# The Survey of Consumer Behaviors and Needs on Functional Ingredient (Lycopene and a Mixture of Probiotic & Fiber Powder) in Type of Pressed Bottle Cap – New Healthy Beverage

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#### Abstract

Currently, consumers are increasingly interested in healthy beverages and food. Fruits and Vegetables contain vitamins and minerals. Both of them are sources of antioxidants, which support the immune system and aid in disease prevention. Lycopene, probiotic, and fiber have been a trend of healthy functional ingredients throughout the world. Thus, the product idea generates a product concept for new product development. This research is aimed to study the survey of consumer behaviors and acceptance on functional ingredients (lycopene and a mixture of probiotic & fiber powder) in a pressed bottle cap as a new healthy beverage. The 100 participants who participated are originated from Panyapiwat Institute of Management. These individuals were divided into 2 groups: university students and workers at a ratio of 20:80. The data was collected using a questionnaire and a sensory test with a 9-point hedonic scale. The results showed that the objectives of their consumption are beneficial and nutritional (63%, 56%). The acceptable pricing is at 18 THB per 4 grams (52%, 41%) and the packaging satisfaction is OK (70%, 55%). The expected frequency to buy is a week per bottle (84%, 78%) and the purpose to purchase is when they do not have enough rest at 48%, 55%. A likely place where they would purchase the product is at convenience stores at 90%, 94%, and the purchase intent is 46% and 33%. The expected benefits of the product are 59% antioxidant, and 43% digestive system improvement. For the sensory evaluation, the overall liking score of those are  $6.46\pm1.49$  and  $6.36\pm1.80$  (P $\ge$ 0.05), respectively. Accordign to the survey, the developed product should therefore have a similar characteristic to the product survey, and fit to target consumer acceptance.

Keywords: Consumer Behaviors, Consumer Acceptance, Functional Ingredient, Lycopene and the Mixture of Probiotic & Fiber powder, Sensory Evaluation, New Healthy Beverage

#### 1. Introduction

The trend for healthy food has been continuously increased each year. Moreover, consumers expect healthy food choices in order to have an improved quality of life with the availability of aging. Functional foods and beverages from natural ingredients are now getting quite some attention because these ingredients contain quality to prevent deceases (Vicentini et al, 2016). The three major markets in the world for functional foods are the USA, Japan, and Europe. The global market value of functional foods has increased by 26.7% from 2009 to 2013 with an average growth rate of 8.5% annually. The global market value is expected to reach approximately \$305.4 billion by 2020. The functional beverage market is the fastest-growing segment within the functional food sector at \$25 billion value in 2005. In 2012, the USA's sales of functional beverages accounted for approximately 59% of the global functional food market. The functional beverages market in 2025 is forecasted to account for 40% of the overall consumer demand (Nazir et al, 2019). Thus, new healthy beverages are an interesting product to manufacture.

Lycopene is a carotenoid group as bright red, which is a natural pigment in plants which have antioxidant properties, such as tomatoes,. Therefore, these account for more than 85% of all lycopene sources in the diet. However, Lycopene are also presented in guava, cranberry, peaches, pink grapefruit, apricot, watermelon, and papaya. Lycopene is accountable for several health benefits ranging from heart strength to sunburns and certain types of cancers protections (Condori et al, 2020).

Probiotics are good living bacteria and yeasts which help keep the stomach healthy. These probiotics are found in food supplements and some products such as yogurt. Probiotics are defined by the World Health Organization (WHO) as "live microorganisms which when administered in suitable amounts

