Jurnal Aisyah: Jurnal Ilmu Kesehatan

Volume 8, Issue S1, 2023, p. 309 – 314
ISSN 2502-4825 (print), ISSN 2502-9495 (online)

Qualitative analysis of phenol group compounds on antiseptic products X and Y

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ARTICLE INFO

Article history:

Received 19 October 2022
Accepted 10 January 2023
Published 20 January 2023

Keyword:

Antiseptic
Phenol
Qualitative
Wound

A B S T R A C T

Injuries or wounds often occur in humans and animals, with various levels of severity, namely mild, moderate, and severe. The entry of pathogenic microorganisms into the open wound area can cause infection and can cause various effects including rapid loss of organ function, stress response from the sympathetic nervous system which triggers rapid physiological changes, a bleeding process accompanied by hemostasis, and even death. The substances can assist wound healing in the drug given. Antiseptic can prevent infection in the wound and clean the body parts where there are wounds. This study aimed to qualitatively analyze the phenol groups found in antiseptic products X and Y using an experimental method. The results obtained from all tests, namely sample X showed positive results in the organoleptic test, solubility test, and firmness test, but negative in the group test, while sample Y showed positive results in the organoleptic test, solubility test, group test, and firmness test. The conclusion obtained is that both positive antiseptic samples contain phenol.

Kata kunci:

Antiseptika
Fenol
Kualitatif
Luka

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DOI: 10.30604/jika.v8iS1.1721

A B S T R A K

Cedera atau luka sering terjadi pada manusia maupun hewan, dengan tingkat keparahan yang berbeda-beda yaitu ringan, sedang dan berat. Masuknya sejumlah mikroorganisme patogen didaerah luka yang terbuka dapat menyebabkan infeksi dan dapat menimbulkan efek yang bervariasi diantaranya hilangnya fungsi organ tubuh secara cepat, timbul respon stres dari sistem saraf simpatis sehingga memicu perubahan fisiologis secara cepat, proses pendarahan disertai hemostatis dan bahkan kematian. Penyembuhan luka dapat dibantu dengan zat-zat yang ada didalam obat yang diberikan. Pencegahan infeksi pada luka sekaligus membersihkan bagian tubuh yang terdapat luka dapat digunakan antiseptika. Tujuan dilakukannya penelitian ini yaitu untuk menganalisis secara kualitatif golongan fenol yang terdapat pada produk antiseptika X dan Y menggunakan metode eksperimen. Uji yang dilakukan pada penelitian meliputi uji organoleptik, uji kelarutan, uji golongan, dan uji penegasan. Hasil yang diperoleh dari semua uji yaitu sampel X menunjukkan hasil positif pada uji organoleptik, uji kelarutan, dan uji penegasan, namun negatif pada uji golongan, sedangkan pada sampel Y menunjukkan hasil positif pada uji organoleptik, uji kelarutan, uji golongan, dan uji penegasan. Kesimpulan yang diperoleh bahwa kedua sampel antiseptik positif mengandung fenol.

INTRODUCTION

Injuries or wounds often occur in humans and animals and have different levels of severity, namely mild, moderate, and severe (Putriyani & Fitrianingsih, 2022). According to data from RISKESDAS, Indonesia has an increasing number of injuries every year, this shows an increase of 8.4% in 2013 to 9.2% in 2018 (Kemenkes RI, 2018). The entry of several pathogenic microorganisms into an open wound area can cause infection and can cause various effects including the rapid loss of organ function, the emergence of a stress response from the sympathetic nervous system which triggers rapid physiological changes, the process of bleeding accompanied by hemostasis, and even death. One of the efforts to prevent unwanted infections is to use antiseptics (Abdurrahmat, 2014). Antiseptic is defined as a substance that can be used to prevent or kill the growth of bacteria in living tissue by inhibiting their metabolic activity. One of the anti-septic agents is phenol (Fajriputri, 2014).

