> Dry heat (no liquid and no lid)	
		<u>Comments.</u> (Both favorable and unfavorable comments are useful to us and are greatly appreciated.)

Your name _____

Interviewer _____ H. H. No. _____ Week _____

TABLE 3
CONSUMER PANEL

Nested Experiment on Differences in Source Groups				
Source	Sum Squares	d.f.	Mean Squares	Variance Ratio
Farm Source (Within)	$SS_3 = 33.69$	7	$SS_3^* = 4.81$	$SS_3^*/SS_1^* = 2.55^*$
Hogs (Sources)	$SS_2 = 47.38$	136	$SS_2^* = .35$	$SS_2^*/SS_1^* = .18$
Error	$SS_1^* = 2516.74$	1865	$SS_1^* = 1.89$	
Total	$SS = 3597.81$	2008		

Mean Acceptability Scores by Source Groups			
Source	Mean*	Rank	Range in Loin Means
1	7.96	4	7.07 - 8.57
2	7.99	3	7.21 - 8.57
3	7.80	7	7.07 - 8.42
4	8.00	1	7.50 - 8.35
5	7.88	5	6.92 - 8.50
6	7.63	8	6.78 - 8.71
7	8.00	1	7.14 - 8.50
8	7.81	6	7.00 - 8.85

* $k = .35$ = the necessary magnitude between means for significance at the .05 level; i.e., means of groups 6 and 7 differ by .37 and since this is greater than "k" ($k = .35$) they are significantly different.

TABLE 4
LABORATORY PANEL

Nested Experiment on Differences in Source Groups				
Source	Sum Squares	d. f.	Mean Square	Variance Ratio
Farm Source (Within)	$SS_3 = 278.41$	7	$SS_3^* = 39.77$	$SS_3^*/SS_2^* = 7.68^{**}$
Hogs (Sources)	$SS_2 = 704.25$	136	$SS_2^* = 5.18$	$SS_2^*/SS_1^* = 2.71^{**}$
Error	$SS_1 = 3028.76$	1584	$SS_1^* = 1.91$	
Total	$SS = 4011.42$	1727		

Mean Acceptability Scores by Source Groups

Source	Mean	Rank	Range in Loin Means
1	8.06	1	7.00 - 8.83
2	7.60	3	7.58 - 8.75
3	6.88	7	5.83 - 8.08
4	6.88	7	5.66 - 8.00
5	7.12	5	5.08 - 8.25
6	6.99	6	5.66 - 8.08
7	7.65	2	7.00 - 8.16
8	7.17	4	5.83 - 8.33

* $k = .42$

Shear

Shear values were taken on three one-half inch cores from a chop from each carcass. The chops were cooked in deep fat to an internal temperature of 155°F and then placed in an oven at 220°F for five minutes. The cores were taken from the cooked chops and pounds of force required to shear the core were measured by the Warner-Bratzler mechanical shear (Table 5). An analysis of variance indicated a high significant difference between means of source groups (Table 6).

TABLE 5
SHEAR FORCE BY SOURCE

Source	Source Mean	Range of Means
1	7.68	5.83 to 10.19
2	7.09	5.25 to 9.53
3	9.42	6.75 to 11.75
4	8.27	6.08 to 10.78
5	7.66	4.81 to 11.94
6	8.91	6.08 to 11.39
7	6.73	5.03 to 7.89
8	7.80	6.03 to 9.78

Loin Eye Area, Firmness and Marbling Scores

Before cutting the loins, subjective ratings were given as to firmness and marbling, and loin eye measurements were taken. An analysis of variance revealed differences between source groups at the .01 level of significance in all three criteria (Table 6).

Proportion of "Entirely Satisfactory" Chops

The rating scale provided an opportunity for the panels to rate the chops as completely acceptable (9), something less than completely acceptable (8-1), or unacceptable (0). Only three chops in the consumer panel and two chops in the laboratory panel were rated completely unacceptable. The proportion of chops rated 9 (entirely satisfactory) to chops rated less than 9 (not entirely satisfactory) supports the hypothesis that the source groups differed in consumer acceptability. Source groups 1, 2, and 7 received the highest number of entirely satisfactory scores and source groups 3 and 6 the lowest (Table 7).

