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The Potential Of *Chlorella Vulgaris* And Avocado Seed Oil As Anti-Aging Cream Material

Tri Widayati Putri, Resky Amalia Rajab, Indah Raya

Abstract : This study aims to determine the potential of *Chlorella vulgaris* and avocado seed oil as an anti-aging cream ingredient. The method to the production of the avocado seed oil is pressing and heating with a manual press oil tool. The results of pressing avocado seeds and by *Chlorella vulgaris* powder were analyzed of FTIR, toxicity with BSLT method and antioxidants with DPPH method. The percentage of antioxidant activity in *Chlorella vulgaris* is 24.78% and avocado seed oil is 8.13%. Toxicity with an LC50 value of 10,000 ppm shows that avocado seed oil has no cytotoxic potential, so that can be used for the production of anti-aging creams. For the first time this research was conducted about the potential of *Chlorella vulgaris* as an anti-aging cream ingredient.

Index Terms: Avocado Seed Oil, Anti-aging Cream, *Chlorella vulgaris*, Sonication Method, Extraction Fatty Acid, FTIR, Antioxidant Activity

1. INTRODUCTION

Cosmetics are something that is in great demand by the public, especially for women. cosmetics are used for various purposes such as attractive appearance, youthful appearance and so on. So wide is the spread and use of cosmetics that the products on the market are also very diverse. In these cosmetic cream preparations, several ingredients are often added to achieve the desired effect. However, there are also those who add hazardous materials such as mercury, hydroquinone, steroids and other hazardous materials which are very toxic especially if used for long periods of time [1] At the end of 2018 BPOM found 112 billion rupiah of illegal cosmetics and hazardous materials. They works by inhibiting melanin synthesis but its side effects are very dangerous, including membrane nephropathy, tubular necrosis of the central nervous system damage and even cancer. The cosmetics industry that has grown rapidly in the last few decades has been influenced by the desire to get skin that is smooth without wrinkles to make it look youthful [2] Not only the addition of hazardous ingredients but the solvents used in the manufacture of anti-aging creams are generally toxic organic solvents such as n-hexane, chloroform and others [3], so that there is a need for alternative solvents that are safe to use for the skin . Avocado seeds oil can be used as natural solvents to extract fatty acids from phytoplankton using the sonication method. Avocado seeds are still classified as waste and have not been utilized. Avocado production in Indonesia is quite high, data from the Central Bureau of Statistics (BPS) states that avocado production in Indonesia in 2014 reached 307,326 tons

per year and continues to increase every year, along with the increase in avocado production, so avocado seed waste continues to increase [4] In addition to non-polar avocado seed oil also contains chemical compounds that are useful and needed by the skin such as vitamin A, vitamin B2, niacin, pantothenic acid, vitamin C, vitamin E and folic acid [5] From the explanation above so that conducted the research on "The Potential of *Chlorella vulgaris* and Avocado Seed Oil as Anti-Aging Cream Material"

2. MATERIAL AND METHODS

The materials used in this research include microalgae *Chlorella vulgaris* powder, avocado seeds, DPPH, 2% NaOCl, shrimp larvae, filter paper, label paper, and tissue roll. And the equipment used in this study include tools used in laboratories, centrifuges, digital scales, erlenmeyer, pipettes, vial bottles, manual press oils, US-110 UV-Vis spectrophotometers, FTIR (Fourier Transform Infra Red) Prestige-21 Shimadzu.

2.1 Preparation of Avocado Seed Oil

Avocado seeds that have been separated from the avocado meat were cleaned with aqudest, dried until the skin of the avocado seeds was peeled off. This indicates that the water content in the avocado seeds is reduced and even lost. Then dried avocado seeds were pressed to produce avocado seed oil.

2.2 Analysis of Avocado Seed Oil and *Chlorella vulgaris* Powde

Avocado seed oil that has been obtained was analyzed for its functional groups using FTIR (Fourier Transform InfraRed) and toxicity analysis with BSLT method, and its antioxidants activity by DPPH method. The *Chlorella vulgaris* powder, it was analyzed for its functional groups using FTIR (Fourier Transform InfraRed) and its antioxidant activity using the DPPH method.

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5 RESULT AND DISCUSSION

3.1 Production of Avocado Seed Oil

Avocado seeds are pressed by using manual oil press production by Maksindo, where approximately 36 Avocado Seeds can produce about 18 ml of avocado seed oil.



Figure 1. Avocado seed



Figure 2. Avocado seed oil

3.2 Characteristics of Avocado Seed Oil and Chlorella vulgaris with Fourier Transform Infra Red (FTIR)

FTIR analysis shows the functional groups of a material, in this case a functional group in avocado seed oil and Chlorella vulgaris powder. From figure 3 and 4 can be seen