Phenol is an antiseptic with bactericidal and fungicidal properties (Karlina & Nasution, 2022). Example of a drug used for wound healing is povidone-iodine and ethacridine lactate. The use of ethacridine lactate can only be used on clean wounds and is better for compressing wounds. Meanwhile, ethacridine lactate has low antiseptic power when compared to povidone-iodine (Diah et al, 2019). Wound healing can occur due to the help of substances in the drug so that it can stimulate the faster growth of new cells in the skin. Medical measures for the wound healing process are in line with developments in the field of health science so there are several ways such as using high-dose antiseptics, bandaging with the use of absorbent materials, and suturing wounds (Putriyani & Fitrianingsih, 2022).

The above is what underlies the researchers to conduct the research, namely to analyze qualitatively the phenolic compounds contained in the two antiseptic products X and Y.

METHOD

The type of research used is qualitative analysis with experimental methods. Qualitative analysis is the first step for quantitative analysis which aims to identify components in chemical substances including the formation of precipitates, colors, and other non-numeric data (Maharani & Yusrin, 2019).

Tools and Materials

The tools used are test tubes, tube racks, pipettes, spatulas, glass beakers, and measuring cups. The materials used were distilled water, DAB HCl, ferric chloride ($FeCl_3$), ammonium hydrochloride (NH_4OH), hydrochloric acid (HCl), sulfuric acid (H_2SO_4), sodium hydroxide (NaOH), and two samples of X and Y antiseptic products.

Procedure

Organoleptic Test

Both samples were subjected to organoleptic testing including shape, color, taste, and smell.

Solubility Test

Prepared four test tubes for each sample, labeled with the name on each test tube (NaOH, HCl, distilled water, ethanol). Put 2mg of the sample into each test tube. Dilute with each solvent.

Group Test

Put 2mg of sample into a test tube + 2-3 drops of DAB HCl reagent for each sample. Observe the color change. The sample is positive for phenol (orange-red) when added with positive NaOH (Redish Brown).

Affirmation Test

Prepare 3 test tubes for Sample X and 3 test tubes for Sample Y. Put 2mg of the sample into 3 test tubes for each sample. Enter the specific reagent in each test tube as follows:

X sample

Tube I: 2mg Sample + 3 drops of $FeCl_3$ reagent (purple) + 3 drops of NH4OH (yellow)

Tube II: 2mg Sample + 3 drops $FeCl_3$ + 3 drops HCl (yellow)

Tube III: 2mg Sample + 3 drops of H_2SO_4 (Red)

Y sample

Tube I: 2mg Sample + 3 drops of H_2SO_4 (Yellow Crystals)

Tube II: 2mg Sample + 3 drops of NaOH (Red Precipitate)

Tube III: 2mg Sample + 3 drops H_2SO_4 + 3 drops NaOH (Purple Red)

RESULTS AND DISCUSSION

Organoleptic Test Results

The results obtained can be seen in Table 1. Sample X is yellow, odorless, and liquid. It is different from sample Y which is reddish brown in color, smells sweet, and is in liquid form. The following is a table of the results of the organoleptic test research:

Table 1. Sample organoleptic results

X	Y
Yellow	Reddish brown
Not smelly	Smells sweet
Liquid	Liquid

The data processed by researchers in 2022

According to the Indonesian Pharmacopoeia Edition III (1979), yellow ethacridine lactate is odorless. So it is known that sample X shows a positive result. Whereas povidone iodine according to the Indonesian Pharmacopoeia Edition III (1979), is yellowish brown in color with a slight characteristic odor (Dirjen POM, 1979). Based on these results it is known that sample Y showed positive results.

Solubility Test Results

Based on the solubility test of samples X and Y, the following results are obtained:

Table 2. Sample solubility results

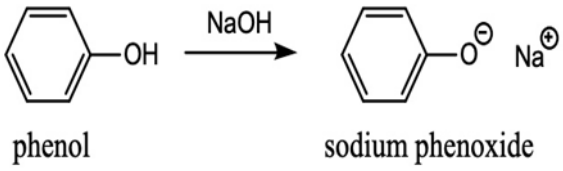
Solvent	Sample	
	X	Y
Aquadest	-	-
Ethanol	++	++
HCl	+	+
NaOH	++	++

Information: Not dissolved (-)
A little late (+)
Late (++)

The data obtained is slightly different from the exposure Ardini (2020), In general, phenolic compounds are more soluble in polar solvents. Examples of polar solvents that can be used to dissolve phenol are ethanol, methanol, acetone, and water (Ardini et al, 2020). From Table 2 it can be seen that both samples were not soluble in distilled water, this is contrary to the Indonesian Pharmacopoeia Literature Edition III, that ethacridine lactate and povidone-iodine are water-soluble (Dirjen POM, 1979). This is because the double bonds in phenol are more likely to cause delocalized electrons to undergo resonance. This resonance causes phenolic compounds to ionize easily in water (Aisy, 2019).

