

Article

Utilization of Dry Cocoa Pod Husks as an Antioxidant-Rich Herbal Drink

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Abstract. Cocoa (*Theobroma cacao* L) production in Indonesian has increased every year, therefore more cocoa pod husks are produced. Currently, the use of cocoa pod husks is still very limited, even most farmers only dump the pods and turn them into plantation waste which will later become new problems in the plantation environment, such as causing bad smell and spreading diseases to healthy cocoa. Even if there is use of cocoa pods, at this point it is only used for animal feed and compost. In fact, cacao pod husks contain flavonoids and phenolic compounds which have high levels of antioxidant activity which are very beneficial for the health. Based on the results of the sample analysis test using the FTIR and XRF instrument, there are functional groups that contain antioxidants and based on the XRF test, the pods of cocoa also contain several minerals, including 60,69% potassium and 24,56 calcium. Antioxidants can prevent the activity of free radicals which are the main causes of degenerative diseases. Therefore, cacao pod husks are very useful for making herbal drinks by drying and pounding them into a homogeneous powder product.

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1. Introduction

Cocoa is a tree cultivated in plantations originated in South America and planted in various tropical regions now. Indonesia is number 3 in the world after Pantai Gading and Ghana largest cocoa (*Theobroma cacao* L) producing. It is recorded that the total area of cocoa plantations in Indonesia reaches 1,6 million hectares with cocoa production around 593 thousand tons. Cocoa production in Indonesia has increased every year. As a result, the pod husk is very abundant. However, what is used from cocoa pod husk is limited to the seeds, while the pods are wasted. It illustrates the minimal use of cacao pod husk in Indonesia. Generally, cocoa farmers only hoard cocoa pod husk on plantation area which can cause environmental pollution and rot disease in healthy cocoa pod husks. We find that the use of cocoa pod husks is limited to animal feed and compost. However, It has not been optimal in the utilization of the abundant cacao pod husks [10]. As the biggest waste from cocoa processing, it turns out that the pod husks contain chemical compounds, namely polyphenols, which have high levels of antioxidant activity that are useful to human body. Antioxidants can be useful as a scavenger of free radicals which are the main factors causing degenerative diseases.

Based on the data obtained, about 70% of the total cocoa is cacao pod husks [12]. The phenolic and polyphenol compounds contained in the cocoa pod husks are high antioxidants. Moreover, cocoa pod husks also contain polysaccharides (cellulose and hemicellulose) and lignin [18].

The antioksidant in the cacao pod husks can work by inhibiting free radical activity which is the main cause of skin tissue damage [16]. Antioxidant are electron donor substances (reductants). This substance has a small molecular weight which can prevent the development of oxidation reactions [2].

Utilization and processing of cocoa pod husks is very necessary due to its abundant presence and its current lack of use causing the economic value of cocoa pods to be low. In fact, the pods contain antioxidant compounds which are very useful for human body. Therefore, new innovations are needed to utilize the pods so that can also increase the economic value of cocoa pod husks.

Sometimes people fulfill their antioxidant needs by consuming antioxidant supplements in the form of tablets such as medicines. Now we can innovate and make new breakthroughs by utilizing cocoa pod husks that contain high levels of antioxidants as herbal drinks that are useful for health.

2. Method

The method used is literature studies from national and international journals. Based on the literature, it is known that the skin of cocoa pod husk contains antioxidant compounds that can prevent free radical activity causing degenerative diseases such as stroke, heart disease, premature aging, and high blood pressure [6].

Currently, public knowledge about the contents and benefits of cocoa pod husks is still limited. Therefore, many people do not know that benefits. The use of cocoa pod husks is only used as ingredients for animal feed and compost, even in some cocoa plantations it is simply disposed of and becomes waste [12].

In cocoa pod husk, there are antioxidant compounds and anti-radical compounds that have been tested by invitro. Some phenolic compounds found in cocoa pod husks are catechins, epicatechins, anthocyanidins, proanthocyanidins, antocyanidins, phenolic acids, tannins, laukoantocyanidins, and several flavonoid compounds [11].

Compounds as antioxidants in cocoa pod husks are polyphenols and flavonoids [1]. Antioxidants are electron-giving compounds or as reductants which can reduce the development of oxidation reactions in the body so that they can prevent diseases caused by free radicals. The body also needs external antioxidants that can be obtained from consumption materials [4].

Based on the description above, the cocoa pod husks has the potential to be used as a useful product, namely as an herbal drink that is high antioxidants. The tools and materials used in the

process are digital balances which are used to weight cocoa pod husks, mortars to grind the pods, a sieve to filter powdered cocoa pod husks, a blender to make it smoother and homogeneous, FTIR instruments, XRF instruments, waste of cocoa pod husks, water, other complementary materials.

