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Analysis of Cyanide (CN) Compounds in Gewang Fruit (*Corypha utan Lamk*)

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Abstract
Plants in general are able to produce secondary metabolite compounds that act as a protector against predators. Gewang fruit is often used by the people of Kolbano Village as a natural poison to catch fish.. The purpose of this study is to analyze the cyanide (CN) compound content in gewang fruit (Corypha utan Lamk). This study uses a trimetric method. There are two types of samples used in this study, namely raw samples and dry samples. The results of the qualitative testing of the cyanide compound content in the gewang fruit on 2 (two) samples showed that the color changed from yellow to white and a precipitate was formed at the bottom of the solution when reacted with $AgNO_3$, which showed that the gewang fruit positively contained cyanide compounds (CN). The average cyanide content in the raw gewang fruit samples was 11.52 mg/L or 9.25%. Meanwhile, the average cyanide level in the dry samples was 18 mg/L or 17,19 %.

Keywords: Analysis, Cyanide, Gewang Fruit, Titration

1. Introduction

Plants in general are able to produce secondary metabolite compounds that act as a protector against predators. According to Padamani et al (2020), secondary metabolite compounds are compounds that are synthesized by a living thing not to meet its basic needs, but to maintain its existence in interacting with the ecosystem. The same thing was stated by Jawi (2019), that the main function of secondary metabolites as defense compounds in plants. Cyanide is one of the secondary metabolite compounds that are often found in plants (Iriawati, 2014; Hairuddin, 2013).
Cyanide compounds (CN) are derivative compounds from cyanogenic compounds produced from the enzymatic hydrolysis process (Pratiwi et al., 2023). According to Hairuddin (2013), cyanide is a very toxic chemical compound and can cause death within a period of a few minutes. A large number of green plants contain a lot of cyanogenic glycosides and can be remodeled into toxic hydrogen cyanide (HCN) (Yanuartono et al., 2018). One example of a green plant is luwang (*Corypha utan* Lamk).

The results of the study by Heliawati et al. (2013), showed that the methanol extract of gew seeds (*Corypha utan* Lamk) with the highest toxicity gave a value of 97 ppm. In addition to containing 2 main compounds, namely Linolenic acid and Nigakilactone H, in gewang seeds there are also 4 other compounds whose names are not yet known but have mass candidates or molecular formulas, namely $C_{30}H_{24}O_5$, $C_{30}H_{24}O_4$, $C_{18}H_{32}O_7$ and $C_{43}H_{76}O_6$. In addition, gewang seeds also have a strong toxicity to goldfish (*Cyprinus carpio L*.) with the highest fish mortality percentage of 80% at a concentration of 8 mg/mL (Kanmese, 2022).
Gewang fruit is often used as a natural poison for catching fish because it contains a fairly high toxicity by being ground until smooth and sprinkled on the target fishing area. Based on the background review above, the researcher suspects that the gewang fruit contains cyanide.
The formulation of the problem in this study is how the content of cyanide compounds (CN) in gewang fruit (Corypha utan Lamk). The purpose of this study is to analyze the content of cyanide (CN) compounds in buan gewang (*Corypha utan Lamk*).

2. Method

This research includes experimental research using the argentometry titration method and two (2) forms of testing to analyze cyanide compounds in gew fruits, namely qualitative and quantitative testing; The extraction process in principle refers to the solubility properties (polar and non-polar) of the extracted compound (Ngginak *et al*, 2023).

2.1. Time and Place

This research will be carried out in March 2024 in the laboratory of the Biology Education Study Program, Faculty of Teacher Training and Education, Artha Wacana Christian University.

2.2. Tools and Materials

The tools used in this study include erlenmeyer flasks, distillation devices, static and clamps, droppers, test tubes, and heaters. Meanwhile, the naan used is fresh gewang fruit, $AgNO_3$1% solution, HNO_3, KSCN, ferri ammonium citrate, and aqudest.