Both samples seemed soluble in ethanol and these results were by the study by Ardini (2020). Sample X is slightly soluble in hydrochloric acid, while sample Y is slightly soluble in hydrochloric acid with a yellow color change and the formation of a white precipitate. In NaOH solution both samples are soluble, sample Y dissolves in the presence of crystals, and sample X with a bright color change, this is to the existing

literature that phenol has polar properties that can dissolve in NaOH solution. The stable aromatic ring that is owned by phenol causes phenol to dissolve with NaOH and form a single phase (Ardini et al, 2020). In addition, phenol is a compound that belongs to a polar compound and can dissolve in NaOH by releasing a proton to become an anion (Sari, 2020). The following is the reaction between phenol and NaOH:



Picture 1. Phenol + NaOH reaction (Sari, 2020)

Class Test Results

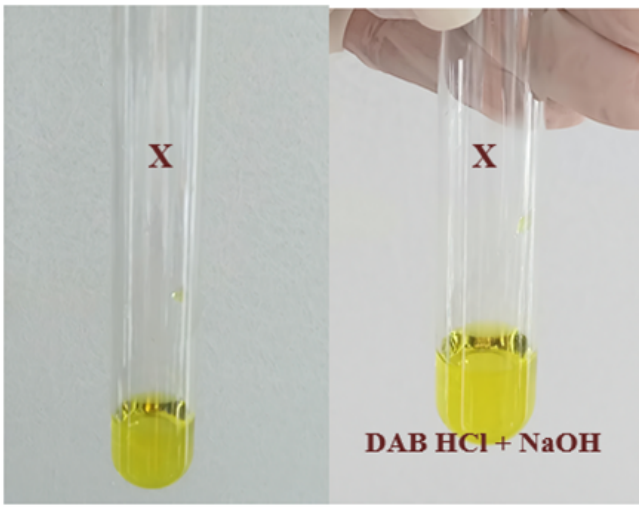
Based on the solubility test of samples X and Y, the following results are obtained:

Table 3. Sample group test results

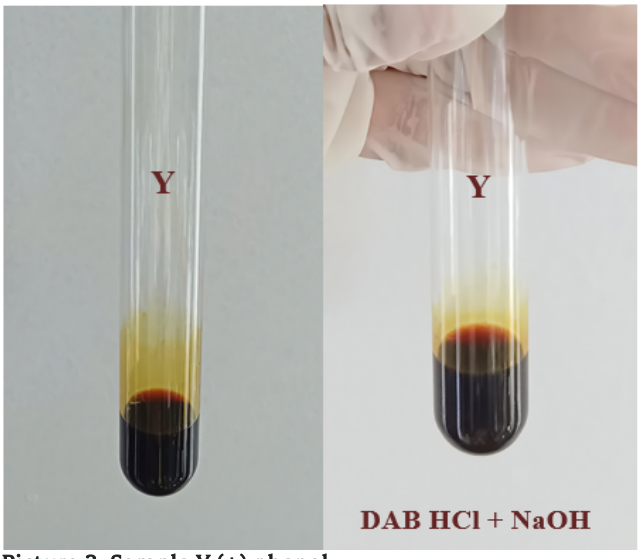
Reactor	Sample	
	X	Y
DAB-HCl	-	+
NaOH	-	+

