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Sensory Evaluation and Consumer Acceptability of Ready-to-Drink Flower Product

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Abstract

The study on sensory evaluation and consumer acceptability of two formulas of ready-to-drink flower products included damask rose beverage and water lily beverage were carried out. One hundred target consumers (20% male and 80% female) participated in this study. Acceptance testing for two formulas of flower beverage was evaluated by panel test. The sensory evaluation of two formula beverages showed that the participants preferred the water lily flower beverage (57%) more than the damask rose flower beverage (43%). The hedonic scores of freshness attribute of water lily flower beverage were significantly higher than damask rose flower beverage (P<0.05). The result of the JAR scale analysis suggested that the freshness attribute should be increased in both product formulas. The study on the effects of demographic characteristics on product acceptance impressed that the age and income factors affected the product acceptance. For damask rose beverage, age and income factors had the impact on color and sweetness attributes, respectively. While, only age factor affected the product acceptance of water lily flower beverage in terms of flower fragrance, sweetness, freshness, and overall liking attributes.

Keywords: Healthy beverage, Flower drink, Sensory evaluation, Consumer acceptability

1. Introduction

In the present, healthy food and beverage consumption are more important to consumers. Vegetables and fruits provide human body with vitamins and minerals. Moreover, they consist of phytochemicals which contain various antioxidant substances. These substances are able to suppress diseases (1, 2). Some studies revealed that the beverage development by using fruits and vegetables as an ingredient improved the antioxidant property of the beverage (3). Apart from fruits and vegetables consumption, the edible flowers are the alternative choice for healthy consumer. Similar to fruits and vegetables, colorful flowers also compose of various phytochemical substances (4). Moreover, they contain unique fragrance and flavor. Some research works studied about active ingredients and benefits of edible flowers in 3 groups of color, red flowers (Dala and spike flowers), yellow flowers (yellow damask rose and Sesbania), and blue flowers (Butterfly pea and Bougainvillea flower). The result revealed that all of color flower groups have antioxidant capability, and then healthy concentration beverage was developed from those color flowers (5).

Damask rose flower or *Rosa damascene* has been referred as the king of flowers. It has earned fame for its gorgeous color and its fine fragrance. The petals' hue of this flower is a light to moderate pink to light red. Scientific research has revealed numerous pharmacological properties to the damask rose including antibacterial, antioxidant, anti-tussive, hypnotic, anti-diabetic, and relaxant effect on tracheal chains. It is being used as medicine for treatment of gastric problems, hepatic and blood disorders, chest and abdominal pain, menstrual, digestive and heart problems. It is also being used to heal depression, grief, nervous stress and tension. It helps in the reduction of thirst, healing old cough, special complaints of women, wound healing, and skin health (6).

Water lily flower is an aquatic plant that has many medical benefits. It has been found to be useful for controlling blood sugar and insulin levels, protecting against liver damage, reducing high blood pressure and blood lipid**,** reducing stress and fatigue, antibacterial, anti-diabetic, and antioxidant effects (7).

Thus, this work studied sensory acceptance and the consumer acceptability of ready-to-drink flower products. The data can be used to develop ready-to-drink flower product which meet the consumer demands. For the entrepreneur benefits, competitive advantage is increased and the plan of marketing strategy is further developed.

2. Materials and

2.1 Flower drink samples

Two formulas of ready to drink flower beverage, damask rose flower and water lily flower were used to evaluate for the sensory evaluation. The main ingredients of damask rose beverage consist of water (91.82%), sugar (5%), and damask rose syrup (3.17%). The main ingredients of water lily flower beverage are water (92.89%), sugar (3.92%), and water lily flower syrup (3.17%).

2.2 Consumer acceptance test

A hundred consumers, who were selected from the staffs of Panyapiwat Institute of Management, participated in the consumer acceptance test. Gender of participants was specified, being 80% female and 20% male, and ages ranging from 18 – 60 years old. This specified ratio of genders was based on the target group of customer which high number in women. Participants were selected on the basis of their interesting to participate in the research. The participants were asked to complete a questionnaire. The questions included general demographic information, and sensory evaluation.

