SET UP AN IDEAL MODEL BETWEEN SENSORY PROPERTIES AND CONSUMER PREFERENCES FOR SOME HERBAL TEA PRODUCTS

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TÓM TẮT

Trà dược thảo hiện nay đang được sử dụng như một loại thực phẩm chức năng để phòng và chữa bệnh. Mục tiêu của nghiên cứu này là xây dựng một mô hình trà dược thảo phù hợp với thị hiếu người tiêu dùng Việt Nam. Có hai thí nghiệm được tiến hành trong nghiên cứu này: thí nghiệm mô tả và thí nghiệm thị hiếu. Trong thí nghiệm thứ nhất, chín người thử đã qua huấn luyện gồm 8 nữ và 1 nam đánh giá mùi vị, màu sắc, hương vị và hậu vị, độ trong của sáu mẫu trà dược thảo trên một thang không cấu trúc là một đoạn thẳng dài 100 mm, với hai đầu mút "rất yếu" và "rất mạnh". Trong thí nghiệm thứ hai, 81 người thử là những người tiêu dùng bình thường tham gia đánh giá mức độ ưa thích đối với 6 mẫu trà dược thảo đó trên một thang 9 điểm có cấu trúc (với điểm 1- cực kì không thích, điểm 9 – cực kì ưa thích). Kết quả cho thấy mức độ ưa thích phụ thuộc vào độ tuổi, và các sản phẩm trà được phân lớp dựa trên các tính chất cảm quan của chúng, mà những tính chất này được ưa chuộng bởi người tiêu dùng. Phân tích hồi quy bán phần nhỏ nhất được tiến hành trên mức độ ưa thích cho phép thiết lập mô hình trà dược thảo tối ưu phù hợp với phân bố tuổi của người tiêu dùng Việt Nam.

ABSTRACT

Herbal teas, functional foods and the Vietnamese traditional drink are used for treatment or prevention diseases. Some herbal teas have typical attributes about flavours, tastes and some of them can be accepted. The aim of this research was to set up a model of some herbal teas corresponding to the Vietnamese consumer preferences. Two experiments have been carried out: the descriptive test and the preference test. In the first test, 9 trained panelists (8 females, 1 male) evaluated the flavour, colour, aroma, taste, and aftertaste, clearness properties of 6 herbal teas on a 100 mm unstructured scale with the end anchors "very weak" and "very strong". In the second experiment, 81 untrained subjects evaluated the hedonic consumer of 6 tea samples on 9-point hedonic scale (1-extremely dislike, 9-extremely like). The results showed that there were 3 consumer groups and the overall liking of consumer depended on age, the categories of products were driven by the sensory attributes, which were the preferences of certain groups of consumers. Partial Least Significant regression (PLS) analysis based on the liking to set up the optimum model of some herbal tea products according to age distribution.
These data are important in demonstrating that sensory evaluation influences business decisions and ensures product success through understanding and linking consumers and products.

Key words: functional foods, herbal tea, PLS, sensory profile

1.INTRODUCTION

Herbal tea is considered functional food existed and developed history a long time ago. Tea leaf basic material of herbal tea origined by China. The Chinese use it in 2500 B.C and next to Japanese and the others in Asia. Ancient documents call herbal teas important medicinals with its benefits. Teas proved that its useness was good for health a long time ago. The previous research about herbal tea in Vietnam was to study to produce Antipyretic tea (Luu Duan et al, 2000). The typicality degree of

herbal tea and conventional profile researched before (Nguyen Ba et al, 2003). While the precise size of the functional foods market is difficult to determine, there is general agreement that it has large potential for growth (Sloan, 2000; De Groote, 2001). Consumers more and more believe that foods contribute directly to their health (Young, 2000).

In relation to functional soft drinks, the trend in health awareness has contributed to a recent slowdown in cabonates sales, focusing consumer attention to other sectors. This means that growth opportunities over the next five years are more likely to be found in alternatives to carbonates that are perceived as healthy, including the range of functional soft drinks and water (Elvira Rashid, 2004).