2.3. Research Procedures

The first process carried out is to select and determine the lure fruit to be used as a sample. The lure fruit used is a young fruit (2 months old) that is fresh green and round in shape. There are two (2) types of samples used in this study, namely samples in raw preparations and samples in dry:

1. The sample in the raw preparation is a lure fruit that is still in a fresh state that is mashed and then tested.
2. The sample in the dry preparation is fresh gewang fruit that is mashed and dried for three (3) days, after three (3) days then the test will be carried out.

2.3.1. Qualitative Test

A sample of 10g was crushed, then given 100 ml of aqudest and left ± 2 hours and then filtered. A 1 ml sample is inserted into a test tube. The test tube is heated at 100°C for 10 minutes and then dripped with $AgNO_3$. Positive results are indicated by white precipitate if reacted with $AgNO_3$ (Budiman et al., 2021).

2.3.2. Quantitative Test

A sample of 20g was crushed then given 200 ml of aquadest and left ± 2 hours. Then the sample solution is distilled, the distillate is contained in an erlenmeyer containing 20 ml of $AgNO_3$ and 1 ml of HNO_3. The distillate obtained was divided into three erlenmeyers each containing 25 ml of destilate. The distillate that has been divided is titrated with KSCN with the addition of an ammonium citrate ferry indicator until the solution appears red.

2.4. Data Analysis Techniques

Formula for calculating cyanide compound levels (Qomariyah, 2023):

$$\frac{(A-B)\times N\ \times 27}{V}\times 1000$$

Formula for calculating cyanide compound levels (Lumbantobing et al., 2019):

$$\%HCN=\frac{(N\ \times VHCN\ \times BE)-(N\times VKSCN)\times BE}{W}\times 100$$

Information:
A : Volume of Potassium Thiocyanate solution at sample titration (mL)
B : Volume of Potassium Thiocyanate solution for blank titration (mL)
N : Normality of KSCN (N)
W : Sample weight (g)
VKSCN: Volume KSCN
VHCN : HCN Volume
BE : Equivalent Weight
V : Sample volume (mL)
27 : HCN molecular weight (g/gmol)

3. Results and Discussion

3.1. Results

(a) (b)

Figure 1. Sample before titration (a) sample Raw (b) dry sample

(a) (b)

Figure 2. Sample after titration (a) sample Raw (b) dry sample

Table 1. Cyanide compound content in crude sample (mg/L)

Repetition	A	B	N	V	HCN Molecular Weight (g/gmol)	CN Rate (mg/L)
1	4,8	3,6	0,01	25	27	12,96
2	4,6	3,6	0,01	25	27	10,8
3	4,6	3,6	0,01	25	27	10,8
Average						11,52

Source : Research results, 2024

Table 2. Percentage of Cyanide Compound Levels in Raw Samples

Repetition	N	VHCN	BE	VKSCN	W	Cyanide (CN) content (%)
1	0,01	12,96	27	4,8	20	11,02
2	0,01	10,8	27	4,6	20	8,37

3	0,01	10,8	27	4,6	20	8,37
Average						9,25

Source : research result data, 2024

Table 3. Cyanide compound content in dry samples (mg/L)

Repetition	A	B	N	V	HCN Molecular Weight (g/gmol)	CN content (mg/L)
1	5,3	3,6	0,01	25	27	18,36
2	5,2	3,6	0,01	25	27	17,28
3	5,3	3,6	0,01	25	27	18,36
Average						18

Source : Research Results, 2024

Table 4. Percentage of cyanide compounds in dry samples

Repetition	N	VHCN	BE	VKSCN	W	Cyanide (CN) content (%)
1	0,01	18,36	27	5,3	20	17,631
2	0,01	17,28	27	52	20	16,308
3	0,01	18,36	27	5,3	20	17,631
Average						17,19

Source : research result data, 2024

3.2. Discussion

3.2.1. Qualitative Test of Cyanide Compound Content in Gewang Fruit

Based on the results of the qualitative testing of cyanide compound content in lure fruit on 2 samples (raw sample and dry sample) which were reacted with 1% AgNO3 (table 1**),** it was shown that there was a color change from golden yellow to turbidity white and a precipitate was formed in the part of the solution. The color change that occurs is due to a change in the pH of the environment (Wati & Hasby, 2020).

