Research Festus Evly Liow

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Preference Level Effect to the Additional of Aloe Vera Gel and Lime Juice in producing "Cap Tikus" Hand Sanitizer"

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ABSTRACT: *Various regulations have sprung up to break the chain of the Covid-19 Pandemic issued by WHO, Indonesian government, and regional governments, and even the religious leaders have also appealed to comply with the existing health protocol. The changes require all humans for obeying to wear mask, keep one meter minimum distance, wash hands with soap in running water or using hand sanitizer. As a result of this surge in demand for various medical devices, all elements of society, especially the scientific community, are competing to make innovations by utilizing natural resources in the regions. This research is about the making hand sanitizer by utilizing "Cap Tikus" alcohol with the addition of aloe vera gel and lime juice. The purpose of this study is to produce hand sanitizer from "Cap Tikus" alcohol distillation with the addition of aloe vera gel and lime juice to determine the level of preference for the public for hand sanitizer product. The research in determining the results based on analytical study applied Experimental Research method. The data were collected through distributing questionnaires to 15 people randomly as sampling, while the sampling used random sampling technique. Another step that also gave an effect is the mixture of additional ingredients such as lime juice and aloe vera gel to disguise the distinctive odor of "Cap Tikus" while providing other benefits. Sensory analysis was carried out to test the level of preference and opinion of the tester on the hand sanitizer made. In the sensory analysis testing process, a Likert scale was used to test the level of preference of respondents to hand sanitizers based on the special treatment variables carried out. The result of "Cap Tikus" alcohol distillation showed that for each processing of 1000 ml of 40% alcohol obtained 250 ml technical alcohol with 86 % alcohol content. Based on these data, the distillation results for the production of alcohol-based hand sanitizer were taken at the distillation results with 85% alcohol content and above. This is to maintain alcohol content not less than 60% and not more than 70% for hand sanitizers after the addition of other ingredients, so that they comply with the minimum standards for alcohol content as the active ingredient that has been set. Thus, based on the comparison of the mixtures that have been made, the alcohol-based hand sanitizer product from distillation of "Cap Tikus" with 60% alcohol content and a total volume of 1000 ml consisting of each mixture of additives, namely 500 ml of lime juice and 500 ml of aloe vera gel. The conclusion is that of the 15 testers, 8 of them preferred hand sanitizer with the mixture of aloe vera gel, while the remaining 7 liked the lime juice mixture. In terms of sensation (on hands), Lime Juice (LJ) was more preferably than Aloe Vera Gel (AVG) in the ratio of 80% and 76%.*
KEYWORD: "Cap Tikus" alcohol, Aloe Vera Gel, Lime Juice

I. INTRODUCTION

The emergence of COVID-19 outbreak as a new type of virus is very disturbing to the world community. The virus that developed from the Wuhan city in China has spread to various countries around the world making the World Health Organization (WHO) has designated it as a pandemic.

Since the first infection case that occurred in Indonesia in March 2020, there has been a total of 60,695 positive cases and 3,036 deaths as of July 2020 (Indonesian Health Ministry, 2020). In order to prevent the transmission of COVID-19 which can be transmitted among humans through droplets from coughs, flu or when talking and other intermediary media affected by these droplets, various health protocols are implemented in all countries in the world based on the guidelines set by WHO. As a result of the massive spending on health equipment by the public, there has been scarcity and hikes in prices, especially masks and hand sanitizers. This occurs because the demand is high while the supply is increasingly insufficient to meet the demand for these goods. Since the use of cloth masks has been announced by the government as an alternative to surgical masks, which are preferred for medical personnel, the community has started to apply them in everyday life, on the other hand, the use of hand sanitizers by the community is still high.

Currently, hand sanitizers have become a staple item that must be carried wherever you go, referring to the provisions of the New Normal health protocol from the government. Completing the description above, hand sanitizer is liquid or gel that is generally used to reduce pathogens in hands (Oxford Dictionaries, 2017). Alcohol-based hand sanitizers have been placed on WHO list of essential medicines, and are the safest and most effective medicines needed in the health system (WHO, 2019). Alcohol-based hand sanitizer usually contains several

combinations such as isopropyl alcohol, ethanol, or n-propanol. 60% - 95% alcohol content is proven to be the most effective (Boyce & Pittet, 2002). However, its use must be careful because it is flammable (Bolon, 2016).

Alcohol has been used as antiseptic since early 1363 with evidence of its use in the late 1800s (Block, 2001). Alcohol is also often used to refer to ethanol or grain alcohol and sometimes for drinks containing alcohol. This is because ethanol, which is often used as base for alcoholic drinks, not methanol, or other alcohol types. Likewise alcohol used in the pharmaceutical world is ethanol. Ethanol is very commonly used, and has been made by humans for thousands of years. Ethanol is also one of the recreational drugs (drugs used for pleasure) and the most widely used in the world, but consuming large amounts of ethanol can cause hangover. One example of the use of ethanol as liquor is “Cap Tikus” which is very familiar and has been circulating for generations in the community, especially in North Sulawesi.