2.3 Sensory evaluation

The blind test was applied in sensory evaluation using 9 points hedonic scale. The samples of 2 flower beverage recipes were chilled and kept in the refrigerator at a temperature of 4°C before serving. They were then served on a tray in numbered plastic cups containing 30 mL of sample. A cup of drinking water was also provided to the panelists to cleanse their palate between evaluations. The acceptability of the color, flower fragrance, sweetness, freshness, and the overall acceptability were evaluated using a hedonic scale of 9 points (8) as follows:

9 score means like extremely
8 score means like very much
7 score means like moderately
6 score means like slightly
5 score means neither like nor dislike
3 score means dislike moderately
4 score means dislike slightly
2 score means dislike very much
1 score means dislike extremely

The panelists also evaluated the Just about Right (JAR) level for the flower beverage attributes to determine the optimum levels of the attributes. They rated the same flower beverage samples on a 3-point JAR scale (1 = too much, 2 = just about right, 3 = too low) for color, flower fragrance, sweetness, freshness.

2.4 Statistical analysis

The descriptive statistics were used to analyze such as percentage, mean, and standard deviation. In addition, paired t-test, analysis of variance (ANOVA) and mean comparison (Duncan method) were performed at 95% of confidence level by using SPSS program.

3. Results and Discussion

3.1 Hedonic scores of ready-to-drink flower beverage

Demographic information of 100 participants was presented in Table 1. These participants were 20 men (20%) and 80 women (80%). Most of them were ranging in age from 18 to 21 years (50%). There were 28% of participants which 31 between 40 of age. Education categories demonstrated 74% of the participants having a bachelor degree and 24% with higher bachelor degree. For the occupation profiles, most participants were students (50%) and company employees (46%). Categories of family incomes indicated that 46 participants reported the income less than 10,000 Baht per month, and 19 participants reported income in the range 20,001 – 30,000 Baht.

Table 2 showed average hedonic scores of product attributes of 2 formulas of flower drinks. The paired t-test was applied to analyze the difference between hedonic scores of each attributes from two beverage recipes. The results showed that the average hedonic scores of color and freshness attributes of two beverage recipes were significantly difference ($P<0.05$). The color attribute of damask rose flower drink was more preferred than water lily flower drink. This may be due to the color of damask rose beverage is deep pink which the favorite color of most women while the color of water lily is transparent. The deep color of flower drink suggests a high anthocyanin pigments and antioxidant activity that are of interest for human nutrition (9). However, the participants liked the freshness of water lily drink more than damask rose flower drink.

3.2 Just about Right (JAR) scale analysis

Just about Right (JAR) scale analysis of 2 flower products was carried out to adjust the product attributes included color, flower fragrance, sweetness and freshness. Adjustment direction of product attributes was indicated by product attributes net score. Net score of product attributes lower than -20 indicated that product attributes should be increased, while net score of product attributes higher than -20 indicated that product attributes should be decreased, whereas the value of net score from -20 to 20 indicated that product attributes were not adjusted.

Table 3 represented the JAR scale of 2 flower drink products. The results showed that product attributes of 2 formulas of flower drinks include color, flower fragrance, sweetness, freshness and overall liking were rated at just right while freshness should be increased in both products.

Table 1 Background characteristics of participants (N=100).

Variables	Number (N=100)	Percentage
Gender		
Men	20	20
Women	80	80
Age		
18-21 years	50	50
22-30 years	16	16
31-40 years	28	28
41-50 years	6	6
Education		
Senior high school	2	2
Bachelor degree	74	74
Higher bachelor degree	24	24
Occupation		
Student	50	50
Company employee	46	46
Self-employed	4	4
Income (per month)		
below 10,000 Baht	46	46
10,001 – 15,000 Baht	9	9
15,001 – 20,000 Baht	13	13
20,001 – 30,000 Baht	19	19
30,001 – 40,000 Baht	8	8
more than 40,000 Baht	5	5
Preference formula		
damask rose flower	43	43
water lily flower	57	57
Nutritional acceptability of product		
accept	95	95
not accept	5	5

Table 2 Hedonic scores of two formulas of ready-to-drink flower products.

Attributes	Average hedonic scores	
	Damask rose flower drink	Water lily flower drink
Color*	8.14±0.65	7.58±1.24
Flower fragrance	7.52± 1.40	7.64±1.16
Sweetness	7.38±1.24	7.54±1.13
Freshness*	7.23±1.34	7.61±1.09
Overall liking	7.44±1.35	7.66±1.06

Note: Mean comparison by using paired t-test. The symbol * means the average data in each attribute was significantly different ($P<0.05$).