The cacao pod husks used in the manufacturing process of this product from cocoa plantations is in Padang Pariaman Regency, West Sumatera. The pods taken are yellow ripe skin. The pods are washed under running water to clean them from impurities that are on the pods, and it is cut into smaller pieces with the aim of drying faster. The drying process is carried out in a way that is not directly exposed to sunlight where the aim is to maintain antioxidant levels in it. Generally, polyphenols compounds as antioxidants are easily oxidized, volatile, and sensitive to light and oxygen. Then the dried cocoa pod husks are ground and mashed until becoming homogeneous powder for the pods and they are ready to be used as raw materials for herbal drinks. In this herbal drinks, several other complementary ingredients are also added, including ginger powder which aims to increase the level of antioxidant activity in the product.

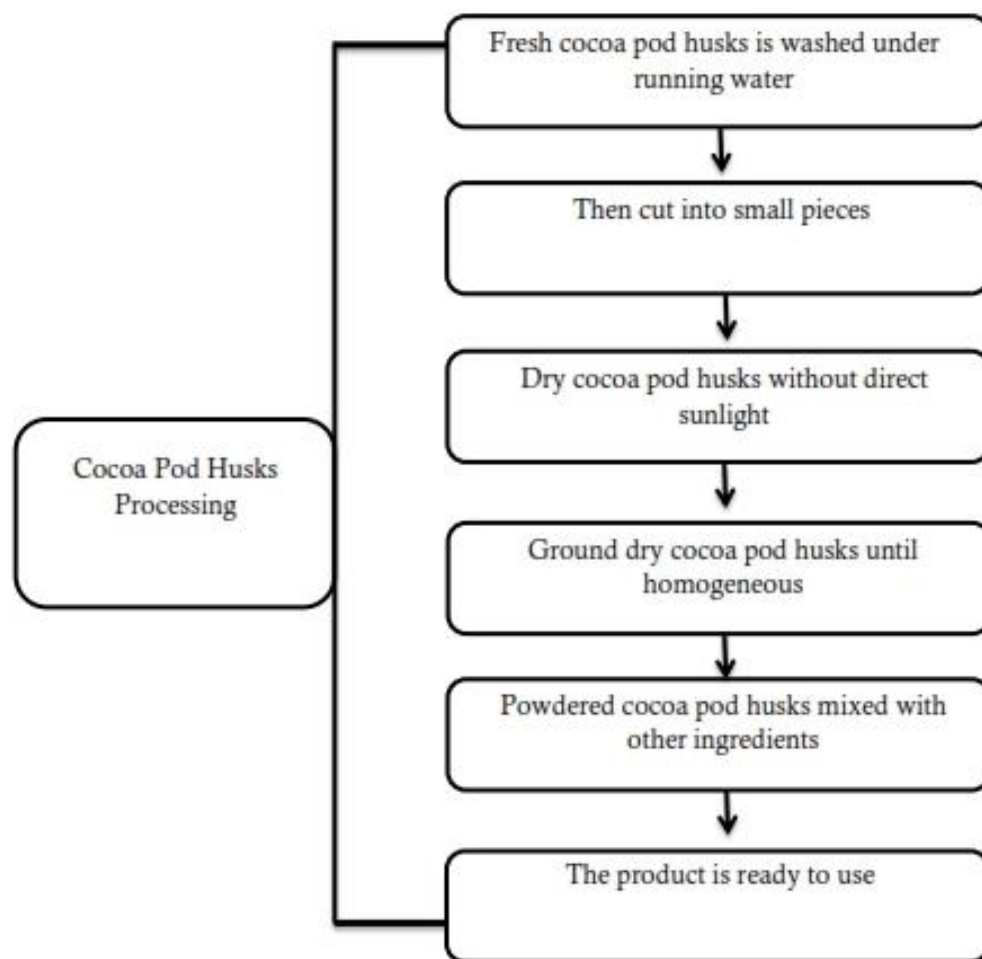


Figure 1. Flow diagram of cocoa pod husks processing

To see biologically active compounds and levels of active compounds contained in the pod husks, sample analysis was carried out using FTIR and XRF instruments.

3. Results and Discussion

A cocoa pod husks consists of several parts, namely the beans, pulp, placenta, and skin. However, the largest part of the cocoa pods is on the skin which is about 70%. As we know that cocoa pods only become waste and does not been use optimally [3]. In the skin of the cocoa pods, there are polyphenol and flavonoid compounds which contain antioxidants [2]. The benefits of cocoa as a natural antioxidant are due to its ability to maintain the immune system and prevent coronary heart disease and cancer [9].

Beside the fruit which has many benefits as an antidepressant, anticancer, and antioxidant, cocoa pod husks also has a role as an antioxidant because of the 0.4% w/w theobromine content and 3-4% w/w potassium content in the dry ingredients of cocoa pod husks [7].

