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Parallel session 7: Meat and gastronomy

PS7.01 Sensory aspects of meals containing meat 348.00

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Abstract - Meat is almost always eaten as a part of a meal in combination with vegetables, bread and sauce or gravy. It is important to be acquainted with the interaction between these components when optimizing the culinary quality of the whole meal. Four different aspects are described in this paper: How does the accompaniment influence the flavour of pork patties? how does gravy influence the flavour of vegetables? how can the development of warmed over flavour after reheating be reduced using a coverage of vegetables? and how does the appearance of the meal affect us? The results show that there are indeed possibilities of optimizing the final quality of a meal based on knowledge of the interaction between the individual components.

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Index Terms - appearance, flavour, meals, pork.

I. INTRODUCTION

Meat is a very important part of our nutrition and it plays a major role in our understanding of meal compositions. Most courses are named after the meat, and many people start thinking of tonight's dinner by thinking of the meat. Still, the meat is almost always eaten together with other food items such as vegetables, bread and sauce or gravy, and these food items are combined into a culturally meaningful combination to constitute a meal. To give the concept "eating quality of meat" a meaningful content, it is necessary to investigate the eating quality of the whole meal including sensory interactions between food items and the appearance of the entire meal. In different aspects,

it is useful to gain knowledge about the sensorial interaction between different parts of the meal and the consumers' reaction towards the appearance of the meal: In developing recipes including well-known meat cuts in new contexts and in producing ready-to-eat/ready-to-heat meals, in which the producer has designed the entire meal. Four different aspects are covered in this paper: (1) how does the accompaniment influence the flavour of the meat? (2) how does gravy influence the flavour of selected vegetables? (3) how can different parts of the meal be used for reducing warmed over flavour in reheated meat? and (4) how does the appearance of the meal influence the consumer?

II. ACCOMPANIMENT AND MEAT

Traditionally, some accompaniments seem to work better in some dishes compared with others. Is this pure tradition? Or is it caused by a sensory interaction between the accompaniment and the meat? We investigated the effect of the four basic tastes in the accompaniment on the flavour of fried pork patties in a model set-up. The patties were described by a sensory profile before and after the assessors were exposed to either a model solution or two different kinds of vegetables with the given basic taste. By comparing the profile before and after it was possible to describe the effect of the basic taste in the accompaniment on the flavour of the meat (Figure 1).

Four different pork patties were tasted before and after the solutions of the basic tastes: Pork patties made from LD (longissimus dorsi) and from SM (semimembranosus) fried to a core temperature of either 65°C or 80°C at a pan temperature of 155°C. Before and after the vegetables of the four basic tastes, LD patties fried to a core temperature of either 65°C or 80°C were tasted. The main effects of the accompaniments are summarized in Table 1 [1].

Table 1. Effects of basic tastes on the taste and flavour of pork patties [Mod. From 1].

Basic taste in the accompaniment	Taste and flavour in the meat						
	Sourish	Bitter	Sweet	Sour	Fried meat	Piggy	Metal/liver
Salt – potatoes	↑	↓					↑
Sweet – carrots		↓					
Sour – pickled vegetable	↓			↑	↓	↓	↓
Bitter - lettuce		↑	↓		↓	↓	

Salt was represented by a solution of NaCl and by potatoes containing two different salt levels (0.65% and 1.42% NaCl). Salt reduced the bitterness of the patties, but also seemed to slightly increase the sourish and metallic/liver flavour (Table 1). Sweet was represented by a solution of sucrose and by two different kinds of carrots. It was regarded as a rather neutral accompaniment which did not alter the flavour of the patties very much (Table 1).

Sour was represented by a solution of vinegar and by pickled cucumber salad and pickled beetroot. It had a significant influence on the flavour of the patties as it increased the sour taste, but decreased sourish, fried meat, piggy and metallic/liver flavours (Table 1). Bitter was represented by a solution of quinine and by the two bitter lettuces radicchio and arugula. It increased the bitterness of the patties and decreased the fried flavour in particular but also the piggy and sweet flavours of the patties (Table 1).

