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PREFACE

On behalf of the symposium organising committee, we would like to express our great pleasure to welcome you in SPISE2009 “FOOD CONSUMER INSIGHTS IN ASIA: CURRENT ISSUES AND FUTURE”, the second sensory evaluation symposium in Vietnam.

This meeting aims to offer the opportunity for all delegates to present their latest works in sensory and food consumer research to give insights into one of the most challenging fields of study in sensory science: consumer understanding. This symposium also provides a chance for academy and industry delegates to exchange ideas on issues related to the symposium topics and to their research interests.

We will continue the successful program features of SPISE2007 with an opening ceremony, workshops and symposium sessions allowing for a variety of oral and poster presentations covering a wide scope of new ideas related to sensory and consumer research, a banquet with Vietnamese flavours, and many occasions to meet colleagues and start new collaborations.

It is an honour to welcome the following keynote speakers: Dr. John Prescott, associate-professor at University of Newcastle, Australia; Dr. Agnès Giboreau, research director at Paul Bocuse Institute, France; and Dr. Thongchai Suwonsichon, associate-professor at Kasetsart University, Thailand.

We are delighted to welcome you and about 100 other delegates to SPISE2009 to explore Asian consumer insights and the largest and more dynamic city in Vietnam – Ho Chi Minh City.

We would like to take this opportunity to thank the sponsors who supported us for the organisation of this symposium: VITAGORA, Fizz Biosystèmes, LogicStream, Vinamilk, Sao-Viet. We extend our thanks to all who have worked so hard to make this event possible: Tâm Minh Lê, Khuong Thanh Nguyễn, Xuân Uyên Thuy Phan.

Dzung Hoang Nguyen Dominique Valentin
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CONFERENCE PROGRAM
FRIDAY AUGUST 7 2009

14:00  Registrations
15:30  Opening speech
16:00  **Keynote speech: J. Prescott**
       Origins of food flavour preferences
17:00  Poster session & Refreshments
17:30  **Oral session 1: New methods and research tools in consumer research**
       *Chairpersons: A. Giboreau & C. Dacremont*
       The ideal profile method: Classical profiling combined with JAR information
       *P.H. Punter*
       Consumer preferences for visually presented meals
       *G. Gabrielsen, M. D. Aaslyn, & H. H. Reisfel*
       Combining the best of two worlds, the “sorted napping”
       *M. Cadoret, S. Lê, & J. Pagès*
18:30  Exotic tasting organised by FIZZ
19:00  Welcome reception at the symposium venue
       *All delegates are invited*

SATURDAY AUGUST 8 2009

9:00  **Keynote speech: A. Giboreau**
       From sensory analysis to perceptive judgment: New approaches to study food
       preference and behaviour
10:00  Poster session & Refreshments
10:30  **Oral session 2: Food choice and Consumer behaviour studies**
       *Chairpersons: D. Valentin & T. Suwonsichon*
       Observational research: A tool for collecting behavioural data and validating
       surveys
       *S. L. Godwin, & E. Chambers IV*
       Hedonic response to the tastes of wine in Vietnam: Does the region of origin
       of consumers matter?
       *B.V. Do, B. Patris, T.D. Ha, H.D. Nguyen & D. Valentin*
       Coffee or margarita: Impact of ambiences on beverage choices in a bar
       *C. Dacremont, A. Sutan, F. Galia, J-F. Desmarchelier, & D. Valentin*
       The soupe du jour effect: Language as a country-of-origin cue and its impact
       on product perception
       *T.X.U Phan & C-F. Sheu*
12:00 Lunch at the HCMUT cafeteria

13:20 **Oral session 3: Application in the food industry / product development**

*Chairpersons: H. Abdi & H. D. Tu*

- Developing consumer preferred yoghurt textures
  *H. Simpson & M. Moragudivenkata (presented by A.T. Tan)*

- Fatigue level measured by labelled magnitude scale in a beverage model
  *K. Khajaremn, L. Duizer, & W. Posri*

- Preference segments on herbal drinks made from Indian gooseberry in Thailand
  *M. Meenune, K. Kijroongrojana, & W. Posri*

- Green coffee beans to brewed coffee: evolution of aroma attributes
  *N. Bhumiratana, K. Adhikari, & E. Chambers IV*

- Gaining insight into marketing strategies and retailer perceptions of US beef in Vietnam: a focus group approach

15:00 Poster session & Refreshments

15:30 **Fizz** software presentation and demonstration
    *F. Sorrentino*

16:30 **EnQuireR** software presentation and demonstration
    *M. Cadoret, J. Bouche, G. Fournier, O. Fournier, F. Le Poder & S. Lê*

17:30 Gala dinner

**SUNDAY AUGUST 9 2009**

8:00 **Keynote speech: T. Suwonsichon**

*Sensory and consumer research: case study of Thai dipping sauce*

9:00 **Oral session 4: Sensory-instrumental relationship**

*Chairpersons: S. Lê & S. Chollet*

- Exploring the optimization model of Vietnamese consumers for sterilized milk
  *B.T. Nguyen, M.T. Le, & H.D. Nguyen*

- Effect of butter fat levels on headspace concentration of esters on model system detected by HS-SPME Gas Chromatography compare with time intensity flavour release detection
  *P. Keawwimol, P. Penroj, & S. Samuhasaneetoo*

9:40 Poster session & Refreshments

10:00 **Round table: P. Punter and E. Chambers IV**

11:30 Closing ceremony
Although food choice is determined by a variety of factors, including product image and marketing, economic factors, and health consequences, the sensory characteristics of foods are the primary determinant of food likes and hence food choice. Therefore, it is crucial to understand those factors that determine food flavour preferences if successful foods are to be created. The impact of sensory factors on preferences is evident at birth in the innate hedonic responses to tastes. In addition, sensory properties, and particularly tastes, are crucial in determining learned preferences for foods via associative learning. In turn, these associative processes are mediated by both cognitive and individual difference factors. Thus, recent research has shown that individual differences in perceptual and hedonic responses to tastes are important influences on hedonic responses to sensory intensity, and almost certainly these differences account for similar differences in preferences for certain foods and beverages. Finally, both short and long term changes in food preferences are a function of feedback systems that are mediated by modulation of the hedonic properties of sensory properties.

Keywords: food flavour preference, individual difference, associative learning
To make competitive and successful products, companies need to know what consumers really want. Manufacturers need to have detailed insight into consumer’s perceived product characteristics and their contributions to consumer liking. Traditionally, this information is collected by the R&D and Market Research departments. These two disciplines use very different methodologies and subjects to obtain this information. For the sensory information, experts or trained panellists are used and for the acceptance data consumers from the target population are used. The sensory professional in R&D is employed by the food company, for the collection of consumer preferences companies can have their own Market Research department or rely on outside Market Research agencies. In recent years, there has been an increasing interest in obtaining both sensory and hedonic information from the target consumers (for instance, Flash profiling or Napping). Market researchers have been collecting this kind of information for many years using the JAR (Just About Right) methodology but this does not lend itself easily to quantitative analysis. When consumers can answer JAR questions about sensory characteristics, they should also be able to rate the perceived and ideal intensities directly. In the Ideal Profile Method, consumers are requested to rate the perceived and ideal intensity for the relevant product characteristics and to give acceptance ratings. The resulting data are used to compute the effect of the difference from ideal for each individual attribute on overall liking. This information is used to guide R&D in product optimization. A practical application of the Ideal Profile Method will be shown in the presentation.

Keywords: profiling, consumer, product optimization
Consumer preferences for visually presented meals

G. Gabrielsen*, M.D.Aaslyngb, H.H Reisfeltc

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The aim of the present study was to develop methods to model preferences at the individual—or even contextual—level. Such methods may increase the explanatory power of the data and thereby be a stronger tool for understanding consumer, contextual, and cultural variations. A better understanding of these variations may replace the concept of “best product” by a portfolio of good products and give input to New Product Development. As the study object we investigated ready meals, the appearance of such products being very important for over choice. A conjoint layout using 32 pictures was constructed as a $2^5$ design: Collation—modern/traditional, Meat cutting—medallions or pieces, Vegetables—wok or root fruits, Herbs—with or without, Sauce—with or without. A total of 880 consumers were interviewed in three different towns in Denmark and at two different stores. The method of scoring the pictures makes it possible to analyse the results as an analysis of variance. The statistical analyses showed that it is possible to estimate the variability of preferences according to the five different aspects in the conjoint layout and furthermore to estimate trade-offs between different aspects. Finally, the analyses indicated the amount and type of products in a product portfolio.

Keywords: Conjoint layout, Analysis of Variance, Multilevel models, Product portfolio
Holistic approaches (i.e. approaches that consider items as a whole), such as napping or sorting task, are becoming increasingly popular in sensory analysis because they require little time and they can be carried out by untrained people. With napping, the judges are asked to position products on a tablecloth according to their resemblances whereas, with sorting tasks, the judges are asked to provide groups of products. The choice between one or the other method depends on the importance we grant to their own specificities, 
a priori more rich for the first one versus 
a priori more synthetic for the second one, or on our own practices.

The purpose of this communication is to propose a new approach combining both napping and sorting tasks, in this approach each judge is asked to provide a tablecloth with products that have been sorted. Thereafter this approach will be called “sorted napping”.

