

Respondents' Acceptance of Functional Candy with Ginger and Tempe as Substitute Ingredients

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Abstract. This study aims to determine the acceptance of functional candy with ginger and tempe as substitute ingredients. This experimental research is conducted in February-June 2022 at the Laboratory of Home Economics Department, UNM. Data was collected from 37 trained panelists in the form of quality and preference of the candy, which consists of color, aroma, texture, taste, and preference. The material studied was candy with a substitution formula of ginger flour and tempe flour. The data analysis uses average, frequency, and t-test. The results show that the color indicator is getting darker, the aroma is getting more fragrant, the texture is brittle, the taste is spicy, and the likes are getting less. The most preferred formula is the formula FS152 with 6.6% of cinnamon extract, 3.45% of ginger extract, 4.95% of tempe flour, 19.295% of water, 56.61% of sucrose, and 9.095% of glucose syrup..

Keywords: Functional Candy, Ginger, Tempe.

1 Introduction

The high number of deaths and declining health caused by infectious factors in the last two years, especially Covid-19 cases with various variants, require us to maintain and increase immunity. Immunity is the barrier against infections that will cause pain. The increase in immunity, in addition to a healthy body condition, also consumes good quality and quantity of food to support the body's immunity [1].

The processing and utilization of tempe in Indonesian society until nowadays have only been in the form of being fried as a side dish and as an addition to other processed foods [2]. The advantage of tempe is the antioxidant activity contained in it, and it has been widely studied in several studies towards its benefits for health [3], [4], [5]. Currently, tempe is categorized as one of the functional foods recommended to be consumed to improve nutritional status and prevent various diseases. In addition, the bioactive of tempe that is beneficial for the human body include isoflavones flavonoids which have efficacy in cardiovascular prevention, Tempe contains nutrition contents, such as essential fatty acids, unsaturated fatty acids, protein, carbohydrate, fiber, calcium, and iron [3], [6], Tempe is a fermentation product by soybean and *Rhizopus* sp., which is known for their great nutritious properties consist of vitamin E, carotenoids, saponins, isoflavones and anthocyanins [4].

Another ingredient that is widely used by the community is cinnamon. Cinnamon oil is a more potent antimicrobial agent and has the potential to be used as a food bio preservative [7], [8]. Food bio preservative is the use of non-pathogenic microorganisms and/or their metabolites that aim to improve microbiological food safety and extend the shelf life of food ingredients [7]–[12].

Cinnamon activity in cinnamaldehyde, aromatic aldehyde that can inhibit amino acid decarboxylase activity, and anti-bacterial compounds that inhibit the growth of microorganisms. Cinnamon contains benzoic acid (benzaldehyde) and cinnamic acid as antimicrobials and also contains eugenol, which is known as a bactericidal or bacteriostatic agent. The fungistatic or fungicidal effect of cinnamon can avoid cytoplasmic granulation, cytoplasmic membrane rupture, and inactivation and/or inhibition of intracellular and extracellular enzymes. Furthermore, cinnamon may also prevent the germination of pathogenic fungal cells [7]–[9], [11], [12]

Another functional ingredient is ginger, which is widely used in cooking because of its taste and ability to aid digestion. Ginger is a good source of nutrition, contains essential minerals and amino acids, and has a high potassium content. It can be used as herbal medicine for colds, stomachaches, diarrhea, and nausea. Ginger also has antioxidant and anti-inflammatory activities, some of which have anticancer potential. Phenolic compounds in ginger, such as 8-gingerol and 10-gingerol, are significantly active against Covid-19. In addition, ginger functionally can relieve joint and muscle pain, sprains and spasms, sore throat infections and fever, acid reflux, hypertension, dementia, and helminthiasis without side effects [13]–[17]

The available number of these three ingredients (tempe, cinnamon, and ginger), especially in the function of antioxidants, antimicrobials, and several other functions, makes it possible to be more optimal if these ingredients are modified in the form of available candy. Functional candy is included in the active food category, where functional food is food (fresh/processed) that contains components that are useful for improving certain physiological functions and/or reducing the risk of illness as proven based on scientific studies, which show the benefits in the amount generally consumed as part of the daily diet [18]

The processing variations of the three ingredients are overgrowing along with the emergence of various food innovations based on local food and various health benefits [1], [19]. Food variations provide convenience in processing and consuming them so that the benefits of tempe, cinnamon and ginger can be better. Several variations of processed tempe are used in the form of functional candy to improve general health for consumers [20].

Utilization of tempe in the form of flour and puree, which is currently used, among others, as a substitute in making biscuits [5], tempe broth [21], tempe milk [22], ice cream [23]–[25], tempe porridge [26], [27]. The innovation based on tempe provides evidence of the benefits, ease of processing and obtaining tempe raw materials [3].

