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## Acceptability of Clitoria Ternatea and Zingiber Officinale Var Rubrum Rhizoma Formulations in the Form of Herbal Tea

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### ABSTRACT

Body immunity is an important factor that must be considered. This is because the body's immunity will provide sufficient protection to the body so that it can avoid various threats of infection. One effort that can be made to increase the body's immunity so that it is in optimal condition is by consuming the herbal tea formulation of clitoria ternatea and zingiber officinale var rubrum rhizome. Therefore the purpose of this research is to analyze the acceptability of clitoria ternatea and zingiber officinale var rubrum rhizoma formulations in the form of herbal tea preparations. This organoleptic research uses an affective test which is based on measuring liking (acceptance). This affective test uses a hedonic scale. Observations for organoleptic tests are carried out using a hedonic scale. The ingredients used in this research were butterfly pea flower simplicia (clitoria ternatea L) and red ginger juice. The herbal tea formulations of butterfly pea flower and ginger are presented randomly with a certain code where each code represents a formulation of butterfly pea flower and ginger rhizome. The number of formulations tested was 5 formulations. From the results of the research that has been carried out, it was found that most of the panelists in this study tended to like the herbal tea formulation of clitoria ternatea and zingiber officinale var rubrum rhizoma with a composition of 20% clitoria ternatea and 80% zingiber officinale var rubrum rhizoma

Keywords: Herbal Teas; clitoria ternatea; zingiber officinale var rubrum rhizoma

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## INTRODUCTION

The Covid-19 pandemic that occurred in the world and including in Indonesia is a disaster and at the same time a challenge to health services. This is because the impact of the Covid-19 pandemic is very serious and has the potential to cause death in sufferers <sup>1</sup>. On the other hand, health services in Indonesia are also required to continue to provide optimal health services with various restrictions imposed to control the spread of the Sars-Cov-2 virus in Indonesia <sup>2</sup>. The status of the Covid-19 pandemic, which has become endemic and has finally been revoked since June 2023, does not mean that the problems surrounding Covid-19 have stopped. This is because in several regions of other countries, cases of Covid-19 infection are still occurring, accompanied by mutations in the virus that causes Covid-19 itself <sup>3</sup>.

The problem of infection with various viruses or bacteria, which is included in this case, is Covid-19, one of which is caused by a decrease in the individual's body immunity <sup>4</sup>. Every individual has the ability to defend themselves/self-defense mechanisms from various noxious agents, namely foreign objects that can be infectious or not. The defense/immunity system itself consists of the first and second lines of defense which are the innate immune system or natural immune system or innate immunity, as well as the third line of defense which is the acquired immune system or adaptive immunity. When the immune system is not able to work optimally, it is certain that the individual has the potential to experience infection <sup>5</sup>.

One of the efforts made by the government to control the spread of infection from a disease, in this case the Covid-19 case, is by implementing a Covid-19 vaccination program. The Covid-19 vaccine works by introducing the body's immune system to the inactive corona virus. This does not cause a person to be infected with Covid-19, but equips the body to be able to fight viral infections in the future. Vaccines usually contain a killed or weakened version of the virus, such as protein or nucleic acid <sup>6</sup>. When a person gets a vaccine, the body's immune system recognizes it as a foreign object. The immune system responds by creating memory cells and antibodies that protect the body from infection. When it enters the body, the Covid-19 vaccine takes several days, or even weeks, to form antibodies. The Covid-19 vaccine will work by creating antibodies to fight the corona virus. The antibodies formed will then attach to the viral protein. When the Covid-19 vaccine is made, the corona virus which is the material used to make the vaccine is turned inactive using a chemical called beta-propiolactone <sup>7</sup>

An inactive corona virus can no longer replicate, but its proteins remain intact. Because the corona virus in the vaccine is dead, it can be injected into the human body without causing Covid-19 infection. Once in the body, some inactive viruses are defeated by a type of immune system called antigen-bearing cells. Cells that carry antigens damage the corona virus until several fragments appear on its surface, so that body cells can detect these fragments. When this fragment has been formed,

antibodies will automatically begin to form, the body's immune cells become active, multiply, and produce antibodies to fight the corona virus <sup>5</sup>. The main aim of the Covid-19 vaccination program is to create herd immunity in society. When herd immunity has been created in society, the risk of spreading viruses or bacteria will be maximally controlled <sup>8</sup>. Apart from taking part in the Covid-19 vaccination program, independent efforts that can be made by the community to overcome the spread of viruses or bacteria that can trigger a pandemic is by increasing the body's immunity independently.