The data processed by researchers in 2022

Based on Table 3. it can be said that sample Y (+) contains phenol, while sample X (-) belongs to the phenol group. The group test used DAB-HCl + NaOH as a reagent. The role of DAB HCl (p-DAB) or para-dimethylaminobenzaldehyde as a reactant is to form two immiscible solutions in the form of a clear solution with a pale orange emulsion. A positive result was shown in sample Y by the formation of a red-orange color when reacted with DAB HCl and turned reddish brown when reacted with NaOH. This is because phenol produces a complex reaction when it is reacted with reagents and then changes the color of the solution (Haqqi, 2014)



Picture 2. Sample X (-) phenol
No change in color (still yellow)



Picture 3. Sample Y (+) phenol
Orange-red change→ reddish brown

Affirmation Test Results

A confirmation test was carried out to further ensure the presence or absence of phenolic compounds in the sample. Various reagents are used, especially $FeCl_3$. Positive phenol was shown when sample X reacted with $FeCl_3$+HCl, the color changed to yellow. Meanwhile, sample Y showed a positive result when it was reacted with sulfuric acid which was marked by a change in color to reddish brown crystals.

$FeCl_3$ solution can react with various compounds and produce different colors, this is due to the difference in the number of replacement of atomic groups that occur in the compound and the difference in calorimetry (Haqqi, 2014).

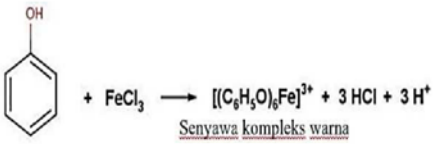
The following is a table of research results obtained in the confirmation test of samples X and Y:

Table 4. Sample confirmation test results

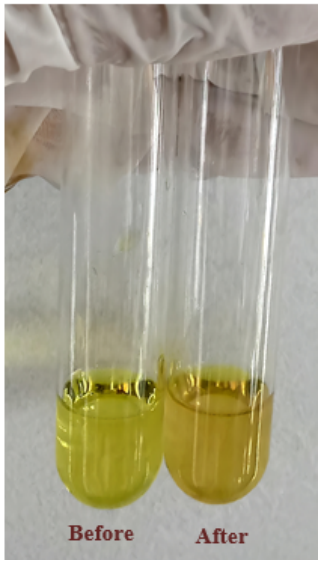
Reactor	Sample	
	X	Y
$FeCl_3 + NH_4OH$	-	-
$FeCl_3 + HCl$	+	-
H_2SO_4	-	+

The data processed by researchers in 2022

Based on Table 3. it can be said that the two samples (+) contained phenol when reacted with FeCl3 + HCl and H2SO4 while the other reagents did not show the presence of phenol (-). This is because the aromatic group that belongs to phenol can carry out resonance, namely the rotation of the electron cloud around the phenol ring. This resonance ability causes phenol to be quite reactive in its identification and can emit certain different colors (Haqqi, 2014).

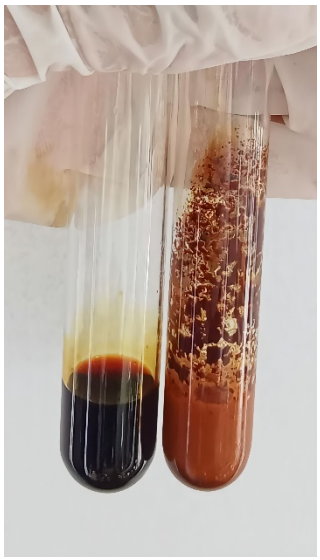


Picture 4. The reaction of Phenol + FeCl3 (Mukhriani et al., 2019)



$FeCl_3 + HCl$

Picture 5. Sample X (+) phenol
There is a yellow discoloration



H_2SO_4

Picture 6. Sample Y (+) phenol
There are reddish-brown crystals

CONCLUSIONS

Based on the research that has been done, it can be concluded that in the organoleptic test both samples positively contained phenol, in the solubility test using ethanol, HCl, and NaOH solvents, both samples dissolved, but in the aqua dest solvent, both samples were insoluble. The group test used the reagent DAB-HCl + NaOH, sample Y was positive for phenol, and the affirmation test for both was positive for the reagent $FeCl_3$ + HCl, sulfuric acid (H_2SO_4) so that both samples contained phenol and could be used as antiseptics.

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 ISSN 2502-4825 (print), ISSN 2502-9495 (online)