Antioxidants are molecules that can prevent oxidation reactions caused by free radicals [5]. They are very reactive and unstable. So, they are stable free radicals will bind to the molecules around them to obtain an electron pair. This reaction takes place continuously in the body so that it causes a chain reaction and can quickly damage cell structures, and if it is not prevented, it will cause diseases that are dangerous to health [14].

The pods have not been managed and utilized optimally currently. Cocoa pod husks are the biggest waste from cocoa plantations which are always abundant [8]. Every 1 tonne of dry cocoa beans produces 10 tonnes of wet cocoa pod husks [15]. Even though 20 grams of dry cocoa pod husks are equivalent to 1 mangosteen [17]. It is what encourages us to be able to process and utilize cocoa pod husks optimally because the pod skin contains antioxidants and reduce cholesterol levels which are useful to human body. So, it has the potential to be used as powder for antioxidant drinks [13].

Fresh cacao pod husks are obtained directly from cocoa farmers. Then, it is washed to clean and pods used are ripe. After the pods are cut into small pieces, the skin of the cocoa pods is dried without direct exposure to sunlight where the aim is to maintain the antioxidant levels in it. The drying process takes approximately 5 to 7 days. Because in general, polyphenol compounds acted as antioxidants are easily oxidized, volatile, and sensitive to light and oxygen. It is known that 20 grams of dry cocoa pods are equivalent to the antioxidant content of 1 whole mangosteen [17]. Then the pod husks is ground until it becomes a homogeneous powder and ready to be used as raw material for herbal drinks. In this herbal drink, several other complementary ingredients are also added, including ginger powder, which aims to increase the level of antioxidant activity in the product.



Figure 2. Dried Cocoa Pod Husks

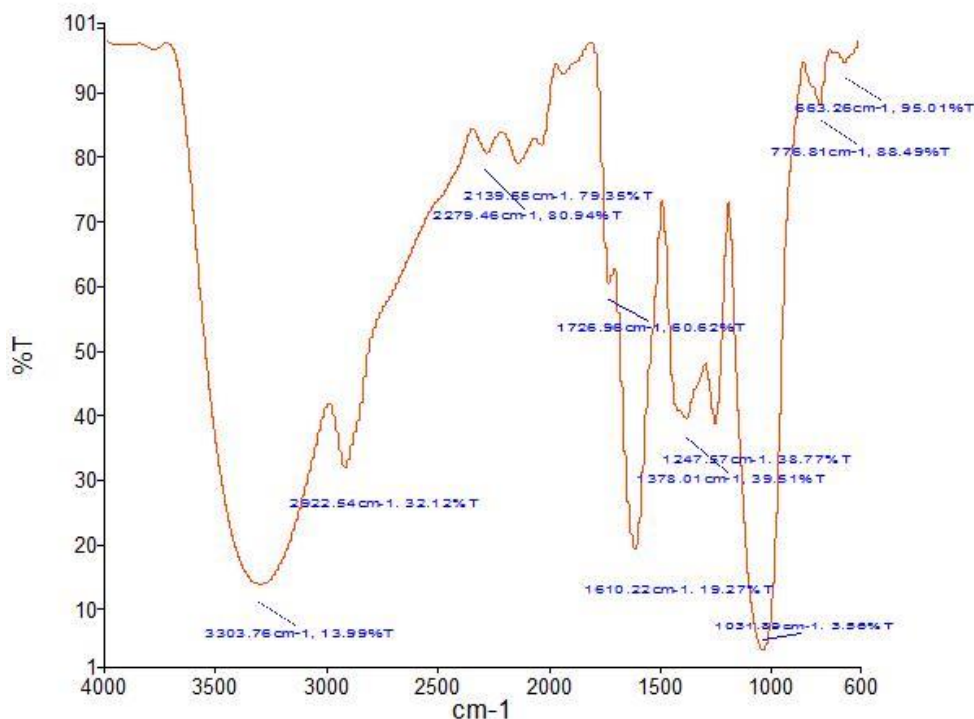


Figure 3. FTIR Test on Dry Cocoa Pod Husks

Table 1. FTIR Data

The value of the wave number obtained (cm^{-1})	Bond type
3303,76	O-H
2922,54	C-H
2139,65-2279,46	C-N
1726,96	C=O
1247,57-1378,01	C-C
	C-O
1610,22	C=C
1021,09	CH ₃ bonding
776,81	C-C

The types of antioxidant bonds contained in the dry cocoa pod husks were tested using FTIR through the wave numbers obtained during sample analysis. FTIR test results show that there are types of antioxidant compounds, namely flavonoids, phenolic and polyphenols in the skin of dry cocoa pods through the wavelength value as shown in Figure 3.