The function of the immune system in humans is influenced by several factors, such as genetics, age, metabolic, environmental and nutritional, anatomical, physiological and microbial. Genetic control of immune responses can be seen from differences in immune responses when exposed to antigens. In humans, the major histocompatibility complex (MHC) genetic complex determines a person's susceptibility to disease. Regarding the development of the thymus, a person's age affects the immune system. In infants and the elderly there is a hypofunction of the immune system, so this group is vulnerable to infection. The decline in various immunological functions such as humoral and cellular immunity in the elderly group can be related to the fact that there is a high incidence of autoimmune phenomena and malignancies. Hormonal balance disorders such as in people with diabetes mellitus, hypoadrenal and hypothyroidism are metabolic factors that cause an increase in a person's susceptibility to infection. Anatomical structures and physiological functions, such as skin, mucous membranes, cilia on the respiratory tract epithelium, gastric acid, enzymes and urine flow, constitute a barrier to invasion by pathogenic elements. If there is a disruption in this barrier system, a person will very easily suffer from infection <sup>5</sup>.

The implementation of the basic Covid-19 vaccination program by the Indonesian government is a concrete form of the government's role in overcoming and simultaneously controlling the spread of the Covid-19 virus that is occurring in Indonesia. However, it is important to note that the Covid-19 virus has the potential to experience mutations and is still present in the community even though the Indonesian government has declared the status of the Covid-19 pandemic over <sup>3</sup>. In order to ensure that they do not experience re-infection by the virus that causes Covid-19, apart from playing an active role in the Covid-19 vaccination program, the community can also independently make efforts to increase their body's immunity personally. One method that people can use to increase the body's immunity against the Covid-19 virus is to consume synthetic or natural immunodilators. Immunodilators can be obtained from active compounds contained in the simplicia that we often encounter around us. Examples are simplicia from butterfly pea flowers and ginger rhizomes.

Purba (2020) said that butterfly pea flowers are not only ornamental plants but also a source of food and traditional medicine. Khan et al. (2020) dan Vellingiri et al., (2020) stated that butterfly pea flowers are known to inhibit metalloproteinase (ADAM17) which is involved in the destruction of ACE.

This can be achieved using butterfly pea flowers because the destruction of ACE-2 is linked to virus production. Plants with the ability to inhibit viral replication are often preferred as promising options to adopt against viral outbreaks. Crushing has been associated with increased viral generation. Based on research results Kushargina et al (2022) stated that finely shaped butterfly pea flowers processed at a temperature of 75 0C and a brewing time of 9 minutes can produce moderate antioxidant activity. As explained further, the characteristics of telang flowers do not have a special aroma and do not have a specific taste even though they have a distinctive taste. This is different from tea drinks which are made from roses or jasmine flowers. Fathonah (2011; Wijayanti, 2022) explained that roses and jasmine flowers have the highest gingerin content. This compound is known to suppress prostaglandins and also inhibit the action of the cyclooxygenase enzyme. This indication can help individuals increase body endurance.

Scientific research and studies regarding the antioxidant activity of butterfly pea flower and ginger rhizome have been carried out both regarding the potential of butterfly pea flower or ginger as an immunomodulator and the antioxidant activity of these two types of herbs. However, no scientific studies have been carried out regarding the formulation between butterfly pea flower and ginger rhizome as well as consumer/public acceptance of this herbal formulation. For this reason, scientific studies are needed regarding the formulation of butterfly pea flowers and red ginger rhizomes. This is important to do considering it is able to encourage changes in people's behavior in seeking to increase the body's immunity independently. This concept is in accordance with the HBM (Health Belief Model) theory, where to change behavior in individuals, at least several main components are needed such as the individual's perceived susceptibility to disease, the seriousness (perceived severity / seriousness) of the impact of disease infection, barriers (perceived barriers) that may be experienced by individuals, the benefits that can be obtained include financial losses, self-efficacy and the tendency to act (cues to action).

HBM (Health Belief Model) was first introduced by Houchbaum in 1958 and then developed by Rosenstock. Rosenstock defines the HBM (Health Belief Model) as a behavior depiction model which assumes that health behavior is a function of knowledge and attitudes. HBM (Health Belief Model) can determine a person's health behavior based on their belief in the susceptibility and efficacy of treatment for a disease. When the public has been shown or received scientific evidence regarding the potential of butterfly pea flower and red ginger rhizome to help them increase their body's immunity, then the public has at least received initial information regarding the potential of the butterfly pea flower and red ginger rhizome tea formulation. Furthermore, the community will also assess the formulation of butterfly pea flower tea and red ginger rhizome

Currently, butterfly pea flower tea is consumed by many people, but not all people are used to

the distinctive taste of telang flower tea. Even though telang flowers have a distinctive color, the bland taste is often the dominant factor that makes people reluctant to consume fresh or dried telang flowers. One effort that can be made is to diversify telang flower products which are formulated with ginger rhizome, where ginger rhizome has become a beverage product that is widely known by the public and has high acceptance. Apart from that, adding ginger rhizomes will help people maintain their body's immunity

Therefore the purpose of this research is to analyze the acceptability of *clitoria ternatea* and *zingiber officinale* var *rubrum* rhizoma formulations in the form of herbal tea preparations.

