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UTILIZATION OF EUCALYPTUS GRANDIS LEAF WASTE IN THE PRODUCTION OF VCO BASED LIQUID SOAP

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Abstract

Eucalyptus grandis still not much used, especially the leaves. Besides being used as an industrial material, Eucalyptus is also used as a medicinal plant to cure infectious diseases, fever and rheumatism as well as being an antiseptic and can be applied in the form of bath soap. The purpose of this study was to determine the best combination of liquid body soap with the addition of eucalyptus leaf extract with various concentrations. The research method used was a laboratory experiment using a completely randomized design (CRD) method with the addition of eucalyptus oil A = 1% (w/w), B = 2% (w/w), C = 3% (w/w), D = 4% (w/w) and E = 5% in total VCO 80 oil, 40% KOH = 35 g, glycerin = 60 g, propyleneglycol = 35 g, three times the repetition. The parameters observed were the physicochemical properties of soap based on SNI Liquid Bath Soap 06-4085-1996 including free alkali content, namely A = 0.072%, B = 0.052%, C = 0.078%, D = 0.090$, E-), 104% , pH value, A= 8.36, B= 8.78, C= 8.80, D= 8.85 and E=8.94, Specific Gravity A= 1.008, B= 1.018, C= 1.009, D= 1.190, E = 1.014.

Keywords: Liquid Bath Soap; Eucalyptus Oil; VCO Oil

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INTRODUCTION

Industrial Eucalyptus Plantation Forest is one of the priorities developed in the management of industrial plantation forests in Indonesia which are designated as fiber wood (pulp). The type criteria developed for industrial plantation forests, selected plant species that grow fast in tropical areas such as Indonesia are very likely to grow fast (Sibarani, 2018).

Eucalyptus plants are generally small to large trees, 60-87 m high. The main stem is straight, up to 200 cm in diameter. Young leaves and mature leaves have different characteristics, mature leaves are generally alternate, sometimes facing each other, single, translucent midrib, secondary spines pinnate or parallel, smells nice when crushed (Masullo et al., 2020).

Various studies have shown that *Eucalyptus citriodora* essential oil has a broad spectrum of biological activity including anti-microbial activity against bacteria, fungi and yeast, analgesic and anti-inflammatory effects, antioxidant activity and insecticidal effects. Other properties of the main monoterpene constituent, citronellal, have been explored. Eucalyptus essential oil has antioxidant activity that is effective against gram-negative and positive bacteria (Hadjer et al., 2017).

One of the essential oil producing plants is eucalyptus. According to Blaak et al., (2011). Apart from making liquid soap, eucalyptus leaves can also be used to make biopesticides (Taufik et al., 2022). Essential oils are a potential agro-industrial export commodity that can be a mainstay for Indonesia to earn foreign exchange. World export-import statistics show that consumption of essential oils is around 10% from year to year (Qisti, 2009; Damayanti et al., 2015). Essential oils are also known to evaporate easily and are called flying oils. The definition or understanding of essential oils written in the Chemical Technology Encyclopedia states that essential oils are compounds in liquid form which are obtained from plant parts, roots, bark, leaves, stems, seeds, and from flowers by means of distillation and water distillation (hydrodistillation). Hadjer et al., (2017) essential oil from eucalyptus leaves can

inhibit the growth of Staphylococcus aureus bacteria.

The active compounds contained in eucalyptus leaf essential oil are 1,8-cineole, linalool, and pinocarveol. Eucalyptus leaf extraction is an effort to separate essential oils from plants. Essential oils can also be made from squeezed orange waste (Rangkuti et al,, 2020). Essential oils can only be separated from plant cells if moisture or other solvents reach the oil (Batubara et al., 2016).

Liquid soap is more in demand by the public compared to solid soap, because its use is more practical, more economical, not contaminated with bacteria, easy to carry (Blaak et al., 2011; Dasopang & Simutuah, 2016) and easy to store. Soap is a cleanser made by a chemical reaction between potassium or sodium with fatty acids from vegetable oils or animal fats (Dewan Standarisasi Nasional (DSN), 1996).

The chemical reaction between potassium or sodium and fatty acids, both vegetable and animal fatty acids, will produce liquid or solid soap products, using eucalyptus leaf extract as a variation of liquid soap.

RESEARCH METHODS

Material and Tools

The materials used included Eucalyptus robusta leaves, VCO, 40% KOH, glycerin, distilled water, PG, buffer solution, 96% alcohol, 0.1% KOH, acetone (C_6H_6O), diethyl ether (C_2H_5)2O, sodium chloride (NaCl), Buffered Peptone Water (BPW), Potato Dextrose Agar (PDA) and Plate Count Agar (PCA).

