Consumer Behavior Towards Lemongrass (*Cymbopogon citratus*) Tea in Benguet Province, Northern Philippines

Marie Klondy Dagupen[1], Renata Januszewska[2], Lorna L. Lino[1], Darlyn Tagarino[1,*], Jacques Viaene[2], Roberto Arguelles[3], and Reynaldo Bautista[3]

[1] Benguet State University, La Trinidad, Benguet, the Philippines.
[2] Gent University, Coupure Links 653, 9000 Gent, Belgium.
[3] Saint Louis University, Baguio, Benguet, Philippines.
* Corresponding author. E-mail: dtagarino@yahoo.com.

Abstract

Sensory evaluation was done with 256 respondents who were willing to participate in the study and chosen through quota sampling based on age and sex. The respondents evaluated pure lemongrass tea and lemongrass with pandan (*Pandanus amaryllifolius*) using the research questionnaire given to them. Analysis of variance, factor analysis, and cluster analysis were used to assess a degree of association between different study components.

Results show that herbal teas were the most favored drinks among the respondents who strongly believe that these help in digestion and relieve stress. The sensory attributes driving acceptability of lemongrass teas were linked to light and clear green colors, citral aroma, and distinct taste. The high acceptability of lemongrass tea mixed with pandan, a locally appreciated herb, shows future possibilities in the product expansion lines.

Keywords: consumer behaviour; lemongrass; sensory quality

Abbreviation:

BSU – Benguet State University
KMO – Kaiser-Meyer-Olkin
PhP – Philippine peso
SLU – Saint Louis University
TDS – temporal dominance of sensation
USD – United States dollar

Introduction

Cymbopogon citratus is a perennial plant, probably of Indian origin, and is commonly cultivated in humid tropical and subtropical regions of the world (Seaforth and Tikasingh, 2005). In the Philippines, lemongrass grows in almost any place where there is proper drainage and adequate sunlight. Lemongrass has many uses. It is used in traditional medicine as treatment for fever and infectious diseases and has been reported to have antimicrobial and antifungal properties (Montala, 2006). Lemongrass is rich in a substance called citral, the active ingredient in lemon peel that is very helpful for treating indigestion; relieving spasm, muscle cramps, and rheumatism; and soothing headaches ("Lemon grass," 2000). Adegoke and Odesola (1996) observed that the phytochemical components like alkaloids, tannins, and cardiac glycosides found in powdered lemongrass are associated with its preservative and antimicrobial effects.

With its wide use as an ingredient for cooking, Berry (2004) describes lemongrass as the rising star in the herbal world, having both floral and fragrant characteristics that add an instant exotic appeal. It has traditionally been used to add flavor to Thai foods, but today, it is showing up in all types of foods, including soups and curries, as well as dishes based on chicken, pork, and seafood, particularly crab. The grass is not only used as a fresh herb but is also commercially available as tea. By definition, tea is an infusion prepared with the leaves of *Camellia sinensis* (Coimbra et al., 2006). However, lemongrass and other herbs steeped in boiling water and used as drinks are commonly referred to as herb tea ("Lemon grass," 1995).

Benguet Province, located in Northern Philippines, is a predominantly agricultural province with at least 54% of its population dependent on agricultural activities as their main source of income. The main agricultural activity in the province is vegetable production in small landholdings of less than 1 ha per farming household (Batt et al., 2007). Benguet is a major tourist destination in the Philippines because of its picturesque landscape and temperate climate. The municipality of Bokod is the second largest town in Benguet, occupying 13.40% of the total land area of the province. It is the gateway to Mt. Pulag, the second highest mountain in the Philippines. Like Benguet Province, agriculture is the main source of livelihood of the people, but the natural attractions of the town made it a tourist destination.