It is interesting to note that well over 50 percent of the chops in most groups were rated less than 9, indicating that something was lacking in the meat. Yet, the mean scores tended to be quite high, dropping no lower than 7.63 in the consumer panel and 6.88 in the laboratory panel. The palatability problem appears to be one of a very high proportion of not quite the best chops rather than

TABLE 6
SHEAR, LOIN EYE, FIRMNESS AND MARBLING CHARACTERISTICS BY SOURCE GROUPS

Source	Shear		Loin Eye Area		Firmness*		Marbling [#]	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
1	7.68	4	4.26	3	3.44	2	4.44	1
2	7.09	2	4.18	5	3.89	4	7.78	8
3	9.42	8	3.64	8	2.22	1	5.00	2
4	8.27	6	4.26	3	4.11	5	6.22	3
5	7.66	3	4.10	6	4.33	8	6.94	7
6	8.91	7	4.04	6	3.83	3	6.39	4
7	6.73	1	4.71	1	4.22	6	6.72	6
8	7.80	5	4.36	2	4.22	6	6.50	5
	k=1.23		k=.40		k=1.02		k=1.53	

*1 - very firm to 6 - very soft

[#] 10 - extremely abundant to 1 - traces

TABLE 7
PERCENTAGE OF CHOPS RATED 9 BY THE PANELS

Source	Consumer Panel % 9's	Laboratory Panel % 9's
1	49.0	53.2
2	44.4	33.3
3	37.7	14.8
4	44.3	17.1
5	43.8	19.4
6	35.7	20.4
7	46.6	34.7
8	43.2	19.0

a significant proportion of very unsatisfactory chops. The fact that the chops from some source groups were significantly more palatable may not be any more important than the fact that a majority of chops in each source group were a little less than completely acceptable.

While the mean ratings of the source groups were significantly different, it has already been noted that the mean ratings of loins within groups did vary considerably. Some of this variation within groups is probably due to scoring differences of the particular groups of consumers who were testing various loins. However, a detailed analysis of the individual ratings by loins suggests that there were some real differences in palatability of hogs within source groups.

It seems reasonable to assume that there might be one or two people testing any loin who for various reasons would not give it a completely acceptable score. However, when more than half of the 12 or 14 people rating a loin gave it a score "below 9," then it seems reasonable that the loin was somewhat lacking. The number of loins in each source group which a majority of consumers rated "below 9" are shown in Tables 8 and 9. Thus, the highly rated source group 1 had a low average number of "below 9" ratings in the laboratory panel and included only 5 loins—out of 18—which had a majority of "below 9" ratings. However, the other side of the interpretation is that even highly rated source group 1 had 5 loins which were somewhat deficient in acceptance. Even if all of the high average palatability of source group 1 was attributed to the sire, the evidence of these 5 loins suggests that some of the progeny would be a little lacking in palatability—perhaps because of the dams, perhaps because of environmental factors. Likewise, even the lowest rated source groups contained

TABLE 8
CONSUMER RATINGS OF LESS THAN 9

Source	Total No. of Ratings in Source Group	Mean No. of Ratings Per Loin	Range in Ratings Per Loin	No. of Loins with More than 7 Such Ratings
1	128	7.11	5 - 12	7
2	140	7.77	4 - 12	10
3	157	8.72	4 - 12	13
4	141	7.83	5 - 13	9
5	140	7.77	5 - 11	8
6	160	8.88	3 - 13	14
7	134	7.44	4 - 10	9
8	143	7.94	2 - 11	12
Maximum Possible	252	14.0	0 - 14	18

TABLE 9
LABORATORY PANEL RATINGS OF LESS THAN 9

Source	Total No. of Ratings in Source Group	Mean No. of Ratings Per Loin	Range in Ratings Per Loin	No. of Loins with More than 7 Such Ratings
1	101	5.61	2 - 11	5
2	144	8.00	1 - 11	14
3	184	10.22	6 - 12	17
4	179	9.94	5 - 12	15
5	174	9.66	4 - 12	15
6	172	9.55	7 - 12	16
7	141	7.83	2 - 11	11
8	175	9.72	5 - 12	15
Maximum Possible	216	12.0	0 - 12	18

a few loins which received almost unanimous approval. But, in general, the lower the average acceptability of the source group the larger the proportion of loins in the group receiving a majority of "below 9" ratings. This relationship and the differences between groups were shown more clearly in the laboratory panel than the consumer panel, but the results of the two panels were generally consistent.

