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ANACARDIC ACID ISOLATION FROM CASHEW SEED SKIN

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Abstract: Research on the isolation of anacardic acid compounds from cashew nut shells has been carried out. This study aims to develop a method of isolating anacardic acid compounds from cashew nut shells in an easier way but still produces pure compounds. In this study, isolation and identification of anacardic acid compounds contained in CNSL were carried out. The results of anacardic acid isolation contained in CNSL form a thick brown extract with a characteristic dark odor. Anacardic acid was isolated using a maceration method using methanol as a solvent. The results of the isolation of anacardic acid compounds were then tested for purity using a thin layer chromatography test (TLC) using an eluent or a mobile phase of methanol: chloroform. Furthermore, anacardic acid compounds were identified using IR spectroscopy and UV-vis spectroscopy. This identification was carried out to prove that the compound obtained was indeed an anacardic acid compound. The identification results found that the compound isolated in this study was indeed an anacardic acid compound. It can be compared with the structure of existing anacardic acid compounds.

Keywords: *Anacardic Acid, Isolation, Cashew Seed Skin*

INTRODUCTION

Cashew (Anacardiumoccidentale) plant is one of the plantation commodities that has a high economic value. This plant can grow well in tropical regions such as Indonesia. Cashew plants have the advantage because they can be developed in areas with marginal agro-ecological conditions and dry climates. They are a mainstay commodity in Eastern Indonesia, such as in the Province of West Nusa Tenggara (NTB). The main product, cashew nuts, is one of the potential export products.

Based on 2016, the export value of cashew seeds is 30 thousand tons, and cashew exports as much as 7 thousand tons. Indonesian cashew production is 130 million tons. Most of the cashew is exported in a peeled form so that the cashew husks become waste in Indonesia. A side product of cashews that has only been a waste is cashew nutshell. At present, the utilization is only limited to methane seeds. Until now, in Indonesia, cashew nut shells have not been utilized to the fullest. Most are still waste, burned, or thrown away as rubbish. This cashew nutshell is around 70% of the cashew nut shells (unpeeled cashew), and it is estimated that the amount of cashew shells removed is 100 thousand tons. This condition results in by-products of cashew nut processing in the form of cashew shells that are pretty abundant and inexpensive [1-3].

Cashew nut shells contain 50% oil called Cashew Nut Shell (CKBM) or Cashew Nut Shell Liquid (CNSL). Cashew nut shell oil contains natural phenol characterized by aromatic rings that bind to the OH group. They consist of anacardic acid, cardanol, cardols, and methyl cardols with a composition of anacardic acid that can reach 70%, cardanol 5%, cardanol 18%, and methyl cardol [4].

The phenol compound in CNSL has a chemical structure similar to synthetic phenol, so it has the opportunity to substitute and replace synthetic phenol compounds with petroleum derivatives [5]. The needs of phenol in Indonesia are vast, where the fulfillment of these needs is carried out by importing. The Central Statistics Agency reported that Indonesia imported phenols in phenols and phenol resins as much as 53,640 tons/year. So that if the potential of CNSL contained in cashew nut shells is used properly, there will be foreign exchange savings due to a reduction in the import of phenols by the natural phenol substitution from CNSL [6].

One of the natural phenol compounds contained in CNSL is anacardic acid. Anacardic acid is very corrosive, so that it can blot the skin of the hands, but corrosive properties can be lost by heating treatment because there is a decarboxylation that changes corrosive anacardic acid into soft cardanol [7]. Anacardic acid has the chemical formula C22H30O3 with a general structure that can be seen in Figure 1.

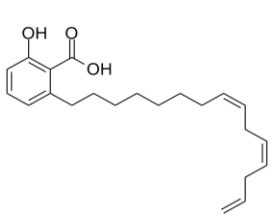

Figure 1. The general structure of c

Anacardic acid has various biological activities necessary for health, such as inhibitors of different essential enzymes, anti-bacterial, and anticancer [8-10]. Research on the use of anacardic acid for anticancer drugs researched cervical cancer cell cytotoxic tests (HeLa) [11]. In addition, the ability of anacardic acid to fight cancer cells that get anacardic acid has potent cytotoxic activity against BT-20 breast cancer cells [12]. Thus anacardic acid has a high economic value.

Based on this background, researchers intend to develop methods of isolating anacardic acid compounds from cashew nut shells in an easier way but still producing compounds that remain pure. Therefore, in this study, isolation and identification of anacardic acid compounds in CNSL were carried out. The results of anacardic acid isolation contained in CNSL form a thick brown extract with a characteristic dark odor.

METHODE

Material:

Cashew nutshell, methanol, Ca (OH) 2, concentrated HCl.

Method:

A total of 250 grams of dried cashew nut shells were then pulverized and then extracted by the maceration method using 500 mL of methanol solvent. The methanol extract is then reacted with Ca $(OH)_2$ while stirring until the solution is saturated and forms 2 phases. Then the lower phase (organic phase) is isolated as an anacardic calcium salt which is then reacted with concentrated HCl until the solution is saturated and forms 2 phases. Then the lower phase (organic) is isolated as an anacardic acid compound. Anacardic acid compounds obtained later were purified by thin-layer chromatography (TLC) and identified using IR and UV-vis spectrophotometers.