In support to the development of the municipality, Benguet State University (BSU), in partnership with Saint Louis University (SLU) in Baguio City, Northern Philippines, and Gent University in Belgium, set up a project to process *Cymbopogon citratus* products in the external campus of BSU in Bokod, Benguet, purposely for interested smallholder farmers to adopt as a livelihood project. *Cymbopogon citratus* grows abundantly in Bokod. The initial product developed was lemongrass tea (infusion) with variants such as

combinations of lemongrass tea with pandan (*Pandanus amaryllifolius*), ginger (*Zingider officinale*), and ampalaya (*Momordica charantia L.*). The nature of the said project is research and development, thus the sensory evaluation for the lemongrass teas developed was conducted.

It is crucial to focus on high-quality products when new product development is undertaken. From the consumer point of view, it is important that new products will have competitive sensory quality and that production will be economically viable for the local community. Sensory quality is seen as one of the most important characteristic in the final acceptance in the market.

Two lemongrass products, the pure lemongrass tea and lemongrass tea with pandan, were subjected to sensory evaluation.

This study has two objectives: first, to find out the consumer acceptance scores and characteristics of tea consumers through sensory evaluation, and second, to develop segmented communication strategies and the marketing plan for the lemongrass products of Bokod, Benguet.

Theoretical Concept

The theoretical concept of consumers' acceptance is based on the factors influencing the acceptability of food. Food acceptability is often referred to as liking, preference, enjoyment, selection, and consumption of a food or drink or food quality. Food acceptability represents different forms of behavior to food products. The selection and choice of food by an individual are determined by factors resulting from both product and the individual (Van Oirschot and Tomlins, 2002). Adopted in this study is a model, posited by Wierenga (1983), showing attributes that influence the acceptability of food and drink (Figure 1). The framework illustrates that in the process of choosing a particular item from a class of food products, different attributes of the product may play a role and the overall performance of the product is the result of (1) the relevant perceptual dimensions and beliefs of the consumer with respect to the performance of the product on the relevant dimensions and (2) the way the consumer trades off these product dimensions against each other.

Materials and Methods

The Questionnaire

The research made use of a structured questionnaire with two parts (Figure 2). The first part deals with the evaluation of the lemongrass tea considering color, aroma, taste, intensity, and over-all acceptability of the two test samples. These attributes are evaluated using 5-point bipolar scales. The lower scale of