According to Budiman (2021), the formation of the precipitate is due to the Ag+ ion from the AgNO3 ion reacting with CN- in HCN to form AgCN precipitate to form a white precipitate. The AgNO3 reaction produces a white precipitate of AgCN that will soon dissolve in excess cyanide solution by forming a discyanoargentate (I) $[Ag\ (CN)_2]^-$ complex ion with the following reaction equation (Alauhdin, 2020):

$CN^- + Ag+ \rightarrow AgCN(s)$

$AgCN(s)\ ^+\ CN- \rightarrow [Ag(CN)_2]^-$

With the change in color and precipitate in the solution when reacted with AgNO3, it shows that the gewang fruit positively contains cyanide (CN) compounds.

3.2.2. Quantitative Test of Cyanide Compound Content in Gewang Fruit

This test is carried out using a titrimetric method that can be known from the specified equivalent point of the titration endpoint. The distilled sample was then divided into 3 different erlenmeyers of 25 mL for testing. It can be seen in figures 1 & 2.

The results obtained from the titration process are then calculated using the formula 1 & 2. The percentage of cyanide compounds in macaw fruit can be seen in tables 2 & 3. Based on the data in the table above, it can be seen that the average cyanide level in macaw fruit in the raw sample contains 11.52 mg/L or 9.25%. Meanwhile, the average cyanide level in dry samples was 18 mg/L or 15.56%. With such high levels of cyanide found in geese, it can be ascertained that the use of geeang is not safe as a natural poison for fishing because it can have a bad impact on the environment, especially on corals and other microorganisms as well as humans themselves. With the pollution of an environment, it will have an impact on the destruction of natural ecosystems and the reduction of environmental quality standards (Permadi & Murni, 2013).

Cyanide solutions used to catch fish in coral reef areas have shown effects in the form of the death of most reef organisms, including small fish, active mobile reef invertebrates, and corals (Muyasaroh et al., 2018). According to Puspito (2010), the coral species *Pocillopora damicornis* that is exposed to cyanide at a concentration of 0.4% with an exposure time of 10 minutes will bleach within 4 hours and 90% of the corals die after 4 days of exposure.

With such a high concentration of cyanide compounds if accumulated through the food chain, it will risk poisoning in humans. Cyanide is well-known as a toxic compound that can accumulate in fish, especially in the liver and stomach of fish, which is found in water as HCN (Haurissa ddk, 2018). Cyanide itself is a compound that can cause health problems, such as narrowing of the respiratory tract, nausea, vomiting, headaches, and can even cause death (Hariyanto & Larasati, 2016). This has also exceeded the standard that has been set by the government through the Regulation of the Minister of Environment of the Republic of Indonesia Number 5 of 2014 concerning Wastewater Quality Standards, which is 0.05 mg/L.

The results of the study also showed that there was an increase in cyanide compound levels in gewang fruit samples that were dried for 3 days, which was 6.48 mg/L or equivalent to 6.31%. The increase in cyanide compound levels is suspected to have occurred due to mechanical damage that was not accompanied by immersion in water so that cyanide compounds were formed. As happens with tuber plants if there is mechanical damage to the tubers and is not accompanied by immersion in water, HCN will slowly form (Usman, 2017).

The effect of drying time on the increase in cyanide levels also occurs in cassava. The results of research by Lumbantobing et al. (2019), show that the longer cassava is stored, the higher the level of cyanide acid (HCN) contained in cassava. The rates obtained at 8-day storage were 5.9%, and 6.0%.

4. Conclusion

Gewang fruit (*Coryoha utan* Lamk) contains cyanide compounds (CN). The average cyanide content in lure fruit in raw samples contained 11.52 mg/L or 9.25%. Meanwhile, the average cyanide level in dry samples was 18 mg/L or 15.56%.

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