4:18 Experience in taste testing fresh pork at the Danish Meat Research Institute

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Introduction

Nowadays instrumental and analytical methods are often used in research work, but when organoleptic characteristics are to be described or assessed in detail, a sensory method is indispensable because a sensory evaluation gives results that cannot adequately be determined by physical or chemical tests. Analytical or instrumental methods are on the other hand available to support the sensory methods.

At the Danish Meat Research Institute (DMRI) taste panel assessments are used to measure quality attributes in meat, particularly pork chops and beef, and the results are often supported with objective methods.

This paper will describe experience in taste testing fresh pork at the DMRI.

Materials and methods

A standard method has been developed for assessing the eating quality of pork, mainly pork chops.

Sampling and maturation of meat

One day after slaughter a pork loin about 25-30 cm is cut from the rib end of Longissimus Dorsi. The rib end is chosen for practical purposes. The loin is boned out, de-fatted to about 5-10 mm fat thickness and aged at 2°C till 7 days after slaughter. Ageing has a positive effect on tenderness in normal pork loins (Buchter and Zeuthen, 1971). The main effect is established on ageing 3 days, but ageing for a week gives the optimal effect. Flavour is not affected on ageing for a week. If necessary, the loin can then be frozen below -20°C until required without any effect on taste characteristics.

Preparation of unfrozen chops

The loin is sliced into chops with a thickness of 2.0 cm and allowed to reach a centre temperature of about 20°C before preparation. The chops are then heated for 8-10 minutes depending on size without additional fat on a griddle plate, being turned after 2, 4 and 6 minutes cooking respectively. The temperature of the griddle plate is about 170°C falling to 150°C when turned the first time and about 140°C and 130°C when turned the second and third time. This method gives fried chops with a centre temperature of about 65°C, i.e. not well done, but with a light pink colour. This centre temperature gives optimal juiciness and tenderness for this cooking method and there are no problems in using such a low temperature in Denmark because Trichinella spiralis has not been found in slaughter pigs since 1929. Cooking losses are registered and range from 10 to 20% depending on the meat quality used.

Preparation of frozen chops

Before preparation the loin is thawed in a refrigerator at 4-5°C for 20 hours. This temperature and time gives the minimum of drip loss. The chops are sliced in the same way as the unfrozen chops and cooked as before.

Organoleptic assessment

The chops are cut into samples 2 cm across and 4 cm in length, coded with numbers, and presented hot to the taste panel. The taste panel is given no information about the experiment before taste testing. The limit for the number of samples per session is found to be 12-15 divided into 3-4 servings. The samples are scored for colour (fried), flavour, tenderness, juiciness and overall acceptability. The scoring scale used is a symmetrical hedonic 11-point scale, verbally anchored with categories as follows:

Score	Colour	Flavour	Tenderness
+5	Ideal	Ideal	Ideal
+4	Excellent	Excellent	Excellent
+3	Extremely good	Extremely good	Extremely good
+2	Very good	Very good	Very good
+1	Good	Good	Good
0	Neither good nor bad	Neither good nor bad	Neither good nor bad
-1	Marginally discoloured	Marginal off-flavour	Marginally tough
-2	Slightly discoloured	Slight off-flavour	Slightly tough
-3	Distinctly discoloured	Distinct off-flavour	Distinctly tough
-4	Strongly discoloured	Strong off-flavour	Very tough
-5	Poor	Poor	Poor

	Juiciness	Overall acceptability
+5	Ideal	Ideal
+4	Excellent	Excellent
+3	Extremely good	Extremely good
+2	Very good	Very good
+1	Good	Good
0	Neither good nor bad	Neither good nor bad
-1	Marginally dry	Marginally bad
-2	Slightly dry	Slightly bad
-3	Dry	Bad
-4	Very dry	Very bad
-5	Poor	Poor

For calculation, all verbal scales are subsequently transformed to scores as indicated.

At the DMRI this symmetrical scoring scale has always been used in taste testing. In other countries, for example Great Britain, France and Germany meat research institutes (Dransfield et al., 1982) do not use the position 0, "neither good nor bad", where the tasters don't really make up their minds about the sample. The scale, however, works very well at the DMRI and the tasters find this position useful in taste testing.

The amount of sample each panellist puts in her mouth is of the same dimension. The sample is divided into two pieces in the longitudinal direction and the panellist first chews one half and then the other. This method makes it possible to establish if there is a difference in tenderness within a sample. When tasting, panellists are not allowed to swallow the sample because this can cause fatigue before all the samples are evaluated. Between samples panellists rinse their mouths with mineral-water. One taste testing, including 12-15 samples, takes about an hour. The panellists are told the purpose of the experiment after it is finished.

The taste panels

The DMRI has two taste panels with 8-9 members in each panel. They are all housewives from the nearby town and experienced in taste panel work. Ages range from 35-66 years (average 56). The panel members are selected on the basis of interest, ability to identify the basic tastes, ability to recognize and describe differences in quality attributes, ability to repeat an evaluation and ability to use the scoring scale. In order to maintain these abilities it is necessary for the taste panels to carry out the sensory evaluation regularly.

Testing the taste panel members

The taste panel members are tested once a year. The test is carried out on the "basic" tastes (salt, sour, sweet and bitter) and on representative product types - in this case pork chops. The test is divided as follows:

Step 1.

