Lab Report- Anonnya Mahmud

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Audience Profile Sheet

Reader's Name: Fariha Ahmed
Reader's Job Title: Chemical Engineer
Kind of Reader: Primary____ Secondary_YES__
Reader's level of education: (Cannot be a Student) High School____ Associates____Undergraduate____ Graduate___YES___ Doctorate_____
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What are the things the Reader wants from your document? To know how the pH level of red cabbage water changes when certain solutions are added to it.
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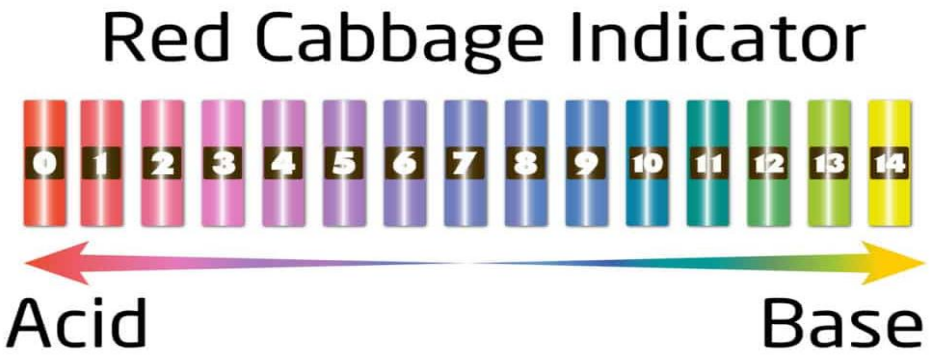

COLOR CHANGE OF RED CABBAGE USING ACID BASE SOLUTIONS

Abstract

Red cabbage juice contains a water-soluble pigment molecule called anthocyanin which can be used as a natural pH indicator [1]. A pH indicator is a chemical compound that determines whether a solution is acidic, basic or neutral. The pigment causes a color change when it is added with different solutions. This color change was tested by mixing different pH level solutions that can easily be found at home such as, baking soda (pH 9), tap water (pH 7), vinegar (pH 2.4) and lemon juice (pH 2). They are used to show whether the red cabbage indicator changes color or not. Baking soda turns the purple color of the cabbage into dark blue indicating that it is a weak base. Tap water changes the color into light purple indicating that it is a neutral solution. Vinegar turns the color into bright red and lemon juice changes the color into light pink indicating that they are acidic solutions. This lab report demonstrates that red cabbage is a pH indicator that changes its color when it comes in contact with different pH level solutions that are acid, base and neutral.

Introduction

We all know Red Cabbage as a vegetable, but do we know what other cool things that can be done using this vegetable? Red cabbage is a natural pH indicator that changes

color when an acidic or basic solution is added. The anthocyanins can be found in flowers, pumpkins, grapes etc. [1]. If anthocyanins are combined with acidic solutions, it changes its pH level by giving the water a red/pink color [1]. Likewise, if anthocyanins are combined with basic solutions, it changes its pH level by giving the water a dark blue/green color.

pH scales are used to find how acidic or basic a water-based solution is. Acids are compounds that release hydrogen ions when they are put in water. Acids like lemon juice releases a lot of H+ [2]. Bases are compounds that release hydroxide ions when they are put in water. Hydroxide is a combination of hydrogen and oxygen and symbolizes as OH- [2]. When you add equal amount of H+ and OH- in water, it creates H2O [2]. If there is less OH- to combine with H+, the water becomes acidic. If there is less H+ to combine with OH-, the water becomes basic. Red cabbage has anthocyanins, are complex molecules that can add and subtract hydroxide ions.

This experiment helps us understand how different solutions react to the red cabbage pigment anthocyanin. We also learn how we can change the acidity and basicity of different solutions when we add them in water. When certain chemicals are mixed in water, the water becomes very dangerous for our health and can cause serious damage. This is why it is very important to know about the pH of different liquids.

Objective

In this lab experiment, we will be learning about,

- How a red cabbage can change its pH level and its color when it comes in contact with different solutions like vinegar, baking soda, tap water and lemon juice.
- Acidity and basicity and how they react with different liquids.

Materials

- One small (26 ounces) of red cabbage.
- Blender, warm water, strainer

- A jug to take the cabbage indicator after straining
- 4 clear glass cups and a marker to label each glass
- Tablespoon to measure baking soda
- Vinegar, lemon juice, baking soda added with water, tap water

Procedure

Step 1: Add 4 cups of warm water in blender.

Step 2: Take three cabbage leaves and add it inside the blender with water.

Step 3: Put the lid on securely, hold the lid and blend it until the juice is made.

Step 4: Take the strainer and put it on top of the jug so you can strain the water. Now you're left with the purple cabbage water.

Step 5: Label each cup with the solution names, baking soda, tap water, vinegar and lemon juice. Also make sure you label the same amount of red cabbage juice you want to add on each cup.

Step 6: Fill 1/3rd of each cup with red cabbage water.

NOTE: Make sure you leave enough room for the solutions to be added.

Step 7: The first solution we will be testing is the liquid baking soda. Fill 2/3rd of the cup with liquid baking soda. Wait a few seconds.

Step 8: The next solution we will be testing is tap water. Fill 2/3rd of the cup with tap water. Wait a few seconds.

Step 9: The next solution we will be testing is vinegar. Fill 2/3rd of the cup with vinegar. Wait a few seconds.

Step 10: The last solution we will be testing is lemon juice. Fill 2/3rd of the cup with lemon juice. Wait a few seconds.

Results

Table 1:

Solution	Initial Color	Final Color	pH level
Liquid Baking Soda	Purple	Dark blue	9
Tap water	Purple	Light purple	7
Vinegar	Purple	Bright red	2.4
Lemon Juice	Purple	Light pink	2

A solution with a pH of between 8 and 14 is a base, between 5-7 is neutral and 4-0 is acid. When baking soda is added to the red cabbage juice, it turns our indicator dark blue. When tap water is added, it turn our indicator light purple. When vinegar is added, it turns our indicator bright red. Lastly, when lemon juice is added, it turns our indicator light pink instantly.

[3] https://www.youtube.com/watch?v=I18K2upEHLc (5 min 24 sec)

Analysis

The initial pH of red cabbage water is around 7 as we tested with tap water. After adding baking soda, it makes the cabbage juice dark blue. This indicates that baking soda increased the pH level red cabbage water. Therefore, we figure baking soda is a basic solution and has a pH of 9. Tap water makes the cabbage juice light purple which indicates that tap water is a neutral and has a pH of 7. When we add vinegar, the color changes to bright red. It indicates that vinegar decreased the pH level and it is an acidic solution that has a pH of around 2.4. At last, when we added lemon juice, it decreased pH level to the lowest turning the color light pink. This indicates that lemon juice is a strong acid solution and has a pH of 2.

References

[1]Khoo, Hock Eng et al. "Anthocyanidins and anthocyanins: colored pigments as food, pharmaceutical ingredients, and the potential health benefits." *Food & nutrition research* vol. 61,1 1361779. 13 Aug. 2017, doi:10.1080/16546628.2017.1361779

[2]OpenStax, Lumen Learning &. "Anatomy and Physiology I." *Lumen*, courses.lumenlearning.com/ap1/chapter/inorganic-compounds-essential-to-human-functioning/.

[3]The Sci Guys: Science at Home - SE2 - EP4: Red Cabbage pH Indicator - Acid Base Indicator. YouTube: The Sci Guys, 2014.