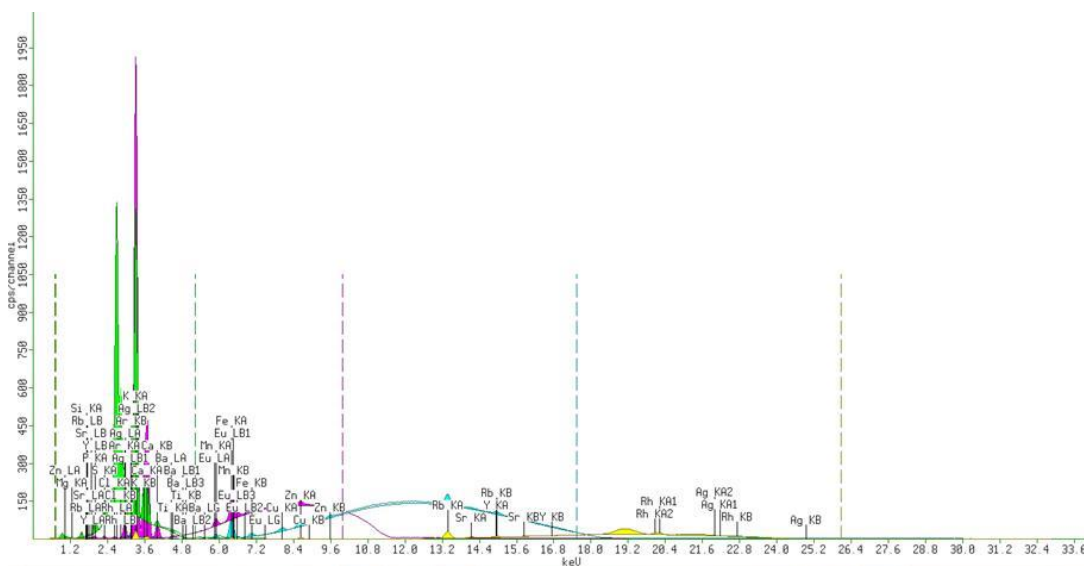


Figure 4. XRF Test on Cacao Pod Husks

Table 2. XRF Data of Dried Cocoa Pod Husks Samples

Elemen			Geology			Oxides		
Compound	Conc	Unit	Compound	Conc	Unit	Compound	Conc	Unit
Mg	3,192	%	MgO	4,653	%	MgO	4,647	%
Si	1,737	%	SiO2	3,188	%	SiO2	3,183	%
P	3,793	%	P2O5	7,326	%	P2O5	7,313	%
S	1,889	%	SO3	3,89	%	SO3	3,883	%
Cl	0,361	%	Cl	0,288	%	K2O	54,147	%
K	60,698	%	K2O	54,303	%	CaO	23,365	%
Ca	24,564	%	CaO	23,453	%	TiO2	0,101	%
Ti	0,091	%	Ti	0,061	%	MnO	0,275	%
Mn	0,322	%	Mn	0,214	%	Fe2O3	0,917	%
Fe	0,969	%	Fe2O3	0,921	%	CuO	0,055	%
Cu	0,066	%	Cu	0,044	%	ZnO	0,252	%
Zn	0,307	%	Zn	0,203	%	Rb2O	0,407	%
Rb	0,567	%	Rb	0,374	%	SrO	0,062	%
Sr	0,079	%	Sr	0,052	%	Y2O3	0	%
Y	0	%	Y	0	%	Ag2O	1,087	%
Ag	1,34	%	Ag	1,015	%	BaO	0,02	%
Ba	0,026	%	Ba	0,018	%	Eu2O3	0	%
Eu	0	%	Eu	0	%	Cl	0,287	%

Based on table 2, it is explained that the elemental content in the cocoa pod husks consist of 18 elements with a high percentage of K and Ca content. Where potassium plays a role in reducing the risk of stroke, lowering blood pressure, keeping the body from losing muscle mass, maintaining

bone density, and reducing the risk of forming kidney stones. And calcium is also useful in the formation of bones and teeth, supports the nervous system, blood clotting, and muscle contraction. From the above explanation, the use of cocoa pod husks is very useful. In addition, the products contain antioxidant levels that can ward off free radicals and have benefit for body health. This product also can overcome the problem of cocoa pod skin waste which has not been handled optimally, and it can increase the economic price of the pod husks.

4. Conclusions

Utilization of dry cocoa pod husks is an innovation and new breakthrough, where usually the pods are only thrown away and turned into waste, but they are used as products that are useful to health now. Based on the FTIR and XRF tests carried out, dry cocoa pod husks contain high levels of antioxidants that is polifenol and flavonoids that can trap free radicals. So, they can prevent degenerative diseases and contain several minerals that are useful for health, including 60,69% potassium and 24,56 calcium.

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