Identifying diluted solutions of the four "basic" taste qualities. The concentration of the solutions used are above threshold values.

Step 2.

Ranking each of the four "basic" taste solutions. The concentrations are as follows:

Salt	Sour (Citric acid)	Sweet (Sugar)	Bitter (Quinine chloride)
2.50 g/l	0.80 g/l	10.00 g/l	0.050 g/l
1.25 g/l	0.40 g/l	5.00 g/l	0.025 g/l
0.00 g/l	0.00 g/l	0.00 g/l	0.000 g/l

All solutions are coded with numbers. When the panellists receive the solutions they are told to identify the taste before they rank them. The purpose of the ranking is to ensure that the panellists are sensitive and able to find differences. In this case the threshold of any one member is not of importance.

Step 3.

Flavour assessments are carried out with pork chops having different off-flavours, for example rancid flavour, fishy flavour and various off-flavours from feeding experiments.

Step 4.

Tenderness assessments are made with pork chops having a wide range in tenderness in order to measure the panellists' abilities to award different scores to different samples. For this purpose chops with different meat qualities are often used.

These above four steps are carried out in one session which is repeated the next day to establish the panel members' abilities to repeat themselves.

An example of a tenderness assessment (step 4)

The data are treated using a three-way analysis of variance with interactions:

$$Y = \mu + \text{Taster (T)} + \text{Session (S)} + \text{Meat Quality (MQ)} + \text{interactions}$$
$$(T \times S + T \times MQ + S \times MQ) + E$$

The results normally show a significant difference between taste panel members and between meat qualities, but not between sessions.

For example in 1983 the average tenderness score for the whole material for the individual panel members ranked according to levels showed that the panellists were divided into two groups.

Difference between panel members

Scores with same letter underneath are not different ($p < 0.05$)															
0.3	0.5	0.5	1.0	1.0	1.2	1.2	1.3	1.7	1.8	1.8	2.0	2.2	2.3	3.0	3.0
a	a	a	a	a	a	a	a	ab	b	b	b	b	b	b	b

In the same test no difference was found between the two sessions, and that means the panellists were all able to use the same scoring level in the two sessions.

Difference between sessions

	Session 1	Session 2
Tenderness score	1.5	1.4

Significant differences were found between meat qualities ($p < 0.001$). All the panel members were able to find these differences, although different scoring were used.

Difference between meat qualities

Meat quality	PSE	Normal	DFD
Tenderness score	-0.6a	1.6b	3.4c

Examples of using taste testing

Meat quality

Using pigs with different meat quality (PSE or not) a clear effect on taste characteristics is found, especially tenderness. This experiment showed that PSE-chops were scored much lower than normal chops, especially in tenderness.

Table 1. Effect of meat quality on taste characteristics in pork chops

Means with same superscript are not different. NS: non significant. *** $p < 0.001$

Number of pigs	Meat quality	TASTE PANEL SCORES				
		Fried colour	Flavour	Tenderness	Juiciness	Overall acceptability
27	PSE	2.0a	0.9a	-0.7a	1.1a	-0.5a
28	Normal	2.5b	1.7b	1.7b	2.0b	1.3b
		***	***	***	***	***

(Source: Barton and Bejerholm, 1982, unpublished work).

Intramuscular fat

Using progeny testing pigs of Danish Landrace, Hampshire and Duroc, a wide range of intramuscular fat levels (high or low) was obtained. Water holding capacity was generally good for all groups. This experiment showed a positive effect of increasing intramuscular fat on flavour, tenderness and juiciness.

Table 2. Effect of intramuscular fat on taste characteristics in pork chops

Means with different superscripts are different. **: $p < 0.01$, ***: $p < 0.001$

Number of pigs	% intra-muscular fat	TASTE PANEL SCORES				
		Fried colour	Flavour	Tenderness	Juiciness	Overall acceptability
24	1.47a	2.5a	0.8a	1.3a	1.7a	0.6a
43	2.89b	2.9b	1.7b	3.1c	3.2c	2.0b
51	4.34c	2.8b	2.2c	2.4b	2.5b	2.0b
	***	**	***	***	***	***

(Source: Mikkelsen and Barton, 1980, unpublished work).

Feeding experiments

When feeding pigs with increasing amounts of animal fat (pig fat) instead of barley and soyabean meal, an effect is found on taste characteristics in pork chops. In this experiment animal fat replaced up to 30% of the total energy content of the feed. The results showed that flavour scores decreased with increasing amounts of animal fat. However the effect was only significant between pigs fed with 0 and 30 percent fat. The off-flavour found was characterised by the taste panel as a "slightly sour" taste.

Table 3. Effect of feeding animal fat on taste characteristics in pork chops

Means with same superscript are not different.
NS: non significant, *: $p < 0.05$

Number of pigs	Fat in feed	TASTE PANEL SCORES				
		Fried colour	Flavour	Tenderness	Juiciness	Overall acceptability
12	0	2.1	1.1b	1.2	2.1	0.8
11	10	2.2	0.8ab	1.7	2.3	0.8
12	20	2.3	0.8ab	0.8	2.3	0.3
11	30	2.2	0.5a	0.7	2.2	0.2
		NS	*	NS	NS	NS

(Source: Mortensen et al., 1983).

References

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