Data can be displayed in a table with as many rows as there are items/products and as many columns as there are judges multiplied by 3: to each judge we associate three columns, two for the coordinates of the items on the tablecloth, one for his partition variable on the items (each sorting task can be considered as a qualitative variable with as many categories as there are groups). Such data can be structured according to two nested partitions on the columns; one at the “judge level” (with as many triplets of columns as there are judges) and the other one at the “approach level” (for each triplet, we consider two subsets of columns, one for the coordinates of the napping and one for the partition variable of the sorting task). We analyzed the data using hierarchical multiple factor analysis (HMFA) in order to balance the part of each judge and within each judge the part of each approach. HMFA provides usual factorial analyses representations (representation of the products, of the variables, etc.) but also a representation of the judges, of the products from the point of view of each judge.

This method will be illustrated with a real example in which 24 judges (students) performed a sorted napping on 8 fresh squeezed juices (smoothies).

Keywords: holistic approaches, sorting task, napping, sorted napping
From sensory analysis to perceptive judgment:  
New approaches to study food preference and behaviour

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Starting from sensory analysis and its Stimulus-Response model, a series of methods have been developed by academic and industrial researchers to understand food products in the complementary fields of instrumental, multi-sensory and statistical techniques. These classical approaches insist on the complexity and the multimodality of sensory perception and the need of multiple methodologies to describe a food (as opposed to controlled laboratory stimulus used in psychophysics).

Raising the question of consumers’ preference leads to study more deeply the differences of perception between trained panellists and consumers in terms of sensation as well as language and judgment. To this end, other competences such as cognitive psychology and linguistics need to be addressed. Consumers are able to detect very small differences and are also capable of describing them with diverse consensual wordings. However, the diversity observed between individuals’ hedonic judgments implies to take socio-cultural aspects into account, in particular through the study of the semantic value of products. The subjects’ past experience, especially their product usage and knowledge, influences their activity, their motivation, and their perception. There is neither a single perception nor a single perceptual judgment of a given product but a plurality of viewpoints. Thus, we need to consider sensoriality in a synthetic perspective as a cooperative subject-object concept, both determined by the object, the subject and the context’s characteristics.

Today, the challenge is to study sensory preferences in more ecological (realistic) and holistic (global) approaches depending on the problematic and “new” methodological approaches can be used, such as:

- free sorting to access to sensory categorization,
- discourse analysis to access to mental representations,
- anthropological participating inquiry to access to usage and habits,
- observation of behaviour in real contexts to access to environmental and social factors.

For instance, at the Institute Paul Bocuse Research Centre, such a multidisciplinary approach is developed and experiments are conducted in a modular experimental restaurant and kitchen both audio visually equipped. Results concern the perception of products, the understanding of consumers’ (and chefs) and the study of eating behaviour in real contexts.

**Key words**: food preference, context, ecological approach
Observational research: A tool for collecting behavioural data and validating surveys

S. L. Godwin* and E. Chambers IV

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Observational research is an underused technique that involves the direct observation of people in a natural setting, or in surroundings that closely resemble a natural situation. This differentiates it from survey research which may be completed in almost any location. Observational techniques can be an effective method for collecting behavioural data and for validating information we obtain from individual surveys. It measures behaviour directly, rather than reports of behaviour or intentions. Thus, observational research is a direct approach to collecting data, as contrasted to a survey where people are asked what they do or would do in different situations, and we assume that they reported actual behaviours. In our studies we use observational research for many purposes including designing better survey by knowing what choices need to be put on the questionnaire. Additionally, we use “casual observation” to assist us in developing a “formal” observation process where the observer will know what types of behaviours to watch for and how they should be recorded. In addition, behavioural research also allows for the flexibility of recording things that were seen but were not expected. Examples of using observational research in recent studies such as watching for specific food safety behaviours as people prepared a meat dish in their own kitchen and research where observational data was used to validate diet surveys will be presented. The reliability of the observations can be increased by training observers, practicing recording observations and reaching agreement between the observers during the training.

Key words: observational research, survey validation
The South and the North of Vietnam appear to have different food habits. For example, recent surveys showed that the consumption per capita of sugar in the South is higher than in the North. Do these different food habits lead to differences in liking for new foods or beverage? For example, do consumers from the South prefer wine to be sweeter than consumers from the North? To address this question, a consumer test was conducted in Hochiminh city in the South and Hanoi in the North.

In the two cities, 211 consumers evaluated 15 samples of Dalat red wine divided in three series. The first series (A) included the Dalat wine (control sample) and the same wine in which respectively 2, 4, 8 and 16 g/l of fructose were added to manipulate sweetness. In the second series (B), sourness was manipulated by adding tartaric acid into the Dalat wine at 0.3 g/l, 0.6 g/l, 1.2 g/l and 2.4 g/l respectively. The last series (C) included the Dalat wine boosted in bitterness (by addition of 20 mg of quinine /l) and the same wine with sweetness manipulated like in series A.

Results suggest that the “frequency of consumption” matters more than the “city of origin” of the participants. Our initial hypothesis that people from Hochiminh city (South) might like wine to be sweeter than people from Hanoi (North) was not proved. In contrast, our results suggest that a difference in bitterness liking might occur between on the one hand Hochiminh city and Hanoi and on the other hand, male and female consumers. However further work is needed to confirm this tendency. In term of application, this experiment suggests that when professionals formulate a wine for the Vietnamese market, they should take into account the “frequency of consumption” of the consumers that they want to target.

Acknowledgment: We would like to express our special thanks to DalatWine company for giving us the wines used in this experiment.

Keywords: Vietnam, food habits, wine, liking.
Coffee or margarita: Impact of ambiences on beverage choices in a bar.

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Two approaches are classically used to perform consumer tests: “central location” tests favouring experimental control or “at home” tests favoring ecological validity. We describe an alternative approach based on immersion combining both approaches. The main idea is to evoke a consumption situation using a few contextual elements. We implemented this idea to study beverage consumption in bars.

In a cultural manifestation, two pub-like ambiences were created with a few pieces of furniture (tables, bar stools and counter): A traditional pub ambiance with raw wood furniture and yellow lights and a modern ambience with blue translucent furniture. For both ambiences, videos and music chosen to evoke different warmth levels were displayed on one wall: three abstract moving shapes (red, white and blue) and two naturalistic scenes (drifting icebergs and a desert landscape). Ninety two participants took part in the experiment in the “wood pub” and 82 in the “blue pub.” For each clip, participants had to choose what they would like to drink among a drink list. They also assessed their appreciation, the warmth, the arousal, and the harmony of the ambience. We expected the perceived warmth of the ambiance to be influenced by both furniture and video clips and participant’s choices to change with the level of perceived warmth of the ambiences.

Results indicated that, as expected, the perceived warmth appreciation and arousal of the ambiences significantly vary according to clips but not according to furniture. A significant furniture by clips interaction regarding harmony assessments was observed. The ambience impacted drink choices: hot drinks were largely chosen when watching the icebergs clip, Mexican drinks were predominantly chosen when watching the desert video-clip, probably because of the South-American style music that accompanied it. Among the abstract clips, the red one favoured fruit juices ordering, the white favoured spirits ordering.

\textit{Keywords: hedonic test, context, drink choice, pub}
This research investigated the effect of language as a proxy of country of origin on people’s perception of a new food product and their purchase intention. A primary study has shown that “to which country a food is thought to belong could influence whether or not people would be willing to try it”. This effect was named the “Soupe du jour” effect. It was verified, first, by surveys conducted both in Taiwan and Vietnam. In these studies, participants read a cover story of a new tea product and its advertising bilingual description (Chinese traditional combined with either Chinese simplified or English or Japanese or Vietnamese and Chinese traditional by itself). They were asked to indicate the prices and whether they were willing to buy the tea products on a 5 point scale. The “Soupe du jour” effect was also confirmed by an experimental study, which was also conducted in both Taiwan and Vietnam. The stimuli were five bona-fide tea boxes with labels written in one of the five languages mentioned above. The participants were asked to choose one and only one tea box to taste. They also indicated the price of each tea box in comparison with the rest. The findings suggested that, depending on types of products and cultures of the marketplace, languages could serve as proxies of country of origin cue and elicit the advantageous or disadvantageous “Soupe du jour” effect.

Keywords: Country of Origin, language effect, culture difference
This research is to develop consumer-preferred yoghurt textures. In this research, we have used a different approach from the current one which goes from ingredients to food, and then to consumers. For the new approach, we have tried to understand consumer and customer texture needs. From these insights, we have developed rational texture designs which include texture mapping, sensory linkage, and rheology. Based on these designs, we could provide scientific information in ingredient systems and formulations to get desired textures.

The research has been carried out firstly by evaluating 80+ yoghurt products sourced globally. Then, we have selected 12 texturally different products. The textures were different in attributes such as thickness, cohesiveness, mouthcoating, smoothness. Next we conducted the descriptive analysis of 12 selected products. Finally, consumer acceptance test with 12 selected products was carried out on nationwide consumers in USA. The research has proved texture as the key driver of consumer liking. The development of consumer-preferred textures will provide cost-effective solutions, both products and services, in food, matched to consumer and sensory insights, increasing speed and success rates, and reducing customer risk in developing new and/or reformulated products.