The tools used are digital scales, beaker glass, measuring cup, magnetic stirrer, thermometer, pycnometer, pH indicator, pH meter, vortex meter, test tube, measuring pipette, petri dish, water bath, incubator cabinet, oven, cup, erlemeyer, and a Stahl distillation apparatus.

Preparation and Extraction of Eucalyptus Grandis Leaves

A. Sample collection

Eucalyptus grandis leaves were obtained from the Padang Bulan area of Medan city. The fresh leaves obtained are immediately separated from the branches. Then the leaves are chopped to a length of 10 cm.

b. Extraction

Prepared Eucalyptus grandis leaves were taken as much as 1,000 grams of leaves then cut into small pieces and put into a stahl flask. Then the oil layer is added anhydrous $CaCl_2$ to bind water.

Making Liquid Bath Soap

Pure coconut oil (VCO) and Eucalyptus oil are placed in a heated glass beaker over a magnetic stirrer. Heating is carried out until the oil mixture is 50-70°C. Then 40% KOH solution was added and stirred at 350-700 rpm until homogeneous. The soap mixture is left for 6-10 hours at room temperature (25-27°C) covered. Then dilution or liquefaction is carried out to make liquid soap using distilled water, glycerin, and propylene glycol (PG). Variations in pure coconut oil (VCO) formulations with Eucalyptus Oil are shown in Table 1.

Table 1. VCO formulation with Eucalyptus

Material	**Treatment**				
	A	**B**	**C**	**D**	**E**
VCO	80	80	80	80	80
Oil Eucalyptus (g)	1	2	3	4	5
KOH 40%	35	35	35	35	35
Glycerin (g)	60	60	60	60	60
Propileneglycol (g)	35	35	35	35	35

Test the Quality of Liquid Soap

Liquid bath soap quality test is a physicochemical quality test in accordance with SNI Liquid Bath Soap No: 06-4085-1996 covering free alkali content, pH value, and specific gravity (Dewan Standarisasi Nasional (DSN), 1996).

Total/Total Microbial Number Plate Test

The method commonly used to calculate the presence of bacteria in the preparations examined is the pour plate technique. This test consists of three stages, namely homogenization, dilution and incubation. Homogenization is a way of preparing a sample to get the best distribution of bacteria in a particular sample.

Dilution aims to facilitate the counting of colonies, because if it is

not done then the bacterial colonies will be very concentrated so that the calculation will be difficult. A 10-4 to 10-5 dilution was made, then 1 ml of the dilution was taken and poured into a petri dish in duplicate. Before pouring the sample, ± [15 ml of NA medium (45° ± 1°) was poured into each petri dish, then allowed to harden, then the sample was [poured and the petri dish was immediately shaken while rotating so that the sample suspension formed. evenly, then allowed to solidify. All plates were incubated at 35°C for 24-48 hours with the plates upside down. Growing colonies were observed and counted.

RESULTS AND DISCUSSION

1. Free Alkaline Test

Based on the analysis performed, it was found that the free alkaline content found in bath soap ranged from 0.072% - 0.104%. The free alkali test is a measurement of alkali in soap that is not saponified or does not react with fatty acids. A high percentage of free alkali value indicates that the soap can cause irritation.

The results of the analysis of free alkali in liquid body soap can be seen in sample B, there was a decrease in free alkali levels compared to sample A because when blending it was not mixed homogeneously, due to human error, but after re-analysis the results obtained were 0.075%, the more oil extract concentration eucalyptus which is added the higher the free alkali content produced, this indicates that the active compound in the eucalyptus grandis leaf oil extract can be alkaline. According to (Masullo et al., 2020) the pH value will increase with increasing alkalinity and decrease with increasing acidity.

Therefore, the higher the pH value of the liquid soap, the higher the alkaline content contained in the liquid soap. The greater the addition of oil, the higher the free alkali content. The free alkali content of each bath soap can be explained, namely in sample A: 0.072%, sample B: 0.075%, C: 0.078%, D: 0.090% and E: 0.104%.

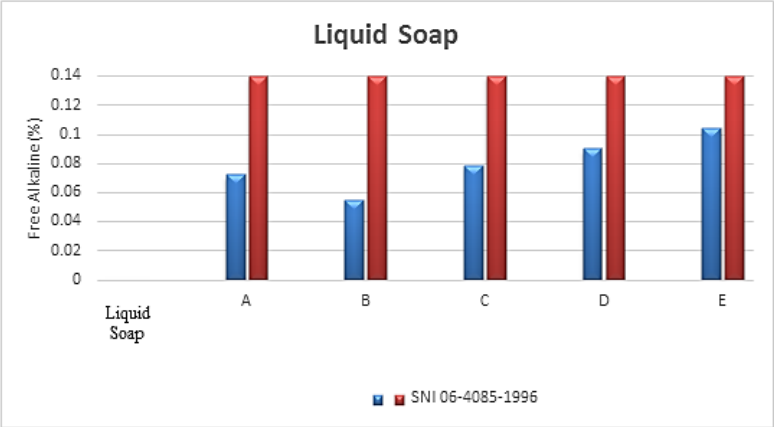

Figure 1. Graph of Free Alkali Test Value

Basically the use of KOH as a raw material for alkaline liquid bath soap will affect the free alkali value and the pH value of the soap (Susanti & Guterres, 2018). From the results of the analysis of the free alkaline content obtained in this study it is still in accordance with the standards set by the Indonesian National Standard (SNI), so it is still safe for the health of consumers or users, however, the high free alkali content contained in each bath soap product will still have an effect on the skin.