The innovation carried out in this research is the available candy made of tempe flour, cinnamon extract and ginger extract. The choice of available candy is because candy is one of the pleasant foods to consume. It is not uncommon for people to consume large amounts of candy. Candy is a solid food formed from sugar or other sweeteners with or without other food ingredients and permitted food additives. Candy is one of the most popular types of processed food by all levels

of society, both kids and adults. The sweet taste and soft texture make this food product get the attention of candy lovers.

Based on this background, it is essential to research health product innovation that has significant benefits to improve public health.

2 Method

This experimental research is conducted in several stages. The first stage is making tempe flour, cinnamon extract, and ginger extract. The second stage is making functional candy using tempe flour, cinnamon flour, and ginger flour. This research was conducted at the Laboratory of Home Economics Department of UNM for the flouring, puree, candy formulation, and functional candy acceptance test. The tools used in making cinnamon extract, ginger and tempe flour are weighing scales, a dough bowl, a spoon, a grinder, an oven, an 80 mesh sieve, a measuring cup, and filter paper. At the same time, the ingredients used are tempe flour, cinnamon extract, ginger, sucrose, water and glucose syrup.

The data collection method in this study began with the process of making functional candy with the addition of tempe flour, cinnamon extract and ginger extract using photo documentation, while the characteristics of available candy with the addition of tempe flour, cinnamon extract, and ginger extract using a scoresheet with 7 scales consist of color (dark to light/ not dark), aroma (fragrant to not fragrant), texture (hard to soft), taste (good to bad). In comparison, acceptance also uses a scoresheet with 11 scales (like to dislike) [1], [28]. Data analysis techniques used for making available candy with the addition of tempe flour, cinnamon extract and the ginger extract is descriptive analysis. Characteristics of candy quality using average, different tests, and further difference tests. The acceptance data used frequency analysis [1], [18], [28], [29], [30].

3 Results and Discussion

3.1. Candy Making Process

The process of making candy starts with the preparation of materials and tools, including cinnamon extract, ginger extract, tempe flour, water, sucrose, and glucose syrup. The next step is weighing the ingredients according to the recipe's amount, mixing them and, heating them at 100°C, then printing and packaging.

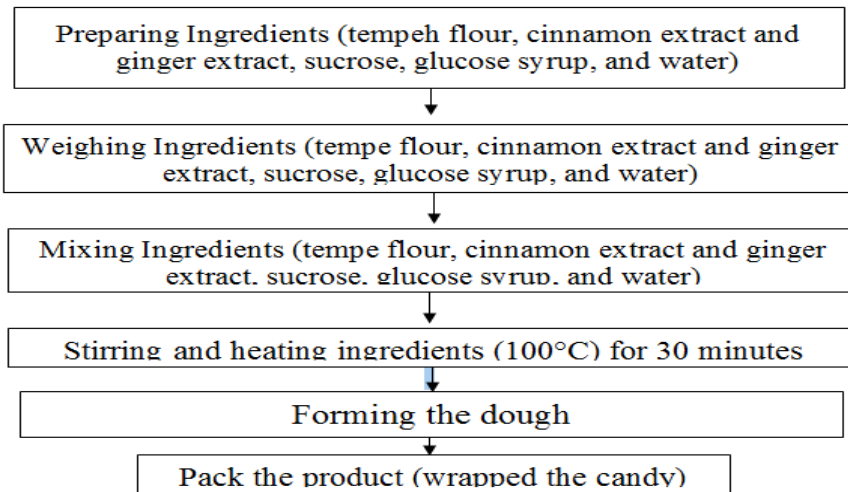


Fig. 1. Flowchart of the candy making process

Table 1. Formulation of candy

INGREDIENTS	F0	5	10	15	20	25	30
		FS52	FS10 2	FS152	FS20 2	FS252	FS30 2
Cinnamon Extract	0	2.2	4.4	6.6	8.8	11	13.2
Ginger Extract	0	1.15	2.3	3.45	4.6	5.75	6.9
Tempe flour	0	1.65	3.3	4.95	6.6	8.25	9.9
Water	22.7	21.56	20.43	19.29	18.16	17.02	15.89
Sucrose	66.6	63.27	59.94	56.61	53.28	49.95	46.62
Glucose syrup	10.7	10.16	9.63	9.095	8.56	8.025	7.49
Amount	100	100	100	100	100	100	100

Candy produced as follows:



Fig. 2. The candy produced

3.2 Candy Quality Test Results and Preference

The hedonic test was conducted to obtain information about the quality of the candy and the panelists' preference for the product. The data can be seen in the following table:

