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Effect of Information and Sensory Property of Honey on Consumer Acceptance and Their Physical Properties

By

Miss. Phornpatsorn Shiu

ID 5716867

A Special Project Submitted to the Biotechnology of Biotechnology.

Assumption University in Part of Fulfillment of the Requirement for the

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By : Phornpatsorn Shiu

Advisor : Dr. Aussama Soontrunnarudrungsri

Level of study : Bachelor Degree

Department : Food Technology

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(Dr. Aussama Soontrunnarudrungsri)

Advisor

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Phornpatsorn Shiu
2017

ABSTRACT

Honey is a thick and golden color liquid which is produces by bees. Honey is made by nectar of flower also saved in the beehive[1]. Honey can provide sweetness to food products this is a reason why many foods use honeys as a major or main ingredient. Also, nowadays a lot of people they consider health more than the part and they know that honey provide several benefits to human body such as potassium, chlorine sulfur[2]. They also know that honey is a type of natural medicines which can improve human's immune system because honey contain antioxidant. This study aims to study effect of information on consumer's acceptance towards different types of honey together with study the physical properties of them.

There were 6 honey samples included Lychee Honey, Forest Honey, Sunflower Honey, Stringless Honey, Apris Cerana and Longan Honey tested by 70 consumers. The consumers were asked to taste all 6 samples with and without information given then gave liking score based on their preference and opinion on each honey together with the acceptance test, consumer also responded to the food related psychographic scales including Food Neophobia Scale (FNS) and Health and Tasted Attitude Scale (HTAS). According to the consumer's responses, it was found that consumer gave significantly higher liking score of Sunflower Honey in floral and overall liking whereas Longan Honey in color, aroma and overall liking. The consumer who participated in this study were considered as Food Neophobia consumers and likely to pay attention to taste of food in term of "Carving for Sweet''. In the second part, 27 samples had been measured the L*, a* and b*. It was showed that Sunflower Honey-Saard Bee Fram was the significate one. After that, use data from L*, a* and b* Logan Honey from Chitralada to compared with another 5 different types of honey allow to find out $\Delta E^{*}ab$. As a result, showed that 6 different types of honey had a value more than Δ 2.3.

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INTRODUCTION

Honey is a thick, sweet and contains high viscosity which make form bees and some insects. Also, honey consider as the oldest sweetening, the main composes of honey are fructose, glucose and water[3]. Also, honey contain many of minerals such as potassium, chlorine sulfur. The color and flavor of honey are depending on the nectar also the place of honey bees buzzed[4].

According to Honey Market Trend in the USA the total consumption in the USA has been reached in 574.1 million pounds in 2016[5]. Then, for the European countries honey's imports rose up more than 339000 tones between 2011 and 2015[6]. According to Index Box, Marketing and Consulting, China is the top country consuming a lot of honey in 2015 and which showed 344 thousand tons in a year[7]. Honey has several benefits to human body such as prevent cancer, heart disease and honey contains anti- bacterial, anti- fungal also honey can reduce a cough and throat irritation[8]. Nowadays, different types and brands of honey have been laughed in the markets and sell to consumers. Also, this is a good opportunity to some companies to establish honey's brand. Information of product and brand name which effect on consumers such as behavior and pushing because the brand, information of the product have built up a strong relationship with their consumers also the relationship which establish base on experience[9]. Next, some brands want to have more sales volume, so they set up a good image to public allow to increase their sale profits. In addition, some consumers think that brand name and quality are related.

On the other hand, sensory property is an important role in food selection. For sensory property can separate as 4 parts which are smell, sound, appearance and texture[10]. Sensory properties not an important role for consumers to choose the products also as a main characteristic drive consumers consumption and repeat purchase.

Therefore, this research aims to study the effect of honey information on consumer acceptance on different types of honey by testing consumers tasting, physical properties and measure 28 different types of honey that have been laughed in the Thai markets. Lastly, our aim was also to compare the result between provide honey information and without provide any honey information.

AIM

1.To study the effect of information on consumer acceptance of different types of honey

OBJECTIVES

1.To study honey's information effect consumer's acceptance or not

2.To determine physical properties of different types of honey in Thai markets

LITERATURE REVIEW

Honey is a natural sweet food which produce by bees some related insects. Mostly honey contains yellow golden color and high viscosity. Also, honey contains around 70 percentage of sugar such as glucose and fructose and not more than 20 percentage of water. The process of bees to produce honey is when bees retuned to the hive and they will pass some nectar to another bee by regurgitation the liquid into the other bee's mouth. They will repeat this regurgitation process until the nectar in the honeycomb. In the honeycomb the nectar still is a liquid form, but bees will set to working as a fanning near the honeycomb, they use they wings as a fan and an effort to speed up allow to evaporate extra water in the honeycomb[11]. Honeys can produce from different types of bees such as Logan Honey, Stringless Honey and Apis Cerana Honey. Logan Honey is a honey which produce from Logan flowers. This honey also called as ''Spring Honey'' because this honey is very common in the Springtime. [12]This honey contains brown color and sweeter than Lychee Honey. Stringless Bee mostly keep by human purpose of produce and store honey[13]. The difference of this honey with another honey is this honey contains the darker color and sour taste than other honey. Apis Cerana Honey is produced by Apis Cerana Bees and mostly can found them in Southern part Asian, but this type of honey contains danker color than another honey but not darker than Stringless Honey.

There are several health benefits of consumer honey. According to research of Traditional and Modern Uses of Natural Honey in Human Diseases had been showed that honey can reduce the duration of diarrhea. Also, this study showed that some honey had ability to block some actions of pathogens that cause diarrhea[12]. Second, there had a study about honey can fight infections. In 2010, in the European Journal of Clinical Microbiology & Inflection Diseases showed that honey has an ability to kill a protein which call defesin-1 and they showed that honey can prevent bacteria (Clostridium *difficile*) to set the body[13]. Nevertheless, in the research of Honey, Propolis and Royal Jelly: A Comprehensive Review of Their Biological Actions and Health Benefits honey is a good source to reduce acid reflux and some foods that unable to digested by lining between esophagus and stomach[14].

Honey does not need any preservation because honey contains high percentage of sugar which means low water available for microbiology to use and high sugar content to inhibit fermentation process. Honey can keep in room temperature and long time because honey is a food that contents unique composition and chemical properties. However, if honey exposes to the air which can cause honey spoil because sugar in honey can pull moisture from the air.

Nowadays, most of the consumers have higher expectation of products including foods. They expect foods have a high quality and suitable price. However, information of product which can affect consumers acceptance and purchasing. There have a lot of products sale in markets the best way for company to communicate with their consumers are packaging and advertising. Those of them can give information of their products to consumers and promote their products to pull consumers to buy. Also, information of products can make consumers change their mind and accept the new type of products that never been sale in markets.

Not only information of products can make consumers to change their mind and behavior. Brand can be a main factor to effect consumers buying decision. Brand not only a symbolic it means a deep feeling relationship between company and consumer. On the other hand, the symbolic as a role of communication in social medium and social interaction. In addition, experience, social, income, education and life style are factors make consumers acceptance and change their behavior.

Food Neophobia Scale

Food Neophobia is a scale or a measurement to measure that person can accept or eat some unfamiliar foods or not. Because naturally occur when human want to protect themselves from the risk to consume some harmful food. So, this scale is an important determinant of food choice and have a big impact on the quality of diet. Food Neophobia which call FNS, developed by Pliner and Hobden in 1992[15].

There are several factors make results different or make people accept new type of foods or not. For example, culture, lifestyle, gender, education, economic and age. Also, there are three types of Food Neophobia which are neophilic, natural and neophobic. The group of people who is in neophilic's group which tend to accept some new type of foods, whereas the group of people who is neophobic which hardly or cannot accept some unfamiliar foods.

Nowadays, FNS has been widely to use because this is an important scale makes researcher to know people that involved in their study is afraid to accept the new type of foods or not and provide reliable results. Researcher will set up questionnaire to measure their participants which group are they and the question will be provided. After that, the researcher can calculate out the point from 1 to 7, 1 means strongly disagree while 7 means strongly agree.

Food neophobia scale	Mean	SD
1 I constantly taste new and different foods.[R]	3.53	1.53
2 I do not trust new foods.	3.14	1.56
3 I do not want to taste foods with unknown materials.	3.26	1.80
4 I prefer foods from other countries.[R]	3.33	1.71
5 I am reluctant to eat foreign foods that I see for the first time.	3.78	1.80
6 If I go to a buffet, meetings, or parties, I'll eat new foods.[R]	2.35	1.42
7 I'm afraid to eat foods that I did not eat before.	2.98	1.70
8 I am very picky about the food I eat.	3.63	1.80
9 I eat whatever is good.[R]	3.44	1.90
10 I like to go new foreign food restaurants.[R]	3.51	1.78
Total	32.96	10.13

Figure 1 an example of Food Neophobia Scale

In American, the American Dietetic Association done about Food Neophobia in Childhood Affects Dietary Varity. They used Food Neophobia Scales and Health Eating Index score to test children do they had a healthy diet or not. Also, they classified children based on the Food Neophobia Scale. For the experiment design was randomly to give children dietary at 3 days and analyzed the data allow to obtain Health Eating Index scores.

Health and Taste Attitude Scales

Health and Taste Attitude Scales developed by Roininen, Lähteenmäki and Tuorila in 1999. This scale uses to measure the importance of health and taste aspects of foods in the food choice process. The main function by using Health and Taste Attitude Scales is measuring health and taste attitude of consumers[16].

There is different type of questions will be provided in the questionnaire which can divide as General Health Interest, Light Product Interest, Natural Product Interest, Craving for Sweet Foods, Using Food as Reward and Pleasure. After that, consumers will base on their mind and opinion to choose the answer which close to them.