3.3 Consumer acceptability

The consumer test revealed that most of participants (95%) accept the nutrition of the flower beverage (Table 1). The preference of 100 participants was distributed between the 2 beverage formulas, damask rose and water lily. The preference of water lily beverage (57%) was higher than damask rose (43%). For damask rose beverage, monthly income and age range factors had a significant affected on the hedonic scores as in Table 4 and Table 5, respectively. However, the genders, education level, occupation, and age range factors affected the hedonic scores of all attributes insignificantly.

Results from Table 4 demonstrated that the average hedonic scores of color attribute were significant different in each age group of participants. Nevertheless, the average hedonic scores of flower fragrance, sweetness, freshness and overall liking according to age were insignificantly different. The hedonic scores of color attribute from participants between the age of 31-40 and 18-21 years old were highest and significantly higher than participants which the age between 22-30 and 41-50 years old. The lowest average hedonic score of color was gained from participants between the ages of 41-50 years. The results indicated that participants between

the ages of 41-50 years were least preferred color of damask rose flower drink because the color of product was deep pink; it seems that product was added by synthetic color.

Results from Table 5 expressed that there were no significant differences of average hedonic scores in color, flower fragrance, freshness, and overall liking attributes in each income status of participants. While, average hedonic scores in sweetness attribute of participants who earned monthly income lower than 10,000 Baht were significantly higher than participants who earned monthly income higher than that (P<0.05).

Table 3 Just about Right scales (JAR) of ready-to-drink flower beverage products.

Product Formulas	Attributes	Intensity			Net score	Improvement
		Too little	JAR	Too much		
Damask rose flower beverage	Color	9	89	2	-7	no need to improve
	Flower fragrance	18	62	20	2	no need to improve
	Sweetness	20	64	16	-4	no need to improve
	Freshness	41	59	0	-41	increase the intensity
	Overall liking	19	84	3	-16	no need to improve
Water lily flower beverage	Color	18	78	4	14	no need to improve
	Flower fragrance	19	68	13	-6	no need to improve
	Sweetness	12	72	16	4	no need to improve
	Freshness	24	75	1	-23	increase the intensity
	Overall liking	15	80	5	-10	no need to improve

Table 4 Comparison of average hedonic scores of participants according to age for damask rose flower drink.

Attributes	Age range			
	18 – 21 years	22 – 30 years	31 – 40 years	41 – 50 years
Color*	8.18 ± 0.66^{b}	8.00 ± 0.82^{ab}	8.25 ± 0.52^{b}	7.67 ± 0.65^{a}
Flower fragrance	7.32 ± 1.67^{a}	7.62 ± 1.03^{a}	7.75 ± 1.18^{a}	7.83 ± 0.41^{a}
Sweetness	7.38 ± 1.32^{a}	7.00 ± 1.63^{a}	7.61 ± 1.10^{a}	7.33 ± 0.52^{a}
Freshness	7.18 ± 1.70^{a}	7.25 ± 1.00^{a}	7.29 ± 1.05^{a}	7.33 ± 0.51^{a}
Overall liking	7.51 ± 1.08^{a}	7.47 ± 0.84^{a}	7.72 ± 0.77^{a}	7.54 ± 0.29^{a}

Note: Mean comparison by using Duncan's new multiple rang test. The different letters mean the average data in the same row were significantly different (P<0.05).

Table 5 Comparison of average hedonic scores of participants according to income for damask rose flower drink.