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provide a health benefit on the host" (Geest et al, 2020). Probiotics help in the digestive tract that provides beneficial effects on health. Therefore, disturbance of its composition and function may contribute to the development of diseases (Villanueva et al, 2020). As for the dietary fiber that couldn't be digested, it would be defecated from the body after absorbing harmful substances in the intestinal tract. Moreover, dietary fiber can improve the body's immunity, as well as prevent diseases (He et al, 2020). The demand for healthy beverage industry containing lycopene, probiotics and fiber have been continuing to rise as consumers "go with their gut" to improve health and prevent disease. Normally, combining probiotics with fiber in the beverage industry is popularly used because these can increase the number of benefits in gut health (Karg, 2020). The lycopene in food formulations is utilized as a functional ingredient. The factor of lycopene stability largely depends on the food system and processing which increase bioavailability (Meroni & Raikos, 2018). Nowadays, the easy-to-use smart packaging market was valued at USD 36.81 billion in 2019, and is estimated to reach USD 46.25 billion by 2025, recording a CAGR of 4.19% over the estimated period of 2020-2025 (Mordor Intelligence, 2019). The smart packaging, press type powder packaging plastic bottle caps for beverage has been a trend in China and the USA. The steps of using this kind of bottle cap are to sip some water in first to prevent leaking, then put the beverage bottle cap on. Next, press the top of the cap to let the powder drop into the water and dissolve into the beverage.

This research is aimed to study the survey of consumer behavior and acceptance on functional ingredients (lycopene, probiotic and fiber powder) in a pressed bottle cap packaging, which is a new and healthy beverage for product development and has a similar characteristic to product survey and adhering towards target consumer acceptance.

## 2. Objectives

1. To study consumer behaviors and needs on functional ingredient (lycopene and the mixture of probiotic & fiber powder) in a pressed bottle cap packaging - new healthy beverage

2. To study consumer acceptance on functional ingredient (lycopene and the mixture of probiotic & fiber powder) in a pressed bottle cap packaging - new healthy beverage by using sensory evaluation

## 3. Materials and Methods

3.1 Research framework



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### 3.2 Methods

The research is a quantitative research using sampling method to the target consumer and sensory test with the blind of sample names using liking scores (9-points hedonic scale). The data are analyzed using t-test and descriptive statistic including percentage, average, and standard deviation.

#### 3.2.1 Consumer acceptance test

3.2.1.1 Data collection and analysis of consumer behaviors and needs

3.2.1.2 Creation of research instrument; validation of content (content validity) and reliability

3.2.1.3 Trying out of research instrument for the consumer then solving for application

3.2.1.4 Analyze and conclusion

### 3.2.2 Population and samples

## 3.2.2.1 Population

The 100 participants (target consumers) were conducted at the Panyapiwat Institute of Management in partitioned sensory booths and were divided into 2 groups: university students and workers. The population size design of this study used consumer acceptant tests that provided the sample size of 60 or more for power calculations conducted following the method of ISO 8587: 2006 in the topic of sensory analysis - methodology - ranking (Birol et al, 2015).

#### 3.2.2.2 Samples

The participants are university students and workers at a ratio of 20:80, and the proportion of male to females is 20:80, respectively.

## 3.2.3 Research Instrument

The research instrument using data collection was divided into 2 parts per sample as follows:

### Lycopene powder

Part 1: Questionnaire in the topic of consumer demographics and behavior on functional ingredient (lycopene powder) in a pressed bottle cap packaging - new healthy beverage.

3.2.3.1 Consumer demographics (sex, age, education, career, income)

3.2.3.2 Consumer behavior and acceptance on lycopene powder (suitable price, purchase quantity, purpose to purchase, the interest of taste)

Part 2: Consumer liking on functional ingredient (lycopene powder) in the a pressed bottle cap packaging - new healthy beverage.

### **Samples preparation**

The pressed bottle cap - new healthy beverage's first step of preparation is to drink some water first after opening the bottle. Then the beverage powder bottle cap is put on the bottle's outlet. When the top of the cap are pressed, the aluminum lid will be broken. Then the beverage powder will drop from the bottle caps. Finally, shake the bottle until the mixture of water and the beverage powder becomes drinking juice.

For sensory evaluation, 100 panelists are used to determine color, flavor, taste and overall liking score of samples using a 9-point hedonic scale ranging from 9 (extremely like) to 1 (extremely dislike) (Feng & Mahony, 2017).

#### Probiotic & fiber powder

Part 1: Questionnaire in the topic of consumer demographics and behavior on functional ingredient (the mixture of probiotic & fiber powder) in a pressed bottle cap packaging - new healthy beverage.