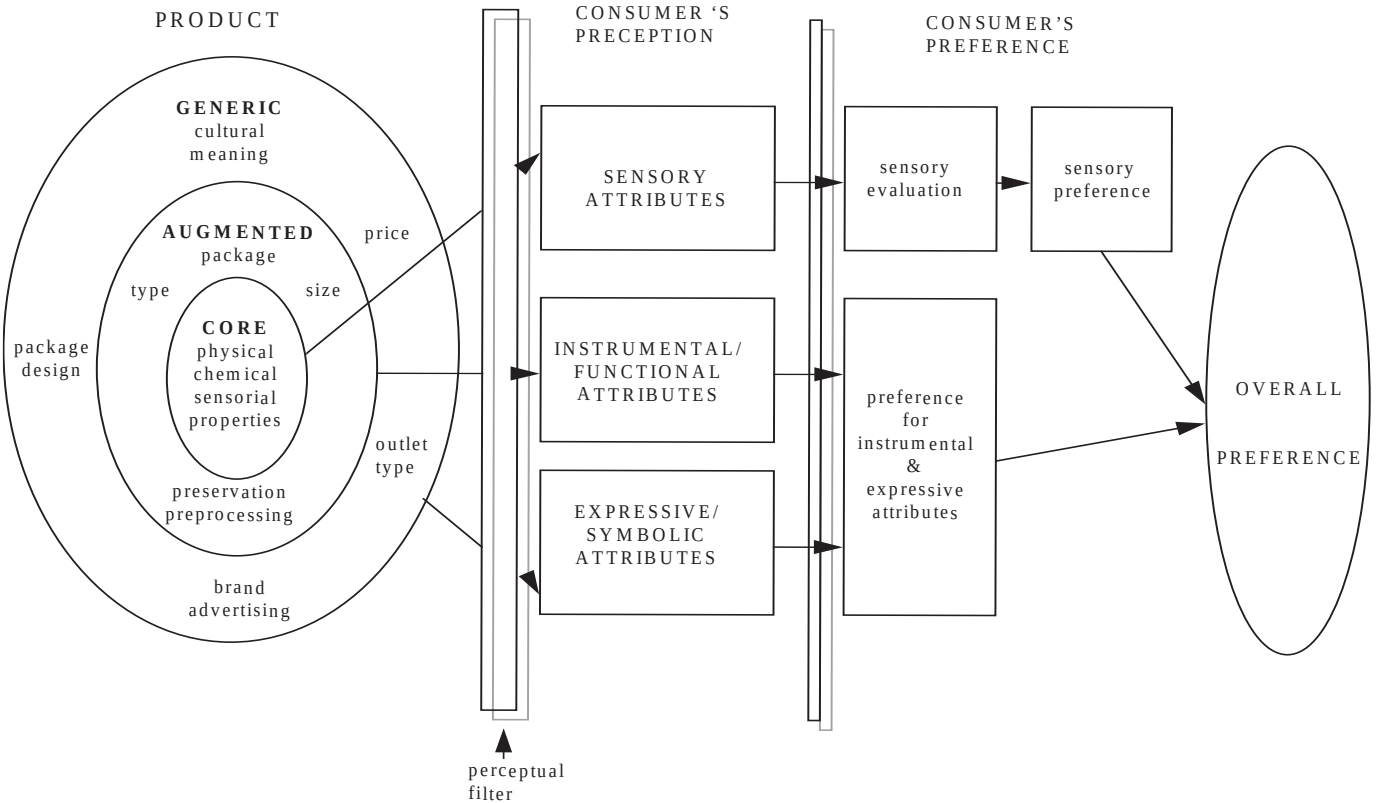

Figure 1. Formation of perceptions and preferences depending on the type of stimuli

Part 1. Perception of core product cues

Sensory directionals (bipolar semantic scales)	**Preference scores** (5-point Likert)
How did you judge _____ of this tea? **-colour** (1 - very light, 3 - just right, 5 - too dark) **-aroma** (1 - very light ←→ 5 - too fragrant) **-taste** (1 - very bitter ←→ 5 - too bitter) **-strength/intensity** (1 - too mild ←→ 5 - too strong)	What is your preference score for the tested sample of tea? 1. extremely disliked 2. disliked 3. neither liked nor disliked 4. liked 5. extremely liked

Part 2. Respondents' characteristics and beliefs

- Gender
- Age
- Education
- Occupation
- Income
- Place of living during the last year
- Where do you buy tea?
- How much tea do you usually buy?
- What kinds of tea do you buy (multiple choice)
- Do you prefer tea: hot or cold?
- Do you prefer tea packed as _____ (multiple choice)
- When do you drink tea?
- Do you believe that green tea has some special health curing properties?
- Do you believe that lemongrass tea/infusion has some special health curing properties?
- Do you believe that drinking tea is good for: soothing headaches, stopping colds/fevers, relieving pains/muscle cramp, solving indigestion/stomach problems, relieving stress, curing arthritis?

Part 3. Willingness to buy

- Would you buy the tested products if they were available on the market?
- How much would you pay for a single bag? (suggest price)
- How much would you pay for the pack of 25 bags? (suggest price)

Figure 2. Research design indicating structure of the questionnaire (based on Januszewska, 2001)

1 for the attributes indicates very light color, too light aroma, very light bitter taste, and very mild (intensity). The upper scale of 5 indicates the opposite: very dark color, too fragrant and distinct aroma, too bitter taste, and very strong (intensity). The middle point of 3 in each scale represents the point where the attributes are "just right." Respondents indicated their overall acceptability of the two products after giving their judgment on sensory attributes. This liking was indicated through a 5-point Likert scale. A scale of 1 and 2 represents "extremely disliked" and "disliked," respectively, while a scale of 4 and 5 represents "liked" and "extremely liked." The middle scale represents "neither liked nor disliked."

