

A NOVEL APPROACH TO INVESTIGATING THE INFLUENCE OF FAT ON FLAVOUR RELEASE IN FRANKFURTERS.

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INTRODUCTION

One of the major interests of food product development is to reduce the amount of fat in foods. Ideally this should be achieved without any effects on the sensory quality of the food. As most sensory attributes of foods and beverages display dynamic changes in intensity the sensory analyst requires a method of recording these measurements over time. Time intensity allows for such measurements (Cliff and Heyman, 1986; Lee and Pangborn, 1986). To date few studies have been carried out on flavour release in meat products. Headspace analysis of volatile compounds from frankfurters containing 5 and 30% fat has shown that fat reduction increases the rate of flavour release (Ingham *et al.*, 1996). This investigation was set up to investigate these differences in release using time intensity methodology.

OBJECTIVES

The aim of this study was twofold. Initially a taste panel was selected and trained, according to ISO standards, for time intensity analysis. The panel was then used to examine the influence of fat on flavour release from frankfurters.

EXPERIMENTAL METHODS

Candidates were recruited internally from laboratory staff within The National Food Centre. The training of the panellists took place over several months and consisted of basic training, specific product training, computer training and time intensity training. During the basic training the panellists were trained on basic tastes of sweet, sour, bitter and salt, and in addition, spice and smoke flavourings were presented to the panellists. Using these stimuli the panellists carried out Matching and Recognition tests which were repeated until they scored above 70% correct responses. Following this the panellists were trained in the use of scales using the Ranking test. During the specific product training panellists assessed eight different parameters of three commercial frankfurters using a 6-point hedonic scale. Results were recorded manually, on paper, by the panellists. Computer training involved training in computer software (PSA system 3, version 2.07a). This was similar to the specific product training however, results were recorded directly onto the computer. Results obtained in this session were compared to those from the specific product training to determine if there was any differences between the two methods of testing. The final stage of the training was concerned with time intensity methodology. Frankfurters with 5, 12 and 30% fat were used to train the panellists. The test time was 1 min during which the overall flavour intensity of each product was recorded with the aid of the above software. Data were imported into Excel where the curves for each panellist for each product were calculated. This test was repeated until good replicate curves were obtained for each individual. A preliminary investigation was carried out with 4 of the panellists who gave good replicate curves. As in the time intensity training session the frankfurters containing 5, 12 and 30% fat were presented to the panellists. Each product was presented three times. The data was imported into Excel where the average curve was obtained for each product. ANOVAs were carried out on the maximum intensity (Tmax) and time to reach maximum intensity (Imax) for each product.

RESULTS

The results of the basic training are presented in table 1. These are the final results after repetitions of some of the tests. There was no difference observed between the results for specific product training when the manual and computer methods were compared (results not shown). Good replicate curves are shown for individual assessors in figure 1. Panellist A shows good replication over three repeats of one product. Panellist B, on the other hand, has not shown consistency between the three repeats and will need further training. Panellists that can determine and replicate differences between products were ready for use in testing.

As described above four candidates that showed good replicate curves were used for a preliminary time intensity study on the frankfurters containing 5, 12 and 30% fat. The results of this study are shown in Table 2 and Figure 2. The maximum intensity (Imax) reached was significantly higher in the 5% frankfurters, while the time to reach maximum intensity (Tmax) was shorter (didn't reach significance), compared to 12 and 30% frankfurters.

Table 1: Results of the matching, recognition and ranking tests. Matching and recognition tests are calculated in % correct responses while the ranking test is calculated in terms of number of incorrect pairs identified.

Matching test	Recognition test	Ranking test
100% 8 panellists	100% 13 panellists	No correct pairs 6 panellists
87-97% 7 panellists	78-87% 5 panellists	1 pair incorrect 4 panellists
73% 1 panellists		2-3 pairs incorrect 6 panellists
		4-5 pairs incorrect 2 panellists

Table 2: Maximum intensity (Imax) and time to reach maximum intensity (Tmax) of flavour release in frankfurters containing 5, 12 and 30% fat. Those bearing the same letters in a column are not significantly different (P < 0.05)

	Imax	Tmax
5%	80.97 ^b	14.31
12%	66.30 ^a	27.09
30%	61.38 ^a	32.16

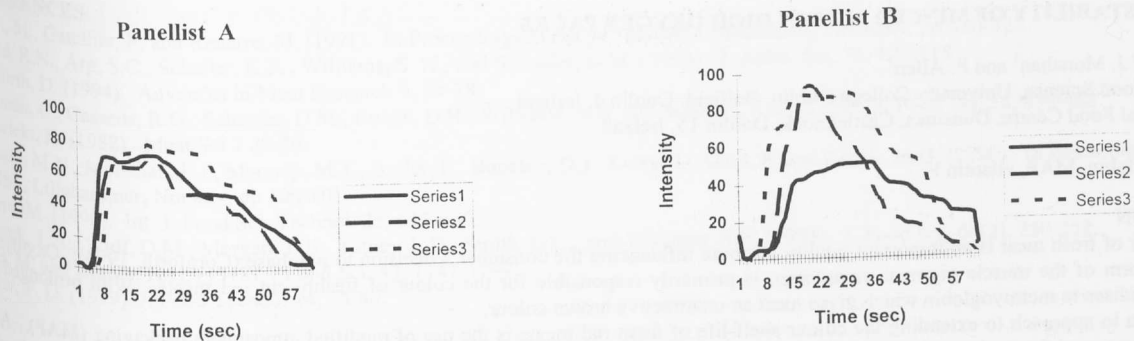


Figure 1: Time intensity curves from two panellists. Each graph shows three repeats of the one product during the training session. Series number refers to the repeat number of one frankfurter.