RESULT AND DISCUSSION

Cashew nutshell is extracted using the maceration method intended to isolate anacardic acid compounds present in cashew nut shell oil. Methanol as a solvent in the maceration process is because anacardic acid compounds are polar, so anacardic acid compounds will only dissolve in polar solvents such as methanol [13-15]. Then the methanol extract obtained from the maceration process is connected with calcium hydroxide. Acidic anacardic acid reacts with alkaline calcium hydroxide to form an anacardic calcium salt distributed in the liquid phase. The reaction of anacardic calcium salt formation can be seen in Figure 2.

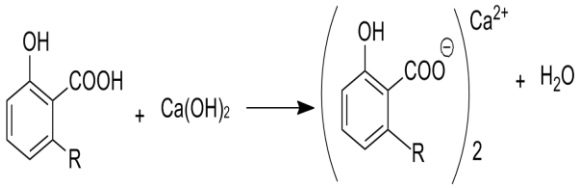

Figure 2. The reaction of anacardate calcium salt formation.

Furthermore, to obtain anacardic acid, anacardic calcium salt is hydrolyzed with hydrochloric acid [11]. Therefore, the hydrolysis of calcium anacardic salt to anacardic acid is distributed in the liquid phase. The hydrolysis reaction of anacardic calcium salt to anacardic acid can be seen in Figure 3.

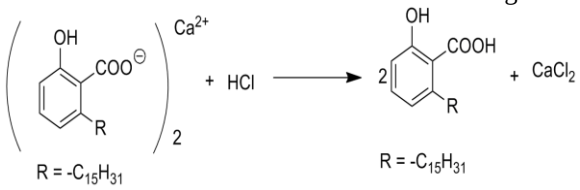

Figure 3. The hydrolysis of anacardic calcium salt hydrolysis to anacardic acid.

Based on the experiments' results, anacardic acid compounds were obtained in the form of the thick brown extract with a weight of 175 grams and a yield value of 70%. Images of anacardic acid isolation can be seen in Figure 4.

Figure 4. Results of the isolation of anacardic acid compounds

Then the purity of the compounds obtained was tested using thin-layer chromatography (TLC) under 366 nm UV light [16-18]. The eluent or mobile phase used to test the purity of anacardic acid compounds in methanol: chloroform in a ratio of 9: 1. The results of the purity test of anacardic acid compound can be seen in Figure 5.

Figure 5. Results of anacardic acid TLC test

Compounds that are said to be pure can be proven by only seeing one spot obtained. After purity testing, the compounds were identified using IR spectroscopy and UV-vis spectroscopy. Its identification was carried out to confirm that the isolated compound was indeed an anacardic acid compound. Identification using IR spectroscopy functions to see the functional groups identified in the isolated IR spectrum is indeed by the functional groups in the structure of anacardic acid. Results Identification of anacardic acid IR spectrum can be seen in Figure 6.

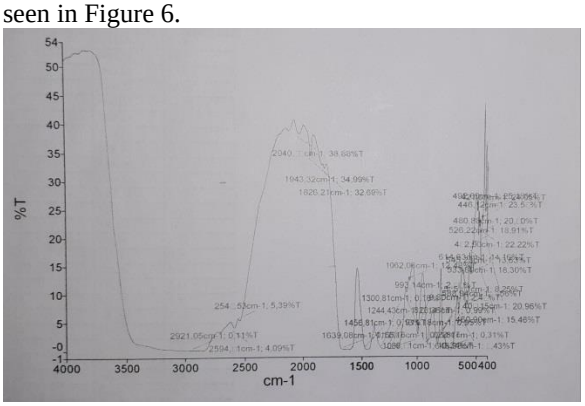

Figure 6. IR spectrum of anacardic acid

The IR spectrum results above can prove that the compounds obtained in this study were anacardic acid compounds. It can be seen from the functional groups identified in the IR spectrum. The OH function group is shown in the range 3000-3500 cm^{-1}, the CH group is shown in the range 3000-2800 cm^{-1} and is reinforced with the band 1456 cm^{-1}, the C = O group is shown in the range 1639 cm^{-1}, the C = C group aromatics are shown in the range 1500-1600 cm^{-1} and C-O groups are shown in the range 1062-1300 cm^{-1}.

In the analysis of UV-Vis spectroscopy anacardic acid isolation results obtained the highest peak at 336 nm. It shows that the structure of anacardic acid compound has a conjugated double bond, where the peak (peak) of the conjugated double bond is at a wavelength above 250 nm. The UV-vis spectrum of the isolated anacardic acid extract can be seen in Figure 7.

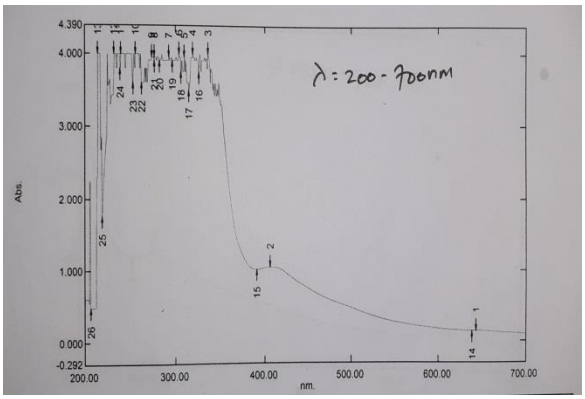

Figure 7. UV-visanacardic acid spectrum

When compared with the structure of anacardic acid, it can be seen that anacardic acid does have a conjugated double bond.

CONCLUSION

Based on the purity test results and identification using UV-vis spectroscopy and IR spectroscopy, the compounds obtained from the isolation results in this study were indeed anacardic acid compounds. The isolation method used in this study can be used as a reference to isolate anacardic acid compounds.

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