This study included two experiments: the first was consumer test and the second one was the descriptive profile, a modern technique used to establish a detailed qualitative and quantitative specification of the sensory characteristics of food (Mason *et. al.*, 2002; Meilgaard *et. al.*, 1997; Jellinek, 1985; O'Mahony, 1986. In this study we determine herbal teas' sensory properties and the liking of those products as well as choice factors to select herbal tea products. Partial Least Significant regression (PLS) analysis based on the liking to set up the optimum model of some herbal tea products according to age distribution. These data are important in demonstrating that sensory evaluation influences business decisions and ensures product success through understanding and linking consumers and products

2. MATERIAL AND METHODS

2.1.Experiment design

The main objective of the study was to investigate the relative of sensory properties and liking in a complex food product. The study was to conduct in two tests: consumer test and descriptive test. Descriptive analysis gives a "perceptual map"of the samples sensory character and showed the intensities of samples. The consumer test was used to determine the habit of consumer and their liking.

2.2. Descriptive test

2.2.1 Herbal tea samples

Sample of 6 different teas are Tranquillize tea Seaweed tea Diet Tea Lotus tea Health tea corn tea chosen from two categories frequently used in the Vietnam retail market: bag tea and instant tea. All teas were preserved and prepared followed the TCVN 1456-74.

2.2.2. Subjects

Sensory analysis was carried out by a panel of nine assessors, eight males and one female, aged from 22-26, selected and recruited from Hochiminh University of Technology, Vietnam, according to International Standards (ISO, 1993)

2.2.3. Descriptors

A vocabulary of nineteen descriptors used for descriptive test, including: 2 colours , 10 flavours, 6 tastes and aftertaste and 1 texture state. Consensus was reached as to the exact meaning of each descriptor and each was defined during in 6 weeks. The descriptive analysis was carried out in 6 weeks with three times a week, 2 hour per time. The random presentation was balanced to account for first order and carryover effects (MacFie, Bratchell, Greenhoff &Vallis, 1989). An interstimulus interval of 2 min was used between the samples to reduce carryover.

Panelists receive a sample volume of 30ml at 60-70^{0}C in a cup of glass coded with randomly selected three-digit codes. Each assessor was provided with pure drinking water and instructed to clean their mouth between tastings. All assessors were provided with a list of defined descriptors during the assessment. Herbal teas were scored for descriptive descriptors on unstructured 100mm line scales with extremes for each descriptor. The intensity of each descriptor was ticked on scale line in paper answer. All tests were carried out in Sensory lab, Department of Food Technology, Faculty of Chemical Engineering, Hochiminh City University of Technology, Vietnam.

2.3. Consumer test

2.3.1. Herbal tea samples

In this study, we use the same samples in descriptive test. The sample volume served to

the assessors was 30 ml were served at room temperature (20-25^{0}C).

2.3.2. Subjects

The consumers were recruited from the local community and were selected according to the following criteria: career such student, lecturer, sale retailer, employee, household...).at Sensory lab Department of Food Technology Faculty of Chemical Engineering Hochiminh city University of Technology (HCMUT). A panel of 81 consumers (55 males and 26 females) from 18 to 76 ages) was presented with six coded samples of 30 ml. In this test, consumer will answer some questions about the habit, familiarity, frequency of using products and the herbal teas were evaluated for overall liking on a 9-point hedonic scale anchored with "like extremely" and "dislike extremely" either end and with a neutral point of "neither like nor dislike" in the middle as well as the liking about herbal tea products' attributes (flavour, taste, colour, appearance...). No more information concerning the products or the experiment was given. Serving order within each session was random.