The second part of the questionnaire contains questions related to demographics such as age, sex, education, occupation, income, and residence. In addition, the amount of liquid intake, place of purchase, preference in buying tea (i.e., single tea bags, packs), product variations (i.e., green tea, black tea, red tea, flavored tea, or blends and herbal teas), preference in tea preparation, and time of consumption were also asked from the respondents. The other items included questions related to health and common beliefs about green tea and lemongrass tea (Mela, 1996) and willingness to buy the products if they were available in the market.

Sensory Evaluation

The sensory evaluations were done at the Benguet State University (BSU), La Trinidad, Benguet, and St. Louis University (SLU) in Baguio City.

Pure lemongrass and lemongrass with pandan teas processed by the project partners in BSU Bokod Campus were prepared hot for the sensory evaluation by filling up 2.2-L capacity thermos jars with boiling water. The thermos bottles were properly labelled for easy identification. Then, 7 bags of 2-g pure lemongrass and lemongrass with pandan teas were steeped for three minutes in coded thermos jars. The teas were then poured in small plastic cups labelled with 3-digit codes and served to the participants for sensory evaluation.

The participants in the study were chosen through quota sampling based on age and sex. The researchers made sure that the participants fully understood the objectives of the study and the procedure of the sensory evaluation before they started the evaluation. Questionnaires were given to the respondents, and they were asked to describe color, aroma, taste, intensity, and overall acceptability of the 2 test samples. Questions related to demographics, amount of liquid intake, place of purchase, preference in buying tea, product variations, preference in tea preparation, and time of consumption were answered by the respondents. There were 256 participants in this study.

Data Analysis and Results

Data was analyzed using descriptive and multivariate statistical analyses. First, the characteristics of respondents were calculated through crosstabs with Pearson Chi-square test. Second, the result of the sensory evaluation of the two sample teas was analyzed by a paired samples *t*-test discussed by Malhotra (2004). Finally, multivariate statistical analyses like two-group discriminant analysis and factor analysis were applied in order to find out the consumer segments.

Characteristics of Respondents

Of the 256 respondents, 51% are female and 49% are male (Table 1). The age of the respondents are fairly distributed with 33% below or equal to 25 years old, 35% are within 26 to 40 years old, while 32% belong to age group 41 years old and above. As to occupation of the respondents, the highest percentage (40%) are office employees, followed by students (32%), then workers employed in technical jobs other than office work (16%), and the rest are self-employed (private practitioners, farmers), unemployed, and retired. Most (84%) of the respondents finished tertiary or college level of education. The average monthly personal income indicated by the respondents was PhP10,000 (USD238 at USD1=PhP42) for 46%; PhP10,000–PhP20,000 for 20% of the respondents; PhP20,000 and above for another 20%; and 0 for 14% of the respondents. Sixty-five percent of the respondents live in the municipalities (rural areas) while the other 35% live in the cities. There were 61% of the respondents who indicated that they buy their tea in the supermarkets, 14% in public markets, 9% in convenience stores (*sari-sari* stores), 7% from all the aforementioned outlets, while 9% either make their own teas or receive them from friends.

Sensory Evaluation of the Lemongrass Tea

The results of the sensory evaluation of the lemongrass tea considering color, aroma, taste, strength or intensity, and overall acceptability using paired *t*-test is given in Table 2. Respondents described pure lemongrass as light yellow while the lemongrass with pandan infusion was described as light yellow to golden yellow. Aroma for both products was considered to be "just good." The taste came up to be light bitter with moderately strong intensity. Most respondents had also marked "liked" under the variable, overall acceptability. The paired *t*-test resulted to a significant difference between how the respondents look at the two products in terms of color, taste, and strength/intensity, with respective t values of -3.139, -2.891, and -2.135 and probability of .002, .004, and .034. However, overall acceptability showed no difference between the two products.