Keywords: texture, consumer insight, ingredients
Fatigue level measured by labelled magnitude scale in a beverage model

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There is relatively little research testing the effects of food on mood. Fatigue has been classified both as a mood and as a symptom, and yet beverage effects on fatigue have rarely been explored. In this study, fatigue scale items were generated and tested for scale reliability among Thai and Canadian subjects in Labelled Magnitude form. Napping technique was applied and revealed that both Thai and Canadian participants showed similar patterns on perception of fatigue scale items, comprising 3 dimensions in the form of physical and mental fatigue and wanted symptom. Labelled Magnitude Fatigue Scale (LMFS) was evaluated based on six exercise situations, for 45 Thai and 45 Canadian consumer subjects using physiological changes such as heart rate and blood pressures. The results showed that the 13-item LMFS presented high internal consistency (α = .85 for Thais and .81 for Canadians) and high validity when related to heart rate (r = .62 for Thais and .56 for Canadians). The LMFS was applied in a beverage model study with Thai participants (N=45). Its reliability was tested by internal consistency using Cronbach’s alpha of the fatigue scores derived in the beverage tests (drinking water, banana drink A, and banana drink B). Test-retest reliability was also demonstrated using Pearson correlation coefficients of the fatigue scores between replications of the 13-item LMFS in the test of three beverages. The scale criterion-related validity in the test of drinking water, banana drink A and B were moderate when related with systolic blood pressure (r equal to .47, .46, and .43, respectively), and were higher when related with heart rate (r equal to .62, .66, and 0.65, respectively).

After drinking the banana juice samples, fatigue mean scores were reduced more than after drinking water. Consumer liking, willingness to pay (WTP), and expected price preferred to pay mean scores for the fatigue reduction drink were also higher for the banana drinks (p < .01). The fatigue mean scores showed a significant negative relationship to the liking mean scores and WTP (r equal to −.22, p < .01 and −.20, p < .01, respectively) but no correlation to the expected price given. When the subjects were classified into high and low fatigue groups, there was no beverage effect on fatigue reduction in ‘low fatigue group.’ However, the banana drinks showed impact on fatigue reduction more than drinking water did in ‘high fatigue group.’

Keywords: Fatigue, Labelled magnitude scale, cross-cultural, Multi-item scale, Beverages
Preference segments on herbal drinks made from Indian gooseberry in Thailand

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This study aimed to examine the composition of consumer segments for Indian-gooseberry based herbal drinks and consumer characteristics that determine membership of segments. Eight herbal drinks made from Indian gooseberry grown in Thailand were tasted by 242 consumers, ages ranging from 25 to 70. The drink samples were varied based on two drying methods (traditional hot air and spray dry) for infusion or instant usages, with combinations of either chrysanthemum, mint, ginger, lemongrass or no additional ingredient. Controlled serving conditions in terms of serving temperature (65 ± 4°C), cleansing material (0.2% carboxymethyl cellulose), and balanced first-order carry-over effects design were applied in a two-session taste test. Cluster analysis revealed five preference segments, characterized by 1) preference for chrysanthemum, 2) preference for ginger, 3) preference for strong sour taste (sole gooseberry), 4) lack of preference for spray dried samples, and 5) lack of preference for sole gooseberry. Membership of the five consumer segments was characterised based on demographic data using Discriminant analysis, and age, gender and educational levels were found to be the key factors for classifying the groups, with 86.0% variance explained and 94.65% correct cases predicted. Male participants tended to dislike the spray dried sample with chrysanthemum for the reason of weak flavour. Participants 25-30 years of age disliked pure Indian gooseberry taste but those above 41 years of age preferred its strength. Middle to low income subjects seemed to prefer ginger and lemongrass flavours in the drinks.

Keywords: Indian gooseberry, instant drink, herbal, drying, consumer segment
Aroma of coffee is one of the most important aspects that contribute to sensory experience during drinking. Each processing step including roast levels has a major impact on the aroma profile of the coffee drink. This study investigated the effect of roasting (dark, medium or light), grinding, and brewing on the evolution of coffee aroma of green beans of three different origins (Ethiopian, Kona, and Bourbon). Using a highly trained descriptive panel, 15 aromatic sensory attributes were identified and quantified (two replicates) in whole green coffee beans, whole roasted coffee beans (light, medium and dark), ground coffee, and brewed coffee. Fifteen aroma descriptors were identified by the panel. Analysis of variance (ANOVA) and canonical variate analysis (CVA) were performed separately for each coffee variety. The ANOVA showed that green beans had very low coffee-related characteristics and were high in beany, green, musty/earthy, and sour aromatic attributes, all of which were carried through to the final brews, although the intensity was much less for the musty/earthy attribute. It was observed from the CVA biplots that the aroma of the brewed coffee for all three varieties and roast levels was less intense as compared to the roasted beans and roasted ground beans. This is because of the dilution of aroma in the brews. In general, the darker roasts for all samples had higher intensities of coffee aroma. Both Ethiopian and Kona light roasts had higher intensity of roasted and cocoa notes, while being low in burnt/acrid and ashy/sooty notes. For Bourbon, the roasted character was accompanied by burnt/acrid and ashy/sooty attributes in the dark roast, while cocoa was present in the lighter roasts. Light roast for Kona, and light to medium for Ethiopian and Bourbon may be the level of roast that brings out the character aroma notes in these beans.

Keywords: coffee, aroma, descriptive analysis, roast levels
Vietnam is considered an emerging market for the United States (US) beef industry. However, little is known about the perceptions of Vietnamese retailers and consumers regarding US beef. As a result the US Department of Agriculture Emerging Markets Program funded a US Beef Export School with the dual purpose of (a) enhancing awareness of U.S. beef agribusiness “from-farm-to-table” in Vietnam retail sector as well as (b) assessing marketing strategies and ascertaining retailer perceptions regarding US beef using a focus group approach. A multi-disciplinary team from Texas Tech University, Oklahoma State University and Ho Chi Minh City University of Technology with support from the US Meat Export Federation and the National Cattlemen’s Beef Association collaborated in forming strategic alliances between the US and Vietnam with the purpose of enhancing export of US beef to Vietnam.

Data were obtained from a convenience sample of US Beef School participants. Two focus group interviews (n = 11) were conducted with executives representing the food retail sector in the northern and southern regions of Vietnam. A discussion guide was produced in English, translated into Vietnamese, and back-translated into English. A bilingual member of the research team led the participants through each 90-minute discussion session. The professional audio recording of each session was transcribed into English, and a note-tape-transcript based content analysis was prepared. The focal point of this presentation is the summary of the major themes resulting from the content analysis.

Keywords: US beef, focus group, Vietnamese retailers, marketing strategies
Remote Sensory Testing through Internet using Biosystèmes’ FizzWeb software

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Multinational food companies are developing products aimed to be sold in various countries. Globally sold products should be tested for acceptance in the target countries, or country specific products, adapted to the liking and behaviour of local consumers, should be developed. However, organizing sensory or consumer studies in emerging markets can be expensive and complex to implement, because of the scarcity of local service companies in sensory and consumer science. Using the internet for self administered remote sensory studies seems a promising solution.

Providing an efficient tool for sensory tests over the web was the main goal in the development or the Web based version of the well known Fizz sensory software. Unlike standard web based consumer survey systems, FizzWeb has been developed not only for simple MCQ tests but can implement every type of sensory test such as the traditional difference, ranking, and QDA tests and even more recent tests such as TDS and Napping/Sorting tests. All of these tests can be conducted using sample presentation designs including Williams Latin Squares or Balanced Incomplete Block Designs. Fizzweb is also perfectly adapted to global studies as the questionnaires can be designed in any language/script, for example Chinese, Japanese, Arabic, or Thai.

To help define the experimental conditions in which distant sensory tests may be effectively conducted through internet, Biosystèmes sponsors and participates in a study called “SENSODIST” which is currently being conducted. The tests factors studied are instruction language (local language vs. English), test complexity (lower lever of complexity: triangle test vs. higher lever of complexity: A/not-A with reminder) and product preparation requirements (product preparation for instant coffee samples vs. no preparation for bottled water samples). The tests will be conducted in different countries: France, Italy, Madagascar, Morocco, and Vietnam. In each country the same tests will be conducted in an University sensory laboratory and at judges’ homes with answers transmitted via an internet connection.

The first results of the study will be presented at SPISE 2009. This study is aimed to be extended to many more product types, test types and countries.

Keywords: remote tests, global markets, internet, Fizz sensory software, triangle test, A not A test.
The term *insight* may be defined in many various ways such as: clear understanding of a complex situation, grasping the inner nature of things intuitively. For some people, in particular in psychology, *insight* means an understanding of the motives and reasons behind one's actions.

Mohan Sawhney defines a *consumer insight* as “a fresh understanding, but not obvious, about consumers beliefs, values, habits, desires, motives, emotions, and needs, that can be translated into competitive advantage”.

The purpose of this communication is to present the EnQuireR package, a free solution which main objective is to automate the survey process in order to get quickly consumer insights out of survey data. This package performs univariate and multivariate data analyses. Those two levels of analysis provide the user a range of functions to improve decision-making aid. The EnQuireR package focuses on one type of applications, *i.e.* the statistical analysis of questionnaires and hence on categorical variables mainly, and allows:

1. a faster way to perform the survey process, or any dataset including categorical variables;
2. the display of many different outputs including both numerical results and graphs which are precious tools for decision-making aid;
3. an easier view of the results by the automatic generation of a report and of slides.