Relationships and Comparison of Tests

Results of both panels and the shear test measurements tended to be complementary. The loin eye area, firmness and marbling scores, however, had progressively less relationship to the panel results.

Source groups 1, 2, and 7 ranked well in both acceptance panels. Shear values correspond with these findings and indicate that these source groups were significantly more tender than the other groups (Table 10). Source groups 5 and 8 were ranked near the middle by both panels and again shear test results correspond.

The major difference in the results from the two panels came in the evaluation of source group 4. This group was ranked first by the consumer panel and last by the laboratory panels. Shear tests tended to agree with the laboratory panel as the mean shear value was significantly higher for group 4. The loins in source group 4 were soft, watery, and oddly shaped. Although the consumer panel was asked to disregard size of chop in making their evaluation, it is probably that size and uncooked appearance had some affect on ratings. In group 4, size may have affected the consumer panel, but probably this would not account

TABLE 10
COMPARISON OF RESULTS OF TESTS BY SOURCE GROUPS

Source	Panels							
	Consumer		Laboratory		Shear		Loin Eye Area	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
1	7.96	4	8.06	1	7.68	4	4.26	3
2	7.99	3	7.60	3	7.09	2	4.18	5
3	7.80	7	6.88	7	9.42	8	3.64	8
4	8.00	1	6.88	7	8.27	6	4.26	3
5	7.88	5	7.12	5	7.66	3	4.10	6
6	7.63	8	6.99	6	8.91	7	4.04	7
7	8.00	1	7.65	2	6.73	1	4.71	1
8	7.81	6	7.17	4	7.80	5	4.36	2

TABLE 11
NUMBER OF REPLIES IN EACH CRITICISM CATEGORY

	Consumer	Laboratory
Not tender enough	585	912
Not juicy enough	528	385
Lacked flavor	331	332
Poor flavor	84	203
Very unpleasant flavor	11	42
Too fat	159	14
Too lean	62	6
Cooked overdone and dry	83	2
Appearance	34	2
Maximum Possible Criticisms per Category	2,016	1,728

for the complete reversal in ratings by the two panels. Loin eye area in group 4 was significantly smaller than in the largest group (7), but was significantly larger than in the smallest group (3).

ANALYSIS OF CRITICISMS

If the pork chops were rated less than 9, a reason, or reasons, was given as to why the chops were not completely acceptable. A vast majority of the comments on why the chops were not satisfactory were contained in the first three categories (Table 11). Due to the small number of chops marked "poor flavor" and "very unpleasant flavor," the two categories were combined with "lacked flavor" for a more meaningful analysis.

Comparison of Panels

The trained laboratory panel was noticeably more critical of lack of tenderness than was the consumer panel. However, the laboratory panel gave fewer criticisms of "not juicy enough" than did the consumer panel. This might be due to the uniform manner in which the laboratory chops were prepared. The consumer panel gave 83 ratings of "cooked overdone and dry" as opposed to only two in the laboratory panel.

The laboratory panel gave proportionately more ratings of "lacked flavor," "poor flavor" and "very unpleasant flavor" than did the consumer panel. This could be due to the previous training of the judges to detect flavor differences. The consumer panel naturally was more critical of chops for being "too fat" or "too lean" than was the laboratory panel who could not view the entire chop. However, these two areas of criticism were distributed rather evenly among source groups and made no contribution in any explanation of differences in sire groups.