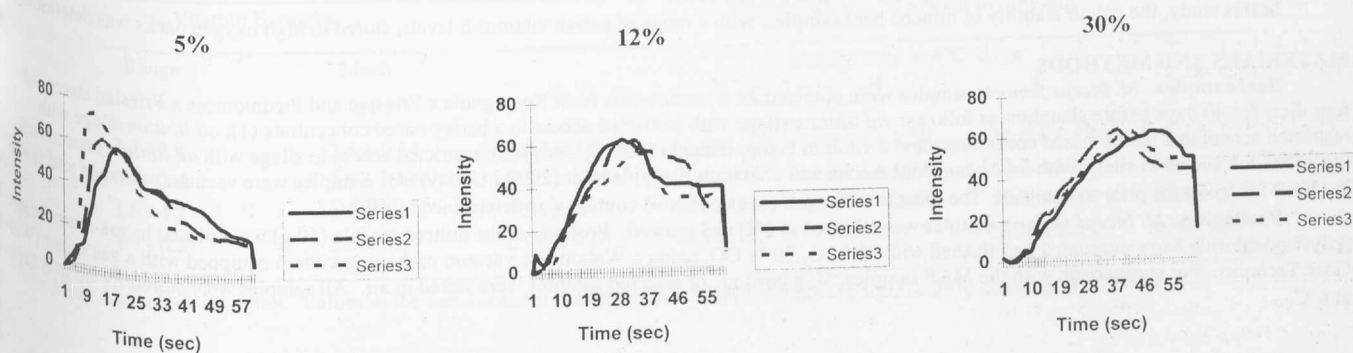


Figure 2: Time intensity curves of frankfurters containing 5, 12 and 30% fat. Each graph shows the average curve obtained from the four panellists for each repeat of the one product. Series number refers to the repeat number of each frankfurter.

DISCUSSION

Time intensity studies have been used in investigations on flavour release from a variety of foods such as yoghurt (Tourila *et al.*, 1995) and cheese (Stampanoni, 1991). Recently investigations have focused on the use of time intensity as a method of measurement of meat tenderness (Duizer *et al.*, 1993; Butler *et al.*, 1996 and Brown *et al.*, 1996). However, little research has been carried out on flavour release from meat products. This investigation was initiated to explore this area of interest. Panellists were trained according to ISO standards (8586-1 and 3973-1979). From the results of the basic training it is clear that the majority of the panellists scored above the required level. However, during the time intensity training it was apparent that many candidates required further training. From the results of the work with four panellists the results support the hypothesis that flavour release increases in low fat products.

CONCLUSION

This study has outlined the steps required to train a panel for time intensity methodology. It has also shown that fat reduction in frankfurters can increase the rate of flavour release. This confirms previous work on volatile release from these products (Ingham *et al.*, 1996). These results are of importance to the meat industry as they highlight the potential time intensity methodology has for meat products. Specific (e.g., salt or spice) or overall flavour release within a variety of meat products as well as the effect of ingredients on these attributes could be investigated.

REFERENCES

- BROWN, W.E., LANGLEY, K.R., MIOCHE, L., MARIE, S., GERAULT, S. and BRAXTON, D. (1996) Individuality of understanding and assessment of sensory attributes in foods, in particular, tenderness of meat. *Food Quality and Preference*, **7**, 205-216.
- BUTLER, G., POSTE, L.M., MACKIE, D.A. and JONES, A. (1996) Time intensity as a tool for the measurement of meat tenderness. *Food Quality and Preference*, **7**, 193-204.
- CLIFF, M. and HEYMAN, H. (1993) Development and use of time-intensity methodology for sensory evaluation: A review. *Food Research International*, **26**, 375-385.
- DUIZER, L.M., GULLETT, E.A. and FINDLAY, C.J. (1993) Time-intensity methodology for beef tenderness perception. *Journal of Food Science*, **58**, 943-947.
- INGHAM, K.E., TAYLOR, A.J., CHEVANCE, F.F.V. and FARMER, L.J. (1996) Effect of fat content on volatile release from foods. *8TH Weurman Flavour Research Symposium, Reading, UK*. 339-345.
- LEE III, W.E. and PANGBORN, R.M. (1986) Time-intensity: the temporal aspects of sensory perception. *Food Technology*, **82**, 71-78.
- STAMPANONI, C.R. and NOBLE, A.C. (1991) The influence of fat, acid and salt on temporal perception of firmness, saltiness and sourness of cheese analogues. *Journal of Texture Studies*, **22**, 381-392.
- TOURILA, H., SOMMARDAHL, C. and HYVONEN, L. (1995) Does fat affect the timing of flavour perception? A case study with yoghurt. *Food Quality and Preference*, **6**, 55-58.