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Processing Methode Effect to Virgin Coconut Oil (VCO) Quality After Storaging

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***Abstract*— Virgin Coconut Oil (VCO) is extracted from coconut milk cream by breaking up the coconut milk emulsion in some ways like heat using, centrifugation, fermentation, inducement and acid using. The difference of oil extraction ways will influence produced oil quality and oil storage capacity then. Low quality oil will be boosting earlier damage process while storage time. Therefore, it had been done a research in Chemical Laboratory of Agricultural Polytechnic state of Payakumbuh. The design used in this research was Complete Random Design (CRD) by 5 (five) actions and 3 (Three) repetitions. For the advance test would be done by Duncan's New Multiple Rang Test (DNMRT) at about 5 % real level. The Observations that had been done in this research were free fat acid, peroxide number and saponification number in storaged dark glass bottle VCO. The result of research showed the VCO oil that had the best quality after storaging was the oil made by centrifugation process with 0,68% free fat acid value, 5,49 % meq/Kg oil peroxide number and 205,05 mg KOH/g oil saponification number.**

***Keywords*— Virgin Coconut Oil; Free Fat Acid; Hydrolysis; Oxidation.**

I. INTRODUCTION

This Virgin Coconut Oil (VCO) is pure coconut oil got by emulsion splitting-up in coconut milk. VCO is extracted from coconut milk by breaking-up emulsion through some ways like : Heat using, Centrifugation, Fermentation, inducement and acid using [1]. But, the making process of VCO in public life may much more. The difference of coconut oil extraction ways will influence produced oil quality and oil storage capacity then. In addition, another factors will also take effect to coconut oil quality while storaging process, i.e storaging room condition, temperature, sun light and oil packaging materials. Good VCO quality will postpone rancidity process of produced VCO.

According to Ketaren (2005) that Oil and fat breakage can be happened in time of processing and storaging. In time of oil storaging will happen flavour change and taste followed by unwanted components formed and signed by rancid smell appears [2].

Based on the background above writer had done a research entitled "Processing Method Effect to *Virgin Coconut Oil* (VCO) Quality After Storaging". The purpose of this research was about to know VCO quality after storaging from some producing process until the industry doer could choose which processing way gave the longest lasting power duration toward after storaging VCO in room temperature.

II. MATERIALS AND METHOD

This research had been done in processing and chemical laboratory of Agricultural Polytechnic State of Payakumbuh. The materials used in this research were storage dark glass bottles VCO and kept in room temperature, whereas the materials for analyse were Chloroform, KI 15%, Natrium Thiosulfat 0.1N, Phenolphthalein and n-heptane/n-heksane. The tools used were erlenmeyer, Measure pipette, titration tool, decycator, water bath and breaker glass.

The design used in this research was Complete Random Design (CRD) by 5 (Five) actions and 3 (Three) repetitions for free fat acid observation, peroxide number and iodium number. Data was analysed with kinds investigation and if the case different it's continued with the test of Duncan's New Multiple Range Test (DNMRT) at 5% real level (f counted > f table 0,05). The treatment were : A = Controlled heating process, B = Fermentation Process, C = Inducement Process, D = Centrifugation Process, and E = Asetat Acid Adding Process (Vinegar).

III. RESULT AND DISCUSSION

A. Free Fat Acid Level

Kinds investigation analysis result showed that from each process of making VCO gave real effects to Free Fat Acid

Level. Average of Free Fat Acid Level of VCO can be seen on the Table 1 below :

TABLE I
THE AVERAGE OF FREE FAT ACID LEVEL DURING STORAGE TIME FROM FIVE WAYS OF MAKING VCO

Treatments	Average of Free Acid Level (%)
B (Fermentation)	1,55 [a]
E (Adding of Acetat Acid)	1,26 [b]
C (Inducement)	1,19 [c]
A (Controlled heating)	1,17 [c]
D (Centrifugation)	0,68 [d]
KK = 2,70 %	

Numbers were followed by the same lowercase at the same lines and The same capital at the same rows were unreal different according to DNMRT continuation test at 5% real level.

On the Table 1 to be seen there were real differences at the average of VCO free fat acid level for each treatment except on treatment C and A unreal different each other's. The highest free fat acid level in storage was gotten at the fermentation process i.e. 1,55 next followed by treatment E and C. From the three treatments were showed that the oil had highest free fat acid level caused by fermentation process and by adding acid in making process. In fermentation process there was also produced acid by microorganism so that would accelerate free fat acid formation.

The hydrolysis process to oil or fat contain short chain fat acid will produce free fat acid that makes rancid smell. Oil or fat hydrolysis generally happened as the cause of lipase enzyme or microbe and to be accelerated by temperature, water level and high humidity [3]. In addition at the beginning of storaging free fat acid level for fermentation treatment already high indeed so that by storaging the value will be more and more.

Free fat acid already got in the oil or fat since that materials started to be harvested and the amount will always increase during the processing and storaging process [4]. The increasing acid number and free fat acid caused by peroxide compound formed as the conssequence of saturate fat acids hydrolysis process and non-saturate fat acids oxidation process [5].