2.4. Data analysis

The results were analyzed by Analysis of variance – ANOVA - (using SAS 8.1 for Windows) in order to determine whether originality of herbal teas had significant effects on herbal tea profile and herbal tea preference. The ANOVA model was $S_9*A_3*B_6*C_{19}$ (S: subject factor; A: replication factor; B: product factor; C: attribute factor). The *t-student* had been used to determine the difference of one attribute among the studied products. The means of the intensity of each attribute and each type of herbal tea were gathered a matrix T (m, n), where m is the number of product (m = 6) and n is the number of attribute (n = 19), was analyzed by **P**rincipal **C**omponents **A**nalysis (PCA) and **H**ierarchical **C**lassification **A**nalysis (HCA) in order to specify the correlation among sensory properties and the correlation among these products. The **P**artial **L**east **S**quares Regression (PLS) had been used to figure out the relation between the descriptive data and the preference scores of consumers. All analyses were performed by SAS® version 8.1 and SPAD® version 4.5.

3. RESULTS AND DISCUSSION

3.1. Descriptive test

The results showed that in each herbal tea product had a typical attribute making the difference between products. Liquorice flavor had strong intensity in tranquillize tea and health tea. Corn flavor had strong intensity in corn tea (5.84). Seaweed flavor did in seaweed tea (4.91). Black tea flavor in Diet tea and lotus tea. ANOVA analysis showed that there are significant differences between attributes of

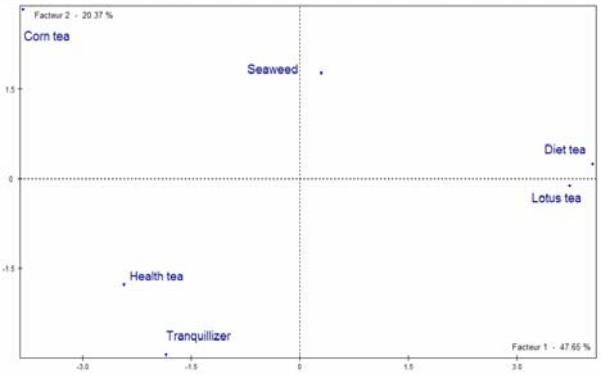

Fig 1. PCA-product mapping dimensions 1 and 2

herbal teas ($F_{6,35}$=6.2, $p<0.05$).

T-student showed that there is a significant difference of the intensity of yellow color between seaweed tea and diet tea ($p<0.05$); corn tea ($p<0.05$) between heath tea and diet tea ($p<0,05$); corn tea ($p<0,05$). The results showed the sweetness of Tranquillize tea ***(3.26)*** and health tea (4.62) is stronger than the others because of liquorice ingredient; the sweetness of corn tea ***(4.78)***, the one of corn and sugar-cane is stronger than that of seaweed tea, lotus tea (p<0.05).The difference of sweetness is liquorce in tranquillize tea and health tea as well as corn and sugar-cane. While lotus tea and diet tea have strong intensity of attributes such as: astringent, bitterness, black tea flavor (Fig. 1 & Fig 2). Bitterness and astringent taste are closed to lotus tea and diet tea because of some Chinese and Vietnamese medicinal ingredients (ginseng, cassiatora Linn, campanula....).Sensory profiles showed some herbal teas' taste attributes are closed to traditional tea (Nguyen Ba et al, 2003) proved that some herbal ingredient are filled up.

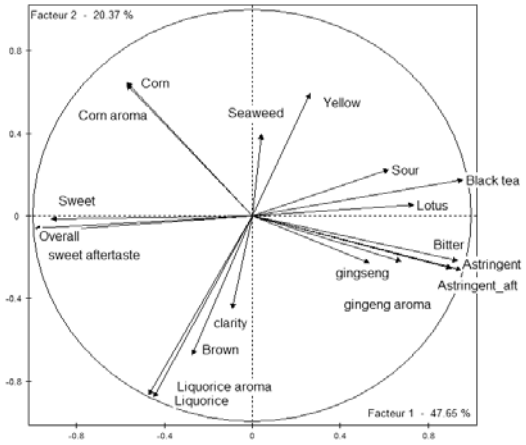

Fig 2.Correlation between herbal teas' attributeson PCA1 and PCA2

3.2. Consumer testing

3.2.1.Classification of consumers

The result we received consumers' habit and opinions, including **68%** male and **32**% female with three age group: 18-24, 25-51, and 52-76. HCA analysis showed 3 consumer groups: Group A (under 25 yrs (71%), 29% 25-51 yrs), group F(58% 25-51 yrs, 40% under 25 yrs) and 21% above 52 yrs) and group E (52% under 25 yrs, 38% 25-51 yrs and 10% above 52 yrs).