Table 1. Characteristics of respondents

Characteristics	Percentage (%)	Characteristics	Percentage (%)
Sex		**Income**	
Male	49	<P10,000	46
Female	51	10,001–15,000	15
Age		15,001–20,000	5
<25 years old	33	>20,001	20
26–40 years old	35	No Income	14
>41 years old	32	**Place of living**	
Highest educational attainment		City	35
		Municipality	65
Primary	2	**How much liquid do you drink during the day?**	
Secondary	14		
Tertiary	84	Up to 4 glasses per day	34
Occupation		5–6 glasses per day	35
Retired/emeritus	1	7–8 glasses per day	20
Student	32	> 8 glasses per day	11
Worker	16	**Where do you buy tea?**	
Office employee	40	Public market	14
Farmer	3	Small *sari-sari* stores	9
Private	6	Supermarkets	61
Unemployed	2	All of the above	7
		Others (make my own, given by friends)	9

Since 65% of respondents liked or extremely liked the pure lemongrass while 58% preferred the lemongrass mixed with pandan, it is concluded that both products could penetrate the market. Additionally, about 80% of the respondents were willing to buy pure lemongrass, and 70% indicated their willingness to buy the lemongrass mixed with pandan. Meanwhile, 67% preferred herbal tea; 59%, green tea; 49%, tea blends; 22%, black tea; and 20%, red tea. Based on this result, it is concluded that the product marketability is high.

Moreover, the respondents believed that lemongrass helps in dissolving kidney stones (100%). Green tea is an important source of flavanoids, namely catechins, which are strong anti-oxidants (Coimbra et al. 2006), and is believed

Table 2. Consumers' sensory evaluation for pure and pandan lemongrass teas

Variable	Mean		Value t-test	Significance
	Lemongrass Pure	Lemongrass with Pandan		
Color	2.11	2.35	-3.139	.002
Aroma	2.73	2.78	-.653	.514
Taste	1.89	2.11	-2.891	.004
Strength/ intensity	2.02	2.17	-2.135	.034
Overall Acceptability	3.6055	3.5742	.486	.627

to have healing properties (94%). There are 87% of the respondents who believed that lemongrass has healing properties. Also, there were 82% of the respondents who believed that lemongrass helps in indigestion and stomach problems, soothes stress (73%), stops colds and fevers (68%), relieves pains (57%), and cures arthritis (42%).

Sensory Segments

Two consumer segments were established based on sensory profiling including color, aroma, taste, intensity, and overall acceptability of two lemongrass teas (Table 3). Consumer segmentation was achieved through a 3-step procedure: (1) factor analysis (KMO = .538, Bartlett's Test of Sphericity p=0.000, 55% of explained variance, 3 factors solution); (2) cluster analysis; and (3) discriminant analyses (Wilks' lambda = .344, p=0.000, and 99.6% cases correctly classified).

The first segment is called "Positive Consumers" (TDS = 3.74). Results of cross-tabulation showed that these consumers are potential lemongrass tea drinkers; they were less educated, bought less green tea, strongly believed in the healing properties of lemongrass (90% vs. 85% for segment 2), liked both tested lemongrass teas (especially the one with pandan), and preferred light green color of lemongrass tea with balanced bitterness and distinct citral aroma.

The second segment is called "Negative Consumers" (TDS = - 2.64) and included higher-educated respondents living in the cities, who were skeptical and did not believe in the healing properties of lemongrass and disliked the taste of both tested lemongrass teas.

