JOURNAL OF NATURAL SCIENCE AND LEARNING

p-ISSN 2963-1041, e-ISSN 2962-9837
Vol 02 , No 1 , pp. 6-10
Availble online
https://journalng.uwks.ac.id/index.php/jnsl

Comparison Of Butterfly Pea Extract And Purple Sweet Potato As A Natural Indicator Of Acid-Base Solution

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Abstract

Indicators are substances that can be used to show the properties of a substance through a special change in its color. The types of plants used in this study as natural indicators are found in the surrounding environment for example purple sweet potatoes (*Ipomea batatas L*) and butterfly pea (*Clitoria ternatea L*). . The purpose of this study is to identify the effectiveness of purple sweet potato extract (*Ipomea batatas L*) and butterfly pea (*Clitoria ternatea L*) as natural indicators of acid-base so that it can be used as an alternative learning medium. This research was conducted in 5 stages: 1) cut the purple sweet potato and butterfly pea into small pieces and then mash until smooth: 2) pour 5 tablespoons of alcohol and then leave until it settles; 3) pour the extract on 3 test tubes to test acid, base, and control; 4) drip the test solution on 2 test tubes; 5) then do testing to identify discoloration in purple sweet potato extract and butterfly pea a large amount of anthocyanin content in butterfly pea (*Clitoria ternatea L*) affects the results of acid and alkaline testing so that the test results on butterfly pea extract (*Clitoria ternatea L*) show a clear change in color.

Keywords: *Acid-base, butterfly pea, indicators, purple sweet potatoes, solvent*

Article History: 3 January 2023; Received in revised form 23 February 2023; Accepted 4 March 2023; Available online 11 March 2023.

1. Introduction

The acid-base solution is a solution that is in everyday life. Acid-base solutions can also be identified using special features, such as acids having a sour taste e.g. kitchen vinegar, vitamin C, and lime. While the base has a bitter taste when tasted, for example, dish soap, toothpaste, and baking soda. Any substance or compound has acidic, alkaline, or neutral properties. To find out the acidic, alkaline, or neutral properties can use an indicator.

Indicators are substances that can be used to show the properties of a substance through a special change in its color. Generally, the indicators used in identifying the properties of acids and bases, one of which is litmus paper, this indicator is a synthetic indicator that is not environmentally friendly and very expensive (Bria and Leba 2021). Synthetic indicators can be replaced with other alternatives in the form of natural indicators. Natural indicators are indicators made from natural ingredients such as purple sweet potatoes (Ipomea batata L) and butterfly pea (Clitoria ternatea L). While the synthetic indicators of the material are made in the laboratory. Indicators are usually used as a medium for practical learning in chemistry. Meet practical activities in schools, it requires natural indicators because synthetic indicators are not environmentally friendly and are quite expensive.

Types of plants that can be used as natural indicators are found in the surrounding environment, for example purple sweet potatoes (Ipomea batatas L) and butterfly pea (Clitoria ternatea L). The two natural ingredients have striking dyestuffs. Dyes in plants are colored organic compounds similar to synthetic indicators. Plant parts contain color pigments including anthocyanins, flavonoids, tannins, saponins, and alkaloids. Purple sweet potatoes (Ipomea batatas L) and butterfly pea (Clitoria ternatea L) have one of the color pigments, namely anthocyanins. Anthocyanins are a type of polyphenol group of flavonoids that can give red, purple, and blue colors in plants. The compound is sensitive to pH, because it can describe changes in the color of acidic and alkaline pH. The purpose of this study is to identify the effectiveness of purple sweet potato extract (Ipomea batatas L) and butterfly pea (Clitoria ternatea L) as natural indicators of acid-base so that it can be used as an alternative learning medium.

2. Ingredients and Methods

The research method uses qualitative descriptive methods. Descriptive research is the study to find facts with the right interpretation. Descriptive qualitative (QD) is a term used in qualitative research for a descriptive study (Yuliani 2018). Data collection is carried out by purposive sampling. According to (Sugiyono, 2009) purposive sampling is a sampling technique from data sources with certain considerations (Rosdianto and Murdani 2017).

Sample preparation: preparing equipment, sorting the quality of materials, washing materials, and utensils, cutting materials into small parts, and measuring the dose of the tester's solution. Sample testing: This study was conducted in 6 stages: 1) cut the purple sweet potato and butterfly pea into small

pieces and then mash until smooth: 2) pour 5 tablespoons of alcohol and then leave until it settles; 3) pour the extract on 3 test tubes to test for acid, base, and control; 4) drip the test solution on 2 test tubes; 5) then conduct testing to identify discoloration in purple sweet potato extract and butterfly pea.

Data analysis: this study used reference data from various sources. Then it is proved through sample testing and observation.

3. Results and Discussions

Based on the test results of natural indicators of acid-base solution using butterfly pea (Clitoria ternatea L) and purple sweet potatoes (Ipomea batatas L) obtained the results of the analysis to compare the indicators of the two natural indicator extracts. According to observations of indicator extracts from butterfly pea (Clitoria ternatea L) and purple sweet potatoes (Ipomea batatas L) showed that the color produced from butterfly pea extracts (Clitoria ternatea L) was more contrasting compared to purple sweet potatoes (Ipomea batatas L). The results can be seen in the following table.

Table 1. Test results of acid-base solution

Indicator Name	**Acid**	**Base**	**Control**
Butterfly pea	Purple	Moss green	Dark blue
Purple sweet potatoes	Reddish purple	Dark purple	Purple

From the 2 extracts, the color difference can be seen. Based on the results obtained, the number of droplets from alcohol and the tester's solution affects the extract yield of natural indicators.

Picture. 1. Butterfly pea (*Clitoria ternatea L)*

The large amount of anthocyanin content in Butterfly pea (Clitoria ternatea L) affects the results of acid and alkaline testing, so that the test results on Butterfly pea extract (Clitoria ternatea L) show obvious discoloration. Anthocyanins are a class of organic chemical compounds that can dissolve in polar solvents, and are responsible for giving orange, red, purple, blue, to black colors to higher plants such as flowers, fruits, grains, vegetables, and tubers. (Priska et al., 2018). Anthocyanins also include the content found in purple sweet potatoes. But the color change is not contrasting when compared to Butterfly pea.

Picture.2. Purple sweet potatoes (*Ipomea batatas L)*

Picture. 3. Butterfly pea extract test results

Picture. 4. Purple sweet potato extract test results

A good indicator is one that can clearly show color change. Telang flower extract is highly recommended to be a natural indicator that can be used in the medium of the practice of chemical science in schools.

4. Conclusion

Based on the description above, the results of the conclusion were obtained that Butterfly pea extract can be used as a natural indicator to determine the acidic and basic properties of a substance or compound because it provides contrasting color changes in acids and bases. In acid solutions, it becomes purple in color, and in alkaline solutions it becomes moss-green.

This research is limited to a relatively small data scope, so it is still possible to conduct follow-up research with wide data coverage. Therefore, an in-depth study is needed regarding the stability and effectiveness between purple sweet potato extract and Butterfly pea in their use on filter paper media as one of the learning media for the acid-base concept in schools.

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