"Cap Tikus" is one of the traditional alcoholic drinks of the Minahasans from fermentation and distillation of sap from palm tree. This drink has been known for a long time by the Minahasans, and is generally consumed by aristocrats or by the public in traditional events. With 40% alcohol content, "Cap Tikus" is included in the category of high alcoholic drinks and if a person drinks it too much, he/she will get drunk. However, the use of "Cap Tikus" is not always used as alcohol. One example is to process it into technical alcohol which has more than 70% alcohol content (Ministry of Industry, 2003). The processing of "Cap Tikus" as technical alcohol can be done, one of which is the distillation process to increase its alcohol content. Technical alcohol is used not only as the main ingredient of antiseptic fluid but also as the substitute or additive in several health products, for example hand sanitizer. The use of alcohol-based hand sanitizer continues to increase during COVID-19 pandemic. Regarding this current situation where the need for health products is increasing, it is necessary to conduct research in producing alcohol-based hand sanitizer from "Cap Tikus" distillation as a form of contribution to society regarding the innovation in processing "Cap Tikus" alcohol amidst the current COVID-19 Pandemic.

II. REVIEW OF LITERATURE

2.1. Hand sanitizer

Hand sanitizer is liquid or gel that is generally used to reduce pathogens in hands (Oxford Dictionaries, 2017). According to the Food and Drug Administration (FDA), hand sanitizer can remove germs in less than 30 seconds. The alcohol contained in hand sanitizer has good bacteriocidal activity against Gram positive and Gram negative bacteria. In addition, hand sanitizer also contains anti-bacterial ingredients such as triclosan or other anti-microbial agents that can inhibit the growth of bacteria in hands such as Escherichia Coli and Staphylococcus Aureus (Radji, 2007). The use of alcohol-based hand sanitizer is preferable to washing hands using soap and water in various situations in health care facilities (Bolon, 2016). The 60% to 95% alcohol content proved to be the most effective (Boyce and Pittet, 2002). Nonalcoholic types can contain benzalkonium chloride or triclosan (Long; Rollins; Smith, 2015). Alcohol-based hand sanitizer has been commonly used in Europe since the 1980s (Miller and Palenik, 2016). Alcohol-based hand sanitizer has been placed on WHO List of Essential Medicines, and are the safest and most effective medicines needed in the health system (WHO, 2019).

2.2. Alcohol

Since 5000 years, alcohol has been used as a drink with various purposes, such as a means for transcendental communication in religious ceremonies and for obtaining pleasure (Dewi, 2008; Dorland, 2005). Like water, alcohol is very weak acid or base. In dilute solutions in water, alcohol has a pKa which is roughly the same as the pKa of water. However, in a pure state, the acidity of alcohol is much weaker than water (Syabatini, 2008).

Table 2.1. Ethanol Physical Property

Property	Score
Normal Boiling Point (°C)	78,32
Critical Temperature (°C)	243,1
Density (g/ml)	0,789
Energy Density (MJ/kg)	25,0
Self-Ignition Temperature	793,0
Burning Limit in Air	
Lower limit (% vol)	4,3
Upper limit (% vol)	19,0
Combustion Heat At 25 ° C, J/g	29.676,69

Source: Hwan Um, 2007

2.3. *"Cap Tikus"* Alcohol

In Minahasa, the main products of palm juice are sugar and "Cap Tikus" as local products, a traditional Minahasa alcoholic drink from fermentation and distillation of arenga pinnata sap. This drink is often served at social events as a symbol of strengthening friendship / kinship, and is hereditary as a myth that drinking "Cap Tikus" in certain doses serves health as a supplement drink that can warm the body and increase appetite naturally. But nowadays, most people consuming "Cap Tikus" as a traditional drink get uncontrolled, and it causes people get drunk and causes social insecurity that can disrupt public security and order. The physical and chemical properties of "Cap Tikus" are presented in Table 2.2.

Table 2.2. Chemical Physical Property of "Cap Tikus"

Alcohol Property	
Alcohol Content (%)	40,2
Esther compound (g/l)	190
Total Acid	140
Acid Steam (g/l)	150
Color	Clear Yellow
Odor	Typical aroma of palm tree sap

Source: Joseph, 2012

Generally, "Cap Tikus" product is consumed directly by the community and absorbed by alcoholic beverage companies approximately 30% per year of the total production of 350,000/year, and around 240,000/year are marketed illegally to certain places such as stalls, shops, kiosks and even delivered to Ternate, Maluku, and Papua (Anonymous, 2010). The efforts of the Regional Government by issuing Local Regulation on alcoholic drinks aimed to curbing the circulation of "Cap Tikus" so that it is properly used and controlled, often does not work and experiences many obstacles. Another way to suppress the circulation of "Cap Tikus" is marketed illegally, namely through innovative processing technology, namely by further processing "Cap Tikus" alcohol into technical alcohol.

Technical alcohol is alcohol whose content is more than 70%. The need for technical alcohol as the main ingredient and substitute material continues to increase from year to year, especially in the development of pharmaceuticals, food / beverage factories, and cosmetics. The supply of technical alcohol needs is still taken from outside of the region, so that it affects the continuity of its use because there are often transportation problems that causes the delivery is not on time. In one side, technology innovation in processing technical alcohol can be an effort to overcome the dependency. On the other side it also can increase farmers' income and local income (Anonymous, 2005; Lay et al., 2004).

III. THE PURPOSE AND BENEFIT OF RESEACH

3.1. The Purpose of Research

1. To learn how to make hand sanitizer from the distillation of "Cap Tikus" with alcohol content of 60% - 70% using of aloe vera gel and lime juice additives.
2. To find out the effect of using aloe vera gel and lime juice as additive on the level of preference for hand sanitizer products.

3.2. The Benefits of Research

1. Researcher: maximizing the use of "Cap Tikus" as an alternative to make both technical alcohol and alcohol-based hand sanitizer.
2. Community and Government: introducing "Cap Tikus" as an alternative alcohol-based hand sanitizer product made from local ingredients and can provide input for the community and local government to develop ideas for making simple alcohol-based hand sanitizer products from local ingredients of "Cap Tikus" during the COVID-19 pandemic.
3. Readers: as a reference for further research on the use of "Cap Tikus" alcohol.