#### 3.2.3.3 Consumer demographics

3.2.3.4 Consumer behavior and acceptance on the mixture of probiotic & fiber powder

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Part2: Sensory evaluation on functional ingredient (the mixture of probiotic & fiber powder) in a pressed bottle cap packaging - new healthy beverage.

### Samples preparation

The pressed bottle cap - new healthy beverage's first step of preparation is to drink some water first after opening the bottle. Then the beverage powder bottle cap is put on the bottle's outlet. When the top of the cap are pressed, the aluminum lid will be broken. Then the beverage powder will drop from the bottle caps. Finally, shake the bottle until the mixture of water and the beverage powder becomes drinking juice.

For sensory evaluation, 100 panelists are used to determine color, flavor, taste and overall liking score of samples using a 9-point hedonic scale ranging from 9 (extremely like) to 1 (extremely dislike) (Feng & Mahony, 2017).

#### 3.3 Analysis of research instrument quality

- 3.3.1 The questionnaire is validation checked by experts using the content validity method. The Item Objective Congruence index (IOC) of each question choice of the survey is analyzed, then the reliability of the questionnaire is checked.
- 3.3.2 The reliability of the questionnaire is analyzed with 30 consumers, and is then improved it for application.

#### 3.4 Statistical and data analysis

- 3.4.1 The data of consumer demographic needs and acceptance section are analyzed using frequency and percentage.
- 3.4.2 The data of consumer likings are expressed as means ± standard deviations (SD) and the significant differences among means are determined by one-way ANOVA using SPSS (Version 12, SPSS Inc., Chicago, USA).

## 4. Results and Discussion

Most of the participants, who are for lycopene and the mixture of probiotic & fiber powder are female (73%, 75%), are 18-21 years (77%, 67%), are with bachelor degree (83%, 81%), are student (89%, 89%) and have lower than 10,000 THB income (49%, 66%) as shown in the Table 1.

The results of consumer behaviors and needs are showed in Table 2. Most of the participants have the objective to buy lycopene and the mixture of probiotic & fiber powder because they like the benefits and nutrition (63%, 56%). For the lycopene and the mixture of probiotic & fiber powder , they think 18 THB per 4 grams of is an appropriate price (52%), but for the mixture of probiotic & fiber powder, 15 THB is a suitable price (52%). Their level of packaging satisfaction are OK (70%, 55%), and their frequency to buy is at 1 time per week (84%, 78%). For lycopene, their expectations of the beverage are to have antioxidant (59%), to help brighten skin (52%), but for the mixture of probiotic & fiber powder, the expectations are digestive system improvement (43%) and relaxation (35%). They have an intention to purchase when they have not enough rest at 48% and 55% for lycopene and the mixture of probiotic & fiber powder, 94%).

However, even though the participants suggested that the product still needs development and taste improvement, their purchase intention are purchase immediately at 43% and 33% for lycopene and the mixture of probiotic & fiber powder, respectively(21%, 42%). As for the taste, the participants receive strong tomato taste for lycopene powder and vegetable taste for the mixture of probiotic & fiber powder. Hence, the product should have development and improvement of taste by reducing tomato flavor for lycopene powder and vegetable flavor for the mixture of probiotic & fiber powder.

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### Table 1 Demographics information of consumers participated

Demographics	Lycopene powder (%)	Mixture of Probiotic & Fiber powder (%)	
Sex			
Male	27	25	
Female	73	75	
Age			
18-21 years	77	67	
22-30 years	16	31	
Over 31 years	7	2	
Education			
Bachelor	83	81	
Higher than Bachelor	10	4	
Career			
Student	89	89	
Private employees	11	11	
Income			
Lower than 10,000 THB	49	66	
10,001-15,000 THB	38	29	
Higher than 15,001 THB	13	5	

## Table 2 Consumer Behaviors and Needs

Consumer Behaviors and Needs	Lycopene powder (%)	Mixture of probiotic &	
Objective of consumption			
Want to try a new strange product	26	23	
Want benefits and nutrition	63	56	
Like the flavor and taste	16	13	
Etc. for example, easy to drink	6	5	
Is 18 THB per 4 grams a suitable			
price?			
Suitable pricing	52	41	
Not <b>a</b> suitable price			
15 THB	34	50	
20 THB	9	7	
22 THB	3	2	
25 THB	2	0	
Level of packaging satisfaction			
Very dissatisfied	1	3	
Dissatisfied	5	8	
OK	70	55	
Satisfied	23	32	
Very satisfied	1	2	
Frequency of purchase			
1 time per week	84	78	
2-3 times per week	15	15	
4-6 times per week	1	7	

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 Table 2 Consumer Behaviors and Needs (cont.)