2. pH Value Test

The pH value will increase because the amount of KOH used also increases because the KOH used in the manufacture of liquid body soap is a compound that is classified as a strong base. Based on measurements, the pH contained in each soap.

Table 2.The amount of pH soap sample

Sample	pH
A	8,36
B	8,78
C	8,80
D	8,85
E	8,94

The recommended pH according to SNI 06-4085-1996 is no more than 8 - 11%. High pH can cause skin irritation because it has a high level of free alkali. The pH of the bath soap that was sampled in this study included safe liquid soap to use. The level of free alkali in the soap is caused by the presence of alkali which does not react with fatty acids in the saponification process (Irawati, 2016; Sukeksi et al., 2017). The amount of alkali in each formula is the same, so there is no significant difference in the pH between the formulas.

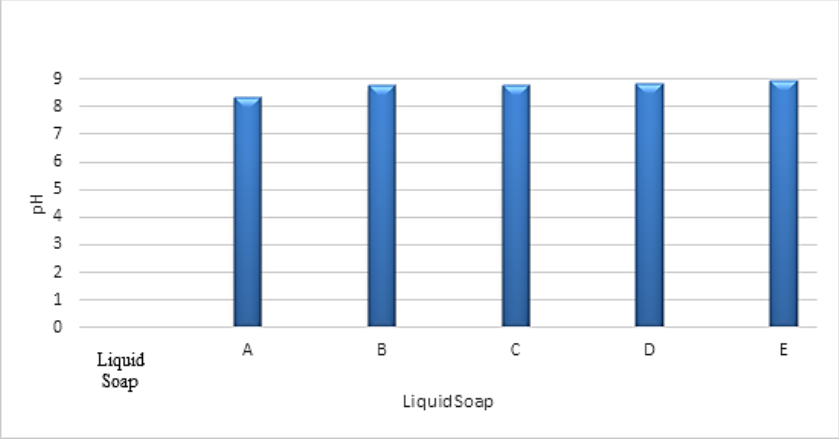

Figure 2. Graph of Liquid Soap Sample pH

The results showed that the E value had the greatest pH, namely pH 8.94 and the lowest pH value was in sample A pH 8.36, changes in eucalyptus concentration did not have a significant effect. The pH of liquid body soap tends to be stable and alkaline because KOH is a strong base but for B, C, D and E soaps the pH increases due to the addition of alkaline eucalyptus oil, eucalyptus pH is 5.78 and this shows eucalyptus oil is acidic, compounds active cineol and alpha pinene ($C_{10}H_{18}O$) are organic compounds that are alkaline in nature, so the addition of increased extracts causes the pH to increase.

3. Specific Weight Test

Specific gravity is the ratio of the weight of the substance in the air at 25oC to the weight of water in the same volume (Zhang et al., 2022). The specific gravity test was carried out to determine the specific gravity of liquid soap. The specific gravity of a liquid soap preparation according to SNI is 1.01 – 1.1 g/mL. The purpose of the specific gravity test on suspension preparations is to calculate the viscosity value of the preparation because specific gravity is one of the factors that affect viscosity, the specific gravity test results can be seen in Figure 3.

Specific gravity testing was carried out to determine the effect of the ingredients used in the liquid soap formulation, namely the ingredients contained in the formula on the specific gravity of the resulting soap. Based on SNI, the standard specific gravity for liquid soap is 1.01 – 1.1 g/m.