We will show how to perform a typology of consumers out of survey data but also how to interpret “automatically” the consumers segments issued from the EnQuireR package.

*Keywords: consumer insights, survey data, reporting*
Food consumer and sensory research play a prominent role in food industry. Their role is to enhance and strengthen food Product development. In Thailand, food is well known for its fiery and spicy flavour. Recently, world communities have expressed interests in the exotic flavour of Thai cuisine. Understanding consumer needs and sensory characteristics will help build a reputation in foreign markets. In the study presented in this talk, sweet chilli sauce one of Thai seasoning and dipping sauce was selected as an example of how to conduct research. There are three parts in this presentation: 1) consumer needs (2) sensory characteristics and consumer acceptability of sweet chilli sauce and (3) effect of sugar types on heat pattern of sweet chilli sauce. First, conjoint analysis and multidimensional scaling techniques were applied to investigate consumer needs of sweet chilli sauce appearance and packaging style. Result showed that consumers preferred product having small chilli size, low amount of chilli and high amount of chilli seed. Chilli size was the most influential factor of sauce appearance liking rather than the amount of chilli and chilli seed, respectively. Ranking preference of fourteen bottle styles was also investigated and data were subjected to multidimensional scaling. Result showed that consumer preferred bottles having small cylindrical shape (200-350 ml.). Second, Descriptive analysis (DA) and consumer preference data for twenty five commercial products were collected. These data were analysed using partial least square regression. Results showed that there were twenty four sensory attributes and that consumers preferred product with the following flavours; garlic, pickled chilli, vinegar, fishy, salty and sour. Third, effects of sugar (glucose, sucrose, and fructose) on perceived heat pattern of sweet chilli sauces were studied. Results showed that samples having 100% fructose provided the lowest heat intensity (1.40) and lasted for the shortest time (64.45) while samples having 100% of glucose provided the highest heat intensity (2.31) and lasted for the longest time (101.21 seconds). We conclude that sensory and consumer research provides useful information about consumers’ perception of products. Food manufacturers can reduce their decision risks and can have a direction to meet their customer needs and satisfaction.

Keywords: consumer needs, chilli heat pattern, descriptive analysis
The objective of this study was to describe sensory and physico-chemical properties of seven commercial strawberry sterilized milk products bought in local supermarkets and to evaluate consumer preference for these products. Three experiments including (1) descriptive analysis; (2) physico-chemical analysis and (3) consumer analysis were carried out. In the first experiment, six trained panellists identified and evaluated 14 sensory attributes (taste, aroma, texture) using a 7-point structured line scale. In the second experiment, the gross physico-chemical compositions were determined: protein, lipid, total sugar content, viscosity, and colour of strawberry sterilized milks using CIE L*a*b tristimulus method. In the third experiment, we performed a consumer analysis, in which 140 consumers from a panel were asked to evaluate the overall-liking of the samples using a 7-point hedonic scale.

The results differentiated the milk samples based on sensory attributes (e.g. pink colour, greasiness, creaminess, etc.) and physico-chemical properties (lipid content and viscosity), respectively. Health and sensory appeal are the most important factors when to choose products. MFA (Multiple factor analysis) showed that consumer preference was forecasted by sensory attributes better than physico-chemical properties. A statistically significant influence of gender on the overall-liking was observed ($p < .05$). Preference mapping revealed two clusters of consumers and was used to explore the most preferred sterilized milk around the optimization model. Sweetness and greasiness are the key sensory attributes driving consumer preference.

Keywords: dairy products, Vietnamese consumer, preferences, food choice
Effect of butter fat levels on headspace concentration of esters on model system detected by HS-SPME gas chromatography compared with time intensity flavour release detection

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In this paper we study the effect of butter fat levels on headspace concentration of esters (methyl, ethyl, propyl, and butyl butyrate) on milk model system detected by headspace solid phase micro extraction (HS-SPME) gas chromatography. First, it was necessary to determine the optimum conditions to extract volatile ester compounds from milk model system. For this, the effect of extraction time (10, 20, 40, and 60 min) and temperature (30, 40, and 50°C) by 75μm Carboxen-Polydimethylsiloxane (CAR-PDMS) were determined. The 10 min extraction at 40°C was chosen as the optimum conditions. Milk samples containing 10, 20, 30, and 40 ppm esters, mixed with 2 and 4% butter fat, were analysed by HS-SPME gas chromatography. The results showed that the samples containing higher fat level had less headspace concentration for butyl butyrate compared to propyl and ethyl butyrate respectively, whereas the highest headspace concentration was methyl butyrate. The samples, fortified with butyl butyrate, were also analysed organoleptically by time intensity method. Five sensory trained panellists were used in this session. The panellists found that the samples with higher fat level, had less volatile intensity which corresponded to the chromatogram.

Keywords: HS-SPME, time intensity, flavour release
The objective of this study was to investigate attitude and spending behaviour of members of middle class in economic recession period in Vietnam. Two experiments were carried out: a focus group and a consumer survey. The focus group results provide a description of the general profile of the economy of Vietnam: “this economic situation is not in crisis period,” “it is a downturn as a consequence of domino effect from the recession of capitalistic countries”; and describe the concept of recession as “difficult life”, “bankruptcy”, “unemployment”, and “rise of social evils”. Facing the recession situation, the reactions of the participants were to “work harder”, “study more”, “recruit/select superior sale managers”, “satisfy the outside and inside clients”, and “manage expenses in a planned way.” The questionnaire survey focused on the consumer expense distribution patterns and on forecasting consumer spending behaviours. The proportion of expenditures showed that the five items on which consumers spent the most were food at home (20.56%), savings (15.29%), food services (8.72%), payment for rent (5.61%), and party expenditure (5.34%). Moreover, a new trend in spending behaviour was discussed. Eleven items of expenditures were highlighted in this discussion: food at home, alcoholic beverage, clothing, jewellery, travelling, private transportation, telephone, party expenditure, home equipment (with and without motors), and payment for rent.

Keywords: Vietnam economic, recession, spending behaviour, income distribution
Coconut milk is a popular ingredient in Thai cuisine and it is also exported to several countries. For product development and for understanding consumer perception, it is important to examine the sensory characteristics of coconut milk. This study aimed to characterize and categorize attributes of coconut milk and artificial coconut milk products. Fourteen samples were collected for descriptive analysis performed by eight highly trained panellists. Results showed that there were twenty-seven relevant sensory descriptors which were whiteness, smoothness of liquid and adhesiveness, seven aromatic notes, nine flavours, two tastes, two mouth-feel and three after-tastes. Principal component analysis (PCA) identified two principal components (PCs) which accounted for 75.67% of the variance of the sensory data. Factor scores indicated that the variables showing a high correlation with the PCs were fresh aroma and flavour, salty, dryness, aroma, and flavour of cooking process. The cluster analysis of coconut milk showed four clusters which could be identified as fresh, artificial, extreme temperature processing, and pasteurization of coconut milk.

**Key words:** coconut milk, sensory characteristic, descriptive analysis, principal component analysis, factor analysis.
Chilli sauces as a dipping sauce are often used in a wide variety of foods. The sauce is hot but the individual flavours of the chilli are pronounced. This study focused on the application of the Near Infrared (NIR) technique for the prediction of heat sensation in forty-two chilli sauces via back propagation artificial neural network (BP-ANN). A generic descriptive analysis with ten trained panellists was used to determine the heat attributes. These attributes consisted of four descriptions; heat intensity, tongue burn, oral cavity burn, and throat burn. NIR spectra in the region of 1100-2500 nm were measured. The principal component analysis (PCA) method was applied to reduce the dimensionality of the spectra data, and filtered signal was used to establish BP-ANN models. In these models we used an architecture with 2 hidden layers and used 5, 10, 15, and 20 hidden nodes. The results show that a model with 20 hidden nodes is the best for heat intensity, and that a model with 15 hidden nodes is the best for tongue burn, oral cavity burn and throat burn.

Key words: chilli sauce, heat sensation, near infrared spectroscopy, artificial neural network, principal component analysis
Many green tea products that are loose leaf form can be brewed multiple times and some products indicate that on the package. However, this fact is not very well-known in the western countries. Flavour and basic taste of green tea may change as brewed multiple times. The objective of this study was to learn how flavour changes as you brew green tea multiple times. Green tea samples were brewed five times from the same leaves and six different Korean green teas were tested. Six highly trained sensory panellists from the Sensory Analysis Centre at Kansas State University participated in the study and the green tea lexicon developed by Lee and Chambers was used. Canonical Variate Analysis (CVA) was conducted to compare green tea flavour overall at each stage of brewing. The first two canonical variates explained less than 50% of the variance and were difficult to interpret. A repeated measurement ANOVA was conducted to detect changes at different stages of brewing within the same product on common attributes: brown, green, seaweed, bitter, astringent, overall aftertaste. Generally first brew and/or second brew tea had the highest score and decreased as brewed repeatedly. However different attributes show different trend of changes over time.