IV. METHODS

4.1. Place and Time of Research

This research was carried out at the Industrial Engineering Laboratory of the Industrial Technology Faculty of Minaesa Institute of Technology (ITM) Tomohon for the process of making alcohol-based hand sanitizer, then a laboratory test for the sample results at the Manado Research and Standardization Center (BARISTAND). This research was carried out in 2 (two) months, starting from June to August 2020.

4.2. Tools and Materials

1. Tools: Alcohol meter, thermometer, electric stove, Beaker glass, Erlenmeyer flask, flat bottom flask, measuring tube, stirring rod, condenser, 3 (three) hole connecting tube, condenser connecting tube, stand, small glass plate, knife, bottles, hoses, digital scales (Metler Toledo), aluminum foil, plastic foil and suction pipes.
2. Ingredients: "Cap Tikus" with 40% alcohol content produced by the local community in Tomohon City, lime juice and aloe vera gel.

4.3. Type of research

This research used Experimental Research method. According to Sugiyono (2017), the experimental research method can be interpreted as a research method used to find the effect of certain treatments on others under controlled conditions. In experimental research, the researchers compiled the variables of at least 1 (one) hypothesis which states a causal relationship between the variables that occurs. The studied variables include the independent and the dependent variables which have been determined explicitly by the researchers since the beginning of the study.

4.4. Data collection techniques

Data collection includes:

1) Observation: namely the method of collecting data by making direct observations on the object and research subject. In this step, the researchers made initial observations about the need for alcohol-based hand sanitizer and saw firsthand the conditions that existed in the environment of the research subject.
2) Survey: data collection through distributing questionnaires to 15 random people as sampling, where the sampling used random sampling techniques. In its implementation, the researchers surveyed directly to obtain the necessary data because this method required contact between the researchers and the respondents.
3) Documentation: The image documentation carried out in this study includes documentation from the initial process of making alcohol-based hand sanitizer from "Cap Tikus" distillation to final testimonials to students and educators at ITM Tomohon.

4.5. Data Analysis

In distillation process, the mixture of additives and sensory analysis are the core of the alcohol-based hand sanitizer production process. In the distillation process stage, temperature is one aspect that needs to be monitored carefully because the effect of temperature on "Cap Tikus" alcohol distillation process will determine the final result of the alcohol content produced. Another step that is also influential is the mixture of additional ingredients such as lime juice and aloe vera gel to disguise the distinctive odor of "Cap Tikus" while providing other benefits. The use of these two materials is due to the ease of obtaining them and is well known by the public. Sensory analysis is carried out to test the level of preference and opinion of the testers on hand sanitizer made. As for the sensory analysis testing process, a Likert scale is used to test the level of preference of respondents to hand sanitizers based on the special treatment variables carried out. Percentage index calculation:

$$Index\ (\%)\ = \frac{Total\ Score}{Maximum\ Score}\ X\ 100$$

For the calculation of the total score on the Likert scale, the Mean formula is used to calculate the sensory analysis questionnaire data from each of the test variables.

Mean formula: $\bar{x} = \frac{x_1 + x_2 + x_3 \ldots\ldots + x_n}{n}$ $\bar{x}\ = \frac{1}{n} \sum_{i=1}^{n} x_i$

Information:

$\bar{x}$ = Average Calculation
x_i = Sample Score i
n = Number of Samples

Before deducing total respondent's favorite level of hand sanitizer made, it is necessary to know the interval (distance range) and the interpretation of percent in order to know score with method of finding the percent score interval (I).
Score interval caculation:

$$I = \frac{100}{Score\ (Likert)}$$

$$\mathrm{I} = \frac{100}{5} = 20$$

Then the result (I) = 20 (the interval from the lowest 0% to the highest 100%).

The following are the criteria for interpreting scores based on intervals:
- 0% - 19.99% = Don't like it very much (bad)
- 20% - 39.99% = Don't like it (dislike)
- 40% - 59.99% = Fair / Neutral
- 60% - 79.99% = Like
- 80% - 100% = Like it very much (good)

However, this still needs to be further investigated by testing the sample results to BARISTAND Manado to determine the alcohol (ethanol) content and other substances (pH and methanol) contained in the product based on Indonesian National Standard (SNI).

4.6. Experimental Design and Construction

Simple distillation equipment was designed and constructed consisting of condenser (1 unit), thermometer (1 unit), connecting tubes (2 pieces), electric stove (1 piece), and distillation tubes (2 pieces). The dimensions of the distillation equipment made are: 125 cm condenser length and 1L boiler volume (distillation tube), 250/500 ml distillate tube volume. The supporting equipment specifications are mercury thermometer, alcohol meter, water hose, direct water tap, condenser connecting tube, supports, aluminum and plastic foil, measuring tubes, bottles, stirring rods, small plates, knives, digital scales (metler toledo) and electric stove.

Each of the above component has its own function, namely: simple distillation tool as a tool used to distillate "Cap Tikus" with 40% alcohol content of the community's production into technical alcohol, Electric stove as a heating device, mercury thermometer as a temperature measuring device, boiler as a container for "Cap Tikus" alcohol raw material heated, connecting tubes as connector between boiler-condenser-distillate tube, buffer as condenser buffer in order not to fall, running water tap to lower the temperature in the condenser, alcohol meter as a tool for measuring the alcohol content of the distillation, a cylinder measuring cup as a vessel for the alcohol to be measured for purity, a knife for cutting lime as an additive, a stick for moving the aloe vera gel, small plate as a container for aloe vera gel, Metler Toledo for calculating the weight (g) of aloe vera gel as an additive.