Consumer Behaviors and Needs	Lycopene powder (%)	Mixture of probiotic & fiber powder (%)	
Expectation of the product			
Antioxidant	59	34	
Relaxation	14	35	
Digestive system improvement	27	43	
Helps brighten the skin	52	33	
Etc.	3	3	
Reason of purchase			
Not enough rest	48	55	
Noticing the product at a store	23	31	
Going for a travel	17	9	
During holidays or special days	8	1	
Etc.	4	4	
Place to buy			
Convenience store	90	94	
Supermarket	5	5	
Trade shows	3	1	
Etc.	2	0	
Purchase Intention			
Purchase immediately	46	33	
No decision			
Expensive price	5	2	
Do not want to try the new product	11	17	
The product still needs	21	42	
development and taste improvement			
Do not purchase immediately	5	3	
Expensive price	1	3	
Do not want to try the new product	3	0	
The product still needs	6	0	
development and taste improvement			
Etc.	2	0	

Table 3	The overall liking score	e of both samples (	lycopene and the n	nixture of probiotic	& fiber powder)
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Attribute	Lycopene powder (%)	Mixture of probiotic &
		fiber powder (%)
Color	$7.53^{a} \pm 1.16$	$6.92^{b} \pm 1.52$
Flavor	$6.46^{a} \pm 1.47$	$6.03^{b} \pm 2.05$
Taste <sup>NS</sup>	$6.57 \pm 1.70$	$6.56 \pm 1.70$
Overall liking <sup>NS</sup>	$6.46 \pm 1.49$	$6.36 \pm 1.80$

<sup>a-c</sup> Significant difference was based on the T- test at P < 0.05. N = 100 consumers. <sup>NS</sup> No significant difference was based on the T- test at  $P \ge 0.05$ . N = 100 consumers.

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The sensory attributes in terms of color, flavor, taste and overall liking are measured. This data is used to show consumer likings of both samples (lycopene and the mixture of probiotic & fiber powder). The sensory attributes (Table 3) shows that the lycopene powder have a higher color score at  $7.53 \pm 1.16$  (moderate liking) and flavor score at  $6.46 \pm 1.47$  (slight liking) (significant difference; P < 0.05) than the mixture of probiotic & fiber powder. The results of taste and overall likings of both samples (lycopene and the mixture of probiotic & fiber powder) at  $6.46 \pm 1.49$  and  $6.36 \pm 1.80$  (like slightly) are not significantly different ( $P \ge 0.05$ ). Hence, the sensory characteristic of both samples are conducted for product development in the future following target consumer needs.

Both samples (lycopene and the mixture of probiotic & fiber powder) of functional ingredients in a pressed bottle cap packaging type - new healthy beverage is shown in Figure 1.



Figure 1 Functional ingredient in a type of pressed bottle cap - new healthy beverage

## 5. Conclusion

The data of consumer behaviors, needs and acceptance on functional ingredient (lycopene and mixture of probiotic & fiber powder) in pressed bottle cap packaging type - new healthy beverage is important for future product development in terms of pricing, packaging and place for sale, according to the data of target consumer needs. The product's flavor should be improved by decreasing tomato flavor in lycopene powder and vegetable flavor in the mixture of probiotic & fiber powder. And as for the sensory evaluation, the overall liking score of those are  $6.46\pm1.49$  and  $6.36\pm1.80$  (P $\ge$ 0.05), respectively. Hence, the developed product should have a similar characteristic to the product survey and fit the target consumer acceptance.

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