This scales which included total six subscales, three subscales about health-related and another three subscales referred to taste of foods. Also, for the health scale part which consisted three subscales such as general health interest, light product interest and natural product interest. Moreover, for the taste part which separate as caving for sweet foods, using food as a reward and pleasure. When the researcher got answers from consumers they base on each statement to calculate the answers from 1 to 7 points, 1 means strongly disagree and 6 means strongly agree.

Since 1999 to present, Health and Taste Attitude scales is using because the results from this scale is so useful in segmenting consumers which group are they.

Table 1 Table 1 Questions of Health and Taste Attitude Scale

Category 1: General Health Interest - I am very particular about the healthiness of food. - I do not avoid any foods, even I know they may rise my cholesterol[R].
Category 2: Light Product Interest - I believe that eating light product can control my cholesterol. - I do not light product is healthier than conventional food[R].
Category 3: Natural product Interest - I do not consume any processed foods. - I do not care how much additives in my daily diet[R].
Category 4: Craving foe Sweet Foods - When I order drinks, I will order "less sugar". - In my opinion, it is strange that some people have caving for ice-cream[R].
Category 5: Using Food as Reward - I do not believe food is a source of pleasure. - I reward myself by buying something really tasty[R].
Category 6: Pleasure - I do not believe food is a source of pleasure. - An essentials part of my weekend is eating delicious food[R].

In study of Health and taste attitudes in the prediction of use frequency and choice between less healthy and more healthy snacks. In this part which had 144 people involved from 15 to 60 years, they need to fill out the health and taste attitudes questions. After that, they need to choose apple or chocolate bar as a reward for they participation this study, but these choices had been recorded. Finally, they collected the data from questionnaire and compared the results of snacks that consumers choose, found out consumers who joined this study was very consider health but most of them chose chocolate bar.

Related Research

In a study Impact of Brand on Consumer Behavior, this research which conducted in Slovak University of Technology in Bratislava, Faculty of Materials Science and Technology in Trnava. This study is about the impact of the brand on influencing consumers to buy a product. They got results from questionnaire and analysis the data that they got. As a result, showed that 52% of people think the brand affect their choice by purchasing a product and a service. They also pointed out brand is a main factor impact consumer decision making process and brand provides information about products which affect the mind of consumers[17].

In a research of Color Identification of Honey and Methodical Development of its Instrumental Measuring. This study was conducted in Szent Istvan University, Faculty of Agricultural and Environmental Sciences. They study about color of honey because color is the one of important sensory traits for consumers. They selected 21 type of honeys which from different plant origin, most of the sample form Hungary but some from other countries. Firstly, they analyzed the samples by using Lovibond instrument. After that, they measured color by using Minolta Chromameter CR 410. Finally, they got three of four acacia honeys belonged to the brightest and had the highest number of L^* with white background. However, if honey had higher value in a^* which falls to meet Lovibond categories[18].

The last one research is Use of Rheometric Instrument for Analysis of Pure Honey and Jaggery Mixture. This study was conducted in HNB Garhwal University in India and the research aims to measure rheological behavior of the pure honey with different percentage of Jaggery. PAR PHYSICA MCR Rheometer was used in this study and results that they got was all samples showed Newtonian fluid behavior and for refractive index of honey with increase in Jaggery solution mix it. Also, this study can be useful in honey shelf-life prediction. In addition, materials that they used were 5%, 10%, 15% and 20% of jaggery solution to pure honey and all samples were tested in room temperature 27°C [19].

METHODOLOGY

Materials:

1. Lychee Honey -TPA
2. Longan Honey- Chitralada
3. Macadmia Honey- Doi Tung
4. Sesame Honey- Supha Bee Farm
5. Forest Honey- KMUTT
6. Longan Honey -Doi Kham
7. Lychee Honey- KMUTT
8. West Region – Cobbie Brown
9. Wild Flower Honey- Ambrosia
10. South Region- No Brand
11. Sunflower Honey – Sa-ard Bee Fram
12. Apis Florea – KMUTT
13. Wild Flower Honey- Fora Bee
14. Sesame Honey – TPA
15. East Region – Arun
16. Coffee Honey- Fora Honey
17. Apis Cerana – KMUTT
18. Middle Region- Sa-ard Bee Fram
19. Forest Honey – Healthy Mate
20. Stringless Bee – KMUTT
21. Sunflower – Good. B
22. Coffee Honey -Fifth Month Honey
23. North Region – Fifth Month Honey
24. Longan honey – Chumchon
25. North East Region – OTOP Gallery Ploenchit
26. 7:3 (glucose; Sunflower Honey – Sa-ard Bee Farm)
27. 6:4(glucose; Sunflower Honey – Sa-ard Bee Farm)
28. HunterLab MiniScan EZ 4500L Spectrophotometer -Hunter Associates Laboratory
29. SAS program (version 9.4) (Copyright © [2017] SAS Institute Inc., Cary, NC, USA.)
30. Microsoft Excel

Methods:

1. To study honey's information effect consumer's acceptance or not

1.1 Samples

Table 2 the samples used in consumer testing

Honey/ Types of flora/ Bee	Brand	Origin place
Lychee Honey	TPA	Lambhun/Chiangmai
Forest Honey	King Mongkut's University of Technology Thonburi	Unknown
Sunflower Honey	Good.B	Lopburi
Stingless Honey	King Mongkut's University of Technology Thonburi	The Eastern part of Thailand
Apis Cerana	King Mongkut's University of Technology Thonburi	Unknown
Longan Honey	Royal Project / Chitralada	The North part of Thailand

1.2 Reasons to use 6 different type of honey samples

The given table number 2 shows the samples that used in consumer testing and there are several reasons to use these honeys. The first reason to use these honeys is this project cooperated with King Mongkut's University of Technology Thonburi. Then, brand of TPA, Good B and Chitralada which the brand familiar with Thai consumers. Second, the honeys form the King Mongkut's University of Technology Thonburi which are not familiar and hardly to find in Thai markets. So, need to find honey that Thai consumers familiar with and the brand they mostly known, for example Chitralada Honey allow to compare the results.

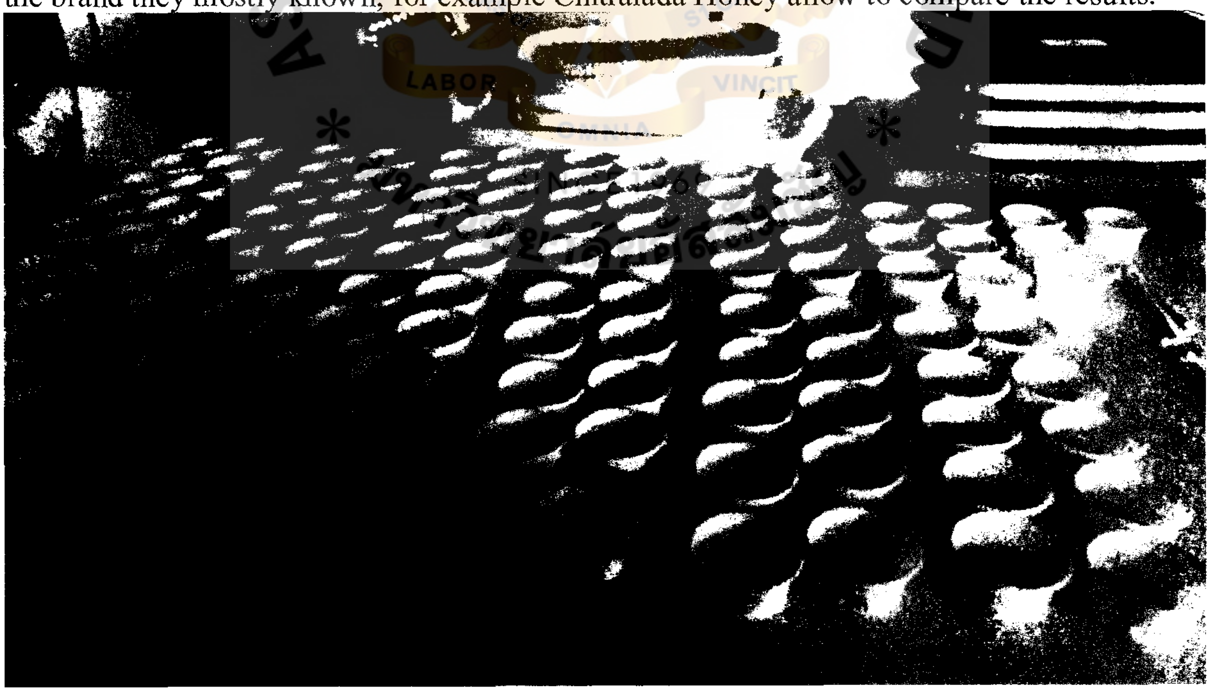

Figure 2 prepared samples

1.3 Sensory Test

All samples had been showed up as 3 digits codes and the samples would be set base on William's Design. A questionnaire will be given to consumers and the questions would be asked about sensory property such as color, aroma, sweet, sour, bitter, floral and overall liking. Consumers need to fill out the questionnaire and give the score (9-point Hedonic Scale). In addition, the questionnaire including consumer behavior, Food Neophobia Scale, Food Health and Taste Attitude Scales and Demographic. After that all 6 samples will be provided to consumers, consumers need to taste them allow to give score. Then, researcher collect the set A questionnaire, provide same samples with different order (base on William's Design) and information of honey such as, sample number, brand, origin place, sensory property, benefits and types of flora to consumers to taste and give the score again.

Data will be collected allow to enter the data into excel. The data will be analyzed with same selection for example color's score without provided information of honey and color's score with provide information of honey. Finally, enter the raw data into the SAS program (version 9.4) (Copyright © [2017] SAS Institute Inc., Cary, NC, USA.) by using pair- t test to allow to compare the different of before and after.