Keywords: green tea, flavour, multiple brew, canonical variate analysis, repeated measure ANOVA
Impact of processing on sensory properties of fresh tomatoes

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Vine-ripened fresh tomatoes are often believed to have better flavour than those harvested at the mature green stage and ripened artificially. However, tomato cultivars and various growing conditions impact the flavour characteristics of fresh market tomatoes considerably. When creating new tomato cultivars, breeders often have focused more on providing higher yields and more resistance to diseases and postharvest conditions than on sensory quality fruit. The current research examined the sensory characteristics of various fresh tomatoes and the effect that processing of these tomatoes has on sensory properties. The research included newer and older cultivars to better understand their sensory properties. The effect of various ripening stages also was investigated. Fresh tomatoes and processed tomatoes (juice and paste) were produced and examined by descriptive sensory evaluation. The sensory properties of the tomato varieties and properties of fresh versus processed tomatoes were compared. Results showed significant differences in many sensory characteristics among the fresh tomatoes as a result of cultivar and ripening stages. The sensory characteristics of fresh and processed products were considerably different however, with lower heat processing such as that for making tomato juice, several key sensory attributes were intensified. In general, flavour differences among cultivars tended to disappear after processing, especially high levels of processing such as those found in tomato paste, but texture differences were prominent among cultivars when processed into tomato juice and paste.

\textit{Keywords: sensory characteristics, flavour, tomatoes, processing, fresh}
Research in extension of self-life of raw meat roll and sauce

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Objective: Grill meat rolls, nowadays, have become one popular and traditional dish among Vietnamese people and visitors. A major problem in producing this product is that its raw material shelf-life is quite short, at most a few days under cold storage condition. The objective of the present work is to investigate the extension of shelf-life of raw meat roll (RMR) and sauce (S) from 3 to 6 months with acceptable quality level for consumption.

Methods: RMR and S were sampled directly at a local enterprise. These samples were divided into four groups, and then were preserved according to four different methods including cold storage (CS) at $4 \pm 1^\circ C$ with or without preservative and frozen storage (FS) at $-20 \pm 1^\circ C$ with or without preservative. Sensory evaluation was performed using a 9-point liking scale. Microbial analysis was determined according to Vietnamese standards such as TCVN 5165:90; 5155:90; 5042:94; 4829:89; 4883:90; 3348:2001. Data were analyzed using Statistica V. 8.0 (Stasoft Inc., Tulsa, AZ).

Results: FS method can retain acceptable sensory quality (ASQ) of RMR and S until 4.5 months. Whereas, CS method can maintain ASQ until one month only, FS method inhibits bacterial growth better than CS method. Bacterial analysis result is still under control to FS sample after 4.5-month storage. By contrast, CS preservation is over the critical limit of bacterial value after 1.5-months of storage. Using 0.1% (w/w) of preservative showed no significant effect on SQ of product quality.

Conclusions: When RMR and S were stored at $-20 \pm 1^\circ C$ with or without preservative, we found that this can extend product self-life until 4.5 months with acceptable sensory and microbial quality. Preservative use at 0.1% has no significant effect on sensory quality.

Key words: grill meat roll, self-life, sensory quality, and preservative
Research in producing ready-to-eat product from pink salmon (O. gorbuscha) fillets

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Objectives. While frozen and canned products from salmon are familiar to consumers, demand for new products development with nutritional quality and convenient for usage from this fish specie is being expected. The main objective of the present work is to find if this is possible to produce ready-to-eat product from pink salmon fillets (O. gorbuscha) with acceptable quality level for consumption using freeze–drying technology.

Methods. Salmon blocks were cut into cubes of 10 \times 10 \times 10 (mm) using machine cutter Butcher Boy and High-Tech-Cutter, Koch Equipment LLC, USA. A two-step process was performed. \textit{First}, frozen salmon cubes (SC) were immediately dipped into flavouring throughout two-step thermal treatment by immersing hot bath (HB) and cold bath (CB) at 60\degree\textsuperscript{C} and 0\degree\textsuperscript{C} for 5 and 30 min, respectively. \textit{Second}, SC were dried using freeze drier Virtis 52 ES at drying temperature from –40\degree\textsuperscript{C} to 25\degree\textsuperscript{C} for 26 hrs. Proximate composition analysis was performed using AOAC’s standard methods, fatty acid analysis was performed using GC, and the sensory evaluation was performed using a 9-point hedonic scale.

Results. Two-step thermal treatment causes a decrease in the lipid content and an increase in the amount of \(\omega-3\) fatty acids in the finished products. Using 9 different flavour recipes which included salt (0.5-4\%), sugar (1-3\%), fish sauce (2\%), onion (0.1-0.5\%), and garlic (0.1-1.0\%) created no effects on sensory quality (\(p < .05\)) except for salt. The best flavour formula for sensorial quality of product is salt (2\%), sugar (2\%), fish sauce (2\%), onion (0.5\%), and garlic (0.5\%) for HB and salt (0.5\%), sugar (1\%), fish sauce (2\%), onion (0.1\%), and garlic (0.1\%) for CB.

Conclusions. A ready-to-eat product (\textit{i.e.}, snack) was produced from pink salmon fillets using freeze drier model Virtis 52 ES, USA with acceptable quality for consumption. The product contains high content of \(\omega-3\) fatty acids, protein, and low lipid content.

Key words: ready-to-eat product, freeze dried, and salmon (O. gorbuscha)
Combination of chemical analysis and sensory evaluation for assessing freeze-dried salmon product stability during storage at various temperatures and packaging conditions.

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Objectives. In previous studies, we reported that freeze-dried salmon (FDS) products have porous texture and contains high content of omega-3 fatty acids (Duy and et al., 2008, 2009). This high fat content makes these products being sensitive to lipid oxidation. Therefore, a major concern about FDS products was to find out solutions for preventing oxidative lipid. The objective of this study was to investigate effects of packing method and storage temperature on lipid oxidation (LO) and colour loss of freeze-dried salmon product during storage.

Methods. Pink salmon cubes (5 × 5 × 5 mm) were dried in a freeze drier Virtis 52 ES according to the method described by Duy and et al., (2008, 2009). The finished product was packaged with different methods and stored for 4-months at 5, 20, and 40°C. Lipid oxidation (LO) was evaluated using PV and TBA value. Colour change was determined using quantitative measurement of astaxanthin loss combined with a colorimeter (Minolta CR-300, Japan). Sensory evaluation was also carried out following chemical analyses.

Results. The PV values increased until 8-week storage for all samples, and then decreased. Otherwise, TBA value increased during the whole storage time for all samples. Astaxanthin content decreased with increasing period of storage. Both the L (whiteness) and b (yellowness) values increased, but the a (redness) value decreased. LO rate increased with increasing temperature storage. A Combination of low temperature and vacuum-packaging was found to be the best for sensory quality, colour loss, and oxidation prevention. Overall acceptability, rancidity, and colour loss showed a strong correlation with PV, TBA, and Astaxanthin content.

Conclusions. Storage at low temperature (5°C) combined with vacuum-package condition showed that the best product quality had both LO prevention and sensory quality. We conclude that we can use the relationship between chemical and sensory parameters for predicting FDS product quality stability during storage.

Keywords: lipid oxidation, freeze-dried, salmon, and sensory
Determination of heat sensation of Thai sweet chilli sauces by near infrared spectroscopy and back propagation neural network

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The Thai sweet chilli sauce is a popular condiment which is often used to increase the heat and the sweet taste of Thai food. Heat sensation is a sensory characteristic that can influence consumer preference. This research aimed to determine heat sensation of Thai sweet chilli sauces using near infrared (NIR) spectroscopy and back propagation neural network (BPNN). Heat attributes of forty samples of Thai sweet chilli sauces were characterised by a generic descriptive analysis obtained from ten trained panellists. These attributes consisted of heat intensity, tongue burn, oral cavity burn, and throat burn. NIR reflectance spectra were obtained from 1100 to 2500 nm and applied with smoothing pre-treatment method to decrease the noise in the spectra. The NIR spectra were then processed with principal component analysis (PCA), and the factor scores obtained from the PCA were used as input for the neural networks. These neural network models were then optimized by selecting suitable inputs, number of hidden nodes and length of training. The resulting BPNN was able to predict well heat sensation of Thai sweet chilli sauces. The coefficients of determination ($R^2$) of heat intensity, tongue burn, oral cavity burn and throat burn were equal to .976, .984, .985 and .982, respectively. We conclude that NIR reflectance spectroscopy can be used to develop quantitative models of heat sensation in Thai sweet chilli sauce.

