EFFECTIVENESS OF SECANG WOOD (*Caesalpinia sappan l*) CONCENTRATION AS NATURAL INDICATOR FOR ACIDIMETRY METHOD

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Abstract

Acidimetry is a titration method used to determine acidic levels such as H_2SO_4, and HCl with methyl red (MR)1% w/v as indicator. As synthetic indicator, MR is relatively expensive, therefore a replacement indicator is needed. This study aimed to investigate the potential of a natural indicator from secang wood (Caesalpinia sappan l) containing brazillin compounds to be used as replacement of MR. The efectiveness of wood concentration 0.5; 1.0; 1.5 and 2 % w/v used as indicator of acidimetric titration, particularly for standardizing HCl solution was measured. Next, the minimal concentration of wood secang which can be used as indicator of acidimetric titration was determined. The result showed that secang wood has potential to be used as replacement indicator of MR. The percentage difference of concentration of HCl solution using MR indicator 1.0% with wood concentration 0,5; 1.0; 1.5 and 2.0 % w/v were 6.7; 6.7; 10.0; and 21 % respectively. Minimum concentration of wood secang that can be used as indicator in acidimetry is 0.5 %b/v.
Keywords: acidimetry, secang wood, natural indicator, and synthetic indicator MR

Introduction

Titration Acidimetry is a method of measuring the basic content of a substance by using acid solution as standard [1]. Titration is a process of measuring the volume of titrant needed to reach the equivalent point with a titrat. The difficult equivalent point is observed, since it is only a theoretical endpoint.

At the end point titration required methyl red (MR) indicator. The availability of MR as a chemical indicator (synthetic indicator) in remote areas is very difficult, so it needs natural indicators derived from plants or flowers such as roses, turmeric, shoeflowers, secang wood and purpleyam [2].

The natural indicator comes from organic material which is a natural substance that can change its color in acidic, alkaline and neutral solution, but can not show its pH value [3]. Natural indicators that are usually performed in acid-base testing are strikingly colorful plants, in the form of flowers, tubers, fruit peels, and foliage.

The color change of the indicator depends on the color of the plant species, eg red hibiscus in acid solution will be red and in the base solution will be green, the purple cholesterol in the acid solution will be purplish red and in the base solution will be green. Examples of natural indicators are, flower shoot extract, rose extract, turmeric, wood secang, and others. Wood secang contains Brazilin compounds, which are compounds that produce red.

Structure molecule of brazilein and brazilin at Figure 1.

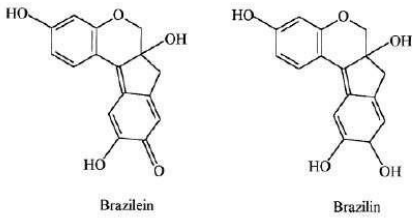

Figure 1. Structure molecule of brazilein and brazilin [4].

Brazilin is a compound isolated from secang wood, Brazilin including flavonoid compounds that are structurally belonging to isoflavonoid groups. Brazilin is a yellow crystal but if oxidized it will produce brownish-browned and water-soluble brazilien.

Brazilin is too an antioxidant compound that has an effect as a chemical anti-radical. Brazilin has many benefits such as antipoliferation, antioxidants, anti diabetics, anti-inflammatory and accelerate blood circulation [5]. According [4], Brazilin ($C_{16}H_{14}O_5$) is a yellow crystal which is a color

pigment on secang. Acid does not affect brazilene, but alkali can make it redder. Ether and alcohols cause pale yellow to brazilline solution. Brazilin will quickly form a red color is caused by the formation of brazilein. Brazilin oxidized to produce brazilein compounds that are red brown and soluble in water [6].

Ether and alcohol will cause a pale yellow to braziline solution, when exposed to sunlight, brazilline will quickly form a red color. The occurrence of red color is caused by the formation of brazilein ($C_{16}H_{12}O_5$). Brazilin belongs to the flavonoid as isoflavonoid and based on its antioxidant activity, brazillin has the effect of protecting the body from chemical toxicity poisoning. Natural wood pigment secang influenced by the level of acidity. At the acidic (pH 2-4) is yellow while in neutral and alkaline (pH 6-8) is purplish red. Brazilin includes flavonoid compounds that are structurally belonging to the isoflavonoid group. Brazilin is an antioxidant compound that has an effect as a chemical anti-radical [4,5]. Benefits of Brazilin such as anti poliferasi, antioxidants, anti diabetics, anti-inflammatory and accelerate blood circulation [5]. Therefore, it is necessary to research about the use of natural indicator of wood of secang as a substitute of chemical indicator for acidimetric titration.