1.4 Statistical Analysis

Analysis of variance was applied to determine the differences of liking score among all honey samples. Pair comparison t-test was applied to indicate the difference of liking score between blind and informed session. SAS program (version 9.4) was used for all statistical analysis in this study.

2. To determine physical properties of different types of honey in Thai markets

1.1 Samples

Table 3samples used to measure lightness of honeys

Honey	Brand
1. Lychee Honey	TPA
2. Longan Honey	Chitralada
3. Macadmia Honey	Doi Tung
4. Sesame Honey	Supha Bee Farm
5. Forest Honey	KMUTT
6. Longan Honey	Doi Kham
7. Lychee Honey	KMUTT
8. West Region	Cobbie Brown
9. Wild Flower Honey	Ambrosia
10. South Region	No Brand
11. Sunflower Honey	Sa-ard Bee Fram
12. Apis Florea	KMUTT
13. Wild Flower Honey	Fora Bee
14. Sesame Honey	TPA
15. East Region	Arun
16. Coffee Honey	Fora Honey
17. Apis Cerana	KMUTT
18. Middle Region	Sa-ard Bee Fram
19. Forest Honey	Healthy Mate
20. Stringless Bee	KMUTT
21. Sunflower	Good. B
22. Coffee Honey	Fifth Month Honey
23. North Region	Fifth Month Honey
24. Longan honey	Chumchon
25. North East Region	OTOP Gallery Ploenchit
26. 7:3 (glucose; Sunflower Honey)	Sa-ard Bee Farm
27. 6:4(glucose; Sunflower Honey)	Sa-ard Bee Farm

1.2 Color measurement

The given table number 3 is showing samples use to measure color. Firstly, opened and connected HunterLab MiniScan EZ 4500L Spectrophotometer with computer and standardize by using back port and white port. Put rubber into the Hunterlab cup, pull honey in to the cup, cover with white lid and cover with black lid finally. Each sample will be measure as five times and records the data into the Excel. For the port used to measure color of honey used the biggest size, the size of the port is 5mm. The reason to use 5mm to measure the lightness of color because honey is a liquid form substance and used the biggest port to measure allow to get the whole area of honey. Before starting to measure the lightness of color should avoid bubbles since the bubbles can reflect the lightness source which from the machine.
Analysis of variance was applied to determine the differences between L*, a*, and b* of all samples at 95% confidence level.

Color data of five samples of honey including Lychee Honey-TPA, Forest Honey KMUTT, Sunflower Honey-Good B, Stingless Bee Honey-KMUTT, and Apris Cerana Honey – KMUTT were compared with color data of Longan Honey from Chitrada in order to obtain **ΔE.**

Figure 3 measure lightness of honey

RESULTS AND DISCUSSION

Nature of the consumer participated in the study is the group who does not want to try new type of food product and table number 4 shows 82% of consumers.

Type of Food Neophobia:

The results from Food Neophobia Scale which divide in 3 different group, Neophilic, Neutral and Neophobic. Based on data collect from questionnaire most of the consumer in Neophobic means 82% of consumers did not want to try new things or foods. Also, 90.38% of consumers who is female does not want to accept new product. However, most of males are the group of Neutral and Neopphilic, shows 33.33% and 13.33% respectively

Table 4 results of Food Neophobia Scales (Overall)

		Number of Consumers in (percentage)		
Number of consumer	$\bar{x} \pm$ S.D	**Neophilic (<25)**	**Neutral (25-35)**	**Neophobic (>35)**
Overall (70)	43.10 ± 10.95	6	12	**82**
Male (15)	42.86 ± 8.27	13.33	33.33	53.33
Female (55)	43.17 ± 11.68	3.84	5.76	90.38

Health and Taste Attitude Scale (HTAS) – Overall:
According table number 5 shows the results of overall HTAS, consumers who joined this study pay attention in taste more than health. So, the results from ANOVA showed Craving for Sweet Foods was the most significant one ($P \leq 0.05$).

Table 5 results of Health and Tate Attitude Scale (Overall)

Statements	Subscales	$\bar{x} \pm$ S.D
Health -related statement	General health interest	4.19 ± 0.43^{bc}
	Light product interest	3.60 ± 0.59^{ab}
	Natural product interest	3.81 ± 0.55^{cd}
Taste-related statement	Craving for Sweet Foods	4.94 ± 1.12^{a}
	Using Food as Reward	3.49 ± 1.00^{d}
	Pleasure	3.60 ± 0.59^{cd}

Health and Taste Attitude Scales -Gender:

Table number 6 shows only result of HTAS of male group, based on results of ANOVA most of male that consider taste more than health but some of them consider health. Craving for Sweet Foods is the most significant and shows 5.00 ± 1.19 whereas light product interest and general health interest also shows significant different, 4.70 ± 0.66 and 4.34 ± 0.31 respectively ($t \leq 0.05$).

Table 6 results of Health and Taste Attitude Scale for male

Gender	Statements	Subscales	$\bar{x} \pm$ S.D
Male	Health -related statement	General health interest	4.34 ± 0.31^{abc}
		Light product interest	4.70 ± 0.66^{ab}
		Natural product interest	3.88 ± 0.64^{bc}
	Taste-related statement	Craving for Sweet Foods	5.00 ± 1.19^{a}
		Using Food as Reward	3.33 ± 1.23^{c}
		Pleasure	3.73 ± 0.58^{bc}

As a result of table number 7 shows result of HTAS in female group which shows that half of female pay attention in health while the half of female consider taste more than health. However, mean from raw data and ANOVA showed most of the female they put taste as the first consider and health as the second one, 4.90 ± 1.13 and 4.66 ± 0.59 respectively ($t \leq 0.05$).

Table 7 results of Health and Taste Attitude Scales for female

Gender	Statements	Subscales	$\bar{x} \pm$ S.D
Female	Health -related statement	General health interest	4.15 ± 0.37^{ab}
		Light product interest	4.66 ± 0.59^{a}
		Natural product interest	3.82 ± 0.53^{b}
	Taste-related statement	Craving for Sweet Foods	4.90 ± 1.13^{a}
		Using Food as Reward	3.54 ± 0.93^{b}
		Pleasure	3.56 ± 0.59^{b}

Results of consumer testing

The following is results of 6 samples that used in consumer testing, only 2 samples showed significantly different which were Logan Honey and Sunflower Honey ($t \leq 0.05$) whereas another sample showed non-significant ($t \geq 0.05$).

Table 8 blind and informed liking score of honey samples (all samples)

	Longan Honey - Chitralada		Sunflower Honey - Good B.		Lychee Honey- TPA		Forest Honey - King Mongkut's University of Technology Thonburi		Stingless Honey - King Mongkut's University of Technology Thonburi		Apis Cerana - King Mongkut's University of Technology Thonburi	
	Blind	Informed	Blind	Informed	Blind	Informed	Blind	Informed	Blind	Informed	Blind	Informed
Color	$6.9 \pm 1.7^{*}$	$7.5 \pm 1.2^{*}$	6.8 ± 1.8	7.2 ± 1.5	7.3 ± 1.6	7.5 ± 1.2	5.9 ± 1.8	5.7 ± 2.1	3.8 ± 2.2	4.0 ± 2.3	5.4 ± 2.1	5.8 ± 2.0
Aroma	$6.3 \pm 1.6^{*}$	$7.0 \pm 1.6^{*}$	6.2 ± 1.9	6.7 ± 1.8	6.4 ± 1.7	6.4 ± 1.8	5.3 ± 2.1	4.8 ± 2.3	4.2 ± 2.1	4.4 ± 2.2	5.7 ± 1.8	5.7 ± 2.0
Sweet	6.9 ± 1.5	7.4 ± 1.3	6.9 ± 1.8	7.2 ± 1.5	6.6 ± 1.9	7.0 ± 1.6	4.7 ± 2.5	4.4 ± 2.4	4.0 ± 2.4	4.1 ± 2.4	6.1 ± 2.2	6.2 ± 2.0
Sour	6.2 ± 1.9	6.5 ± 1.8	6.0 ± 2.1	6.3 ± 1.8	5.9 ± 2.1	6.3 ± 1.8	4.5 ± 2.5	4.4 ± 2.1	4.1 ± 2.5	4.2 ± 2.5	5.9 ± 1.9	5.8 ± 1.9
Bitter	5.8 ± 2.3	6.2 ± 1.9	6.0 ± 2.2	6.5 ± 2.0	5.8 ± 1.9	6.0 ± 2.0	4.0 ± 2.4	4.0 ± 2.2	4.1 ± 2.5	4.6 ± 2.3	5.6 ± 2.4	5.6 ± 2.1
Floral	6.6 ± 1.9	7.1 ± 1.5	$6.6 \pm 2.1^{*}$	$7.2 \pm 1.6^{*}$	6.1 ± 2.1	6.4 ± 1.9	4.6 ± 2.5	4.8 ± 2.3	4.4 ± 2.5	4.5 ± 2.3	6.1 ± 1.9	6.1 ± 1.9
Overall liking	$7.0 \pm 1.6^{*}$	$7.6 \pm 1.3^{*}$	$6.9 \pm 1.8^{*}$	$7.4 \pm 1.4^{*}$	6.7 ± 1.9	6.9 ± 1.4	4.7 ± 2.4	4.8 ± 2.3	4.5 ± 2.3	4.3 ± 2.3	6.5 ± 1.7	6.3 ± 1.7

Note: * indicates there was found to be significantly different with t-value at 0.05.

The following table shows the results of consumers testing 2 different ways which are blind test and informed test. As a result, can observe that Longan Honey which significate in color and overall liking while Sunflower Honey showed significate different in floral and overall liking ($t \leq 0.05$). Closely to see the result notice that information of honey effect consumer accepts since based on means score from data informed data is higher than blind data.

