# Vitamin C as a Functional Property And Characteristics of Traditional Spice-based Beverage During Fermentation

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## ABSTRACT

Modern lifestyle accelerates the emergence of degenerative diseases at a young age including children and adolescents, which are usually associated with old age. As a result of exposure to environmental pollution and chemicals, oxidative stress occurs in the body which damages cells, triggers inflammation and causes degenerative diseases. Vitamin C is an antioxidant that slow down the degenerative process occurs so that its role in prevention becomes increasingly relevant. Increasing daily vitamin C intake through fermented spice-based drinks is important to consider because it is natural, has a distinctive taste and aroma and has the potential to be developed as a contemporary drink. The purpose of this study was to determine the effect of fermentation time on vitamin C, chemical and organoleptic properties of spiced-based fermented beverage using jahe emprit and cinnamon. A Completely Randomized Design was used with fermentation time treatments consisting of 3 days, 6 days, 9 days and 12 days. The results showed that the fermentation time increased pH and total acid significantly; significantly decreased vitamin C, total sugar, taste and color. Fermentation for 3 days produced the highest vitamin C levels of 45.48%; The preference score for taste was 5.50 (like-really like) and aroma was 6.09 (like-really like) with a pH of 3.73 in accordance with the requirements of SNI for fermented drinks.

Keywords: jahe emprit, cinnamon, vitamin c, functional drink, fermentation time

#### **INTRODUCTION**

Modern lifestyle accelerates the emergence of degenerative diseases at a voung age including children and adolescents, which are usually associated with old age. As a result of exposure to environmental pollution and chemicals, oxidative stress occurs in the body which damages cells, triggers inflammation and causes degenerative diseases. Vitamin C is an antioxidant that slow down the degenerative process occurs so that its role in prevention becomes increasingly relevant. Increasing daily vitamin C intake through fermented spice-based beverage is important to consider because it is natural, has a distinctive taste and aroma and has the potential to be developed as a contemporary beverage.

Fermentation able to increase the vitamin C content. According to (1) stated that ascorbic acid content increased

gradually during fermentation, wherease little concentration was detected in the unfermented samples. This increasing of vitamin C in fermented beverage is in line with (2). It was resulted from the lactic acid bacteria and yeast metabolite during the process.

The use of natural fermented spices (ginger and cinnamon) with functional components Vitamin C promote general wellbeing of consumer. However, this drink is identical with its sharp aroma and bitter taste, so it is less popular with teenagers and children. According to (3), sensory properties, especially color and taste, are the main factors that determine consumer acceptance, so the development of this drink must pay attention to consumer preferences. (4) has researched fermented ginger called *jahe emprit* (Zingiber officinale var. amarum) from Indonesian and no panelists choosed this beverage with no addition of sugar.

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То functional improve the properties and taste of fermented gingerbased drinks, some have been fermented in combination with cinnamon (5) Although currently, there is no data regarding the benefits of ginger and cinnamon for health, especially for Vitamin C in the form of fermented drinks. The purpose of this study was to determine the effect of fermentation vitamin C. chemical time on and organoleptic properties of spiced-based fermented drinks using jahe emprit and cinnamon.

#### MATERIAL AND METHODS

Raw Materials including ginger, cinnamon and sucrose. This material were acquired from local market in Semarang, Central of Java, Indonesia. Ginger bug is made to be a starter culture to initiate the fermentation.

Ginger bug is made according to (6) with modification. A 15 grams of coarsely chopped ginger put into a glass bottle that has been prepared with 100 ml of 15% sugar solution. Then incubated at a temperature of 30  $^{\circ}$  C for 3 days. Every 24 hours need to add 15 g of sugar, 15 g of ginger, 100 ml of water and open the lid for 10 minutes so that the carbon dioxide formed can be released.

Spiced-based beverage is made according to (7) with modification using ginger and cinnamon. Beverage are made by boiling 31 of water, 200 g of ginger, 100 g of cinnamon, and 350 g of sugar until boiling, after which it can be left to stand until room temperature. Then the solution is put into a fermentation bottle of 500 ml and 15% natural ginger bug starter is added. Then close and store in a dark room for 3, 6, 9 and 12 days. Every 24 hours the drink must be opened for 10 minutes to remove the carbon in it.

Completely Randomized Design is used with fermentation time as treatments,

consisting of 3 days, 6 days, 9 days and 12 days. Parameters observed are vitamin C, lactic acid, sugar, organoleptic (taste and aroma).

#### **RESULT**

The data presented the vitamin C level is shown in the table 1. Vitamin C levels obtained ranged between 30,88% to 45,88%. It was relatively low according to recommended daily requirements, the value of wich 70% to 90% for adult.

Table 1.	Vitamin	С	of	spiced-based
	beverage	durin	g fer	mentation

Example to the Time (dow)	Level of Vitamin C (%)		
Fermentation Time (day)	p-value	α 5%	
3	45,48°	<0,05	
6	38,82 <sup>b</sup>	<0,05	
9	35,02 <sup>ab</sup>	<0,05	
12	30,88 <sup>a</sup>	<0,05	

Means with different superscript in the same coloum differ significantly (P<0,05)

Table 1. show the yield of vitamin C in spiced-based beverage decreased with increasing fermentation time.

The data presented lactic acid is shown in the table 2. Lactic acid obtained ranged between 0,19% to 0,28%.