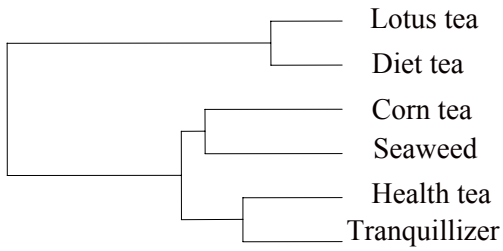

Fig 3. Classification of herbal teas

ANOVA analysis showed there was significant difference between six products $F_{5,\ 485}$=5.46, $p<0.0001$. T-student showed the significant difference between pairs (p<0.05). The liking of 3 group products were significant difference, $F_{2,15}$=11.86, p<0.001 and t-student analysis are significant between pairs of consumer group (p<0.05). The liking of group A is stronger than group E. The result (fig.4) showed there were the interfere between consumer groups: diet tea, lotus tea between group A and F; health tea between group E and F. Generally, there was a highest oscillation the liking in group 4 (~ 4), next to group E (~2) and group F(~1)

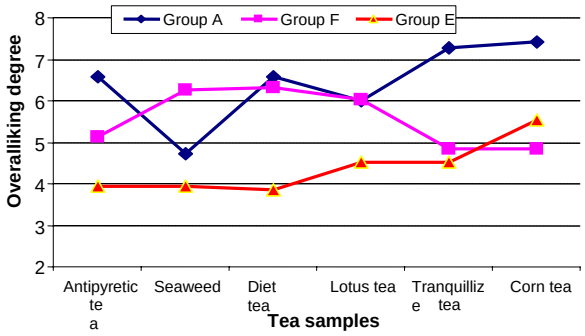

Fig 4. The liking of six herbal teas

3.2.2.Consumer habits on drinking teas

☯ **Frequency to drink**

The result showed that, group A' frequency is similar to group F's and decrease from "at least one time/week" to "occasionally". There was a balance frequency to drink: "3-4 times/week", "less than 2 times/week" and" occasionally" (Fig 5).

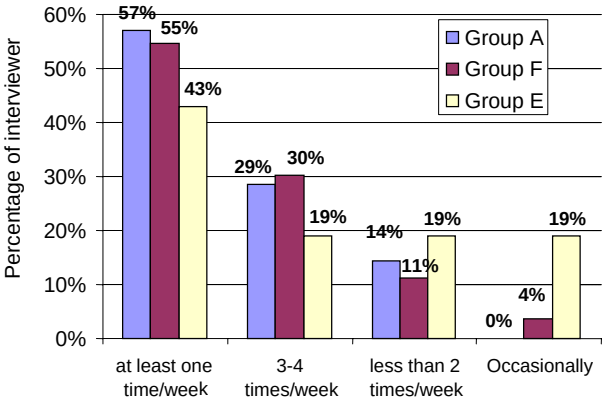

Fig. 5. Distribution of frequency

The result also showed that most of consumers often drink teas in the morning, the evening at home or in office and the ratio of using herbal tea is equal to others, especially, above 25 years old in three group and 70% of consumers drinks herbal teas and green teas. This is logical because some herbal teas are recommended to use everyday such as herbal tea. This result proved that the age effect to consumer's habit to drink herbal teas. Although the result showed

there was strong correlation between "interest degree" and "benefit to health" (R=0.75).

The result showed that the most interested factor to select herbal tea was "health", next to "sensory appeal", "trademarks"," familiarity" and " convenience"(fig.6).