This experiment underlines that the accompaniment actually does influence the meat flavour. Especially sour and bitter accompaniments seem to decrease most flavours in meat. This might explain why we in Denmark often serve sour pickled red cabbage to pork roast in which the piggy flavour can be pronounced as the cabbage reduces this flavour of the meat. However, it is seldom served to pork chops in which a fried flavour is more pronounced as we do not wish to reduce this flavour. We often serve more than one type of vegetables in a meal,

and the combined effect of the selected vegetables is therefore of interest. Does a synergetic effect arise? Or a summarized effect? Or is the effect smaller, when different kinds of vegetables are served together? In a set-up like the first experiment, we investigated the effect of combining two or three of the basic tastes salt, bitter and sour. As sweet was a neutral accompaniment, it was not included this time. In this experiment, the patties were LD, fried at 155°C until 70-72°C core temperature, LD with pH < 5.5 fried at 155°C until a core temperature of 70-72°C, LD fried at 220°C until 75°C core temperature, fore-end fried at 155°C until a core temperature of 70-72°C. The vegetables were pickled cucumber salad (sour), potatoes with salt (salt) and arugula (bitter). Tasting more vegetables together still altered the flavour of pork patties, but the effects were smaller compared with tasting them individually. If sour taste was included in the accompaniment, it dominated the effects. If arugula and potatoes were tasted together, the effect was mostly similar to arugula alone.

The conclusion is that sour accompaniment does reduce especially the piggy and fried flavour of pork patties both when tasted alone and together with other accompaniment. Bitter accompaniment also reduces the flavours, but not to the same extend.

III. GRAVY AND VEGETABLES

Gravy is an important part of the meal for many people. And by mixing gravy with vegetables, the flavour of the vegetables is altered. In this experiment, we wanted to investigate the extend to which the flavour of selected vegetables was altered, and whether the fat or the water soluble part of the gravy had the largest influence on the taste of vegetables. We chose potatoes, as they are the main carbohydrate source in a Danish meal, cauliflower, as it is a rather unpopular, strong tasting but also healthy vegetable, and broccoli, as it represents many of the same characteristics as cauliflower, but is not as strong tasting. In the first experiment, the effect of four different gravies was compared to each other, all made from cooking pork LD in an oven and collecting the cooking loss. A full-fat gravy (64% fat), the same gravy diluted 1:1 with tap water (29% fat), a fat free gravy and the fat-type gravy also diluted 1:1 with tap water. All gravies reduced the flavour of the vegetables. For broccoli and potatoes, the reduction was largest for the fat free gravies while the fat had less influence on the reduction of cauliflower flavour (Figure 2), and especially in bitter taste, the effect of fat was very clear (Figure 3).

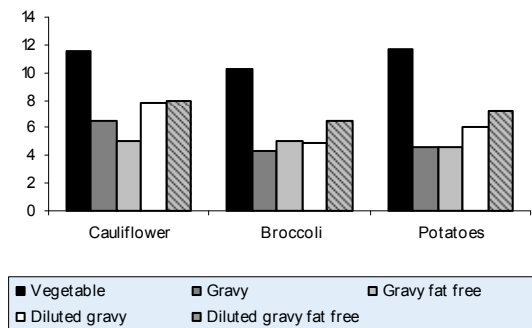


Figure 2. Flavour of vegetables with and without gravy.

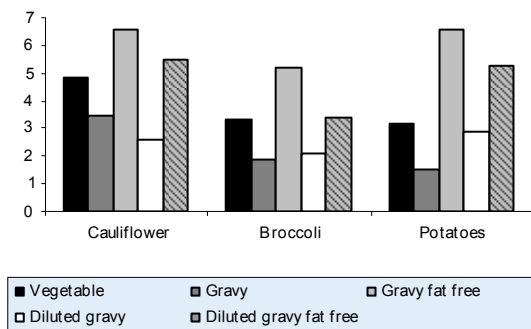


Figure 3. Bitterness of vegetables with and without gravy.

However, there was no difference between 64% and 29% fat. In the light of the health debate it is interesting to investigate, how low the fat content can be, and still have an effect on the flavour of vegetables. A dose response experiment with 10-30% fat showed that the effect was slightly larger in 30% fat compared with 10% fat, but as the differences were so small that 10% fat seems to be enough to reduce the flavour of vegetables. A further investigation of 0-10% fat is currently accomplished. Using gravy to alter the flavour of some unpopular vegetables to make more people eat them could be an interesting opportunity to produce healthy meals.

IV. REDUCING WARMED OVER FLAVOUR

In food service, meals are often produced, chilled, stored perhaps for some days and then reheated. Reheating meat produces a rancid flavour called warmed over flavour (WOF), and this is a large problem for the culinary quality of industrial meals. By optimizing the individual components of the meal, it is possible to reduce the development of WOF.