Keywords: Sweet chilli sauce, sensory, near-infrared (NIR), back propagation neural network (BPNN), principal component analysis (PCA)
Preference mapping of commercial green tea with roasted brown rice for Thai consumers

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The objectives of this study were to investigate the 1) sensory characteristics 2) consumer acceptability of commercial green tea with roasted brown rice (genmaicha) available in Bangkok, Thailand and 3) relationships between sensory attributes and consumer acceptance using internal preference mapping. We used seven tea samples in this study: three brands of dry leaf tea (D) and four brands of infusion tea (I). The sensory descriptive analysis of imported commercial green tea with roasted brown rice products were conducted by eight trained panellists of Kasetsart University Sensory and Consumer Research Unit. The panel identified 18 sensory attributes from seven tea samples. The results from principal component analysis (PCA) of the descriptive data demonstrated that two principal components (PCs) could explain 87.31\% of the variance of the data. The samples were classified into three groups which were composed of 1) three brands of dry leaf tea, 2) three brands of infusion tea and 3) one brand of infusion tea (I-B). The later group was characterised by stronger roast aroma, flavour, and aftertaste than the others. For the acceptability test, the tea samples were also evaluated by 200 Thai consumers who consumed hot green tea at least once a month. Internal preference mapping was performed to find out the sensory characteristics which could stimulate consumers’ product acceptance. The results of preference mapping identified attributes into two PCs which described, together, 87.31\% of the variance of the data. PC1, which explained 62.09\% of the variance, was aroma of green tea (tea, dry, green, and seaweed aromas) and PC2, which explained 25.22\% of the variance, was tea taste and aftertaste (bitter, astringent, tea aftertaste, bitter aftertaste and astringent aftertaste). The Korean green tea with roasted brown rice (I-D) tended to be the most accepted product. These data could be useful to specify product concepts of green tea with roasted brown rice for Thai consumers.

Keywords: consumer preference, preference mapping, descriptive analysis, green tea, roasted rice, genmaicha, infusion tea
The identification of aroma compounds in Tom Yum flavour using HS-SPME with Gas Chromatography-Olfactometry with detection frequency analysis

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Tom Yum is one of the most famous Thai foods because it has a unique flavour which derives from the mixture of various spices such as galangal, lemongrass, and kaffir lime. Aroma key components of Tom Yum flavour were extracted and identified by HeadSpace Solid-Phase MicroExtractions (HS-SPME) with Gas Chromatography-Olfactometry (GC-O). A fibre coating of 50/30 μm divinylbenzene/Carboxen/polydimethylsiloxane in conjunction with a 40 min extraction at 50°C was chosen as the conditions for analysis. GC-O is a technique that uses human assessors to detect and evaluate volatile compounds obtained from a GC separation via a specifically designed odour port and compare these results with other detectors, such as a flame ionization detector (FID) or a mass spectrometer (MS). Participants of a panel of 10 assessors carried out GC-O on the same extract and sniffed the GC eluate in order to detect the key aroma compounds. Detection Frequency Analysis was used to indicate key aroma compounds. Forty aroma compounds were detected and seven key aroma compounds were identified. These key volatile compounds were beta.-Pinene, Eucalyptol, 1,6-Octadien-3-ol, beta-linalool, 6-Octenal, 3,7-dimethyl-, (R)-(+)citronellal 3-Cyclohexen-1-ol, 4-Terpinenol, 2,6-Octadienal, 3,7-dimethyl-, Neral (citral b) and 2,6-Octadienal, 3,7-dimethyl-, Geranial (citral a).

Keywords: Tom Yum flavour, solid-phase microextraction, Gas Chromatography-Olfactometry (GC-O), detection frequency analysis
This research aimed to investigate the qualities and consumer acceptance of Sukiyaki sauce. Result of market survey showed that there were 19 brands sold in supermarkets. Fourteen of them were sterilized and the other five brands were pasteurized sauces. The main factors affecting consumer buying decision were colour, odour, ingredients, price, taste, and food safety. For this study, we selected 14 brands of sterilized sukiyaki sauce. Physico-chemical measurements and descriptive sensory analysis were conducted. Statistical data analyses, which were principal component analysis and cluster analysis, were applied to classify these sauces. Results demonstrated that the 14 samples were categorized mainly based on their sensory characteristics into six groups which were: 1) high intensities of soy bean curd-aroma and soy bean curd-flavour; 2) high intensities of chilli amount and particulates; 3) high intensities of orange colour, chilli amount, particulates, white sesame amount, and overall heat; 4) high intensities of overall sweet, garlic flavour, pickled garlic-flavour; 5) high intensities of pungent sensation, pickled chilli aroma, pickled boiled chilli flavour and overall heat; and 6) low intensities of all sensory attributes. Consequently, consumer acceptance using 9-point hedonic scales was investigated. Eight sukiyaki sauce samples were selected from these six classified groups. They were evaluated by 140 respondents. Results showed that the fourth group of sukiyaki sauce had the highest liking score (6.84). Partial least square regression was applied to identify relationships among physical, chemical, descriptive sensory data, and consumer acceptance as well as to illustrate the preference mapping of samples. Results showed that the most preferable Sukiyaki sauce should have total acidity 0.77-1.03%, pH 3.47-3.94, total soluble solid 33.9-34.0 °Brix, reducing sugar 4.23-11.41%, total sugar 17.96-21.31%, Bostwick consistency 10.33-14.52 cm/30sec, L* value 22.48 – 22.55, a* value 26.30 – 32.44 and b* value 38.05 – 45.46. The acceptable Sukiyaki sauce should have these predominant sensory attributes which were: 1) high intensities of garlic, pickled garlic, sesame oil and overall sweet-aromas and flavours; 2) high intensities of parsley-flavour and sweetness; 3) viscous; 4) low intensities of soy bean curd-aroma and flavour; 5) low intensities of pickled chilli and pungent flavours; and 6) low intensities of salty, sour, overall heat sensation.

Keywords: sukiyaki, consumer acceptance, hedonic scale, partial least square regression
This research studied sensory characteristics of nine mango varieties at different stages of ripeness. Seven cultivars of “green” mangoes (Khiaosawoey, Raet, Falan, Phetbanraj, Nongsaeng, Chok Anun, and Mun Duean Kao) and two cultivars of “ripe” mangoes (Namdokmai and Ok Rong) popularly cultivated and consumed in Thailand were examined by a highly trained descriptive panel. A lexicon consisting of 20 flavour attributes and 10 texture attributes was developed to describe sensory characteristics of the mango samples. Results showed that there were great variations in both flavour and texture characteristics among samples. Principal component analysis (PCA) grouped the attributes into six key dimensions which explained 73.3% of total variability. The attributes heavily loaded on principal component (PC) 1 (viney, green, firmness, cohesiveness of mass, astringent, and particle amount and size) were found in all or most mango varieties but their intensities changed dramatically during ripening; thus this PC explained changes in sensory characteristics occurring during ripening of the fruits. PC2 (woody, peaches, floral/perfumy, earthy, mango ID, fruity, sweet, mealy, fibre amount and size, and slick) was a group of attributes present in all or some mango samples, but at different intensities depending on varieties; therefore these attributes explained variety differences. The attributes heavily loaded on PC3 (chemical, peel-like, sour, and bitter) and PC5 (piney, oranges, and spicy) were detected in only one or a few varieties, or found in all varieties but some varieties tended to have higher intensities than others; hence these attributes explained variety differences and also the uniqueness of some varieties. PC4 (slimy, fermented, animalic, and pineapple) and PC6 (pulpy residue and starchy) were sets of attributes present in some varieties only at late or early ripening stages, respectively. It can be hypothesised that these attributes explained overripe and under ripe characteristics of mangoes, respectively.

Keywords: mango, fruits, sensory, flavour, texture
Flour based peanut snack is a well known local fried product consumed widely in Thailand. Its textural characteristic is one of the key determining factors influencing consumer acceptance. The aim of this study was to formulate the three flours combination using mixture design facilitated by Design Expert 6.0.5. Rice flour, wheat flour, and tapioca flour were chosen for the study. A quadratic model was assumed for the variable design, resulting in 14 flour combinations, each of which total flour was controlled at 25% w/w. Hedonic scoring and Just-About-Right scales were employed for sensory evaluation of the product. The results suggested that the flour combination consisting of 13% rice flour and 12% tapioca flour achieved the highest liking score, satisfactory attributes and minimum cost.

Keywords: Flour based peanut snack, mixture design, hedonic scoring, Just-About-Right scale
Opinion and behavioural survey of menopausal women in Thailand toward soy and soy germ products

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The objectives of this study were to investigate 1) behaviours and needs of menopausal women in Thailand and 2) factors which have influence in buying decision toward soy and soy germ products. The research was undertaken by collecting data from various sources and interviewing with questionnaires 402 menopausal women in Thailand. The result showed that ages of the respondent had a range from 40–59 years and that 37.6% had bachelor’s degree. The majority of the respondents were government officials (29.1%) with monthly income between 10,001–15,000 Baht. The top five soy products usually consumed by respondents were 1) pasteurized or UHT soy milk (85.8%), 2) soft/silk tofu (68.4%), 3) tofu milk (57.0%) 4) tofu with ginger syrup (55.7%) and 5) firm tofu (48.0%). The respondents consumed soy and soy germ product 1–2 times/week (37.1%) and normally purchased from bazaar (87.1%). Reasons of respondents for consuming soy and soy germ products were nutrition value (32.1%) and medicinal properties (28.6%). The respondents rated important levels of eleven variables affecting consumer’s buying decision of this product. Meanwhile, Factor analysis (FA) technique grouped these variables into four factors which together explained 67.3% of the variance of the data. These four factors were 1) product and price factor describing product appearance, taste and price; 2) marketing factor describing brand, convenient buying and advertising; 3) package factor describing packaging and size of package; and 4) health factor describing nutrition value, medicinal properties and product safety. This exploratory study was conducted to get a better understanding about menopausal women’s behaviour. For soy germ product development, the respondents expressed interest in soy germ products (containing isoflavones) (87.6%). Participants also suggested that soy germ products should be developed in beverage category (57.7%) and supplementary food category (25.3%), and its price should be around ≤ 50 baht/packet (65.1%).