Table 9 results of significate one

	Longan Honey - Chitralada		Sunflower Honey -Good B.	
	Blind	Informed	Blind	Informed
Color	$6.9 \pm 1.7^{*}$	$7.5 \pm 1.2^{*}$	6.8 ± 1.8	7.2 ± 1.5
Aroma	$6.3 \pm 1.6^{*}$	$7.0 \pm 1.6^{*}$	6.2 ± 1.9	6.7 ± 1.8
Sweet	6.9 ± 1.5	7.4 ± 1.3	6.9 ± 1.8	7.2 ± 1.5
Sour	6.2 ± 1.9	6.5 ± 1.8	6.0 ± 2.1	6.3 ± 1.8
Bitter	5.8 ± 2.3	6.2 ± 1.9	6.0 ± 2.2	6.5 ± 2.0
Floral	6.6 ± 1.9	7.1 ± 1.5	$6.6 \pm 2.1^{*}$	$7.2 \pm 1.6^{*}$
Overall liking	$7.0 \pm 1.6^{*}$	$7.6 \pm 1.3^{*}$	$6.9 \pm 1.8^{*}$	$7.4 \pm 1.4^{*}$

Note: * indicates there was found to be significantly different with t-value at 0.05.

Table 10results of consumer testing (non-significate)

Lychee Honey- TPA		Forest Honey - King Mongkut's University of Technology Thonburi		Stingless Honey - King Mongkut's University of Technology Thonburi		Apis Cerana - King Mongkut's University of Technology Thonburi	
Blind	Informed	Blind	Informed	Blind	Informed	Blind	Informed
7.3 ± 1.6	7.5 ± 1.2	5.9 ± 1.8	5.7 ± 2.1	3.8 ± 2.2	4.0 ± 2.3	5.4 ± 2.1	5.8 ± 2.0
6.4 ± 1.7	6.4 ± 1.8	5.3 ± 2.1	4.8 ± 2.3	4.2 ± 2.1	4.4 ± 2.2	5.7 ± 1.8	5.7 ± 2.0
6.6 ± 1.9	7.0 ± 1.6	4.7 ± 2.5	4.4 ± 2.4	4.0 ± 2.4	4.1 ± 2.4	6.1 ± 2.2	6.2 ± 2.0
5.9 ± 2.1	6.3 ± 1.8	4.5 ± 2.5	4.4 ± 2.1	4.1 ± 2.5	4.2 ± 2.5	5.9 ± 1.9	5.8 ± 1.9
5.8 ± 1.9	6.0 ± 2.0	4.0 ± 2.4	4.0 ± 2.2	4.1 ± 2.5	4.6 ± 2.3	5.6 ± 2.4	5.6 ± 2.1
6.1 ± 2.1	6.4 ± 1.9	4.6 ± 2.5	4.8 ± 2.3	4.4 ± 2.5	4.5 ± 2.3	6.1 ± 1.9	6.1± 1.9
6.7 ± 1.9	6.9 ± 1.4	4.7 ± 2.4	4.8 ± 2.3	4.5 ± 2.3	4.3 ± 2.3	6.5 ± 1.7	6.3 ± 1.7

Note: * indicates there was found to be significantly different with t-value at 0.05.

Results of Lightness of Honeys

The following table number 11 shows the L*, a* and b* of honey samples. It is shows that Sunflower Honey-Sa-ard Bee Fram is the most outstand honey in term of L* and b * whereas Lychee Honey- TPA shows the significant in b*. However, Stringless Bee which from KMUTT is the most darkness in all honey samples and shows the lowest value in all three items.

Table 11 lightness of honey

Honey-Brand/Source	**Lightness ± SD**	**a* ± SD**	**b* ± SD**
Sunflower Honey-Sa-ard Bee Fram	61.42 ± 10.10^{a}	31.01 ± 1.71^{ab}	103.91 ± 15.57^{a}
Lychee Honey- TPA	58.27 ± 3.23^{ab}	35.71 ± 4.11^{a}	98.48 ± 4.41^{a}
Coffee Honey- Fifth Month Honey	54.47 ± 0.54^{abc}	5.95 ± 0.93^{mn}	55.40 ± 2.05^{bcde}
Sunflower Honey- Good B.	54.34 ± 0.56^{abc}	5.65 ± 2.06^{mn}	50.78 ± 4.94^{cdef}
East Region – Arun	48.90 ± 0.83^{bcd}	7.65 ± 2.20^{klm}	50.10 ± 4.14^{cdef}
North Region- Fifth Month Honey	47.76 ± 1.36^{cde}	13.30 ± 0.62^{ijk}	66.13 ± 1.04^{b}
Macadamia Honey- Doi Tung	44.23 ± 0.77^{cde}	13.34 ± 1.44^{ijk}	62.11 ± 1.45^{bc}
Forest Honey- Health Mate	43.56 ± 7.00^{defg}	14.12 ± 1.19^{ij}	60.70 ± 4.25^{bc}
Mix Honey (6:4)	43.34 ± 1.23^{defg}	4.25 ± 1.75^{mn}	40.69 ± 3.70^{ef}
North East Honey- OTOP Gallery Ploenchit	43.22 ± 1.22^{defg}	12.01 ± 2.11^{klm}	53.61 ± 3.37^{bcde}
Wild Flower Honey-Fora Bee	42.32 ± 3.61^{defgh}	13.94 ± 3.31^{ij}	57.68 ± 3.06^{bcd}
Sesame Honey- Supha Bee Fram	41.06 ± 4.64^{defgh}	15.17 ± 1.17^{hij}	57.73 ± 3.23^{bcd}
West Region – Cobbie Brown	41.06 ± 5.09^{defgh}	15.00 ± 3.42	61.54 ± 3.87^{bc}
Wild Flower Honey – Ambrosia	40.26 ± 6.07^{defgh}	19.96 ± 1.98^{efgh}	64.79 ± 7.67^{b}
South Region- No Brand	38.62 ± 5.47^{efgh}	17.30 ± 2.39^{ghij}	60.14 ± 5.89^{bc}
Longan Honey- Doi Kham	36.15 ± 5.50^{fghi}	20.66 ± 1.05^{efgh}	59.86 ± 6.59^{bc}
Middle Region- Sa-ard Bee Fram	34.19 ± 2.47^{ghij}	26.69 ± 1.83^{bcd}	57.96 ± 3.93^{bcd}
Mix Honey (7:3)	33.50 ± 1.67^{hij}	7.39 ± 0.49^{lm}	30.74 ± 0.27^{gh}
Longan Honey- Chumchon	27.07 ± 2.48^{ijk}	17.93 ± 1.01^{fghi}	44.69 ± 3.53^{ef}
Lychee Honey- KMUTT	26.65 ± 2.05^{jk}	28.21 ± 0.74^{bc}	45.59 ± 3.44^{def}
Logan Honey- Chitralada	23.49 ± 4.46^{k}	21.81 ± 1.72^{defg}	39.56 ± 6.83^{fg}
Sesame Honey- TPA	13.20 ± 2.66^{l}	28.58 ± 0.96^{bc}	22.73 ± 4.58^{hi}
Apis Florea - KMUTT	11.97 ± 1.49^{lm}	23.54 ± 0.77^{de}	20.56 ± 2.56^{i}
Coffee Honey- Fora Bee	10.11 ± 5.21^{lm}	24.38 ± 7.05^{cde}	17.41 ± 8.99^{ijk}
Forest Honey- KMUTT	4.98 ± 1.37^{lmn}	20.71 ± 3.82^{efgh}	8.58 ± 2.36^{jkl}
Apis Cerana - KMUTT	2.95 ± 0.45^{mn}	15.10 ± 1.86^{hij}	5.09 ± 0.78^{kl}
Stringless Bee- KMUTT	0.19 ± 0.07^{n}	1.02 ± 0.27^{n}	0.32 ± 0.13^{l}

Results of ΔE*ab

The following is a table showing the result of ΔE*ab, the data that gets from ΔE*ab means consumers can identify the difference color of honey. The most outstanding one is Logan Honey with Stringless Honey and showed Δ 86.02. However, Longan Honey with Forest Honey got the lowest value of all honeys.

Table 12 results of E*ab samples (consumer testing)

Honey 1	**Honey 2**	**ΔE*ab**
Longan Honey- Chitralada	Lychee Honey- TPA	Δ 69.81
Longan Honey- Chitralada	Forest Honey- KMUTT	Δ 36.10
Longan Honey- Chitralada	Sunflower Honey- Good B.	Δ 36.58
Longan Honey- Chitralada	Stringless Bee- KMUTT	Δ 86.02
Longan Honey- Chitralada	Apis Cerana - KMUTT	Δ 40.68

Results of Demographic

General information of consumers was derived from demographic information questionnaire which was attached on the last page of the whole. All data was collected and shown in the table number 13. According to table number 13 which had 79% of female and 21% of male joined this study. Most of them in the group age of 35-44 years old and they hold a bachelor's degree but some of them hold a high school and diploma certification. 57% of them are employee of company and another as student.