Consumer Panel

In the number of criticisms received in the "not juicy enough" and "unsatisfactory flavor" categories, there was no significant difference between sire groups. However, a chi-square test on the "not tender enough" category proved significant at the .01 level (Table 12). This leads to the conclusion that lack of tenderness was probably the major difference in the source groups as rated by the consumer panel. Source groups 3, 6, and 8 received significantly more criticisms of "not tender enough" than did the other groups. Source groups 1, 2, and 7 received fewer criticisms than groups 4 and 5 but the difference was not significant.

Laboratory Panel

In the laboratory panel, there was a significant difference between source groups in the number of criticisms for all three major categories (Table 13). However, the number of chops rated "not tender enough" far outweighed the

TABLE 12
 NUMBER OF CRITICISMS IN THE THREE MAJOR CATEGORIES
 BY SOURCE GROUPS AS RATED BY THE CONSUMER PANEL

Source	Not Tender Enough	% of Column Mean	Not Juicy Enough	% of Column Mean	Unsatis- factory Flavor	% of Column Mean
1	58	(79.3)	55	(83.6)	52	(96.7)
2	59	(80.7)	69	(104.9)	55	(102.3)
3	89	(121.7)	68	(103.4)	60	(111.6)
4	66	(90.3)	67	(101.9)	46	(85.6)
5	65	(88.9)	72	(109.5)	51	(94.9)
6	99	(135.4)	76	(115.6)	65	(120.9)
7	63	(86.2)	51	(77.6)	48	(89.3)
8	86	(117.6)	68	(103.4)	53	(98.6)
Total	585		526		430	
X^2 =Chi-square		$X^2=23.73^{**}$	$X^2=7.60$		$X^2=5.05$	

TABLE 13
 NUMBER OF CRITICISMS IN THE THREE MAJOR CATEGORIES
 BY SOURCE GROUP AS RATED BY THE LABORATORY PANEL

Source	Not Tender Enough	% of Column Mean	Not Juicy Enough	% of Column Mean	Unsatis- factory Flavor	% of Column Mean
1	64	(56.3)	24	(49.9)	46	(63.4)
2	73	(64.2)	48	(99.8)	61	(84.1)
3	146	(128.4)	57	(118.4)	84	(115.9)
4	145	(127.5)	48	(99.8)	85	(117.2)
5	121	(106.4)	59	(122.6)	81	(111.7)
6	131	(115.2)	72	(149.6)	87	(120.0)
7	92	(80.9)	30	(62.3)	68	(93.8)
8	138	(121.3)	47	(97.7)	68	(93.8)
Total	910		385		580	
X^2 =Chi-square	$X^2=66.49^{**}$		$X^2=34.89^{**}$		$X^2=19.94^{**}$	

other two categories. Source groups 1, 2, and 7 received significantly fewer criticisms of "not tender enough" than did the others. Groups 3 and 4 received the most criticisms of "not tender enough" but the difference was not significant between the number received in 3 and 4 and the number received in groups 5, 6, and 8.

As in the consumer panel, lack of tenderness was the dominating factor, with source groups 1, 2, and 7 receiving fewer criticisms (Table 13). This finding differs from the findings of Zobrisky and Volk who observed that tenderness was a relatively minor problem in pork.^{7,9} Since source group 6 received a significantly greater number of "not juicy enough" criticisms it appears that this may have been one of the major factors in the poor acceptance of this group. Although there was no statistical significance in the consumer panel, source group 6 received the highest number of "not juicy enough" comments (Table 12). In percentage terms, a greater distinction was made between sources (1 and 6) on lack of juiciness than on either of the other two variables. The number of "unsatisfactory flavor" criticisms in the laboratory panel indicated little as to source group differences except to emphasize the superiority of source group 1.

EFFECT OF ENVIRONMENTAL FACTORS

While it is likely that some of the difference in the source groups was due to a factor or factors other than sires, it was not possible to isolate the influence of any single factor. Owners of the hogs were interviewed and pertinent data were collected. All of the hogs used in the study were approximately the same size (See Table 1). All hogs were fed a basic ration of corn and a commercial supplement; two of the groups received some milo in their ration (Table 14). The groups varied in age from five to seven months, averaging about six months. Some of the groups were more closely confined during their feeding period than others, but no discernible pattern can be traced as to good or poor acceptance due to type of confinement.