V. RESULTS

5.1. Process and Results of Hand sanitizer Distillation with 60% - 70% alcohol content

"Cap Tikus", the main raw material for making alcohol-based hand sanitizer, was purchased from farmers around Tomohon City with 40% average alcohol content. Furthermore, the distillation process was carried out using simple distillation technique. This technique was applied using variety of main distillation tools and other auxiliary tools which included an electric stove as a heating medium, a flat bottom flask as a container for "Cap Tikus", an Erlenmeyer flask as a container for distillation results, a condenser as "Cap Tikus" cooling process from vapor to liquid, a mercury thermometer to measure heating temperature, a 3-hole connecting tube as a connector for a flat-bottom-thermometer-condenser flask, a buffer as a condenser support, a hose as a condenser for the flow of water into and out of the condenser, the tube connecting the condenser to the Erlenmeyer flask and tap water as a source of channeling cold water into the condenser.

In the simple distillation design, the flat bottom flask was filled with "Cap Tikus" alcohol as raw material, then connected to a thermometer and condenser through a 3-hole connecting tube. On the condenser, there was attached a hose to the water flow in and out with a cold water source from the water tap. The condenser was connected via small connecting tube with an Erlenmeyer flask as a reservoir for alcohol from "Cap Tikus" distillation. The main objective in designing this process was to obtain 70% or more technical alcohol content. The following is the design of a simple laboratory-scale distillation process (Figure 5.1):

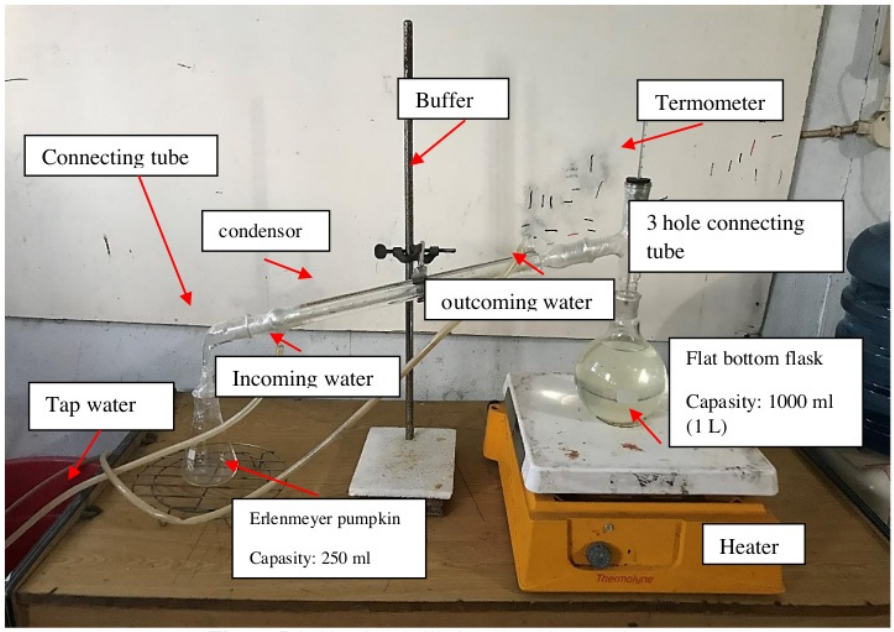

Figure 5.1. Simple Distillation Procedure Design

In the distillation process, observations were focused on the time and heating temperature. Table 5.2. presented data on the results of "Cap Tikus" distillation, including heating temperature and alcohol content.

Table 5.2. Level of Alcohol Distillation Result of "Cap Tikus" at Several Heating Temperatures

Heating Temperature (°C)	Alcohol Content (%)
75 – 78	85 – 87
79 – 82	80 – 81
83 – 86	79 – 80
87 – 90	64 – 65

Table 5.2 shows that the highest alcohol content is obtained at 75 ° C - 78 ° C heating temperature and 85% - 87% alcohol content, and has met the requirements of the Indonesian Industry standard for technical alcohol (Ministry of Industry, 2003). As for measuring the purity level of alcohol starting at 75 ° C temperature, this is due to the alcohol obtained from the distillation process just starting to flow at that temperature. Then experimentally it can be seen that the higher the temperature, the less the purity of the alcohol (ethanol). This is because the water contained in "Cap Tikus" which was used as the material for this experiment was increasingly evaporating along with ethanol. Thus, there is a clear direct relation, namely the reduced purity of ethanol means more water contained in it. The following is a graph of the effect of temperature on the alcohol content produced:

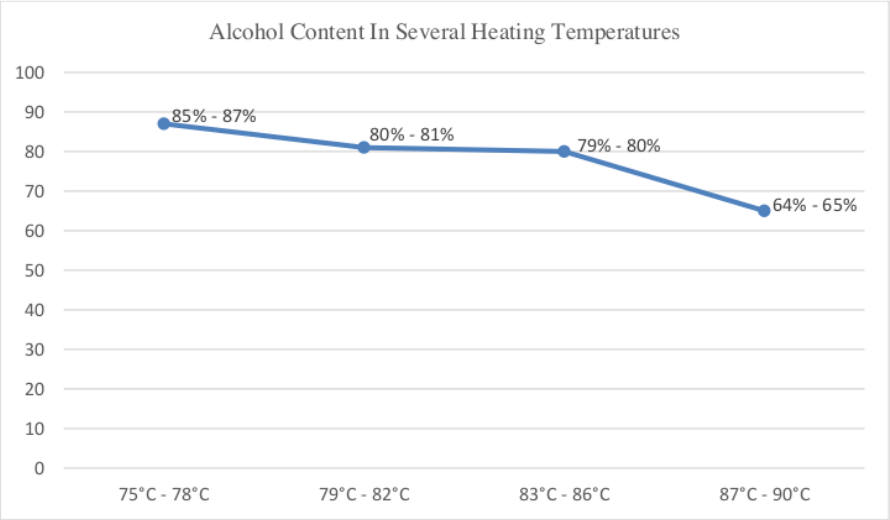

Figure 5.2. Graph of Alcohol Content in Several Heating Temperatures

This is also in line with Winkle (1967) who reported that the distillation heating temperature at 78.5 ° C to 85 ° C resulted in up to 80% alcohol content. As the heating temperature increases, the alcohol content decreases. This is due to the heating temperature between 90 ° C - 95 ° C, the water has started to boil, so that in this situation water vapor will be followed and mixed with alcohol vapor which results in relatively low alcohol content obtained.

Apart from the content, the odor is also used as an indication of the quality of technical alcohol. After the distillation process was carried out, the distinctive odor of "Cap Tikus" still exists, this is due to the influence of the raw materials used. Therefore, other additives were added to disguise the distinctive odor of "Cap Tikus".

Along with the data in Table 5.2, there is a difference in the volume of the distillation at several heating times. The following is the comparison data for each repetition of the distillation process at several times and heating temperatures to the level of alcohol content and volume produced:

Table 5.3. Comparison of Repeated Distillation Process Results

Distillation rate	Warm Up Time (Hours, Minutes, Seconds)	Heating Temperature (°C)	Volume (ml)	Alcohol Content (%)
1	2, 52	75 – 78	146	85 – 87
2	2	79 – 82	145	80 – 81
3	2, 6	83 – 86	195	79 – 80
4	2	87 – 90	285	64 – 65

The following is a chart comparing the heating temperature to the final volume and alcohol content produced:

From Table 5.3, it can be seen that there are differences in each distillation repetition process. The smallest level of alcohol content was obtained in the 4th process, this is clearly because the higher the heating temperature, the lower the alcohol content is produced, but the more the volume of distillation results. It is inversely proportional to the 1st process where the alcohol content produced was greater, but with a smaller volume. The heating time also contributed an effect in which at the 4th process in 2 hours produced 285 ml volume with 64% - 65% alcohol content, meanwhile at the 1st process it took longer time 2 hours 52 minutes and only produced 146 ml volume, but with higher alcohol content, 85% - 87%.

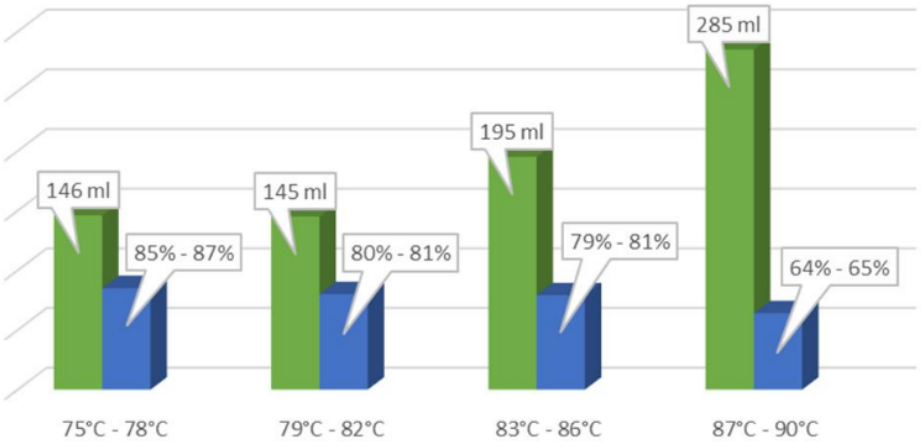

Figure 5.3. Chart of Comparison of Temperature to Final Volume and Alcohol Content Produced

The results obtained from several tables above show the results of the distillation process with an initial volume of 500 ml "Cap Tikus". The yield ranged from 29%, for each processing of 500 ml of 40% alcohol, 146 ml of technical alcohol was obtained with 85% - 87% alcohol content. However, when the distillation process was carried out on "Cap Tikus" with an initial volume of 1000 ml, different data were found in terms of the volume of distillation results with different heating time than in the above table. The following is the distillation result data from the initial 1000 ml volume " Cap Tikus " which is presented in Table 5.4:

Table 5.4. Results of 1000 ml "Cap Tikus" Distillation of the Initial Volume

Warm Up Time (Hours, Minutes, Seconds)	Heating Temperature (°C)	Volume (ml)	Alcohol Content (%)
5, 30	75 – 78	250	86

From Table 5.4., it can be seen that there is a difference in the volume of distillation and heating temperature that is different from the initial volume of 500 ml "Cap Tikus". The yield was around 25%, for each processing of 1000 ml with 40% alcohol content obtained 250 ml technical alcohol with 86% alcohol content.

Based on the data that has been obtained from several tables above, the distillation results for making alcohol-based hand sanitizers were taken from distillations with alcohol content of 85% and above. The purpose of taking the alcohol content was to maintain the alcohol content in accordance with the aim of the researchers to make hand sanitizers with alcohol content of not less than 60% and not more than 70% after adding other additives so that they comply with the minimum standard of alcohol content as an active ingredient that has been established.