Table 13 results of demographic profits

Demographic Profiles	Freq.	%
Gender		
Male	15	21
Female	55	79
Age		
18 - 24 years old	9	13
25 - 34 years old	7	10
35 - 44 years old	43	61
45 - 54 years old	6	9
More than 54 years old	5	7
Level of education		
High school or lower	9	13
Diploma (Vocational certificate)	13	19
Bachelor's Degree	46	66
Master's degree or higher	2	2
Occupation		
Company Employee	40	57
Student	28	40
Housewife/ househusband	2	3
Income per month		
Lower than 8,000 baht	17	24
8,000 - 15,000 baht	18	25
15,001 - 25,000 baht	16	23
25,001 - 35,000 baht	15	22
35,001 - 45,000 baht	2	3
More than 45,000 bah	2	3

Nationality Thai Non-Thai	 65 5	 93 7

In this study which had been involved 70 of people to participated, those were 79% of female and 21% of male. Most of them come from company but some of consumers which from university. For the first time, did consumer testing. There were six samples which were Lychee Honey- TPA, Forest Honey- KMUTT, Sunflower Honey- Good B., Stringless Honey- KMUTT, Apis Cerana, KMUTT, Longan Honey, Chitalanda had been prepared to consumers to tested them. Consumers need to base on their liking and preference to give the liking score (9 points Hedonic scales). When, their finished the questionnaire collect it and gave the second one to my consumer again. But, second one of questionnaire which provided information of honey to consumer to read, consumer need to read the information that provided such as origin place of honey, sensory property of honey, how they provide benefits to human body and types of flora allow to give score again.

As the results, I collected questionnaires from 70 of consumers and analyzed the data in Excel and SAS. According to table number 8 which shows that only 2 samples show significates different between another 4 samples ($t \leq 0.05$). The 2 samples which are Logan Honey from Chitralada and Sunflower Honey from Good B. For Longan Honey showed significate in color and aroma but for Sunflower Honey which showed significate different in floral only ($t \leq 0.05$). However, both of them showed significate different in overall liking. After that, look at the mean score that got from consumer testing noticed that information of honey effect consumers to accept and liking for example, color of Logan Honey for the first time tasting (without honey information) the score got form consumers were 6.9 ± 1.7 whereas second time tasting (with honey information) the score was showed as 7.5 ± 1.2.

On the other hand, in the questionnaire consumers need to fill out 2 types of questions which were Food Neophobia and Health and Taste Attitude Scales. The data used Excel and SAS to analyze the data. As the results that got from 70 of consumers showed that 80% of people was Neophobic group and they did not want to try new type of foods products. Also, most of them which a group of people who consider taste more that health. Then, use SAS program to run the data of Health and Taste Attitude Scales by overall and divided male and female groups, showed that overall part of Health and Taste Attitude Scales showed non-significate different ($t \geq 0.05$). After that, collected the data of Health -related statement and Taste-related statement both of them showed non-significate different too ($t \geq 0.05$). Finally, divide people in based on their gender by using Tukey to run the data which showed significate different based on gender ($P \leq 0.05$). These group of people they very consider taste since the results from SAS showed craving for sweet foods was the most outstanding.

Back to the consumer tasting, those results had strongly support why King Mongkut's University of Technology Thonburi's honeys did not show any significate results in consumer testing. The first reason is the people that participated in this study most of them did not want to try a new food. So, the honeys from King Mongkut's University of Technology Thonburi were not familiar to Thai consumers and those honeys did not have sweet taste. Thus, 70 of consumer cannot accept the new type and non-sweet honeys even they knew theses honeys can provide more benefits than Longan and Sunflower Honey

For second part of this study is about physical testing of honeys. Firstly, for color measurement, 27 samples of honeys had been tested by using HunterLab MiniScan EZ 4500L Spectrophotometer. During the process, honey need to pull in to the Hunterlab cup, but the cup must to have back rubber contains in the cup, cover with white lid and after that cover with back lid. There are several reasons why did this process. For the first reason is back rubber can prevent outside light effect honey's lightness. Then, by using white lid because white color can reflect light so when the light source from machine which can reflect to sample will not cross over with surrounding. Also, the reason by using black lid to cover all things because black color can absorb lightness and prevent another light source from environment. Nevertheless, when pull honey into the Hunterlab cup must be careful air bubble of honeys. Air bubble is a big problem effect light source pass through the sample. So, to prevent air bubble effect light source, when pull the sample should slowly, if air bubbles in the sample should use small spoon to pick out air bubbles. However, some sample will be crystalized during storage process such as Sunflower Honey-Sa-ard Bee Fram so should be heated to around 50° C but cannot more than 60 ° C since this temperature is a temperature not effect chemical and substance of honey. The important thing is main substance contains in honey is sugar if the temperature over than 60 ° C easier to cause browning reaction which effect the color of honey.

The results of color measurement of honey, table number 11 shows the lightness of color. L* is measuring the darkness to lightness and the value from 0 to 100. According table number 11 which shows Sunflower Honey-Sa-ard Bee Fram is the outstanding sample which shows 61.42 ± 10.10, Lychee Honey- TPA, Coffee Honey- Fifth Month Honey and Sunflower Honey- Good B also are the same group showed the most lightness. For a* which use to measure color rang from redder to greener if the value show as positive means the sample tends red color more than green color. For result of a* of 27 samples, Lychee Honey- TPA is a sample which shows significate different than other ($P \leq 0.05$) the value is 35.71 ± 4.11 and Sunflower Honey-Sa-ard Bee Fram also is the same group with Lychee Honey. Moreover, b* value is showing color from yellow to blue so if value is positive which means sample trends yellower more than bluer. Sunflower Honey-Sa-ard Bee Fram and Lychee Honey- TPA show significate different than other ($P \leq 0.05$).

Finally, used the value from the lightness of honeys to calculate the difference of color (ΔE^*ab) between 6 samples which used to measure the consumer testing. During calculation Logan Honey- Chitralada was the base to use to compare with another 5 different samples. A reason to use Chitralada honey because the result from consumer testing this honey was showed significate different from other 5 honeys. As a result, Logan Honey- Chitralada compares with Stringless Bee- KMUTT which the group make consumer easier noticeable difference. This group is the highest value of ΔE^*ab and which shows Δ 86.02.

CONCLUSION

Finally, this research is combining sensory and physic science to achieve this project since physic cannot detailly to explain how consumers think about the honeys. However, physic can provide detail data to explain objective. In this study involved 3 main types of question deeply to know our consumer which Food Neophobia Scales, Health and Taste Attitude Scale and Demographic were. Based on those questions, noticed that consumers involved in this study they so feared to try new type of food products and they were the group who consider taste more than health. So, for the results of Health and Taste Attitude Scales most of the consumer they choose ''Craving of Sweet Foods'' as the most important characteristic. Thus, honeys from KMUTT were showed non-significant with and without information provided. However, sensory property did not enough to explain anything, so measured 27 different types of honey. As a result, which showed that Sunflower Honey-Sa-ard Bee Fram was the outstanding one in L* , a* and b* whereas Lychee Honey- TPA was honey showed the significant one in a*. Finally, the group of Stringless Bee- KMUTT and Logan Honey-Chitralada got the highest of $\Delta E^{*}ab$.

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Honey (น้ำผึ้ง)

Dear Sir/ Madam, I'm a student form School of Biotechnology, Assumption University and I'm studying how information effect consumer acceptance on honey. The following is a questionnaire please kindly complete the questions and your information will be useful in my study. Thank you!

สวัสดีค่ะดิฉันเป็นนักศึกษาปริญญาตรีกำลังศึกษาอยู่ที่คณะเทคโนโลยีชีวภาพ มหาวิทยาลัยอัสสัมชัญ ปัจจุบันกำลังทำงานวิจัยเพื่อศึกษาว่าข้อมูลมีผลต่อการเลือกซื้อหรือการยอมรับของผู้บริโภคอย่างไรโดยใช้แบบสอบถามชุดนี้ กรุณาตอบแบบสอบถามด้านล่างให้ครบถ้วน ข้อมูลที่ได้จากแบบสอบถามนี้จะถูกนำไปใช้ให้เกิดประโยชน์สูงสุด ขอบคุณมากค่ะ!

<u>Part I: Consumer's Behavior: (ส่วนที่1: พฤติกรรมของผู้บริโภค)</u>

1. In the last 6 months how often did you consume honey?

   (คุณรับประทานน้ำผึ้งโดยเฉลี่ยบ่อยแค่ไหนภายใน 6 เดือนที่ผ่านมา?)

☐ Everyday (ทุกวัน) ☐ 3-4 times/ week (3-4 ครั้งต่อสัปดาห์)

☐ 1-2 times/ week (1-2 ครั้งต่อสัปดาห์) ☐ 1-2 times/ month (1-2 ครั้งต่อเดือน)

☐ Other, please specify (อื่นๆโปรดระบุ) ....

2. What food that you normally consume with honey?

   (ปกติแล้วคุณรับประทานน้ำผึ้งกับอาหารชนิดใด?)

☐ Bakery: Pancake/ waffle (ขนมปัง: แพนเค้ก/ วาฟเฟิล)
☐ Beverage: Tea/ soda (เครื่องดื่ม: ชา/ โซดา)
☐ Water: Hot water/ warm water (น้ำเปล่า: น้ำร้อน/ น้ำอุ่น)
☐ Meat: Chicken/ beef/ pork (เนื้อสัตว์: ไก่/ เนื้อวัว/ หมู)
☐ Dessert: Ice cream/ bingsu (ขนมหวาน: ไอศครีม/ บิงซู)
☐ Dairy product: Milk/ yoghurt (ผลิตภัณฑ์ประเภทนม: นม/ โยเกิร์ต)
☐ Other, please specify (อื่นๆโปรดระบุ) ....

3. Where did you buy honey?

   (ปกติแล้วคุณซื้อน้ำผึ้งที่ไหน)

☐ Supermarket (ซุปเปอร์มาเก็ต): Home Fresh Mart, Gourmet Market, Tops Supermarket (โฮมเฟรชมาร์ท, กูร์เมต์ มาร์เก็ต, ท็อป ซุปเปอร์มาเก็ต)

☐ Hypermarket (ไฮเปอร์มาเก็ต): Big C, Makro, Lotus (บิ๊กซี, แมคโคร, โลตัส)

☐ Fresh Market (ตลาดสด) ☐ Bee Keeper (คนเลี้ยงผึ้ง)

☐ Other, please specify (อื่นๆโปรดระบุ) ....