Method

The object of this research is secang wood powder as a natural indicator for acidimetric titration. The material used was secang wood powder, 0.01 N HCl; 0.0100 N of the Sodium Tetra Borate (Borax) and MR 1 %w/v indicator. statif, clamp, burette 50ml, Erlenmeyer 250 ml, 5 ml flask, volume pipette, separating funnel, blender, measuring cup 1000 ml and 10 ml, 250 ml glass beaker, viller, and ilter paper.

Metthod at research Acidimetric titrimetry and data analysis Descriptif.

Preparation of sample of wood powder secang Wood

Secang wood heated to dry then blended and sieved with a mesh size of 100 mesh, then reheated to prevent the growth of fungi.

Preparation of natural wood indicator secang 0.5; 1.0; 1.5; and 2.0 %w/v as much as 5 ml

Wood powder secang weighed 0.025 consecutive; 0.050; 0.075; and 0.100 gram, and each fed into a 5 ml measuring flask plus 1 drop of 0.01 N NaOH; 2 drops of concentrated ethanol until dissolved and then added 2 drops of ethanol 50% and adjusted with aquades until the marks are bounded and homogenized.

Making MR indicator 1.0% w / v as much as 5 ml MR

0.050 gram powders were fed into a 5 ml measuring flask plus 1 drop of 0.01 N NaOH, 2 drops of concentrated ethanol until dissolved and then added 2 drops of ethanol 50% and plated with aquades until the marks were bordered and homogenized.

Standardize 0.01 N HCl solution with 0.0100 N borax solution using MR indicator 1.0% w / v

The standard solution of 0.0100N borax was fed into 250 ml erlenmeyer and then added 3 drops of MR indicator 1.0% w / v and titrated with 0.01N HCl until a change from yellow to red. Repetition is done 5 times. Standardize 0.01 N HCl solution with 0.0100 N borax solution using 0.5% w/v secang wood indicator. The standard solution of 0.0100N borax into 250 ml erlenmeyer and then added 3 drops of 0.5 %w/v secang wood indicator and titrated with 0.01N HCl until a change from yellow to red. Repetition was performed 5 times and the same procedure was repeated for concentration 1.0; 1.5 and 2.0 %w/v. Concentration of HCl using variation of indicator concentration of secang wood at Table 1.

Table 1. Concentration of HCl using variation of indicator concentration of secang wood

Variation of indicator concentration of secang wood				
Repetition	0.5	1.0	1.5	2.0
1	A1	B1	C1	D1
2	A2	B2	C2	D2
3	A3	B3	C3	D3
4	A4	B4	C4	D4
5	A5	B5	C5	D5
6	A6	B6	C6	D6

Information: A, B, C, D are HCl Concentrations

Technique of collecting data

Technique of collecting data that is using data of result of research then done percentage of error compared with control use indicator MR 1,0 % w/v to determine minimal concentration indicator wood secang.

3. Results

Research result the qualitative test of MR and secang wood indicator against the 0.0100 N borax standard solution and HCl solution are listed in Table 2.

Table 2. Qualitative test using filter paper on MR indicator and natural wood indicator secang to standard solution of Borax 0.0100 N

Indicator	Standard solution of borax 0.0100 N	HCl solution
MR	Yellow	Red
Secang Wood	Red	Yellow

Percentage difference normality HCl 0.01 N solution standardized with 0.0100 N borax solution using MR indicator 1% and wood conservation concentration 0.5 %, 1.0 %; 1.5 %; and 2.0 % are listed in Table 3.

Table 3. Percentage Error of Concentration 0.01 N HCl Solution Using MR indicator and wood secang (WS)

Variation of indicator concentration (% b / v)	Concentration of HCl (N)	Difference between HCl concentrations	Percentage Error of HCl (%)
MR 1.0	0.0090		
WS 0.5	0.0096	0.0006	6.70
WS 1.0	0.0096	0.0006	6.70
WS 1.5	0.0099	0.0009	10.00
WS 2.0	0.0109	0.0019	21.00

Information: MR = Methyl red

WS = Wood Secang

Table 3 shows the percentage difference of HCl concentration using MR and wood indicator secang obtained the smallest difference is the wood secang concentration of 0.5 and 1.5% w / v.

4. Discussion

According to [4], the acidic has no effect on the presence of brazillin solution, but in alkaline a red. Brazilin quickly forms a red color caused by the formation of brazilein. Natural wood pigment secang influenced by the level of acidity. At the acidic (pH 2-4) is yellow while in neutral and alkaline (pH 6-8) is purplish red [5]. Brazilin if oxidized will produce a brownish-browned brazilein compound and soluble in water. The wood secang concentration of 0.5 and 1.5% w/v.

5. Conclusion

The acidic has no effect on the presence of brazillin solution, but in alkaline a red. Brazilin The wood secang concentration of 0.5 and 1.5% w/v.

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