Table 3. Classification function coefficients for lemongrass sensory segments

Discriminant Factor	Positive Consumers (n = 106)	Negative Consumers (n = 150)
Factor 1 Liking of lemongrass tea with pandan	0.504	-0.356
Factor 2 Liking of lemongrass tea	2.679	-1.893
Factor 3 Overall acceptability of both teas	0.552	-0.390
Total Discriminant Score (TDS)	3.735	-2.639

Conclusions

Herbal teas are the most favored drinks among the respondents who strongly believe that these products help in digestion and relieve stress. Consumption of such products is not much; only 1/3 of the respondents follow the recommendation of Food Guide Pyramid related to drinking more than 2 L of liquid per day.

Sensory attributes driving acceptability of lemongrass teas are linked to light and clear color, stronger citral aroma, and taste. There are two distinct consumer segments derived: the positive consumers were less educated and held many beliefs about the healing properties of lemongrass tea while the negative consumers were highly educated, did not believe in the healing properties of lemongrass, and disliked the taste of both tested lemongrass teas. Improvement can be focused on the product and/or market development.

Acknowledgments

The authors would like to thank the VLIR program, Prof. Jacques Viaene, and his students taking the course on Strategic Marketing Management at Saint Louis University (SLU), as well as Dr. Jane Avila and Dr. Darlyn Tagarino from Benguet State University, for the inspiration about this study. Special thanks are extended to research assistants of BSU, PIUC Project 5 for data gathering and processing, namely, Lailani Moreno, Beverly Ann Gumihid, Analyn Lucas, and Lester Madino.

References

Adegoke, G., and B. Odesola. 1996. Storage of maize and cowpea and inhibition of microbial agents of biodeterioration using the powder and essential oil of lemongrass (*Cymbopogon citratus*). International Biodeterioration and Biodegradation 37(1&2): 81–84.

Batt, P., S. Concepcion, K. Dagupen, M.C. Lizada, and R. Murray-Prior. 2007. The vegetable industry in the Philippines. Australian Centre for International Agricultural Research, Canberra. 17 November 2007. http://www.aciar.gov.au/publication/FR2007-06.

Berry, D. 2004. Fresh advice on herbs and spice. Virgo, Illinois. 17 November 2007. http://www.foodproductdesign.com/articles/2004/05/food-product-design-applications--may-2004--fre.aspx.

Coimbra, S., E. Castro, P. Rocha-Pereira, S. Rocha, A. Santos-Silva. 2006. Green tea consumption improves plasma lipid profiles in adults. Nutrition Research 26 (11):604–607.

Januszewska, R. 2001. Food product development by integrating marketing and sensory analysis: A tool to the EU-integration challenge. Ghent University, Belgium, Ph.D. Thesis.

Lemon grass. 1995. In: Epicurious food dictionary. 8 January 2008. http://www.epicurious.com/tools/fooddictionary/entry?id=3270.

Lemon grass. 2000. In: GourmetSleuth. 17 November 2007. http://www.gourmetsleuth.com/lemongrass.htm.

Malhotra, N. 2004. Marketing research: An applied orientation. 4th ed. Pearson Education Inc., New Jersey, pp. 415, 453–454.

Mela, D.J. 1996. Eating behaviour, food preferences and dietary intake in relation to obesity and body-weight status. Proceedings of the Nutrition Society 55: 803–816.

Montala, M. 2006. Health benefits of lemongrass. 17 November 2007. http://www.filipinovegetarianrecipe.com/wordpress/?p=11.

Seaforth, C., and T. Tikasingh. 2005. A study for the development of a handbook of selected Caribbean herbs for industry. 17 November 2007. http://www.anancy.net/uploads/file_en/010905_Carribean_Herbs_finalreport.pdf.

Van Oirschot, Q.E.A., and K.I. Tomlins. 2002. Applying analytical sensory evaluation techniques, which translate qualitative perceptions to numerical data to research on development issues. Paper presented at the Conference on Combining Qualitative and Quantitative Methods in Development Research, Centre for Development Studies, University of Wales, Swansea, 1–2 July 2002.

Wierenga, B. 1983. Model and measurement methodology for the analysis of consumer choice of food products. Journal of Food Quality 6:119–137.