4. Do you buy honey by yourself?

(คุณซื้อน้ำผึ้งด้วยตัวเองใช่หรือไม่?)

☐ Yes (ใช่)

☐ No, please specify who bought honey: .... [Please skip to question 6]
(ไม่ใช่, โปรดระบุว่าใครเป็นคนซื้อน้ำผึ้งให้คุณ: .... [โปรดข้ามไปยังคำถามข้อที่6])

5. How often do you buy honey? (คุณซื้อน้ำผึ้งบ่อยแค่ไหน)

☐ Weekly (ทุกสัปดาห์) ☐ Monthly (ทุกเดือน)
☐ Every 2-3 months (ทุกๆ2 - 3เดือน)
☐ Yearly (ทุกปี) ☐ Other, please specify (อื่นๆโปรดระบุ) ....

6. When do you consume honey? [Check all that apply]

(คุณรับประทานน้ำผึ้งตอนไหนบ้าง? [สามารถเลือกได้มากกว่า 1 คำตอบ])

☐ Honey tastes good (มีรสชาติที่ดี) ☐ Honey has health benefits (มีประโยชน์ต่อร่างกาย)
☐ Honey has a nice flavor (มีกลิ่นรสที่ดี) ☐ Honey helps with allergy (ช่วยบรรเทาโรคภูมิแพ้)
☐ Honey contains probiotic (มีโพรไบโอติกส์)
☐ Honey is natural energy source (เป็นแหล่งพลังงานที่มาจากธรรมชาติ)
☐ Honey is good when added into hot drink (ช่วยทำให้เครื่องดื่มร้อนมีรสชาติดีขึ้น)
☐ Honey helps making other foods taste better (ช่วยทำให้อาหารมีรสชาติดีขึ้น)
☐ Honey help with cold and sore (ช่วยบรรเทาอาการเป็นหวัดและเจ็บคอ)
☐ Other, please specify (อื่นๆโปรดระบุ) ....

7. What are the factors make you to buy honey? [Check all that apply]

(ปัจจัยข้อใดต่อไปนี้ที่ส่งผลต่อการเลือกซื้อน้ำผึ้งของคุณ? [สามารถเลือกได้มากกว่า 1 คำตอบ])

☐ Sweetness (ความหวาน) ☐ Type of flora (ชนิดของดอกไม้) ☐ Quality (คุณภาพ)
☐ Package (บรรจุภัณฑ์) ☐ Health benefits (ประโยชน์ต่อร่างกาย) ☐ Price (ราคา)
☐ Origin (แหล่งที่มา) ☐ Shelf-life (อายุการเก็บรักษา) ☐ Color (สี)
☐ Experience (ประสบการณ์) ☐ Taste & flavor (รสชาติและกลิ่นรส) ☐ Brand (ยี่ห้อ)
☐ Other, please specify (อื่นๆโปรดระบุ) ....

8. Do you check the information [type of flora or the label of package or brand name] before purchasing honey?

(คุณได้สำรวจข้อมูล[ชนิดของดอกไม้บนฉลากของบรรจุภัณฑ์หรือยี่ห้อ]ก่อนที่จะซื้อน้ำผึ้งหรือไม่?)

☐ Always (ทุกครั้ง) ☐ Sometimes (บางครั้ง) ☐ Rarely (นานๆครั้ง) ☐ Never (ไม่เคย)

9. Does Brand name influence you purchasing products?

(ยี่ห้อของน้ำผึ้งมีผลต่อการเลือกซื้อหรือไม่?)

☐ Always (ทุกครั้ง) ☐ Sometimes (บางครั้ง) ☐ Rarely (นานๆครั้ง) ☐ Not at all (ไม่มีผล)

10. Which brand of honey do you prefer?

(คุณชอบน้ำผึ้งยี่ห้อใด)

☐ Goob.b (กู๊ดบี) ☐ Doi Kham (ดอยคำ) ☐ Chumchon (ชุมชน)

☐ Vejpong Honey (เวชพงศ์) ☐ TPA (เทพภักดี) ☐ Doi Tung (ดอยตุง)

☐ Chitralada Royal Project (จิตรลดา) ☐ Cannot remember (ไม่สามารถจำได้)

☐ I do not care about brand of honey (ฉันไม่ได้สนใจเกี่ยวกับยี่ห้อของน้ำผึ้ง)

☐ Other, please specify (อื่นๆโปรดระบุ) ....

<u>Part II: Consumer's Index (ส่วนที่2: ดัชนีผู้บริโภค)</u>

Instruction: Please look at the questions carefully and give ✓ into the box.

(คำแนะนำ: กรุณาอ่านคำถามแล้วกาเครื่องหมาย ✓ ลงในช่อง)

Factors (ปัจจัย)	Disagree strongly (ไม่เห็นด้วยที่สุด)	Disagree moderately (ไม่เห็นด้วยปานกลาง)	Disagree slightly (ไม่เห็นด้วยเล็กน้อย)	Neither agree nor disagree (บอกไม่ได้ว่าเห็นด้วยหรือไม่)	Agree slightly (เห็นด้วยเล็กน้อย)	Agree moderately (เห็นด้วยปานกลาง)	Agree strongly (เห็นด้วยที่สุด)
I do not like to eat foods form different cultures. (ฉันไม่ชอบทานอาหารที่มาจากต่างวัฒนธรรม)							
I think eat "light product" is healthy than conventional product. *light product= low fat/ low salt (ฉันคิดว่าการทาน"อาหารที่เบาๆ"จะทำให้มีสุขภาพดีกว่าการทานอาหารทั่วไป) *อาหารเบาๆ = อาหารที่มีไขมันและเกลือต่ำ							
If I go to a buffet, I will try a new food. (ถ้าฉันไปกินบุฟเฟต์ ฉันจะลองทานอาหารใหม่ๆ)							
I am confidence to eat a new and different foods. (ฉันรู้สึกมั่นใจที่จะลองทานอาหารใหม่ๆที่ต่างจากอาหารปกติที่ฉันกิน)							
Very consider about what food that I consumed. (ฉันพิจารณาอย่างถี่ถ้วนกับอาหารที่ฉันทานเข้าไป)							

Factors (ปัจจัย)	Disagree strongly (ไม่เห็นด้วยที่สุด)	Disagree moderately (ไม่เห็นด้วยปานกลาง)	Disagree slightly (ไม่เห็นด้วยเล็กน้อย)	Neither agree nor disagree (บอกไม่ได้ว่าเห็นด้วยหรือไม่)	Agree slightly (เห็นด้วยเล็กน้อย)	Agree moderately (เห็นด้วยปานกลาง)	Agree strongly (เห็นด้วยที่สุด)
I keep drinking 8 cups of water in a day. (ฉันดื่มน้ำวันละ8แก้ว)							
I don't like or trust new foods. (ฉันไม่ชอบหรือไว้ใจอาหารแปลกใหม่)							
I eat any foods even I know they may rise my cholesterol. (ฉันทานทุกอย่างแม้ฉันรู้ว่ามันอาจจะทำให้ระดับคอเลสเตอรอลของฉันเพิ่มขึ้น)							
If I don't know what is that food I won't try it. (ถ้าฉันไม่ทราบว่าเป็นอาหารนั้นคืออะไร ฉันจะไม่ลองทานมัน)							
I love eating vegetables and fruits. (ฉันชอบทานผักและผลไม้)							
I try not eating food additives. (ฉันจะไม่ลองกินอาหารที่มีวัตถุเจือปนอาหารหรือสารปรุงแต่ง)							
When I order drinks, I will order "less sugar". (เมื่อฉันสั่งเครื่องเดิม ฉันมักจะสั่งเครื่องดื่ม "น้ำตาลต่ำ")							
I am afraid to try foods that I never had before. (ฉันไม่กล้าที่จะลองทานอาหารที่ฉันไม่เคยทานมาก่อน)							

Factors (ปัจจัย)	Disagree strongly (ไม่เห็นด้วยที่สุด)	Disagree moderately (ไม่เห็นด้วยปานกลาง)	Disagree slightly (ไม่เห็นด้วยเล็กน้อย)	Neither agree nor disagree (บอกไม่ได้ว่าเห็นด้วยหรือไม่)	Agree slightly (เห็นด้วยเล็กน้อย)	Agree moderately (เห็นด้วยปานกลาง)	Agree strongly (เห็นด้วยที่สุด)
I look carefully of nutrition facts before buying a product. (ฉันพิจารณาข้อมูลโภชนาการอย่างถี่ถ้วนก่อนที่จะซื้อผลิตภัณฑ์)							
I prefer foods that from other countries. (ฉันชอบอาหารที่มาจากประเทศอื่น ๆ)							
I can try to eat the food that I do not like. (ฉันสามาถลองทานอาหารที่ฉันไม่ชอบได้)							
I can eat all most everything. (ฉันสามารทานได้แทบจะทุกอย่าง)							
I can eat whatever food if the food looks good. (ฉันสามารถทานอาหารอะไรก็ได้ถ้ารูปลักษณะของอาหารนั้นดูดี)							
I very enjoy eating taste foods. (ฉันชอบทานอาหารที่มีรสชาติกลมกล่อม)							
I like to go to a new restaurant. (ฉันชอบที่จะไปลองร้านอาหารใหม่ๆ)							
I do not believe food is a source of pleasure. (ฉันไม่เชื่อว่าอาหารเป็นสิ่งที่ทำให้เกิดความพอใจ)							