## METHOD

This organoleptic research uses an affective test which is based on measuring liking (acceptance) or measuring the level of relative liking. This affective test uses a hedonic scale. Sensory assessment or organoleptic testing is a science that uses human senses to measure the texture, appearance, aroma and taste of food products. Consumer acceptance of a product begins with an assessment of its texture, appearance, aroma and taste. Organoleptic tests are required by the panel to carry out the assessment. In assessing the quality or analyzing the sensory properties of a commodity, the panel acts as an instrument or tool. People who are members of the panel are called panelists. Observations for organoleptic tests are carried out using a hedonic scale. Butterfly flower and ginger herbal tea, served randomly with a certain code. Then the panelists were asked to provide an assessment according to their level of liking based on previously determined criteria. The panelists consisted of 30 untrained people. Score criteria for hedonic testing with a criteria scale: 1 = Dislike, 2 = Somewhat like, 3 = Neutral, 4 = Like, and 5 = Very like and the parameters tested on the panelists include appearance, texture, color and taste

The materials used in this research were butterfly pea flower *simplicia* (*clitoria ternatea* L) and red ginger juice. The telang flower *simplicia* is cleaned with running water and drained. Then the drying process is carried out under direct sunlight without covering at 08.00-12.00 for 2 days. The second ingredient used is fresh red ginger. Making red ginger *simplicia* is done by sorting and cleaning the ginger from dirt or remaining soil attached. After washing with running water, the ginger is drained to free it from water particles. Fresh ginger is dried using direct sunlight covered with black cloth. Covering with black cloth aims to minimize damage to the compounds in the rhizomes due to ultraviolet rays exposed to direct sunlight. The butterfly pea flowers and red ginger are then placed in separate containers so that one *simplicia* does not mix with the other

After the *simplicia* has been made, the steps taken are refining the ingredients and mixing the ingredients in various proportions. One tea bag contains 3 grams. The following are the various formulations that were tried: 1) Formula 1 with the composition of butterfly pea flower: red ginger

rhizome 10: 90, 2) Formula 2 with the composition of butterfly pea flower: red ginger rhizome 20 : 80, Formula 3 with the composition of butterfly pea flower: red ginger rhizome 30 : 70, 4) Formula 4 with a composition of telang flower: red ginger rhizome 40 : 60, 5) Formula 5 with a composition of telang flower: red ginger rhizome 50 : 50. Next, the mixed formulation is put into a herbal tea bag container then testing was carried out on research panelists.

## RESULTS

### 1. Characteristics of research panelists

Table 1. Characteristics of research panelists

No	Information	Amount	Percentage (%)
1	Age		
	- Less than 20 years	9	30,0
	- 20-35 years	13	43,3
	- More than 35 years old	8	26,7
2	Gender		
	- Man	11	36,7
	- Woman	19	63,3
3	Education		
	- Senior High School	19	63,3
	- Bachelor	11	36,7
4	Work		
	- Teacher / lecturer	3	10,0
	- Students / students	10	33,3
	- Civil servants	2	6,7
	- Private	7	23,3
	- Not working / housewife	4	13,3
	- Self-employed	4	13,3
5	Marital status		
	- Not married yet	13	43,3
	- Marry	17	56,7

Source: Primary Data, 2023

From the research results, it was found that almost half of the panelists in the study were aged between 20-35 years, namely 13 panelists (43.3%), most of the panelists were women, namely 19 panelists (63.3%), most of the panelists had a high school educational background. namely 19 panelists (63.3%), almost half of the panelists were students, namely 10 panelists (33.3%) and more than half of the panelists had marital status in the married category, namely 17 panelists (56.7%).

