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Preparation of Virgin Coconut Oil (VCO) Using The Pineapple Enzymatic Method

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Abstrak: *Virgin Coconut Oil* (VCO) adalah minyak nabati yang diekstrak dari endosperm kelapa yang segar dan matang dan diperoleh tanpa pemurnian kimia atau pemanasan yang tinggi. Pembuatan VCO dapat diolah melalui beberapa metode, salah satunya dengan metode enzimatis nanas. Hasil pembuatan VCO dengan enzimatis nanas memiliki keunggulan dibandingkan dengan metode lainnya. Nanas merupakan tanaman yang relatif mudah untuk dibudidayakan di Indonesia, namun pemanfaatan nanas masih kurang maksimal, biasanya hanya dibuat sebagai olahan makanan atau minuman yang dapat dikonsumsi secara langsung. Penelitian ini bertujuan untuk mengetahui cara pembuatan VCO menggunakan metode enzimatis dari buah nanas serta parameter fisik VCO yang dihasilkan (warna, aroma, dan rasa). Metode yang digunakan pada penelitian ini adalah metode campuran. Hasil dari penelitian ini menghasilkan minyak sebanyak 40 ml dengan tingkat kejernihan yang bening, aroma yang sedikit menyengat dari aroma kelapa, dan memiliki rasa khas minyak kelapa.
Kata kunci: *Virgin Coconut Oil*, Enzimatis Nanas, Minyak Nabati.

Abstract: Virgin Coconut Oil (VCO) is a vegetable oil extracted from the endosperm of fresh and mature coconuts without chemical refining or high heat. VCO can be produced by several methods, one of which is the pineapple enzymatic method. The results of pineapple enzymatic VCO production have advantages over other methods. Pineapple is a plant that is relatively easy to cultivate in Indonesia, but the utilization of pineapple is still not maximized, usually only as processed food or drink that can be consumed directly. This study aims to determine how to produce VCO using enzymatic method from pineapple fruit and the physical parameters of VCO produced. The method used in this research is a mixed method. The results of this study produced 40 ml of oil with clear clarity, a slightly pungent aroma of coconut aroma, and has a distinctive taste of coconut oil.
Keyword: Virgin Coconut Oil, Pineapple Enzymatic, Vegetable Oil.

1. Introduction

Indonesia is a tropical country with many islands and is the largest coconut producer in the world after the Philippines [1]. Coconut (*Cocos nucifera*) production centers are spread almost in all provinces in Indonesia, such as Sulawesi, Java, Sumatra, Maluku and NTT, which come from smallholder plantations [1]. Coconut plants are a type of multifunctional plant because all parts of the coconut can be used, starting with the roots, stems, leaves, fruit and pulp [2].

Data from the Ministry of Agriculture Directorate General of Plantations, coconut production in Indonesia reached 2,811,954 tons with an area of 3,396,776 Ha [3]. This is an opportunity to utilize coconut into a variety of useful products, but the problem of coconut commodities in Indonesia that are marketed still dominated by primary coconut products, while in other countries such as the Philippines, many coconut products have been marketed into manufactured products that certainly have a higher selling value [4]. One of the coconut manufacturing products that can be marketed and has a high selling value is the manufacture of virgin coconut oil raw materials (Virgin Coconut Oil) [4].

Virgin Coconut Oil (VCO) is a vegetable oil extracted from the endosperm of fresh and mature coconuts without chemical refining or high heat [5]. VCO can be used as a raw material for the food, cosmetic and pharmaceutical industries because it contains Medium Chain Fatty Acids (MCFA). The MCFA content is 45%-53% lauric acid [6]. This assertion is supported by research conducted by [7] that the content of lauric acid and vitamin E in VCO, which is resistant to oxidation, has many health benefits. In addition, MCFA in VCO is also functional as antifungal, antiviral and antibacterial [7]. VCO has several advantages compared to other vegetable oils such as soybean oil, corn oil, palm oil and sunflower oil, namely its high lauric acid content [8]. Lauric acid is converted in the body to monolaurin, a monoglyceride compound that is antiviral, antibacterial, and antiprotozoal.

VCO can be processed by several commonly known methods, including the traditional boiling method, heating method, acidification method, centrifugation method, fishing method, and enzymatic method [9]. The fermentation process in the production of VCO can be done with the help of enzymes, which is called the enzymatic method. The enzymatic method can be done by using protease enzyme. Protease enzyme acts as a breaker of oil protein bonds contained in coconut milk emulsion [10]. One of the enzymes that can be used to break lipoprotein bonds in fat emulsions is bromelain enzyme, which is contained in pineapple fruit, especially in pineapple rinds [11]. Bromelain enzyme can hydrolyze peptide bonds in proteins into smaller molecules [12].

Pineapple is not native to Indonesia, but technically it is relatively easy to cultivate in Indonesia, one of which is the East Java region. Statistically accessed in the Indonesian Central Bureau of Statistics report in 2023, East Java ranks as the third largest pineapple producer in Indonesia after Lampung and South Sumatra, reaching 435,679 tons [13]. However, the utilization of pineapple in East Java is still less than optimal, which is only made into processed food or beverages such as pineapple fruit jam, fruit ice, sweet salad, or consumed directly [14].

Based on previous research conducted by [15] showed that the production of VCO using the pineapple enzymatic method produces coconut oil with aromatic properties and slightly different flavors compared to traditional methods. This is because the bromelain enzyme found in pineapple becomes a precipitating enzyme that can affect the production of VCO from coconut milk. In addition, enzymatic VCO from pineapple also has advantages over other methods, namely, the fat content of VCO does not change much, so its properties are maintained, it is not easily rancid because the fatty acid composition does not change much, and the resulting yield is high [16].