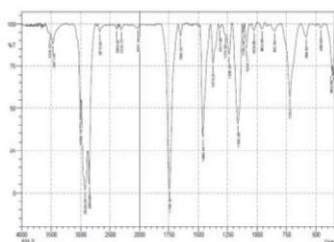


Figure 3. Spectra Avocado seed oil

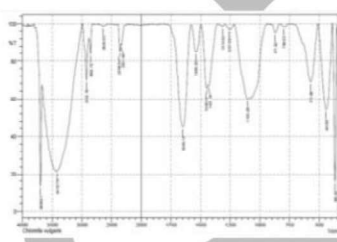


Figure 4. Spectra Chlorella vulgaris

The results of FTIR analysis of avocado seed oil as shown in the table above shows the presence of the -OH functional group on the ripening of 3471.87 cm^{-1} . Absorption 1651.07 cm^{-1} is a stretch that appears as a result of $\text{-C}=\text{C-}$. This is supported by the absorption peak at 3005.10 cm^{-1} which shows the $=\text{C-H}$ stretch. In addition, strong absorption also occurs at $2854.65\text{-}2924.09\text{ cm}^{-1}$ which is a saturated carbon chain stretch. The typical absorption of triglycerides appears at 1745.58 cm^{-1} which shows the absorption of carbonyl group $\text{-C}=\text{O}$ and is supported by stretching of CO at 1163.08 cm^{-1} , while absorption at 1462.04 cm^{-1} is -CH bending and wave number 721.31 cm^{-1} is CH_2 [6]. The FTIR spectra of Chlorella vulgaris showed an absorption peak at 3695.61 cm^{-1} indicating a very weak primary amine and secondary amine. The peak at 3419.79 cm^{-1} shows the O-H strain indicating the presence of strong alcohol group. The C-H stretch appeared at $2922.16\text{-}2852.72\text{ cm}^{-1}$ indicating the presence of strong lipids. 2358.94 cm^{-1} , the strain represented is an alkaline group, 1649.14 cm^{-1} , 1539.20 cm^{-1} and 1431.18 cm^{-1} showing $\text{C}=\text{C}$ stretch representing the alkene group. Especially the 1257.59 cm^{-1} stretch indicates the presence of strong acids. Stretching at 1103.28 cm^{-1} shows the ether group. The absorption range of the remaining 572.86 cm^{-1} indicates the presence of strong alkyl halides [7]

Table 1. Results of FTIR Analysis Avocado Seed Oil and Chlorella vulgaris

No	Wave Numbers of Avocado Seed Oil (cm^{-1})	Wave Numbers of Chlorella vulgaris (cm^{-1})	Information
1		3695,61	-NH
2	3471,87	3419,79	-OH
3	3005,10 2924,09	2922,16 2852,72	stretching bond
	2854,65		C-H
4		2358,94	alkyl group
		2331,94	
5	1745,58		-C=O
6	1651,07	1649,14	-C=C- Stretching
		1539,20	
7	1462,04	1448,54	-C-H bending
		1431,18	
8	1163,08		C-O
9		1103,28	eter group
10	721,31		CH_2
11		572,86	ALkyl Halide

3.3 Toxicity of Avocado Seed Oil

The toxicity test of avocado seed oil was carried out by the BSLT method (Brine Shrimp Lethality Test) then the value of Lethal Concentration (LC_{50}) was determined using probit analysis. A substance is said to be active or toxic if the LC_{50} value $<1000\text{ ppm}$ for extract and $<30\text{ ppm}$ for a compound [8]

Table 2. Criteria for LC_{50} values for toxicity tests according to Clarkson [9]

No	Value of LC_{50} (ppm)	Category
1	>1000	Non toxic
2	$500 - 1000$	Low Toxic
3	$100 - 500$	Middle Toxic
4	$0 - 100$	High Toxic

The LC_{50} value of avocado seed oil is $10,000\text{ ppm}$, which is above 1000 ppm means that it is non-toxic, so avocado seed oil produced from avocado seeds can be used to extract Chlorella vulgaris as a material for production cosmetic.

3.4 Antioxidant Activity of Avocado Seed Oil and *Chlorella vulgaris*

Analysis of antioxidant activity was carried out on avocado seed oil and *Chlorella vulgaris* powder with the DPPH method.

4. CONCLUSIONS

Avocado seed oil does not have cytotoxic potential for shrimp larvae with LC50 values of 10,000 ppm. So that it is very good to use for cosmetic ingredients. Avocado seed oil and *Chlorella vulgaris* have antioxidant activity of 8.13% and 24.78% respectively. It can be seen from the FTIR spectra that *Chlorella vulgaris* contains secondary metabolites such as flavonoids, phenolics and ascorbic acid which act as antioxidant compounds.

5 ACKNOWLEDGMENT

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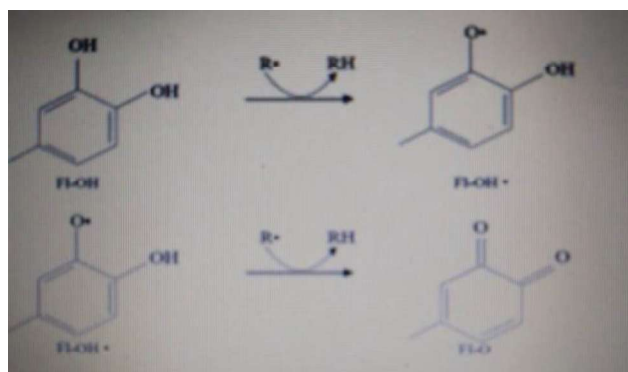


Figure 5. Mechanism of Reducing Radicals by flavonoids [14]

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