Table 2.	Lactic	acid	of	spiced-based
	beverage	during	ferm	entation

	0		
Earmontation Time (day)	Lactic acid (%)		
Fermentation Time (day)	p-value	α 5%	
3	0,19ª	<0,05	
6	0,23 <sup>b</sup>	<0,05	
9	0,25 <sup>b</sup>	<0,05	
12	0,28°	<0,05	

Means with different superscript in the same coloum differ significantly (P<0,05)

Table 2. show the yield of total acid in spiced-based beverage increased with increasing fermentation time.

The data presented sugar is shown in the Table 3. Sugar obtained ranged between 10,21% to 9,39 %.



Example to the time (day)	Sugar (%)		
Fermentation Time (day)	p-value	α 5%	
3	10,21°	<0,05	
6	10,74 <sup>d</sup>	<0,05	
9	10,08 <sup>b</sup>	<0,05	
12	9,39ª	<0,05	

 Table 3.
 Sugar of spiced-based beverage during fermentation

Means with different superscript in the same coloum differ significantly (P<0,05)

Table 3. show the yield of sugar in spicedbased beverage decreased with increasing fermentation time.

The data presented taste and aroma are shown in the Table 4. The amount ranges between 5,50 (like-really like) - 3,17 (dislike-dislike) for taste. And The amount ranges between 6,09 (really dislike- like) – 2,89 (dislike- really dislike) for aroma.

 Table 4. Taste and Aroma of spiced-based beverage during fermentation

Fermentation	p-value		a 50/	
Time (day)	taste	aroma	a 3%	
3	5,50 <sup>b</sup>	6,09°	<0,05	
	(like-	(really		
	really	like-		
	like)	really		
		like)		
6	4,77 <sup>b</sup>	5,34°	<0,05	
	(neutral-	(like-		
	like)	really		
		like)		
9	3,66 <sup>a</sup>	4,23 <sup>b</sup>	<0,05	
	(dislike-	(neutral		
	neutral)	-		
		neutral)		
12	3,17 <sup>a</sup>	2,89ª	<0,05	
	(dislike-	(really		
	dislike)	dislike-		
		dislike)		

Means with different superscript in the same coloum differ significantly (P<0,05)

Table 4. show the yield of taste and aroma in spiced-based beverage, both decreased with increasing fermentation time.

#### DISCUSSION

The level of vitamin C is affected by the fermentation time significantly (P<0,05). It tends to decrease during fermentation. (8) stated that lactic acid bacteria have the ability produces vitamin C or ascorbic acid. But it is potentially reduce along with the fermentation time by increasing H<sub>2</sub>O<sub>2</sub>. It is in line with Duniyah, *et al.* 2011 stated that the increasing of oxidizer (hydrogen peroxide) along with the increasing fermentation time causes the decreasing content of vitamin C. This peroxide is produced by this bacteria it self according to and (8) Another researches found that this fenomena is caused by the mechanism of lactic acid bacteria to protect its cells against oxidation occured (9) and (10).

The level of loactic acid is affected by the fermentation time significantly (P<0,05). It tends to increase during fermentation the large amount of lactic acid produced by lactic acid bacteria through their metabolic pathways. It is known that the fermentation time has a significantly affect the level of lactic acid (P<0,05). (3) stated that increasing fermentation time will increase the total acid content of functional drinks. The longer the fermentation time, the more carbohydrates can be broken down into simple sugars, organic acids, and water.

The level of sugar is affected by the fermentation time significantly (P<0,05). Sugar levels tends to decrease during fermentation due to its conversion into simple sugars as an energy source for lactic acid bacteria and yeast found in ginger bug. (11) added that microbial conversion of sugar encompassess a variety of processes using its enzymes to produce lactate, ethanol and another organic acids. The metabolism of lactic acid bacteria requires sugar to be broken down into simple sugars glucose which will then be absorbed to obtain energy to support the life of lactic acid bacteria. In line with (12) that simple sugar will also be broken down by yeast

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into alcohol so that the sugar content decreases.

Both the level of taste and aroma are affected by the fermentation time significantly (P<0,05). Both tends to decrease during fermentation. The amount ranges for taste between 5,50 (like-really like) - 3,17 (dislike-dislike), and for aroma between 6,09 (really dislike- like) - 2,89 (dislike- really dislike). Fermented drinks are identical to a fresh and pleasant sweetsour taste accompanied by a slightly pungent sour aroma in the nose. Some metabolites derived from fermentation processes will influence the distinctive taste (alcohol and organic acids, (13) and the distinctive aroma (14). (13) stated that the increasing of organic acids along the fermentation triggers the brain to "dislike" the taste of a product. The amount of organic acids that accumulate will create a slightly surprising sensation that is not familiar to the tongue so that the panelists will decide to dislike it. (6) also emphasized drinks with that functional higher fermentation times will increase the sour taste and decrease the taste score. A fresh spicy aroma typical of ginger and a sourfresh aroma from lactic acid and various organic acids are produced in a shorter fermentation period. The dominance of organic acid aroma in longer fermentation overpowers the spicy aroma of ginger (6).

## CONCLUSION

In making functional drinks that rely on the vitamin C content in them, it is necessary to look at the effect of fermentation time on the availability of vitamin C, and other parameters that support the organoleptic score so that it is suitable and in demand by consumers. The longer the fermentation, the more vitamin C, sugar, score for taste and aroma will decrease, on the contrary the more acid will increase.

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