### 2. Organoleptic Test

The organoleptic test used in this research was the hedonic test (liking test) on 30 panelists. Panelists were asked to give their opinions regarding the products under study and were then asked to provide personal responses regarding their likes or vice versa (dislikes). The level of liking possessed by the panelists is hereinafter referred to as the hedonic scale. The organoleptic test results are presented as follows:

Table 2. Results of hedonic test analysis

Butterfly flower and ginger tea formulation	Color	Fravor	Aroma
10 : 90 (A)	3,27 <sup>a</sup>	3,76 <sup>a</sup>	4,66 <sup>b</sup>
20 : 80 (B)	5,21 <sup>b</sup>	5,68 <sup>b</sup>	5,72 <sup>b</sup>
30 : 70 (C)	5,89 <sup>b</sup>	5,34 <sup>b</sup>	5,41 <sup>b</sup>
40 : 60 (D)	4,48 <sup>a</sup>	4,73 <sup>a</sup>	3,82 <sup>a</sup>
50 : 50 (E)	3,58 <sup>a</sup>	3,22 <sup>a</sup>	3,76 <sup>a</sup>

Source: Primary Data, 2023

The results of the analysis using the hedonic test showed that the highest score from the researchers was in formulation C (30% butterfly pea flower and 70% ginger rhizome) with an average score of 5.89 (fairly like to like). The panelists' perceptions of formulation A (10% butterfly pea flower and 90% ginger rhizome), formulation E (50% butterfly pea flower and 50% ginger rhizome), and formulation D (40% butterfly pea flower and 60% ginger rhizome) are not significantly different.

The results of the analysis using the hedonic test showed that the highest score from the authors was formulation B (20% butterfly pea flower and 80% ginger rhizome) with an average score of 5.68 (fairly like to like). The panelists' perceptions of formulation E (50% butterfly pea flower and 50% ginger rhizome), formulation A (10% butterfly pea flower and 90% ginger rhizome), and formulation D (40% butterfly pea flower and 60% ginger rhizome) are not significantly different.

The results of the analysis using the hedonic test showed that the highest score from the authors was formulation B (20% butterfly pea flower and 80% ginger rhizome) with an average score of 5.72 (fairly like to like). The panelists' perceptions of formulation D (40% butterfly pea flower and 60% ginger rhizome) and formulation E (50% butterfly pea flower and 50% ginger rhizome) are not significantly different.

## DISCUSSION

### 1. Product color

The results of the analysis using the hedonic test showed that the highest score from the researchers was in formulation C (30% butterfly pea flower and 70% ginger rhizome) with an average score of 5.89 (fairly like to like). The panelists' perceptions of formulation A (10% butterfly pea flower and 90% ginger rhizome), formulation E (50% butterfly pea flower and 50% ginger rhizome), and formulation D (40% butterfly pea flower and 60% ginger rhizome) are not significantly different

Color is basically a visible visualization of a product that can be seen directly compared to other variables by both panelists and consumers. The visualization of color will influence the perception that panelists or consumers have of a product <sup>14</sup>.

Butterfly pea flowers have a purple base when brewed with hot water. The very deep purple color that in this test was possessed by formulation E (50% butterfly pea flower and 50% ginger rhizome) made the panelists doubtful about a processed herbal tea product. Likewise, with the too weak purple color that in this test was possessed by formulation A (10% butterfly pea flower and 90% ginger rhizome), the panelists tended to see a visualization of herbal tea with a purple color that was too low. One of the purple pigments found in plants comes from anthocyanins and it is known that pharmacologically anthocyanins provide antioxidant activity. The more purple a plant or herbal tea formulation is, it will indicate that the antioxidant activity will also be higher. However, this condition is not widely known and understood by the panelists. Based on the results of the tests carried out, the panelists preferred the visualization of butterfly pea flower tea and ginger rhizome with a slightly dark purple color. This makes the herbal tea of butterfly pea flower and ginger rhizome seem like a refreshing drink

Visualization of the color of a product is sometimes a benchmark for a beverage product. Some colors sometimes attract the attention of consumers themselves. The color of a beverage product that is too dark often makes consumers reluctant to consume or choose that beverage product. This is because the dark color displayed on beverage products gives rise to the perception that processed beverage products taste bitter or have quite a sharp taste and make them uncomfortable when consumed. This also applies to the opposite color of the beverage product. When a beverage product looks brighter/clearer, consumers will have the perception that the beverage product has deliberately reduced the ingredients it contains. When consumers have a perception like this, consumers tend to refuse to consume the beverage product.