B. Peroxide Number

Kinds investigation analysis result showed that from each VCO making gave real effects to peroxide number. The average of VCO peroxide number can be seen on the Table 2 below :

TABLE III
THE AVERAGE OF PEROXIDE NUMBER DURING STORAGE TIME FROM FIVE WAYS OF MAKING VCO

Treatments	**The Average of Peroxide Number (meq/Kg oil)**
A (Controlled Heating)	8,99 [a]
B (Fermentation)	8,41 [a b]
E (Asetat acid adding)	8,03 [b]
C (inducement)	6,46 [c]
D (Centryfugation)	5,49 [d]
KK = 5,67 %	

Numbers were followed by the same lowercase at the same lines and the same capital at the same rows were unreal different according to DNMRT continuation test at 5% real level.

Peroxide number is a number that shows fat amount or oil that already experienced oxidation process especially storage time oxidation. From the research result showed the average of the highest peroxide number level was gotten at the treatment VCO making by controlled heating (A) i.e 8.99 meq/kg. Oxidation process happened because of there's an oxygen contact. Treatment A at its making process had the longest oxygen contact and long-time term heating so that breakage or damage happened to the fat that could increase peroxide number. Reference [3] says that oxidation process especially happened to the fat or oil contained double bind. Oxidation happened because of oil or fat contacted to the oxygen. The oxidation process was accelerated by the existence of metal catalyst like copper, iron, nickel and cobalt, ultraviolet, temperature and high humidity.

Oil storage process would cause its value increase. VCO peroxide number will also experience increasing during storage time and after reaching maximum value it next would experience reduction. This case happened because of during storage time the oxidation process occurred to the non-saturate fat acids so that those were formed peroxide compound as the oxidant materials. That peroxide compound caused the oxidation was still continued and peroxide number increasing [5].

Besides air contact peroxide number could also increase because of the acids around, this case could be seen that peroxide number by treatment A was VCO making treatment with fermentation and acid adding. At the fermentation process would be also formed acid so that it would help peroxide forming. Peroxide forming can also be accelerated by lights, nature situation and air humidity [2].

C. Saponification Number

Kinds investigation analysis result showed that from each VCO making gave real effect to the VCO saponification number level. The average of VCO saponification number can be seen on the Table 3 below :

TABLE IIIII
THE AVERAGE OF SAPONIFICATION NUMBER DURING STORAGE TIME FROM FIVE WAYS OF MAKING VCO

Treatments	**Average saponification number (mg KOH/ g oil)**
A (Controlled Heating)	214,20 [a]
D (Centrifugation)	205,05 [a]
C (Inducement)	190,95 [b]
E (Acetat acid adding)	189,24 [c]
B (Fermentation)	174,58 [d]
KK = 3,43 %	

Numbers followed by the same lowercase at same lines and the same capital at the same rows unreal different according to DNMRT continuation test at 5 % real level.

From Table 3 can be seen that treatment A VCO making by controlled heating had the highest saponification number from all treatments and unreal different each other's with treatment D i.e VCO making by centrifugation. Saponification number was also related to materials contact and atmosphere along with processing temperature so that

oxidation process happened. Treatment A in the making process had heating experience and oxygen contact in long time term so that oxidation process happened that caused free radical was formed. Next the radical with the oxygen were forming active peroxide that had ability to form unstable hydro peroxide and fragile to be shorter carbon chain compound. Shorter carbon chain fat acid would have higher saponification number than longer carbon chain fat acid [6].

While at the treatment B and C were the VCO making process was done by fermentation at room temperature so that the oil contact to oxygen was low, especially for treatment B i.e. 24 hours fermentation so it had lower saponification number than C and E. Low oxidation process caused oil weight molecule was being higher, then saponification number was lower than treatment A and D. There's still oil contact to the oxygen in the making process at the treatment D.

Treatment E in the making process adding acetat acid for emulsion splitting-up so it caused acetat acid was being binded in the oil and also caused oil weight molecule being higher so that the saponification number was low. The existence of tocoferol in the oil also caused saponification number being low because tocoferol couldn't be saponificated [7]. Low saponification number at treatment E also caused by ion H+ existence from the acid in the oil that caused HCl need to titrate alcali excess fewer needed.

Based on the data above saponification number for all treatments had experience of reduction after storaging. This case may happened because of oxidation although hydrolysis existence during the storage time. VCO saponification number inclined had experience of reduction during the storage time. This case signed oil oxidation process occurred during the storage time [5]. During the storage time oil and fat will have physic-chemical changing that can be caused by hydrolysis or oxidation process. Hydrolysis process especially happened to the oil or fat that much contained saturate fat acid than oxidation especially happened to the oil or fat that much contained double bind [3].

In case fat and oil storage if the packages materials well then in storage time much effected by surrounding situation i.e. RH (air humidity), storage room, temperature, ventilation, pressure and transporting case [2].

IV. Conclusions

Based on the research that had done to some treatments in VCO making after storaging, could be taken some conclusions i.e: There's oil quality effect before storaging with oil quality effect after storaging; Reduction of oil quality in storage process happened because of oxidation and hydrolysis process occurred during storage time; Best quality VCO after storaging was centrifugation way with 0,68% free fat acid, 5.49 meq/Kg oil peroxide number and 205.05 mg KOH/g oil saponification number.

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