No data were available as to how many hogs in each group were full or half-brothers. However, the total number of hogs produced on each of the eight farms was relatively small. It is, therefore, likely that the number of dams involved in each group of 18 was small.

RELATED DATA

Cooking Method

Effect of cooking method was analyzed by dividing all methods into moist and dry heat categories (Table 15). In an analysis of variance, the mean ratings differed significantly at the .05 level of significance. However, any inference about relationship of moist heat versus dry heat upon consumer acceptance is hampered by the fact that many households used the same method of cooking throughout the study. Therefore, the differences in acceptability ratings between

TABLE 14
COMPARISON OF ENVIRONMENTAL FACTORS BY SOURCE GROUPS

Source	Age	Ration	Confinement Area
1	5 ½ months	corn and supplement	dry lot
2	6 ½ months	corn and supplement	cornfield & dry lot
3	6 months	corn, milo, supplement	cornfield & dry lot
4	6 months	corn and supplement	cornfield
5	7 months	corn and supplement	dry lot
6	6 months	corn and supplement	cornfield & dry lot
7	5 months	corn, milo, supplement	cornfield & dry lot
8	6 ½ months	corn and supplement	cornfield

TABLE 15
EFFECT OF COOKING METHOD ON ACCEPTABILITY RATINGS

Method	Mean Ratings
Moist	7.93
Dry	7.76

cooking methods may be due to the differences between the people employing the two methods and not actually to the method of cooking.

Chop Position

Chops were numbered one through seven as to position, starting at the posterior of the center portion of the loins. Each household in the panel received chops from the same position each week in order to avoid undue variation in size of chops from week to week. Although the panel was asked to disregard size of chop in making their rating, it was thought that families receiving chops from the smaller end of the loin might tend to give lower ratings than families receiving the larger chops. An analysis of variance test revealed a highly significant difference between the mean scores for chop positions. However, the means did not vary as expected; that is, higher scores for larger chops, lower

TABLE 16
MEAN ACCEPTANCE SCORE BY CHOP POSITION

Position	1	2	3	4	5	6	7
Mean Score	8.11	7.90	7.95	7.53	7.70	7.93	8.05

TABLE 17
EFFECT OF INCOME ON ACCEPTANCE SCORES

Age Group	Mean Score
Low	8.02
Medium	7.93
High	7.81

TABLE 18
EFFECT OF EDUCATION ON ACCEPTANCE SCORES

Education Group	Mean Score
Attended College	7.85
No College	7.91

TABLE 19
EFFECT OF AGE ON ACCEPTANCE SCORES

Age Group	Mean Score
Below 30	7.72
30 - 45	7.89
Above 45	7.99

scores for smaller chops. Instead the scores tended to be higher at either end of the loin and lower for the center chops (Table 16). This differs from the findings of Volk, who in a previous consumer acceptance study, found no significant difference in acceptance ratings as to chop position.⁹

It is possible to place too much emphasis on the significant difference between mean ratings of chop positions found in this study. Since there was no cross-classification of chop position and consumers, the effects of differences in consumers and chop position would be confounded. Therefore, the significant difference may be caused, not by chop position, but by the groups of consumers assigned to each position.

Income and Education

The panel was divided into three classes according to family income. There was a highly significant difference between the mean acceptance ratings for the groups. Consistent with previous studies, the low income group gave better ratings than did the middle or high income group and the middle income group gave a better rating than did the high income group (Table 17).

The panel was also classified as to education and age. There was no significant difference in the acceptability ratings of those who had attended college and those who had not (Table 18). The difference in acceptability between age groups was highly significant with the older age group giving the better acceptance rating. (See Table 19)

Time Period

It was thought that the enthusiasm of the panel might wear off near the end of the study and that acceptance ratings would tend to be lower. However, an analysis of variance indicated no significant difference between the mean scores for weeks.

In the laboratory panel, there was also no significant difference in the ratings between the first and second half of the study.

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