## 2. Product taste

The results of the analysis using the hedonic test showed that the highest score from the authors was formulation B (20% butterfly pea flower and 80% ginger rhizome) with an average score of 5.68 (fairly like to like). The panelists' perceptions of formulation E (50% butterfly pea flower and 50% ginger rhizome), formulation A (10% butterfly pea flower and 90% ginger rhizome), and formulation D (40% butterfly pea flower and 60% ginger rhizome) are not significantly different

Taste is basically a form of assessment made by panelists or consumers regarding sensations or stimuli originating from a product (external) where this sensation will first appear in the mouth



of the panelist or consumer. The taste sensation that appears and is felt first in the mouth is because the mouth has the tongue as a sense of salty, sweet, bitter and sour taste <sup>15</sup>

Indonesian people who have long known ginger rhizome as a beverage product (but tend to be better known as a type of Indonesian herbal) have a fairly high receptivity to ginger's spicy taste. For people, when brewing ginger, they prefer a more dominant ginger taste. When people are presented with processed ginger products that only appear and are tasted briefly, people often do not feel satisfied with the taste of ginger that appears. Vice versa, people tend not to like the taste of ginger rhizome which appears too strong because the spicy sensation felt in the mouth and throat often causes people to feel uncomfortable. In this study, it was found that the flavor that panelists tended to choose was formulation B (20% butterfly pea flower and 80% ginger rhizome). According to the panelists' statements, the taste of ginger that appeared was quite suitable for their tongues and did not feel too spicy. The spicy condition that appears will become stronger when the ginger rhizome is steeped in hot water. When the hot and spicy sensations appear together, the tendency that is felt is uncomfortable or does not suit the tongue

For some people, consuming ginger is a sensation and a habit that cannot be abandoned. For consumers in this environment, drinks made from ginger must have a spicy sensation in both the mouth and throat. When consumers in this group do not get a spicy or warm taste sensation when they consume beverage products made from ginger, consumers will tend to doubt the beverage products served. However, it is different from consumers in the next group. It is not uncommon for consumers to just want to feel a little of the warm sensation or a little of the spicy sensation of drinks made from ginger rhizomes. Even more so if consumers are in the child or adolescent age category. Consumers at this age tend not to like the warm taste or spicy sensation in the drinks they consume.

Several experts and researchers who have conducted scientific studies on ginger rhizomes have found that the safe limit for ginger consumption in one day is between 2 and 4 grams. When this dose is served in a beverage product, the sensation that appears in the drink is a warm and slightly spicy taste. When this composition is brewed in beverage products, the consumers who will consume the drink will of course be in the age range of children and teenagers. What needs to be paid attention to when using ginger rhizome is the correct dose, considering that not all people's digestive systems are able to accept ginger drinks that are too spicy. Stomach pain and the risk of experiencing diarrhea will be experienced by consumers who consume ginger rhizomes that exceed the safe consumption limit. Consuming ginger rhizomes within safe limits or using ginger rhizomes according to the dosage will be more beneficial for health and the formation of the body's immunity than consuming ginger in excess

### 3. Product Aroma

The results of the analysis using the hedonic test showed that the highest score from the authors was formulation B (20% butterfly pea flower and 80% ginger rhizome) with an average score of 5.72 (fairly like to like). The panelists' perceptions of formulation D (40% butterfly pea flower and 60% ginger rhizome) and formulation E (50% butterfly pea flower and 50% ginger rhizome) are not significantly different

The aroma that appears and is received by the panelists' or consumers' senses is one of the key variables in a product itself. This is because the taste and acceptability of consumers are generally determined by the aroma produced by the product itself. However, in some products, an aroma that is too strong can make consumers uncomfortable because this aroma usually remains attached to the product <sup>16</sup>

Aroma is basically an important preference that is of concern to consumers of a product. Butterfly pea flowers, which are the main component in tea products developed in research, tend not to have a special aroma that can appear and be felt by consumers. When a beverage product does not have a special aroma, this condition will make consumers tend to be reluctant to choose or consume drinks in the form of tea made from butterfly pea flowers. One effort that can be made to increase consumer preferences is by adding ginger as a source of aroma. The distinctive aroma of ginger rhizomes is widely known by people in Indonesia. This makes the herbal drink telang flower tea with ginger rhizome added to have a distinctive aroma. The aroma that is generally known to the public makes it easier for people to accept butterfly pea flower tea as an alternative drink that is beneficial for health

## CONCLUSION

From the results of the research that has been carried out, several conclusions can be drawn as follows :

1. The results of the analysis using the hedonic test showed that the highest score from the researchers was in formulation C (30% butterfly pea flower and 70% ginger rhizome) with an average score of 5.89 (fairly like to like).
2. The results of the analysis using the hedonic test showed that the highest score from the authors was formulation B (20% butterfly pea flower and 80% ginger rhizome) with an average score of 5.68 (fairly like to like).
3. The results of the analysis using the hedonic test showed that the highest score from the authors was formulation B (20% butterfly pea flower and 80% ginger rhizome) with an average score of 5.72 (fairly like to like).

Overall, the panelists' preference in this study was for formulation B (20% butterfly pea flower and 80% ginger rhizome)

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