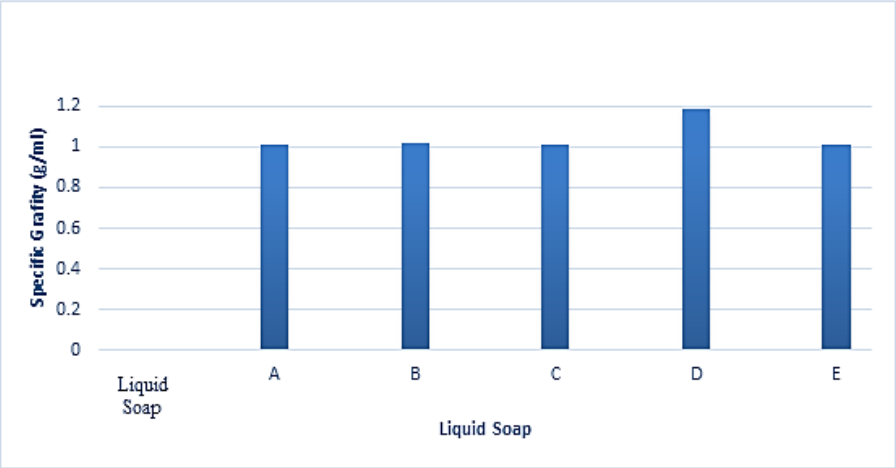

Figure 3. Graph of Specific Gravity of Liquid Soap Samples

Testing the specific gravity using a pycnometer, from the observations obtained the specific gravity of each type of soap sample was 1.008 g/mL, the specific gravity of 1% concentration was 1.042 g/mL, when referred to SNI the specific gravity of the soap sample still complies with the provisions and is safe to use. The difference in specific gravity for samples A, B, C, D and E was not significant because the intervals for administering oil concentrations were not that much different.

4. Total Plate Number Test/Total Microbes

The number indicating the number of mesophilic aerobic bacterial colonies present per gram or per milliliter of sample is also known as the Total Plate Number (ALT). One way to calculate the presence of indications of bacterial contamination in the preparations examined is to test the total plate count using the pour plate technique or the spread plate technique (Brock, 2012).

In this study, it was carried out using the pour plate technique. The plates selected and counted were those containing between 30-300 bacterial colonies. This is because the number of microorganisms in the sample is not known beforehand, so to obtain at least one plate containing colonies in the number that meets these requirements a series of dilutions and cupping must be carried out. Without dilution, growing

colonies will accumulate and make it difficult to calculate the number of colonies. Calculation of the total plate number of microorganisms was selected from petri dishes with the number of colonies between 30-300, so that in this study an examination of the total plate number was carried out, namely counting the number of colonies that grew on the media from the sample dilution. Dilution aims to reduce the total population of microorganisms.

The resulting data can be seen for each soap preparation indicating the presence of microbial contamination with varying amounts. The results of microbiological analysis were carried out by means of a standard plate count using a standard called Standard Plate Counts (SPC), which is as follows.

Table 3. Total Plate Test

Soap Sample	Total Population
A	157 x 10^4 cfu/ ml
B	77 x 10^4 cfu/ ml
C	TBUD
D	186 x 10^4 cfu/ ml
E	71 x 10^4 cfu/ ml

Look at the data from the ALT analysis performed, it can be seen that in soap preparation C the number of microbial colonies is TBUD, meaning that there are too many microbes that must be counted because the microbial population calculation can be calculated if the range of bacterial colonies is from 30 to 300 colonies, this is probably due to the equipment for making soap good distilled water or there are some additional ingredients used, less sterile one of the reasons above has the potential to be a carrier of microbes.

It is also suspected that in the preparation of sample C the number of microbes was not counted because the number of microbes was > 300 so that many colonies combined to form a large collection of colonies so that the number of colonies that could be produced was doubtful. counted as one colony. This is because the agar media with a high number of colonies (> 300 colonies) is not valid, so the possibility of calculation error is very large, while for a small number of colonies (<30 colonies) it is not valid statistically valid.

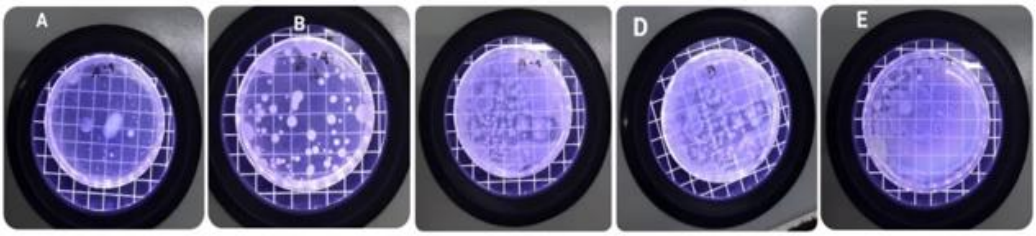

Figure 4. Total Bacterial Plate Number

If the microbial population is 30 to 300 colonies present on the agar medium, the calculation is carried out if the population is less than 30 colonies, this will result in an inaccurate statistical calculation, whereas if more than 300 colonies will produce the same result. numbers due to competition between colonies. Based on the incubation time which usually lasts 24 hours or more (Bhargava et al., 2012), population counting can be done.

CONCLUSION

Based on the research that has been done, the best treatment for the physicochemical properties of liquid body wash is in preparation C, namely liquid bath soap with a mixture of 15% (w/w) eucalyptus leaf oil with a pH value of 9.79, 0.0139% free alkali, 1.038 specific gravity, and a total plate number of 0.28 x 105 colonies/g.

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