5.1.1. The Use of Aloe Vera Gel and Lime Juice

1. **Data processing**

   At this stage, the distillation product with 85% alcohol content was processed into hand sanitizer with the addition of other additives, namely aloe vera gel and lime juice. This was done to reduce the characteristic odor of "Cap Tikus" that still exists and to reduce the alcohol content to 60% - 70%. The reason the researchers chose the two materials was due to the ease to get them and quite a lot is known by the public if the hand sanitizer product to be made is going to be to be practiced in the future.

2. **Dilution of Solution**

   This stage is an important step in the process of making alcohol-based hand sanitizer from the " Cap Tikus "distillation because in this stage the additional ingredients will be added to the alcoholic distillation solution at the level of 85% so that it will reduce its concentration according to the alcohol content that the researchers have set, around 60% - 70%, as the main active ingredient in hand sanitizer product. The purpose of this additional material is also to reduce the distinctive odor of "Cap Tikus" left, so that the user will be not too disturbed by the distinctive odor because it has been disguised by the odor of the additive.

Dilution of the solution is a process to reduce the alcohol content in the alcohol solution, one of which is "Cap Tikus" distillation which was carried out in this study in order to make hand sanitizer product with alcohol content as the main active ingredient based on the standard given. The following is comparison of the mixture of 85% alcohol and additional lime juice and aloe vera gel ingredients in the production of alcohol-based hand sanitizer:

1) To produce 500 ml hand sanitizer with 60% alcohol content and the mixture of lime juice, it is necessary:
   100 ml (lime juice) + 400 ml (85% alcohol content)
   => 500 ml alcohol-based hand sanitizer (60%)
2) To produce 500 ml hand sanitizer with 60% alcohol content and the mixture of aloe vera gel, it is necessary: **120 g (aloe vera gel) + 400 ml (85% alcohol content)**
   => 500 ml alcohol-based hand sanitizer (60%)

To produce it in a smaller volume (100 ml), the ratio will be the following:

1) To produce 100 ml hand sanitizer with 60% alcohol content and the mixture of lime juice, it is necessary:
   20 ml (lime juice) + 80 ml (85% alcohol content)
   => 100 ml alcohol-based hand sanitizer (60%)
2) To produce 100 ml hand sanitizer with 60% alcohol content and the mixture of aloe vera gel, it is necessary: **24 g (aloe vera gel) + 80 ml (85% alcohol content)**
   => 100 ml alcohol-based hand sanitizer (60%)

Thus, based on the comparison of the mixtures that have been made above, the final result is alcohol-based hand sanitizer as a result of "Cap Tikus" distillation with 60 % alcohol content and 1000 ml total volume consisting of each mixture, 500 ml lime juice and 500 ml aloe vera gel.

5.1.2. Discussion

1. **Data analysis;** At this stage, the products that have been made were given to several students and lecturers at ITM Tomohon for taking testimony with questionnaire leaflets before the sample result of laboratory testing was brought to BARISTAND Manado for feasibility tests and standard quality of SNI regarding hand sanitizer product..
2. **Sensory Analysis;** The testimonies of the product were gathered from several students and lecturers at ITM Tomohon using Sensory Analysis Questionnaire. The variables examined in the questionnaire consisted of color, odor and sensation (in hands). In the testimonial process, 30 questionnaires were given to 15 testers consisting of 15 sheets for the hand sanitizer category with aloe vera gel mixture and 15 sheets for the hand sanitizer category with lime juice mixture. The results that have been obtained were then processed using the Mean calculation to find the average level of preference for alcohol-based hand sanitizer product with the mixture of the two additives. The data were input into the Likert scale percentage index calculation for taking conclusion the total respondent's preference for alcohol-based hand sanitizer from "Cap Tikus" distillation. In calculating the mean for sensory analysis, the data taken was single data and the sampling was carried out using Simple Random Sampling (SRS) method which is random sampling without paying attention to age, sex and occupation and is within the scope of research observations. After the final product testimony was done, the products were tested further to BARISTAND Manado to meet the standard quality of SNI. In the final product testimonial, 2 (two) different stages of testimonial were conducted, namely the alcohol-based hand sanitizer sensory analysis questionnaire with the mixture of aloe vera gel and with the mixture of lime juice. The following is the data on the results of product testimonials in the mean score which was carried out with sensory analysis questionnaire for hand sanitizer products with the mixture of aloe vera gel and lime juice (Table 5.5):

Table 5.5. Results of the Sensory Analysis Questionnaire of Hand sanitizer made from the mixture of Aloe Vera gel and lime juice

Type of products	Color	Odor	Sensation (in Hands)	Total Mean Score
AVG	4.26	3.46	3.8	**3.84**
LJ	2.8	3.4	4	**3.4**

Based on the results data from Table 5.5. above, it can be seen that the hand sanitizer with the mixture of aloe vera gel is higher in total score than lime juice. In preparing the questionnaire data, the variables from each questionnaire have 5 (five) points of assessment with the highest point category was 5 and the lowest 1. If the data above is presented as a percentage (%), then the Likert scale percentage index is calculated. Thus, the data from the questionnaire results from the percentage calculation (%) will produce the percentage score of the user's preference level of each variable for the alcohol-based hand sanitizer "Cap Tikus" distillation result with 2 (two) mixtures of additives, presented in Table 5.6 below:

Table 5.6. Results of the Sensory Analysis Questionnaire Hand sanitizer made from the mixture of aloe vera gel and lime juice in percentage