Attributes	Monthly income (Baht)					
	lower than 10,000	10,001 – 15,000	15,001 –20,000	20,001 – 30,000	30,001 – 40,000	higher than 40,000
Color	8.15 ± 0.66^{a}	8.33 ± 0.70^{a}	7.92 ± 0.76^{a}	8.11 ± 0.57^{a}	8.25 ± 0.46^{a}	8.20 ± 0.84^{a}
Flower fragrance	7.41 ± 1.53^{a}	7.44 ± 2.18^{a}	7.62 ± 1.21^{a}	7.95 ± 0.75^{a}	7.12 ± 1.73^{a}	7.40 ± 0.55^{a}
Sweetness*	7.48 ± 0.96^{b}	7.11 ± 2.42^{ab}	7.15 ± 8.01^{ab}	7.74 ± 1.15^{b}	7.38 ± 1.18^{ab}	6.20 ± 2.38^{a}
Freshness	7.28 ± 1.50^{ab}	6.89 ± 2.32^{ab}	7.00 ± 1.00^{ab}	7.47 ± 0.90^{ab}	7.38 ± 1.18^{ab}	6.80 ± 0.84^{ab}
Overall liking	7.58 ± 0.93^{ab}	7.44 ± 1.66^{ab}	7.42 ± 0.62^{ab}	7.81 ± 0.65^{ab}	7.53 ± 1.02^{ab}	7.15 ± 0.93^{ab}

Note: Mean comparison by using Ducan's new multiple rang test. The different letters mean average data in the same row were significantly different (P<0.05)**.**

For the water lily flower drink, only the income factor had a significant affected on the hedonic scores. The results in Table 6 indicated that average hedonic scores in flower fragrance, freshness and overall liking of participants who earned income lower than 10,000 Baht were significantly higher than participants who earned income more than 40,000 Baht (P<0.05). This result was similar to the damask rose beverage and implied that young participants such as students are the target market of these flower beverages. Flower drink were also considered as healthy beverage (5), therefore young participants will satisfy health benefits of flower drink and willingness to pay for this flower drink.

Table 6 Comparison of average hedonic scores of participants according to income for water lily flower drink.

Attributes	Monthly income (Baht)					
	lower than 10,000	10,001 – 15,000	15,001 –20,000	20,001 – 30,000	30,001 – 40,000	higher than 40,000
Color	7.61 ± 1.40^{a}	7.89 ± 0.78^{a}	7.23 ± 1.42^{a}	7.68 ± 1.06^{a}	7.75 ± 1.17^{a}	7.00 ± 0.70^{a}
Flower fragrance*	7.87 ± 0.98^{b}	8.11 ± 0.78^{b}	7.98 ± 1.50^{b}	7.63 ± 0.95^{b}	7.88 ± 0.84^{b}	5.80 ± 1.64^{a}
Sweetness	7.76 ± 0.87^{a}	7.56 ± 1.01^{a}	6.85 ± 1.82^{a}	7.58 ± 1.22^{a}	7.62 ± 0.92^{a}	7.00 ± 0.71^{a}
Freshness*	7.74 ± 0.93^{bc}	8.11 ± 0.78^{c}	7.00 ± 1.41^{ab}	7.58 ± 1.26^{bc}	8.00 ± 0.93^{bc}	6.60 ± 0.55^{a}
Overall liking*	7.74 ± 0.76^{bc}	7.91 ± 0.72^{c}	7.04 ± 1.43^{ab}	7.62 ± 0.91^{bc}	7.81 ± 0.87^{bc}	6.60 ± 0.48^{a}

Note: Mean comparison by using Ducan's new multiple rang test. The different letters mean average data in the same row were significantly different (P<0.05)**.**

However, there were no significant differences in color and sweetness of average hedonic scores for each income status of participants. The participants who earned high income (>40,000 Baht) gave the lowest scores of sweetness attributes because the most people in this group of participants were the middle age people that caring for the health and well-being, therefore they will also choose low sugar food for consume.

4. Conclusions

The study of sensory acceptance on 2 formulas of flower beverages included damask rose and water lily flower concluded that the age of most participants were in the range of 18-21 years old. Most of them accepted the product in term of nutrition. The sensory evaluation showed that the participants preferred the water lily flower beverage more than the damask rose flower beverage. The average hedonic scores of sweetness and freshness attributes of water lily flower beverage were also higher than damask rose flower beverage. From the JAR scale analysis, the result suggested that the freshness attribute should be increased in both product formulas. The demographic factors, age range and monthly income, had the impact on product acceptance of damask rose flower in terms of color and sweetness attributes, respectively. For water lily flower beverage, only the income factor affected the product acceptance in terms of flower fragrance, freshness, and overall liking attributes.

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Declaration of conflicting interests

The authors declared that they have no conflicts of interest in the research, authorship, and this article's publication.

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