Table 2. Acceptance Test of the Candy

Indicators	FS52	FS102	FS152	FS202	FS252	FS302	p.Value		Trend
Color	3.30±0.58 ^a	3.32±0.48 ^a	3.62±0.49 ^{bc}	3.46±0.51 ^{ab}	3.68±0.53 ^{bc}	3.81±0.74 ^c	0.000**	0.0988 x	Darker
Scent	3.03±0.77 ^a	3.38±0.49 ^b	3.62±0.49 ^{bc}	3.46±0.51 ^b	3.81±0.57 ^{cd}	4.00±0.78 ^d	0.000**	0.1714 x	More fragrant
Texture	3.03±0.77 ^a	3.27±0.56 ^b	3.57±0.50 ^b	3.54±0.61 ^b	3.89±0.61 ^c	4.16±0.8 ^c	0.000**	0.2147 x	Less hard
Flavor	4.68±0.67 ^d	4.43±0.65 ^{cd}	4.59±0.55 ^d	3.59±0.6 ^a	3.89±0.61 ^{ab}	4.16±0.79 ^{bc}	0.000**	-0.1483x	Spicier
Overall	3.71±0.56 ^a	4.76±0.35 ^c	6±0.30 ^d	4.49±0.51 ^c	3.74±0.51 ^{ab}	3.93±0.75 ^b	0.000**	-0.0995x	Dislike
Hedonic	6.68±0.67 ^b	7.43±0.65 ^c	9.57±0.5 ^e	8.54±0.62 ^d	5.89±0.61 ^a	6.16±0.8 ^a	0.000**	-0.2347x	Increasingly unacceptable
Levels of preferences									
Dislike	1 (2.7%)	0 (0%)	0 (0%)	0 (0%)	5 (13.51%)	9 (24.32%)			
Neutral	10 (27.03%)	3 (8.11%)	0 (0%)	0 (0%)	6 (16.22%)	13 (35.14%)			
Like	26 (70.27%)	34 (91.89%)	37 (100%)	37 (100%)	26 (70.27%)	15 (40.54%)			

Note: ** p<0.01= Very Different

3.3 Discussion

a. The Process of Making Candy

The process of making candy with the addition of cinnamon extract, ginger extract and tempe flour. The more the number of additives produced, the darker the color, the more fragrant the aroma, the more brittle the texture of the candy produced, and the more unpleasant the taste of the candy with the increase in the additives. So the acceptance is decreasing [20], [31]–[34]

b. The quality of the Candy

The color of the candy produced with cinnamon extract, ginger extract and tempe flour is darker. It is due to the additive ingredients used having a dark color. So the more additives, the darker the candy. In addition, the main component of candy (sugar), when heated, will turn brown due to caramelization [35]–[39]

The aroma of the candy is more fragrant (strong), especially as a result of the increase in the addition of cinnamon, so the panelists did not like it even more. This shows the nature of panelists who do not like food with a strong aroma [36]–[41]

The texture of the candy showed that the increase in the addition of additives showed it was less hard or brittle. This is because the additives have non-binding properties, and the reduced amount of sugar makes the resulting candy more brittle. The hardness of the candy is generally due to the caramelization of the sugar [42]–[46]

The taste of the candy showed that the increase in the additives of cinnamon extract, ginger extract and tempe flour had a more unpleasant taste. The taste is because the additive has a spicy nature (ginger extract) and an intense aroma (cinnamon extract). The taste makes the candy more aromatic and has a strong smell, and the panelists indicated that the sensory quality assessment of the candy taste was more unpleasant and disliked. However, the candy with FS152 formulation or with the addition of 6.6% of cinnamon extract, 3.45% of ginger extract. And 4.95% of tempe flour is the most delicious and the most preferred by the panelists [20], [32], [47]–[50]

The preference test showed that the increase in the additive ingredients of cinnamon extract, ginger extract and tempe flour showed less preference. This was due to the darker quality of the candy. The more fragrant the aroma, the more fragile the texture, and the spicier the taste. The decrease in preference is due to the increasingly spicy taste. The level of choice of the panelists was generally caused by a flavor that was not too extreme and pleasing to the panelists

4 Conclusions

The acceptance of functional candy with ginger extract and tempe extract by 37 panelists, as indicated by the results of organoleptic tests with color indicators showing the darker the color, the more fragrant the aroma, the less complex (brittle) texture, the more unpleasant the taste (spicy), and the least preferred and the most preferred formula was formula FS152 with 6,6% of cinnamon extract, 3,45% of ginger extract, 4,95% of tempe flour, 19,295% of water, 56,61% of sucrose, and 9,095% of glucose syrup.

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