Factors (ปัจจัย)	Disagree strongly (ไม่เห็นด้วยที่สุด)	Disagree moderately (ไม่เห็นด้วยปานกลาง)	Disagree slightly (ไม่เห็นด้วยเล็กน้อย)	Neither agree nor disagree (บอกไม่ได้ว่าเห็นด้วยหรือไม่)	Agree slightly (เห็นด้วยเล็กน้อย)	Agree moderately (เห็นด้วยปานกลาง)	Agree strongly (เห็นด้วยที่สุด)
I do not want to eat foods with unknown materials. (ฉันไม่ต้องการทานอาหารที่ทำมาจากวัตถุดิบที่ฉันไม่รู้จัก)							
I avoid rewarding myself with foods. (ฉันหลีกเลี่ยงการให้รางวัลตัวเองด้วยอาหาร)							
In social events, I would not taste new or different foods. (ฉันจะไม่ลองชิมอาหารใหม่ๆหรืออาหารที่ต่างจากปกติที่ชั้นกินในงานสังคม)							
If I feel sad/ stress I will eat a lot. (ถ้าฉันรู้สึกเสียใจหรือเครียด ฉันจะกินเยอะกว่าปกติ)							
I am picky about food I eat. (ฉันพิถีพิถันเกี่ยวกับอาหารที่ฉันกิน)							
ove eating sweet food even eaing a noodle I need to add sugar. (ฉันชอบกินอาหารที่มีรสชาติหวาน แม้ว่าเวลากินก๋วยเตี๋ยว ฉันก็จะต้องเติมน้ำตาล)							
When I eat chickens must take out chicken's skin. (เวลาที่ฉันทานไก่ ฉันต้องเอาหนังไก่ออก)							
I do not eat processed foods/ can foods. (ฉันไม่ทานนอาหารแปรรูปและอาหารกระป๋อง)							

Factors (ปัจจัย)	Disagree strongly (ไม่เห็นด้วยที่สุด)	Disagree moderately (ไม่เห็นด้วยปานกลาง)	Disagree slightly (ไม่เห็นด้วยเล็กน้อย)	Neither agree nor disagree (บอกไม่ได้ว่าเห็นด้วยหรือไม่)	Agree slightly (เห็นด้วยเล็กน้อย)	Agree moderately (เห็นด้วยปานกลาง)	Agree strongly (เห็นด้วยที่สุด)
I am seldom tasting and experimenting new, different or innovative foods. (ฉันไม่ค่อยชิมและทดลองอาหารใหม่ ๆ ที่แตกต่างจากปกติที่ฉันกินหรืออาหารที่ผลิตโดยการใช้นวัตกรรมใหม่)							
I always exercising to maintain my body shape. (ฉันออกกำลังกายอย่างสม่ำเสมอเพื่อดูแลรักษารูปร่างของฉัน)							
I avoid eating fast food or some unhealthy snacks (ฉันหลีกเลี่ยงการกินอาหารจานด่วนหรือขนมขบเคี้ยวที่ไม่ดีต่อสุขภาพของฉัน)							
I always follow a healthy diet. (ฉันมักจะรับประทานอาหารที่ดีต่อสุขภาพ)							
The first reason to choose food is taste and flavor. (ปัจจัยที่สำคัญที่สุดในการเลือกอาหารของฉันคือรสชาติและกลิ่นรส)							
I eat organic foods only. (ฉันกินอาหารที่ผลิตด้วยวิธีอินทรีย์เท่านั้น)							

<u>PartIII: Tasting (ส่วนที่3: การชิม)</u>

<u>Taste Test Questionnaire (Set A)</u>

<u>INSTRUCTION</u> **<u>(คำแนะนำ)</u>**

- There are 6 samples on the tray.
  (มีน้ำผึ้งอยู่บนถาดทั้งหมด 6 ตัวอย่าง)
- Please rise you mouth with water before starting and between the samples
  (โปรดดื่มน้ำเล็กน้อยเพื่อล้างปากก่อนที่จะเริ่มชิมและขณะชิมระหว่างตัวอย่าง)
- Please test the samples ***from left to right***
  (โปรดชิมตัวอย่างจาก**ซ้ายไปขวา**)
- Feel free to ask any questions
  (ถ้ามีข้อสงสัยใดๆถามได้เลยนะคะไม่ต้องเกรงใจ)

The following question please base on your preference to give a score from **1 = Extremely *DISLIKE*** and **9 = Extremely *LIKE***
(โปรดให้คะแนนตัวอย่างตามความชอบของท่านโดย **1 = ไม่ชอบมากที่สุด** และ **9 = ชอบมากที่สุด**)

1 = Dislike extremely (ไม่ชอบมากที่สุด)
2 = Dislike very much (ไม่ชอบมาก)
3 = Dislike moderately (ไม่ชอบปานกลาง)

4 = Dislike slightly (ไม่ชอบเล็กน้อย)
5 = Neither like nor dislike (บอกไม่ได้ว่าชอบหรือไม่ชอบ)
6 = Like slightly (ชอบเล็กน้อย)

7 = Like moderately (ชอบปานกลาง)
8 = Like very much (ชอบมาก)
9 = Like extremely (ชอบมากที่สุด)

Sample No. (หมายเลขตัวอย่าง)						
Color (สี)						
Aroma (กลิ่น)						
Sweet (ความหวาน)						
Sour (ความเปรี้ยว)						
Bitter (ความขม)						
Floral (กลิ่นรสดอกไม้)						
Overall Liking (ความชอบโดยรวม)						

Taste Test Questionnaire (Set B)

INSTRUCTION (คำแนะนำ)

- There are 6 samples on the tray.
  (มีน้ำผึ้งอยู่บนถาดทั้งหมด 6 ตัวอย่าง)
- Please rise you mouth with water before starting and between the samples
  (โปรดดื่มน้ำเล็กน้อยเพื่อล้างปากก่อนที่จะเริ่มชิมและขณะชิมระหว่างตัวอย่าง)
- **Please read the information of honey before testing the samples**
  (โปรดอ่านข้อมูลของน้ำผึ้งก่อนที่จะเริ่มชิมตัวอย่าง)
- Please test the samples ***from left to right***
  (โปรดชิมตัวอย่างจาก**ซ้ายไปขวา**)
- Feel free to ask any questions
  (ถ้ามีข้อสงสัยใดๆถามได้เลยนะคะไม่ต้องเกรงใจ)

The following question please base on your preference to give a score from **1 = Extremely *DISLIKE*** and **9 = Extremely *LIKE***
(โปรดให้คะแนนตัวอย่างตามความชอบของท่านโดย **1 = ไม่ชอบมากที่สุด** และ **9 = ชอบมากที่สุด**)

1 = Dislike extremely (ไม่ชอบมากที่สุด)
2 = Dislike very much (ไม่ชอบมาก)
3 = Dislike moderately (ไม่ชอบปานกลาง)

4 = Dislike slightly (ไม่ชอบเล็กน้อย)
5 = Neither like nor dislike (บอกไม่ได้ว่าชอบหรือไม่ชอบ)
6 = Like slightly (ชอบเล็กน้อย)

7 = Like moderately (ชอบปานกลาง)
8 = Like very much (ชอบมาก)
9 = Like extremely (ชอบมากที่สุด)

Sample No. (หมายเลขตัวอย่าง)						
Color (สี)						
Aroma (กลิ่น)						
Sweet (ความหวาน)						
Sour (ความเปรี้ยว)						
Bitter (ความขม)						
Floral (กลิ่นรสดอกไม้)						
Overall Liking (ความชอบโดยรวม)						

Part IV: General Information (ส่วนที่4: ข้อมูลทั่วไป)

1.) Gender (เพศ)

☐ Male (ชาย) ☐ Female (หญิง)

2.) Age (อายุ)

☐ Less than 18 years old (น้อยกว่า 18 ปี) ☐ 18 – 24 years (18 – 24 ปี)

☐ 25 – 34 years (25 – 34 ปี) ☐ 35 – 44 years (35 – 44 ปี)

☐ 45 – 54 years (45 – 54 ปี) ☐ More than 54 years old (มากกว่า 54 ปี)

3.) Level of education (ระดับการศึกษา)

☐ High school or lower (มัธยมศึกษาหรือต่ำกว่า)

☐ Diploma: Vocational certificate/ High vocational certificate (อนุปริญญา: ปวช./ ปวส.)

☐ Bachelor Degree (ปริญญาตรี) ☐ Master Degree or higher (ปริญญาโทหรือสูงกว่า)

4.) Occupation (อาชีพ)

☐ Student (นักเรียน/ นักศึกษา) ☐ Company employee (พนักงานบริษัท/ ลูกจ้างบริษัท)

☐ Business owner (เจ้าของธุรกิจ) ☐ Teacher (ครู/ อาจารย์)

☐ Government employee (ข้าราชการ) ☐ Housewife/ househusband (พ่อบ้าน/แม่บ้าน)

☐ Other, please specify (อื่นๆโปรดระบุ) ....

5.) Income (รายได้)

☐ Lower than 8,000 baht (ต่ำกว่า 8,000 บาท)

☐ 8,000 – 15,000 baht (8,000 – 15,000 บาท)

☐ 15,001 – 25,000 baht (15,001 – 25,000 บาท)

☐ 25,001 – 35,000 baht (25,001 – 35,000 บาท)

☐ 35,001 – 45,000 baht (35,001 – 45,000 บาท)

☐ More than 45,000 baht (สูงกว่า 45,000 บาท)

6.) Nationality (สัญชาติ)

☐ Thai (ไทย)

☐ Other, please specify (อื่นๆโปรดระบุ) ....