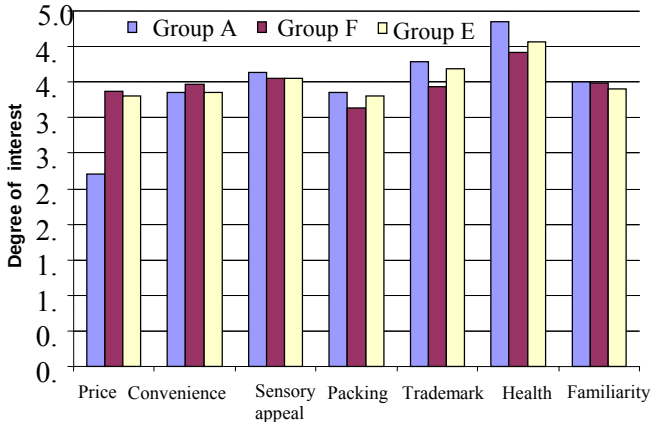

Fig. 6. The interested degree of factors

T-test showed that there was the significant difference between "health" and the others ($p<0.001$). This result similar to functional foods' research Brian Wansink (2001), Liisa Lähteenmäki, Nina Uraila (2003). Especially, the consumer interested the factor "trademark", it means the original of products (J.Prescott, O.Yong,L.O'Nell, N.J.N.Yau, R Stevens, (2002)

3.2.3. Partial least squares regression of descriptive and liking data

Partial **L**east **S**quares Regression was used to investigate which of herbal tea sensory characteristics were responsible for liking in each group (A,E,F) by relating the descriptive profile to consumers responses, 2000) to determine the optimal in three group A, E, F. On examination of the consumers' group A PLS result (Fig 7), it was apparent that their liking was most strongly influenced by the typical flavor level of the herbal teas, which is reflected in the negative B-coefficients of the "color" attributes. The lotus flavor"," ginseng flavor" attributes were positively correlated with increased liking.

The PLS model for the consumers in group F showed difference with the consumers in group A in that they disliked the higher levels of color, astringent taste, aftertaste (Fig.7). However, color had more of influence on liking in this group than in group A. In addition this group showed a stronger negative relation between astringent, bitter, color and liking suggestions that they placed decreased emphasis on the mouth feel characteristics of herbal teas.

The PLS model for the consumer group E showed similarity with group A in that they liked the higher levels of ginseng flavor, typical flavor, sweet taste, sweet aftertaste in herbal teas (fig 5) and group F in that they disliked the higher levels of color, astringent taste, bitter taste, astringent aftertaste. Especially, they differed from the other groups in strong dislike clarity.

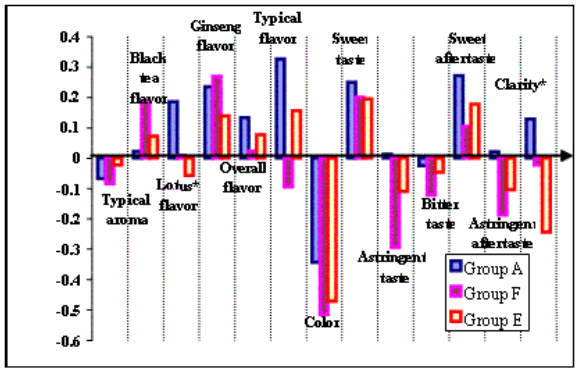

Fig.7. Partial least squares regression of descriptive profiling data and the liking scores for three group A, E, F

Previous research showed that the typicality of a product could relate closely to the familiarity of product (Nguyen Ba et al, 2003) and the role of hedonic dimensions (Phan Thuy et al, 2004). This result was confirmed the relation between the sensory properties of herbal teas and consumers and a strong correlation between the liking and the liking of flavor and taste, that has similarity to the research on coffee (Nguyen Hoang et al, 2003). The relationships seen in each of the PLS models could have been strengthened by having larger numbers of assessors in each group.

4. CONCLUSION

This study highlighted that there were the effects of age, career and frequency to drink tea to the consumers' liking. The liking had strong correlation with the liking of taste and flavor (R>0.7). This explains the taste and the flavor in drinks play important role in those products' consumer preferences. The old often drink and interests in herbal teas, called functional foods, that are useful for the heath. In addition, "health" is the most interested factor in selecting herbal teas and the factor" trademark" is interested proved that the consumer always want to know the "origin" of herbal products.

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