Keywords: consumer behaviour, soy and soy germ product, buying decision, factor analysis
Thai ready-to-eat chilli pastes are generally made from a variety of Thai herbs such as chilli, garlic, shallot, and galangal, and are eaten with vegetables as a dip for their richness in flavours and tastes. Flavour characteristics of six Thai Chilli (Tadang) samples were analysed by instrumental GC-MS using Solid Phase Micro Extraction (SPME) techniques and electronic nose (gas sensors Figaro USA Inc.), together with sensorial Flavour Profile method (FP, ISO, 1985) using trained panellists. The product spicy-hotness was found to range between mild to medium hot levels with Scoville Heat Units (SHU) between 323.52 to 989.86. Heavy Thai users, ages ranging between 18 to 40 years old and consuming chilli paste three to four times a week, were recruited for FP training. Twenty five flavour attributes were evaluated and ten FP panellists were screened and employed. A balanced first-order carry-over effect design was applied in the sample evaluating plan, for testing six samples within two testing sessions. The reference standards were also added to the flavour scale during evaluation. The panellists were instructed to cleanse their palates in four stages, after each of which they were asked to expectorate, applying chilled drinking water, sipping 10% sucrose solution, followed by chewing chilled sliced cucumber, and then rinsing the palates again by taking room-temperature drinking water.

Partial Least Squares regression (PLS) was applied to analyse the data derived from the instrumental (as predictors), FP and hedonic measurements to reveal the relationships among them. Flavour profiles of the chilli samples were perceived as being mainly different in terms of galangal, chilli, and sour tamarind odours perceived by sniffing and tasting, cooked garlic and heated shallot odours perceived by sniffing, as a result of the four main ingredients. The samples with galangal, sour tamarind and fish sauce ingredients dominated the product flavour profile detected by GC-MS in relation to 1) alcohol, 2) acid and 3) aldehyde and ketone compounds, respectively. The E-nose also showed high sensor sensitivity responding to the three dominating odours classified by GC-MS, and showed higher sensitivity on overall flavour profiles of commercial samples due to protein sources such as alkyl pyrazines, nitrogen and sulphur containing compounds. Furthermore, the variation of volatiles derived from 32 replications of E-nose analysis on commercial samples was less than the experimental samples as results of heating process and homogeneity of the samples.

Keywords: Flavour Profile, GC-MS, Chilli paste, SHU, Partial Least Square Regression
Many different industries including food, drink, perfume, cosmetic, and car industries use trained sensory panels. Trained assessors are selected for their sensory abilities and trained to describe product characteristics, to discriminate between products, and to spot sensory defects. To some extent, they can be considered as sophisticated measurement instruments. By contrast, consumer panels are only used to express if they would like or accept a new product. The question that naturally arises is: Is it necessary to develop two different panels, or would consumers be able to provide results similar to those of trained assessors? The aim of the present presentation is to show what beer consumers are able to perform when they taste beers. To answer this question, we compared consumers and trained assessors’ performance on 1) perceptual tasks which included an aroma detection task, a discrimination task, a sorting task and a recognition task and 2) verbal tasks which included an aroma identification task, a communication task and a matching task. Concerning perceptual performance, we found that consumers discriminated between beers as well as moderately trained assessors, and discriminated and recognized beers as well as highly trained assessors when the beers used as stimuli were not learned during assessors’ training. Moreover, consumers and trained assessors categorized beers similarly in sorting tasks. Concerning verbal performance, we found that—although a large part of the terms used is common to consumers and trained assessors’ descriptions of beers—the communicative value of the vocabulary used by consumers to describe beers is lower than the vocabulary of trained assessors. To conclude, it seems that consumers are able to perform perceptive tasks as well as moderately trained assessors, but when language is needed, consumers show lower performance than trained assessors.

Keywords: consumers, trained panel, performance, beers.
Tea, a plant well known for its health benefits, plays an important role in domestic and foreign trade of Vietnam. It is used mainly as beverage in various forms such as green tea, oolong tea, black tea, instant tea, or even bottled tea, while its utilization in other fields is unpopular in the country. In addition, only young tea leaves and buds are used for these purposes, leaving large amount of tea leaves unused. The aim of our current work was to examine the possibility to use freeze dried extract from “unused” tea leaves as ingredient for biscuit cream to improve health benefit and oxidation stability of this product.

Two experiments were carried out in this work. In the first one, perception thresholds of some sensory attributes associated with green tea extract in samples of biscuit cream were examined. The result showed that changes in brightness, astringency, sweetness and bitterness had been detected at level of 0.5%, 0.75%, 1%, and 1% respectively. In the second experiment, a green tea extract was applied as ingredient to biscuit cream at three levels: 500 ppm, 1000 ppm and 1%. Samples were stored at 40°C and the oxidation stability of products with addition of BHT, green tea extracts and without any antioxidant were evaluated by measuring the peroxide and TBAR values as well as sensory analysis. It could be concluded that green tea extracts showed good inhibition effect on cream lipid oxidation while remaining a satisfying sensory value. The inhibition effect of green tea extract at level of 500 ppm was equivalent to the effect of BHT at 200 ppm. The higher the concentration of tea extract was applied, the greater the effect was.

Keywords: green tea, biscuit, antioxidant, sensory analysis, lipid oxidation.
Three compounds with potent α-glucosidase inhibitory activity purified from sea cucumber *Stichopus japonicus*

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Diabetes mellitus is a worldwide health problem which is increasing every year. One therapeutic approach to decrease postprandial hyperglycemia is to retard absorption of glucose through inhibition of α-glucosidase. The aqueous methanol extract of sea cucumber, *Stichopus japonicus* inhibited yeast α-glucosidase activity by 68% at 0.5 mg/ml. The following hexane fraction was the most potent (≈98% inhibition at 10 μg/ml). Three compounds with potent α-glucosidase inhibitory activities were purified from *S. japonicus*. IC\textsubscript{50} values of compound 1, 2, and 3 were 1.22, 0.17, and 0.36 μg/ml against *Saccharomyces cerevisiae* α-glucosidase, and 2.49, 0.24, and 0.21 μg/ml against *Bacillus stearothermophilus* α-glucosidase, respectively. Both compound 1 and 2 inhibited yeast α-glucosidase activity non-competitively (K\textsubscript{i} value of 0.98 and 0.06 μg/ml), while compound 3 showed a mixed type inhibition (K\textsubscript{i} value of 0.61 μg/ml). In addition, compound 1, 2 and 3 were very stable under thermal and acidic conditions up to 30 and 60 min. Therefore, compounds of *S. japonicus* have potential as a natural nutraceutical to prevent diabetes mellitus because of its high α-glucosidase inhibitory activity.

*Keywords*: α-glucosidase, α-glucosidase inhibitors, *Stichopus japonicus*, diabetes mellitus
The purposes of this study were to compare the volatile compounds and the sensory attributes of commercial brand oyster sauces; we also wanted to determine the relationship between these attributes. We used sensory evaluation and consumer preference tests. Volatile compounds were detected by SPME (solid phase micro extraction) coupled with GC/MS and sensory evaluation was carried out by 11 trained panellists. Four oyster sauces were tested for their preferences by 125 Chinese consumers (aged 21 to 53) living in Shanghai, China. The differences in the volatile components and sensory attributes of the oyster sauces were recorded. A total of 83 volatile compounds were identified and we found that alcohols, furans, aldehydes, and pyrazines were dominant. Most of the samples did not show a clear grouping with significant differences; however, two samples (CN1 and CN2) were obtained which showed the clustering of propanone and many kinds of pyrazines and their related substances. Three sensory attributes (Oyster, fishy and fried pork odour) were highly distributed by alcohols (1-Penten-3-ol), aldehydes (propanal, butanal), and pyrazines, respectively. Cluster analysis of overall liking data showed that there were four clusters of consumers with similar preference. According to preference mapping, consumers mostly like VN with oyster odour and sweet taste. Otherwise, sample TL was considered unacceptable because it had a soy sauce odour. The marketing and R&D team might apply this valuable information in manufacturing processes and developing new savoury products towards the right directions.

Keywords: oyster sauce, SPME, sensory attributes, volatile compounds, preference mapping
The objective of this research is to study Thai consumer behaviour on 25% orange juice which is one of the popular drinks for Thai teenagers. Physico-chemical properties of five local 25% orange juices (brand A-E) were investigated. It was found that 25% orange juices had pH in the range 3.00–3.88, brix 6.0–12.2, and acidity 0.27–0.45%. The \( L^* \) values of all samples were in the range 5.79–22.79, \( a^* \) 0.09–7.30 and \( b^* \) 8.77–17.90. Colour of brand A was yellowish orange and darker than brand B which was bright yellow. Brand C and D were pale orange while brand E was dark orange. Sensory evaluation of all samples was performed by 100 Teenage Thai consumers using 9-point hedonic scales. Principal component analysis (PCA) and MANOVA were used to analyse the sensory data. PCA showed that sweetness, sourness, orange flavour, overall preference, viscosity, and orange sac loaded on the first principal component which represented 56.2% of the variance of the data. The sweetness, sourness, and orange flavour were the main quality attributes which affected the overall preference. The second component, which represented 14.1% of the variance, was mostly composed of colour, appearance and cloudiness. MANOVA result showed that brand A had significantly \((p < .05)\) higher liking score for all attributes except orange sac. The attributes which affected the overall preference score were sweetness, sourness, and orange flavour. MANOVA and PCA results concurred. These results were used to develop a new formulation using the response surface technique. It was found that this new formulation had significantly \((p < .05)\) higher preference score than brand A for all attributes. It was concluded that for Thai teenager consumers, sweetness, sourness, and orange flavour were the main sensory attributes which affected the overall preference of 25% orange juice.