Type of products	Color	Odor	Sensation (On Hand)	Total Mean Score
AVG	85,33%	69,33%	76%	**76,88%**
LJ	56%	68%	80%	**68%**

Based on the data in Table 5.6. above, it shows that the level of preference for alcohol-based hand sanitizer products from the distillation of "Cap Tikus" with the mixture of AVG has high total score with percentage reaching 76.88%, while LJ has total score 68% in terms of user preference. Both are included in the LIKE category based on the interpretation of the Likert scale score:

AVG : 76,88% (Like)

LJ : 68% (Like)

The following is comparison diagram of the results of product testimonials:

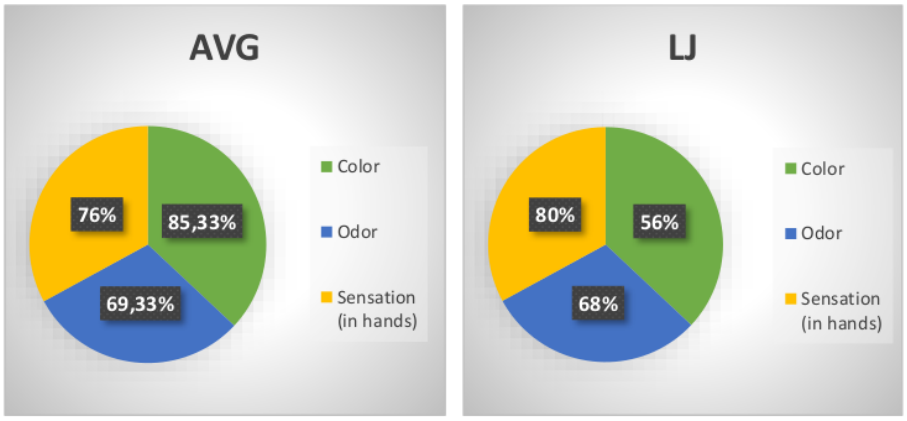

Figure 5.4. Results of Comparison of Product Testimonials Per Each Variable

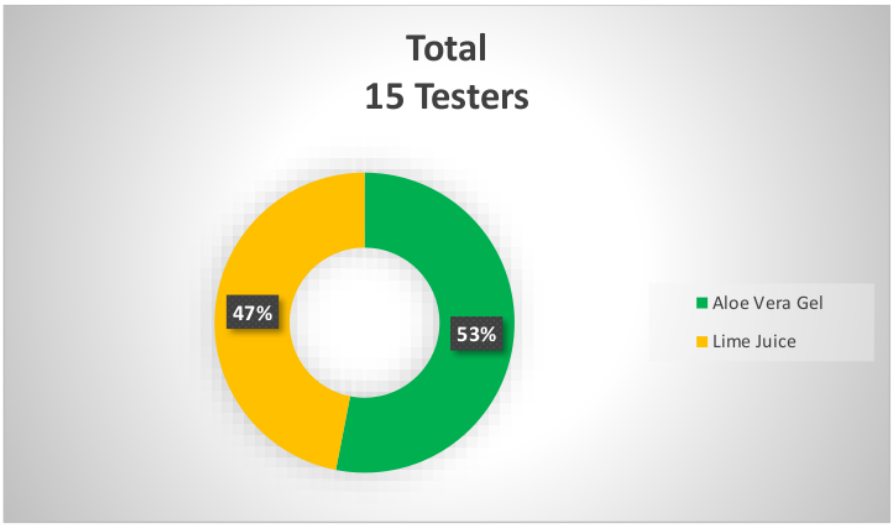

Figure 5.5. Overall Product Testimonial Comparison Results

Based on the diagram above, it can be seen that of the 15 testers, 8 of them preferred hand sanitizer with the mixture of aloe vera gel, while the remaining 7 preferred the mixture of lime juice. However, if it is seen in terms of each variable, the LJ mixture in terms of sensation (in hands) is preferred over AVG with 80% and 76% ratio percentage.

3. **Laboratory Testing at BARISTAND Manado;** The final stage in this research was the two products should be tested at BARISTAND Manado for lab test results in accordance with SNI standard quality regarding hand sanitizer. This lab test also aimed to compare the level of accuracy of the results of the alcohol content obtained using the calculation of the dilution of alcohol volume by the researchers with the results of the BARISTAND Manado laboratory scale parameter test.
The SNI standard quality regarding hand sanitizer, can be seen in Table 5.7. below:

Tabel 5.7. Hand Sanitizer Liquid Soap Quality Standard SNI 2588:2017

Nu.	Test Criteria	Units	Conditions
1	pH	-	4 – 10
2	Total active ingredients	% mass fraction	min. 10
3	Insoluble materials in ethanol	% mass fraction	max. 0,5
4	Free alkalis (calculated as NaOH)	% mass fraction	max. 0,05
5	Free fatty acids (calculated as oleic acid)	% mass fraction	max. 1
6	Microbial contamination (total plate number)	Colony /g	max. $1x10^3$

However, in the lab testing process of product results, the parameters that were tested at BARISTAND Manado by researchers were not only ethanol content but also pH parameters and methanol content which are hazardous materials and should not be contained in alcohol-based hand sanitizer product.
The test parameters are presented in Table 5.8. below:

Table 5.8. Test Parameters of Alcohol-Based Hand Sanitizer Products from "Cap Tikus" Distilation

Nu.	Test Criteria	Units	Conditions
1	pH	-	4 – 10
2	Ethanol	%	Min. 60, max. 70
3	Methanol	%	(-) Negative