Based on this description, the researcher is interested in conducting a study entitled “Preparation of Virgin Coconut Oil (VCO) Using the Pineapple

Enzymatic Method". This study will discuss how to make VCO using pineapple fruit's enzymatic method and the resulting VCO's physical parameters.

2. Research Method

a. Time and Research Location

This research was conducted from April to May 2024 in the science laboratory of the Bachelor of Science Education Study Program, Faculty of Mathematics and Natural Sciences, State University of Surabaya.

b. Data Collection

This research uses the pineapple fruit enzymatic method to produce virgin coconut oil (VCO). The production of VCO begins with the preparation of coconut milk cream from shredded coconut meat. In this experiment, 2.5 grains of old coconut meat were used and mixed with 1.5 liters of boiled water, then filtered and squeezed to produce coconut milk. The coconut milk obtained was allowed to stand for 1 hour to separate the skim and coconut cream.

The milky white coconut cream is on the top layer and the skim (coconut milk water) is on the bottom layer. After the skim and the coconut cream are separated, the coconut cream is taken and put into a jar to make VCO. This experiment produced 200 ml of coconut cream. Then make pineapple juice by peeling the pineapple skin with a knife, then take the stump and mash it.

The mashed pineapple pomace was weighed with a digital balance to 20 grams. Then the coconut milk cream was taken and added to the mashed pineapple juice in a ratio of 10:1, then stirred until evenly distributed and sealed and labeled. Let the mixture stand for 24 hours to form 3 layers including the top layer (oil), middle layer (blondo) and bottom layer (water). After the three layers are formed, separate the VCO oil obtained and put it in a clear bottle so that the clarity can be seen.

c. Data Analysis

The collected data were systematically organized and presented using tables and figures to facilitate comprehensive analysis. The method used in this research is a mixed methods. This research is a research step that combines two forms of research, namely qualitative and quantitative research. According to Sugiyono, mixed methods is a research method between qualitative and quantitative methods that are used together in a study to obtain more comprehensive, valid, reliable, and objective data [17]. This research focuses on how to make VCO using the pineapple enzymatic method and the physical parameters produced. The organoleptic test evaluated the color, aroma, and taste [18]. The test was conducted by 30 trained panelists who were healthy condition and not color blind. The results were then searched by mode (modus) of the panelists' assessment and analyzed descriptively.

3. Results and Discussion

a. Virgin Coconut Oil Results

This study produced 40 ml of VCO oil with a sample ratio of 20 g pineapple juice: 200 ml coconut milk cream. In this study, pineapple fruit contains bromelain enzyme, bromelain enzyme is classified as a sulfhydryl group that can hydrolyze proteins into simple amino acids that are soluble in water, in this case the bromelain enzyme is a hydrolase, an enzyme that works in the presence of water. The bromelain enzyme has an active site that contains cysteine and histidine groups that are important for enzyme activity, allowing bromelain enzymes to specifically cleave peptide bonds from carbonyl groups [19].

Bromelin enzyme is one of the sulfhydryl protease enzyme groups, so Bromelin enzyme can degrade proteins through hydrolysis reactions in the coconut cream emulsion system [20]. Coconut cream is an oil-in-water emulsion stabilized with proteins. Proteins in coconut milk are emulsifiers because they have hydrophilic and hydrophobic groups [21]. The enzyme

bromelain hydrolyzes the peptide bonds of the protein polypeptide chain by breaking these bonds, causing the protein to break down into simpler molecules, namely highly soluble amino acids. This allows the oil emulsified in the water to come out [22].

b. Results of Physical Parameters of Virgin Coconut Oil Produced by Pineapple Enzymatic Method

Based on the production of VCO (Virgin Coconut Oil) with pineapple fruit enzymatic method, VCO is obtained with good quality in terms of organoleptic tests, namely color, aroma and taste of VCO by 30 trained panellists.

Table 1. Organoleptic Test Results by Modus of the Panelists' Assessment

Sample	Color	Aroma	Taste
VCO	Normal	Normal	Normal

Description:

Color : Normal = Clear
Aroma : Normal = Distinctive coconut odor and not rancid
Taste : Normal = Delicious coconut oil specialty

Figure 1. Virgin Coconut Oil Results

The VCO produced in this study has a clear color and there are no blond lumps. Physically, the color of the VCO produced has met the quality standards of SNI 7381:2008 because VCO must be clear, which indicates that other materials and impurities are not mixed in it [23].

The VCO produced has a distinctive fresh coconut aroma and meets the quality standards of SNI 7381:2008. The distinctive fresh coconut aroma occurs because there is no heating during the VCO production process, which can cause oxidation. Oxidation of oil is a process in which oil reacts with oxygen in the air to form compounds that cause off-flavors or rancidity [24].

In addition, the resulting VCO also has a good coconut oil flavor. Basically, a good VCO will have a typical coconut oil flavor, while a bad VCO may have an unpleasant taste accompanied by a rancid odor [25]. The main cause of bad tasting VCO can be due to improper production processes, including the use of non-fresh coconuts, improper extraction process or poor storage [24].

4. Conclusion

Based on the experiments carried out, the production of VCO using the pineapple enzymatic method, starting from the production of coconut milk cream, then pineapple juice, and continued with the production of VCO, which produces 40 ml of oil with clear clarity, a slightly pungent aroma of coconut aroma, and has a distinctive taste of coconut oil.

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