Keywords: Thai consumer behaviour, 25% orange juice, PCA, MANOVA
Relationship between sensory and chemical properties of Jiogulan (*Gynostemma pentaphyllum*) tea with lime juice

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Jiogulan (*Gynostemma pentaphyllum*) is an oriental medicinal herb which is used to improve blood systems, reduce blood pressure and cholesterol levels. This plant contains saponins and gypenosides which have a similar structure to some ginsenosides in ginseng plants. Their taste, however, is bitter, sweet and astringent. Therefore, the objective of this research was to study the relationship between sensory and chemical properties of Jiogulan tea with lime juice fortified with Jiogulan extract. We created, using mixture design, eight formulas of Jiogulan tea with lime juice created. The chemical and physical analysis were moisture content, total soluble solid, total acidity, total saponin, gypenoside, ginsenoside Rb1, and colour (*L*, *a*, *b*, Δ*E*). The hybrid sensory descriptive analysis was conducted by ten panellists with training for 12 hours in one month. They generated 13 attributes of this beverage. The relation between physical-chemical and sensory properties was analysed by principal component analysis (PCA). The results showed that PCA explained 88.71% of the variance of the data with only two components. The first PC (which explained 50.44% of the variance) included the total solid, TSS which related to sweet and sweet aftertaste; these were opposed, on the other hand, to the moisture, total saponin, ginsenoside Rb1, gypenoside related to bitter and astringent aftertastes. The second PC (38.28%) combined the yellow colour, clearness, lime aroma, Jiogulan aroma, lime flavor, Jiogulan flavor, and total acidity which were opposite of pH and *b* (yellow). In conclusion, sensory descriptive analysis could relate with physical-chemical properties, especially sweetness, bitterness, sour flavour and colour of this herbal beverage.

*Key Words: Jiogulan, descriptive analysis, PCA, gypenoside, saponin*
Effects of age and geographical origin in global preference of Malagasy consumers for yam tubers and mix wheat yam flours cookies.

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Yams (Dioscorea spp.) are an important root crop cultivated in Madagascar and constitute an important source of calories. Yet, despite a 45\% rate of malnutrition prevalence in Madagascar, yam is part of dietary habits only in the oriental and southern regions of Madagascar. This study aims at evaluating the effects of age and geographical origin in preference of consumers for mix wheat yam flour cookies.

In a preliminary experiment, the nutritional and sensory potentialities of the four varieties of yam the most cultivated in Madagascar, \textit{D. esculenta}, and three cultivars of \textit{D. alata} spp. were determined. Results indicated that \textit{D. esculenta} is characterised by higher contents in proteins (6.7 g100g\textsuperscript{-1}db), in carbohydrates (90.6 g100g\textsuperscript{-1}db) and is less fibrous (7.4 g100g\textsuperscript{-1}db) than the other varieties. Preference tests realised in a producer region, an urban community, and a rural community with 60 adults and 60 children of school age in each region showed that although consumers in the producer region and in the rural community appreciated more yam tubers than urban consumers, all consumers liked \textit{D. esculenta} best and to a lesser extend \textit{D. alata}. ovilalaina.

In the main experiment, \textit{D. esculenta} and \textit{D. alata}. ovilalaina were used to make cookies with different wheat/yam proportion of dry flour going from 100\% wheat and 0\% yam (reference) to 50\% wheat and 50 \% yam. Preference tests were realised in an urban community and a rural community. For each region, 60 adults and 60 children of school age evaluated, using a 9-point hedonic rating scale, 11 cookies (the reference, and 10 cookies incorporating respectively 10\%, 20\%, 30\%, 40\%, and 50\% of \textit{D. esculenta} or \textit{D. alata}. ovilalaina dry flour).

A three-way ANOVA showed 1) a significant cookies by origin interaction: Participants from rural community liked best cookies with up to 20\% yam flours whereas participants in urban community appreciated more cookies with 0\% yam flavour and 2) an interaction between age and origin: in rural community adults appreciated more cookies than children and inversely, children appreciated more cookies than adults in urban community. In conclusion, age and origin effects were observed in global preference of consumers: Rural consumers appreciated more yam tubers and cookies with mix wheat yam flours than urban consumers.

\textit{Keywords: Madagascar, Yam, nutrition, sensory evaluation, cookies}
Mapping the preferences of fish sauces

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Fish sauce is a traditional condiment in many Southeast Asian countries such as Vietnam, Thailand, Laos, or Cambodia. Ingredients and processing have a strong effect on the sensory characteristics and quality of fish sauces, and these characteristics influence the consumer liking and acceptance of the finished products. Fish sauces are often made from Anchovies, salt, water, and sometimes incorporate additional herbs and spices. In this study, we investigate the effect of Scombridae hydrolysate on the sensory characteristics and consumer preferences of fish sauces, in comparison with commercial products. Another goal of this study is to compare Vietnamese fish sauces and Thai fish sauces in terms of sensory and consumer liking. To explore the fish sauce consuming habit of Vietnamese consumers was also an objective of this study. Eighteen fish sauce samples, including 14 commercial products and four products produced by adding Scombridae hydrolysate (Scombridae samples) were investigated in this study. Quantitative descriptive analysis (QDA) was performed by a trained panel of 10 members to evaluate the sensory characteristics of the 18 samples, using 13 descriptors. The results showed a strong discrepancy between commercial and Scombridae samples for the sensory typical properties. Commercial products were represented by properties such as sweet aftertaste, umami, steamed fish, transparency, red colour, brown colour, black colour, salt and pungent. Meanwhile, Scombridae samples were represented by properties such as fecal odour, ammonia, saltiness, bitter aftertaste and yellow colour. To explore consumer preferences towards these products, a consumer liking test was performed by 84 consumers (age range from 20 to 60). Most of the participants often buy fish sauce for their family use. They were asked to rate their liking for each of 18 fish sauce samples on a 9-point Likert scale, with 1 representing extremely dislike and 9 representing extremely like. After finishing this task, the participants answered questions about their fish sauce consuming habit. The results showed that Vietnamese consumers did not prefer Scombridae products to the commercial products, and Thai fish sauces had low liking scores compared to Vietnamese products. A Preference mapping technique was used to highlight the sensory properties of the preferred fish sauce products in Vietnam. They were sweet aftertaste, umami, steamed fish, transparency, brown and red colour.

Keywords: fish sauce, preference mapping, Vietnam, consumer liking
Two widely used procedures for product optimization, “Just About Right” and its variant called “Ideal Profile Methodology” (IPM) are based on the assumption of the existence of a unique ideal product for a specific consumer panel. This latest method probes the ideal point by directly asking consumers to “rate their perceived intensity and their ideal or preferred intensity separately.” Previous applications of IPM seemed to support the unicity of the ideal product. However, other methods such as Preference Mapping or Landscape using consumers and trained panels, revealed the diversity of consumers’ preferences, suggesting the existence of more than one ideal point. Furthermore, in IPM, participants estimate the ideal intensity after estimating the intensity of a real sample, and therefore it is possible that the ideal estimation is influenced by the sample estimation, and this could create an anchoring effect. Therefore, this study was designed to verify the unicity and the stability of the ideal product and to examine the influence of two cognitive factors, anchoring and order effects, on the validity of IPM approach.

Two experiments were carried out using orange syrup. In the first experiment, subjects were asked to estimate the intensity of the sweetness of a diluted orange syrup (S1); and then, they were asked to estimate the ideal sweetness intensity. After a short break of five minutes, subjects were asked to do the same task on another sample with different dilution ratio of syrup (S2). In this experiment, the samples were prepared by diluting different parts by volume of orange syrup with different parts by volume of drinking water. The following ratios were used: 1: 8, 1:9 and 1:10. Two orders of presentations (S1 vs. S2 and S2 vs. S1) were combined with these three dilution ratios to create six treatment combinations. Sixty subjects were randomly assigned to one of the six experimental conditions. In the second experiment, 40 subjects rated intensity and ideal intensity of 11 sensory properties for five commercial orange syrup products. Correlation coefficients and t-tests were used to investigate whether the ideal intensity depended on the estimated intensity. ANOVA and Chi-squared were used to examine the shift of ideal point among the different ratios of dilution and between the orders of presentation. The results suggest that the ideal intensity varied with the order of presentation in the first experiment. The ideal intensity depended on the estimated intensity only in the second experiment. Furthermore, more than one ideal orange syrup product has been found.

Keywords: anchoring effect, ideal map, consumers’ estimation,