The testing process at BARISTAND Manado laboratory took about 14 working days to get the results whether the pH parameter level, ethanol content, and methanol content were in accordance with SNI standard quality. After laboratory testing for 14 working days, the following laboratory results were obtained (Table 5.9 and Table 5.10):

Table 5.9. Laboratory Testing Results of AVG Category at BARISTAND Manado

Nu.	Test Criteria	Units	Conditions	Result
1	pH	-	4 – 10	**7,295**
2	Ethanol	%	Min. 60. max. 70	**60,56**
3	Methanol	%	(-) Negative	**(-) Negative**

Table 5.10. Laboratory Testing Results of LJ Category at BARISTAND Manado

Nu.	Test Criteria	Units	Conditions	Result
1	pH	-	4 – 10	**3,53**
2	Ethanol	%	Min. 60 , max. 70	**60,69**
3	Methanol	%	(-) Negative	**(-) Negative**

The data in the tables above shows that the alcohol content of the two mixtures of ingredients were not too different. However, the alcohol content of the laboratory test results at BARISTAND Manado from both of them was still in the appropriate category as an alcohol-based hand sanitizer according to most references from various health agencies such as LIPI, WHO, CDC and health experts in the world regarding the use of hand sanitizers that are effective in dealing with various bacteria and viruses, namely with a minimum level of 60%.

From Table 5.9 and Table 5.10, it is also seen the comparison of pH parameters, where the alcohol-based hand sanitizer product for the LJ category has pH less than the SNI standard. It is inversely proportional to the alcohol-based hand sanitizer product in the AVG category which has pH parameters in accordance with the SNI. This is most likely due to the use of the large volume of the lime juice mixture (100 ml from the researchers' determination) compared to the volume of alcohol used (85%). This can be overcome by adding a mixture of aloe vera gel with lime juice or reducing the volume of the mixture to increase the pH according to applicable standards. The production of alcohol-based hand sanitizer from “Cap Tikus” distillation was based on the researchers' observations of local alcoholic beverages circulating in the community in North Sulawesi which will have benefits if it is processed further and not only as alcoholic drinks. Thus, the results of this research on producing alcohol-based hand sanitizer products from the results of distillation of "Cap Tikus" carried out by the researchers in 2 (two) months period, as well as laboratory test results at BARISTAND Manado, showed the feasibility level of the products that can be used for a small scope such as in ITM campus environment as well as personal needs for some people.

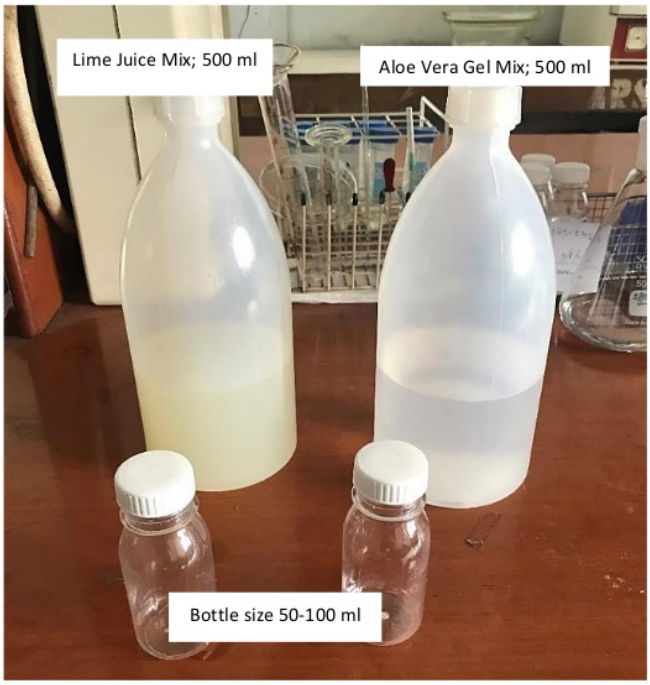

Figure 5.5. Alcohol-Based Hand Sanitizer From "Cap Tikus" Distillation

VI. CONCLUSION AND SUGGESTION

Conclusion

1. The procedure for producing alcohol-based hand sanitizer from "Cap Tikus" distillation used a simple distillation technique to produce 85% alcohol content. The alcohol was then treated with the mixture of additional ingredients, resulting in hand sanitizer with 60% - 70% alcohol content. By utilizing "Cap Tikus" alcohol as an ingredient in local hand sanitizers, it is hoped that it can contribute to the society and the government to meet the needs of health products during the current pandemic.
2. Beside being easy to obtain, the use of the mixture of additional ingredients in the form of aloe vera gel and lime juice can also disguise the distinctive odor of " Cap Tikus " alcohol that still exist in the hand sanitizer products so it is not too disturbing for some people, but it is quite acceptable for some of the testers if it is only used as a daily personal product during this pandemic.

Suggestion

1. The distillation procedure was carried out using a simple distillation technique, so that it only produced around 85% alcohol content. If someone wants to get higher alcohol content, it is needed a different distillation technique from what has been done in this study.
2. In terms of the usage of aloe vera gel and lime juice as additional ingredients to disguise the distinctive odor of "Cap Tikus", for some people is still not optimal. This is because the "Cap Tikus" alcohol which is taken as a sample of alcohol-based hand sanitizer processing is still produced by simple distillation using bamboo by farmers, so that the distinctive odor is still strong. Reducing the odor of "Cap Tikus" alcohol can be done by changing the distillation process using pipes or stainless steel to reduce the odor or by adding essence oil (fragrance) together with the existing mixtures to produce better aroma.

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