INFORMATION OF HONEY

Sample Number	Brand	Origin place	Sensory property	Benefits	Type of flora /Bee
598	TPA (ทพภักดี)	Lambhun/ Chiangmai (ลำพูน/ เชียงใหม่)	This honey contains very light color with monofloral honey. (น้ำผึ้งชนิดนี้มีสีที่ค่อนข้างอ่อนซึ่งผลิตมาจากเกสรดอกไม้ชนิดเดียว) Contain slightly lychee flavor which will bring out some bitter. (นอกจากนี้ยังมีกลิ่นของลิ้นจี่บนๆและมีรสชาติขมอยู่บ้าง)	Slows aging and benefits to your skin. (ช่วยชะลอวัยและมีประโยชน์ต่อผิวพรรณของคุณ) Increases athletic performance and reduces fatigue. (เพิ่มประสิทธิภาพในการเล่นกีฬาและลดความเหนื่อยล้า) Suitable woman who have asthenia and frequent urination (เหมาะสำหรับผู้หญิงที่มักมีความรู้สึกหงุดหงิดและปัสสาวะบ่อย)	Lychee Honey (น้ำผึ้งดอกลิ้นจี่)
159	King Mongkut's University of Technology Thonburi (มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าธนบุรี)	Unknown (ไม่ทราบ)	This honey has a dark brown color. (น้ำผึ้งชนิดนี้มีสีน้ำตาลเข้ม) Have a medium sour taste and are moderately sweet. (มีรสชาติเปรี้ยวและหวานในระดับปานกลาง)	Forest honeys have a lower glycemic index than unifloral honey. (น้ำผึ้งป่ามีดัชนีน้ำตาลต่ำกว่าน้ำผึ้งจากดอกไม้ชนิดเดียว) Has a rich nutritional profile such as vitamin C, folic acid, vitamin B6, etc. (มีคุณค่าทางด้านโภชนาการสูง ประกอบด้วย วิตามินซี กรดโฟลิก วิตามินบี6 และสารอาหารอื่นๆอีกมากมาย)	Forest Honey (น้ำผึ้งป่า)
551	Good. B (กู๊ดบี)	Lopburi (ลพบุรี)	This honey is a bright yellow of medium intensity. (น้ำผึ้งชนิดนี้มีสีเหลืองสดในระดับปานกลาง) Has a strong aroma of floral like jasmine (มีกลิ่นหอมของดอกไม้ค่อนข้างแรงซึ่งคล้ายๆ กลิ่นของดอกมะลิ)	Can help to prevent stomach intestine conditions, lung and kidney diseases. (สามารถช่วยป้องกันโรคที่เกี่ยวกับระบบย่อยอาหารรวมถึงโรคปอดและโรคไตด้วย) Promote hair growth and maintenance. Prevent effects on hyperlipidemia and chronic hypercholesterolemia. (ช่วยส่งเสริมการเจริญเติบโตและการบำรุงรักษาของเส้นผม)	Sunflower Honey (น้ำผึ้งดอกทานตะวัน)

Sample Number	Brand	Origin place	Sensory property	Benefits	Type of flora /Bee
268	King Mongkut's University of Technology Thonburi (มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าธนบุรี)	The Eastern part of Thailand (ภาคตะวันออก)	The colour of this honey is a dark amber and come out with stingless aroma. (น้ำผึ้งชนิดนี้มีสีเหลืองอำพันเข้มและกลิ่นของชันโรง) It is sweet sour and pleasant and with mixing of flora and fruit. (น้ำผึ้งชนิดนี้มีรสชาติเปรี้ยวอมหวานมีกลิ่นผสมของดอกไม้และผลไม้)	Can help to expedite the healing process of wounds and bruises. (สามารถช่วยเร่งการฟื้นฟูของบาดแผลและรอยฟกช้ำสารต้านอนุมูลอิสระสิบเท่ากว่าน้ำผึ้งอื่นๆ) Ten Times more antioxidant than other honey. (มีสารต้านอนุมูลอิสระสิบเท่ากว่าน้ำผึ้งอื่น ๆ)	Stingless Honey (น้ำผึ้งจากชันโรง)
993	King Mongkut's University of Technology Thonburi (มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าธนบุรี)	Unknown (ไม่ทราบ)	The colour of this honey between amber and dark amber. (น้ำผึ้งชนิดนี้มีสีเหลืองอำพันค่อนข้างเข้มแต่ไม่ถึงกับเข้มมาก) Little bitter, sour taste but bring out sweet taste. (มีรสชาติขมและเปรี้ยวนิดหน่อยแต่ว่ามีรสชาติหวานเป็นหลัก)	Contains high amount of enhances metabolism (7). (มีคุณสมบัติช่วยเพิ่มอัตราการเผาผลาญอาหารในปริมาณมาก) Great for man hearth and enhances sexual activity (7). (เหมาะสำหรับครอบครัวและช่วยเพิ่มกิจกรรมทางเพศมีประสิทธิภาพมากขึ้น)	Apis Cerana (น้ำผึ้งจากผึ้งโพรง)
227	Royal Project Chitralada (โครงการหลวงจิตรลดา)	The North part of Thailand (ภาคเหนือ)	Golden yellow color with strong smell of flora. (สีเหลืองทองมีกลิ่นหอมของดอกไม้ค่อนข้างแรง) The taste of this honey is very sweet and after taste bring out a little bitter. (มีรสชาติหวานมากและมีรสชาติขมเล็กน้อย)	Natural cough syrup, effective in treating coughs (สามารถใช้เป็นยาแก้ไอตามธรรมชาติ ซึ่งมีประสิทธิภาพในการรักษาอาการเจ็บคอ)	Longan Honey (น้ำผึ้งดอกลำไย)

SAS CODS

Consumer Testing

```
data liking;
input sample1 sample2 sample3 sample4 sample5 sample6 C1  C2  C3  C4  C5  C6  A1  A2
A3  A4  A5  A5  A6  S1  S2  S3  S4  S5  S6 SO1  SO2  SO3  SO4  SO5  SO6   B1  B2  B3
B4  B5  B6  F1  F2  F3   F4  F5  F6  OL1   OL2  OL3  OL4  OL5  OL6   C21  C22  C23  C24
C25  C26  A21  A22 A23  A24  A25  A26   S21  S22  S23  S24  S25  S26 SO21  SO22
SO23  SO24  SO25  SO26   B21  B22  B23  B24  B25  B26  F21  F22  F23   F24  F25  F26
OL21   OL22  OL23  OL24  OL25  OL26;
cards;
data
;
run;
proc ttest data=liking;
paired C1*C21;
proc ttest data=liking;
paired C2*C22;
proc ttetst data=liking;
paired C3*C23;
proc ttest data-=liking;
paired C3*C23;
proc ttest data=liking;
paired C4*C24;
proc ttest data=liking;
paired C5*C25;
proc ttest data=liking;
paired C6*C26;
proc ttest data=liking;
paired C4*C24;
proc ttest data=liking;
paired A1*A21;
proc ttest data=liking;
paired A2*A22;
proc ttest data=liking;
paired A3*A23;
proc ttest data=liking;
paired A4*A24;
proc ttest data=liking;
paired A5*A25;
proc ttest data=liking;
paired A6*A26;
proc ttest data=liking;
paired S1*S21;
proc ttest data=liking;
paired S12*S22;
proc ttest data=liking;
paired S3*S23;
proc ttest data=liking;
```

```
paired S4*S24;
proc ttest data=liking;
paired S5*S25;
proc ttest data=liking;
paired S6*S6;
proc ttest data=liking;
paired SO1*SO21;
proc ttest data=liking;
paired SO2*SO22;
proc ttest data=liking;
paired SO3*SO23;
proc ttest data=liking;
paired SO4*SO24;
proc ttest data=liking;
paired SO5*SO25;
proc ttest data=liking;
paired SO6*SO26;
proc ttest data=liking;
paired B1*B21;
proc ttest data=liking;
paired B2*B22;
proc ttest data=liking;
paired B3*B23;
proc ttest data=liking;
paired B4*B24;
proc ttest data=liking;
paired B5*B25;
proc ttest data=liking;
paired B6*B26;
proc ttest data=liking;
paired F1*F21;
proc ttest data=liking;
paired F2*F22;
proc ttest data=liking;
paired F3*F23;
proc ttest data=liking;
paired F4*F24;
proc ttest data=liking;
paired F5*F25;
proc ttest data=liking;
paired F6*F26;
proc ttest data=liking;
paired OL1*OL21;
proc ttest data=liking;
paired OL2*OL22;
proc ttest data=liking;
paired OL3*OL23;
proc ttest data=liking;
paired OL4*OL24;
proc ttest data=liking;
```

```
paired OL5*OL25;
proc ttest data=liking;
paired OL6*OL26;
run;
title Before and After;
run;
```

HTAS Overall

```
data htas;
input con gender$ GHLP	NP	CS	RE	PL;
cards;

data
;
ods rtf;
proc ttest data = htas;
class gender;
var GHLP	NP	CS	RE	PL;
run;
ods rtf close;
```

HTAS sub statements

```
data htas;
input con sub$ score;
cards;
data
;
ods rtf;
proc anova data = htas;
class sub;
model score = sub;
means sub/tukey;
run;
ods rtf close;
```

HTAS male

```
data male;
input con sub$ score;
cards;
data
;
ods rtf;
proc anova data = male;
class sub;
model score = sub;
means sub/tukey;
run;
ods rtf close;
```

HTAS Female

```
data female;
input con sub$ score;
cards;
;
ods rtf;
proc anova data = female;
class sub;
model score = sub;
means sub/tukey;
run;
ods rtf close;
```

Color

```
title1 'The Lightness of Honey';
data Lightness;
 input sample   rep  Lightness a b;
 datalines;
data
;
ods rtf;
proc anova data = Lightness;
 class sample rep;
 model Lightness a b  = sample rep;
  means sample / tukey;
  run;
ods rtf close;
```