Development of WOF is an oxidation of the lipids in the meat. Exclusion of oxygen from the meat surface will therefore reduce the intensity of WOF. An experiment was carried out to investigate if covering the meat with vegetables could reduce the development of WOF. ST (Semitendinosus) of pork was cooked in an oven at 90°C oven temperature until 67°C core temperature. Each roast was covered with 400 g of either mashed potatoes, mashed pumpkins, fried onions, a white sauce or nothing (control) for 24 or 48 hours before reheating. Before serving the sensory assessors, the coverage was removed so the assessors did not know what had covered the meat sample. As can be seen in figure 4, WOF developed readily in the control sample, while it was less intensive if the meat had been covered. The reduction was most pronounced for the white sauce and the mashed pumpkins, but also the mashed potatoes and the onions reduced WOF. However, a foreign flavour was also introduced, especially in meat covered with pumpkin and onion and least in the mashed potatoes. If this flavour is a natural part of the meal and can be regarded as a positive and expected flavour rather than a negative flavour, it is an effective way of optimizing the meal to reduce the development of WOF [2].

V. APPEARANCE OF THE MEAT IN THE MEAL

“We eat with the eyes” is an old saying, and plenty of investigations have been carried out concerning the correlation between portion size, the size of the plate and the food intake. However, only very few investigations look upon the effect of the size of the individual meat pieces at a given portion of meat. Elderly people often eat too little and should be encouraged to eat more while obese eat too much and should be encouraged to eat less of the entire meal. Could the meat size be a tool to regulate the energy intake in a given meal? To investigate this aspect, plates with the same amount of meat were served either as a few large pieces or several small pieces. Three target groups were used: obese young people (7-14 years), business people (25-61 years) and elderly 77-96 years). Two kinds of dishes were prepared - one with fried meat balls and one with pork loin roast with cracklings. For the target group of young people, only the meat balls were investigated. The meat balls were served on a plate with either four small or two large meat balls containing the same total amount of meat. For the pork roast the participants could choose between a plate with either four thin slices or two thick slices. Again the total amount of meat was the same at the two plates, only the thickness differed. On the first day of investigation, the plates were presented to the participants and they were asked to choose the one they preferred, but without having to eat it. This was a non binding choice. Due to practical reasons, the target group consisting of young people had to choose from photos of the plates. Another day, the participants were asked to choose one plate with meat balls and actually eating it for lunch that day. This was a binding choice. The young obese people came from two places in Denmark. Everyone in the first place and the boys in the second place very consistently chose four small meat balls, while the girls in the second place mainly chose two large meat balls. These children are obese and properly used to eat much food, but they were living in a centre to loose weight. The results might show that they experienced four small meat balls as being more food compared to the two large (they chose a large portion) - and that some of them were more prone to loose weight than other (they chose the smallest portion). All children reported themselves as being very full after eating the meal. The businesses people were very different in their choice. Half of the people chose

the plate with two large meat balls or roast slices, respectively and the other half chose the plate with four small meat balls or roast slices. This might reflect that this group of people is very heterogeneous in both their desire and their hunger at lunch time. The elderly people very consistently chose two meat balls and two pieces of roast. As this group of people often has difficulties in eating enough food, two pieces of meat might seem easier to overcome compared with four pieces - the opposite effect of the young obese people who need to eat as much as possible to get satisfied. This experiment is a preliminary experiment and has to be confirmed before a final conclusion is made about the effect of meat size. Still, it indicates that for a given amount of meat for the consumer, many small pieces seem to be a large amount of meat. For some groups of consumers, many small units like small meat balls can be recommended, while other target groups need a few large units.

VI. DISCUSSION

Meat is almost always eaten as a part of a meal, and in the work of optimizing sensory quality; the interaction between different food items in the meal must be regarded. Furthermore, these interactions can be used actively in designing meals according to the knowledge about flavour of meat (is sour or bitter accompaniment needed or not), the need for specific vegetables (is gravy necessary or not) and the process (is the meal to be reheated or not). Also the appearance must be taken into account. Not only the serving of the meal, but also the effect of the unit size of the meat on the consumers preference for eating it and how satisfied the consumers are after eating the meal.

VII ACKNOWLEDGEMENT

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REFERENCES

- [1] Aaslyng, M.D., Frøst, M.B. (2008) The effect of basic taste solution and selected vegetable accompaniments on the sensory properties of pork. *J. Sensory Studies* 23, 720-742.
- [2] Olsen, J.R., Aaslyng, M.D. (2007) The meal composition approach – a new way of optimizing the quality of food service products. *J. Food Service*, 18, 133-144