8 - 11 TRAINING OF JUDGES FOR THE SENSORY EVALUATION OF CURED MEAT PRODUCTS.

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Introduction

The taste panel is, and will continue to be in the foreseeable future, the main analytical tool of the food technologist in the assessment of the impact of additives and processes on organoleptic quality.
Just as with any other analytical instrument, its efficient utilization involves a process of selection, initial setting-up and adjustment, and periodical recalibration, which in the case of human detectors corresponds to the screening and selection of the panel members, their initial training and a sistematic check on their performance.
The literature on the subject is rather scant. As would be expected, it doesn't give very detailed information on the best general methodology (Amerine et al., 1965). Descriptions can be found, however, of more specific procedures followed in certain cases, the conclusions of which are of doubtless value (Bennett et al., 1956; Ehrenberg and Shewan, 1953; Shewan et al., 1953;).
The aim of this paper is to describe the procedure followed in the training of a taste panel for the assessment of the flavor of cured meat products,as well as to consider some of the factors affecting the performance of the judges.

Materials and methods

A group of 10 persons fulfilling the generally acknowledged requirements as regards age, health, etc. was initially considered (Amerine et al., 1965). All of them could identify corrctly the usual standards for the four basic tastes (Szabó and Bende, 1975), were used to participate in

taste panel testing of meat products, and had an adecuate level of motivation and general availability for this work.
Standard samples were prepared from lean pork, minced through a 3 mm plate and thoroughly mixed. A part of this meat was mixed with 2% NaCl and 200 ppm $NaNO_2$ (cured meat standard), and the other part was mixed with 2% NaCl alone (uncured meat). Both were cooked in molds, in a thermostatic bath at 80°C, until 70°C core temperature was reached.
The first sessions were devoted to tasting of both extreme samples and their mixtures, until the meaning of some descriptive expressions was settled, particularly the expression "cured flavor", which defined the quality to be evaluated.
This phase was followed by ranking sets of mixtures of the standards of cured and uncured meat containing 100; 75; 50; 25 and 0%, or 100; 67,7; 33,3 and 0% of the cured meat standard. Judges were asked to rank the samples according to the intensity of cured flavor.
Color masking was achieved by extreme dimming of the lights in the tasting room. Samples were served at room temperature. The judges could drink water "ad libitum" and re-taste the samples if they wished.
Rank correlation coefficients (Siegel,1970) were determined for every test and taster, in order to assess their agreement with the true order of the samples. Panel ability to discriminate among samples was evaluated by analysis of variance, using the scores for ordinal data of Fisher and Yates (1963). After every test, results were discussed with the judges.
Correlation coefficients with the true sample order were also calculated for all the accumulated results of every judge, using the coefficients for ordinal data. These correlation coefficients were used as criteria for judge selection.
The chosen judges were asked to score cured meat products according to a 6 point "cured flavor intensity" scale (5:"very intense" ; 0:none). These tasting sessions were carried out at different times after training "completion". Data scattering was studied in each case.

Results and discussion

Results obtained during the trainig stages are presented in Table 1. It is worth mentioning difficulties experienced during experiments 1 and 2. The NaCl used, though nominally "pure for analysis", turned out to containenough nitrate impurities to produce sufficient nitrite to develop cured color and flavor in the suposedly "uncured" samples.
The table shows generally increasing values of ρ and F as training proceeds, indicating a more accurate ranking and a more distinct discrimination among samples. This supports the conclusions of Bennett et al.(1956) as regards the effect of training.

The discontinuities in this progression are enlightening: in trial 6, ρ and F values were lower, probably due to the time passed from the former session -7 days-, whereas higher values during trials 4 and 5 are coincident with more frequent sessions. In trial 10, a 13-day period of inactivity affected the tasters, in spite of a less complicated ranking task. The effect of the degree of difficulty shows in trial 8.
Trial 11, a simple 3-sample test following an acceptable 5 day recess, and after 10 training sessions, gave a perfect result.
Table 2 shows the correlation coefficient r for the accumulated data of every judge. These values should be considered cautiously, since r is only truly mearingful when both variables are randomly distributed, which is not the case. The coefficient has been used, nevertheless, as it is simple to calculate and it visualizes effectively the correspondence between both sets of data.
The performance of judges 1 and 3 was clearly well below average, so the group was reduced. This event showed a markedly positive psychological effect on the selected judges, indicated by an increased interest in experimentals results and a rise in the general level of motivation.
It is significant that tasters repeatedly indicated that their most obvious clue to the ranking of the samples was a flavor component described as rancid,clearly perceptible in uncured pork samples. The slowing down of fat-oxidation processes by nitrite is well known (Nestorov et al., 1981) and has been cited as a cause for "cured flavor" development.
Table 3 shows the detrimental effect of inactivity in panel performance. After a 1 month recess, data scattering increases spectacularly. These results agree with the indications of Ehrenberg and Shewan (1953) and Shewan et al.,(1953) that training is effective in scoring by descriptive terms, and that it reduces the variance of random error of the group.
For a judge to be considered trained, he must be constantly checked and retrained, probably due to the constant drifting of mental standards associated with the sensory evaluation process.(Amerine et al.,1965)

Conclusions

- Training improved substantially the performance of the tasters.
- Constancy in training proved essential in mantaining an adequate level of panel performance. Periods of inactivity affected panel proficiency in ranking as well as scoring tests, increasing random error.
- A specially interesting result was the relationship found by the judges between cured flavor development and the fading from the meat of a flavor component described as "rancid", normally present in the flavor of cooked uncured pork.

Trial Nº	Days from former trial	Nº of tasters	Nº of samples	Spearman's ρ (average)	F value (discrimination among samples)
1	-	7	-	-	-
2	6	7	-	-	-
3	8	5	5	0,460	1,38 (n.s.)
4	1	5	4	0,760	7,48
5	3	9	4	0,667	8,07
6	7	8	4	0,600	6,66
7	2	8	4	0,800	16,14
8	6	7	3	0,929	43,01
9	2	8	4	0,800	12,12
10	13	6	3	0,667	5,59
11	5	7	3	1,000	$\rightarrow \infty$

Table 1.- Results obtained during the training period. Ranking tests.

Taster	Correlation coefficient (r)
1	0,4312
2	0,6264
3	0,9212
4	0,6858
5	0,7525
6	1,0000
7	0,8794
8	-0,4969
9	0,8382
10	0,8842

Table 2.- Correlation coefficient between ranking order according to a taster and the samples order. Values calculated using the scores for ordinal data of Fisher and Yates.

		Mean value ($\bar{X}$)	Standard deviation (S)	Coefficient of variation (cv)
Tastings at the conclusion of the training stage	Choice ham	4,2	0,41	9,8%
	Pressed ham	4,2	0,75	17,8%
	Visking ham	2,9	0,38	13,1%
Tastings after one month inactivity	Choice ham	3,2	1,10	34,4%
	Pressed ham	2,6	1,52	58,5%
	Visking ham	3,2	0,84	26,3%

Table 3.- Results obtained in scoring tests at two stages. 6 point scale, for cured flavor intensity (5-very intense; 0- none)

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