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Manufacture Indicator Paper for BSL or Small Bungur Extract (Lagerstroemia Indica L) as an Indicators Alternative of Acid-Base

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Abstract

This study aims to utilize extracts of local cherry blossoms or small bungur (Lagerstroemia Indica L) in the manufacture of indicator paper as an alternative acid-base indicator. Local Cherry Blossoms were macerated with methanol for ± 2 hours. Extracts and indicator paper of local cherry blossoms were tested as indicators in an acid-base solution, the buffer solution was then compared with phenolphthalein and methyl orange indicators for acid-base titration, namely strong acid and strong base, weak acid and strong base and weak base and strong acid. The results obtained in this study are: local cherry blossom extract is brownish yellow, in a strong acid it is pink, in a strong base it is dark green, in a weak acid it is pale pink and in a weak base it is light green. The indicator paper of local cherry blossom extract in strong acid is light pink, a strong base is yellow, a weak acid is a pale pink, and a weak base is light green. In the buffer solution, the indicator paper of local cherry blossom extract has a pH range of 4-5 colors (pink-green), and 7-11 colors (yellow-green), the stability of the indicator paper from filter paper can maintain its color for 25 days. The type of acid-base titration that is suitable for the use of local cherry blossom extract indicators, precisely in the titration of strong acid-strong base and the weak acid-strong base is good to use as a substitute for phenolphthalein indicator, while in weak base-strong acid titration it is better to use as a substitute for methyl orange.

Keywords: Local cherry blossoms, extract, alternative acid-base indicator, indicator paper

Introduction

An acid-base indicator is a substance that can give different colors to acidic and basic solutions and can be used to predict the pH of the solution. Indicators that are often used include litmus paper, phenolphthalein, methyl red, and bromine thymol blue (Gustriani et al., 2016). This indicator is made synthetically using chemical compounds as raw materials. Synthetic indicators are very much needed at the secondary school to university level (Riyayanti, 2021). The use of this indicator has several disadvantages, such as; chemical pollution, high availability, and cost of production. These synthetic indicators are relatively expensive and very difficult to obtain, especially in rural schools. Therefore, other alternatives are needed so that the learning process continues to run smoothly, synthetic indicators can be replaced with other alternatives in the form of acid-base indicators from natural materials (plants) (Irwan, 2018).

Natural indicators can be made from various colored plants that are around us. However, not all colored plants can give a clear color change under acidic or alkaline conditions, therefore only a few can be used, for example, red dadap plants, purple cabbage (brassica oleracea), purple sweet potato (ipomoea batatas), beetroot (betavuulgaris), hibiscus flower (*hibiscus rosa-Sinensis*), and rosella flower (*hibiscus sabdariffa*) (Erwin et al., 2016). The use of natural indicators is generally only carried out in a short time, given the weakness that is not durable, judging from these weaknesses, the extracts from natural materials are made in paper form so that their use is more durable (Sukemi et al., 2017). In plants, color is caused by the presence of natural organic substances such as flavones, flavonols, anthocyanins, and others (Priska et al., 2018).

Anthocyanins are the basic building blocks of red, purple, and blue pigments in plants (Silvia et al., 2022). Anthocyanins are part of phenolic compounds which are classified as flavonoids. This pigment is responsible for the appearance of red to blue colors in some flowers, fruits, and leaves. Stable anthocyanin compounds will give a bright color at acidic pH and will lose their color as the pH increases (Irwan, 2018). The color stability of anthocyanin compounds is influenced by pH or

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acidity level and will be more stable when in an acidic or low pH atmosphere (Kunnaryo & Wikandari, 2021). Based on this it can be assumed that. Plants containing anthocyanins can be used as acid-base indicators (Rahmawati et al., 2016). Anthocyanins are the largest group of water-soluble natural plant pigments responsible for giving flowers, fruits, and vegetables their color. Plants containing anthocyanins can be used as acid-base indicators. For this reason, a study has been carried out using small flower buds (*Lagerstroemia Indica L*) which are thought to contain anthocyanin compounds (Putra, 2021).

Local cherry blossoms or small bungur (*Lagerstroemia Indica L.*) are one of the plants that have the potential as medicine. The small bungur plant (*Lagerstroemia Indica L*) has medicinal benefits, almost all parts of the plant can be used according to the community, namely the leaves, stems, fruits, and roots. The leaves of local cherry blossoms or small bungur (*Lagerstroemia Indica L*) can treat stroke, leaf extract of small bungur (*Lagerstroemia Indica L*) has been known to have antidiabetic properties, the seeds and leaves of this plant are commonly used as antidiabetic and high blood pressure drugs, while the roots are used as an antidiabetic. coughing up blood, vomiting, and defecating (Dalimartha, 2000). The characteristics of local cherry blossoms or small bungurs are each flower with 6 white to purple petals that are 10-50 cm long, a panicle-shaped compound flower that grows in groups at the end of the stem or out of the leaf axils, the color of the flower is pink or violet. young and wave-shaped at the edge of the crown leaf. For the surface of the flower stalk, there are smooth contours, but some are hairy. However, related to research related to local cherry blossoms or small humpback (*Lagerstroemia Indica L*) has not been studied by others, therefore researchers are interested in researching parts of local cherry blossoms or small bungur (*Lagerstroemia Indica L*) which researchers know have never researched and have the potential to be used as research material as an acid-base indicator paper.

Methods

Research design

This research is a laboratory experimental research conducted to utilize local cherry blossoms or small humpback (Lagerstroemia Indica L) as an alternative acid-base indicator paper.

Sample

The samples used in this study were local cherry blossoms or small bungur (*Lagerstroemia Indica L*) which were taken directly from the housing complex of Unt Tondo lecturer, Palu city, Central Sulawesi.

Tools and materials

The tools used in this study were measuring cups (5 mL, 10 mL and100 mL), beakers (100 mL and 500 mL), spatula, pH meter, stir bar, measuring flask (50 mL and 100 mL), Erlenmeyer (100 mL and 250 mL), burette, dropper, volume pipette (5 mL and 50 mL), shaker, drip plate, Buchner funnel, digital balance, basin, stopwatch, aluminum foil, ruler, spray bottle, filter paper, tissue, tube reaction, electric bath, thermometer, mortar and pestle as well as stative and clamps.

The materials used in this study were local cherry blossoms or small bungur (*Lagerstroemia Indica L*), filter paper, HVS paper, distilled water, 0.1 M HCl solution, 0.1 M NaOH, 0.1 M NH_4OH, 0.1 M CH_3COOH, 2 M HCl solution, 2 M NaOH solution, pH 1-12 buffer solution, phenolphthalein indicator (pp), methyl orange (MO), oxalic acid and methanol.

Research procedure

Extraction of Local cherry blossoms or small bungur (Lagerstroemia Indica L)

Weighed as much as 10 grams of local cherry blossoms that have been washed and sorted, then ground using a mortar and pestle and then put into an Erlenmeyer and added 100 mL of methanol solvent, then shaken and macerated for ±2 hours. The mixture is then decanted and filtered to obtain the extraction results that are ready to be used as natural acid-base indicators (Riswanto & Aminah, 2020).

Anthocyanin qualitative test

A total of 10 mL of the extract was put into each different test tube. Then in the tube, I added dropwise 2 M HCl solution and then heated it for 5 minutes. A positive result is when a red color appears. Meanwhile, in the second test tube, NaOH was added drop by drop while observing the color changes that occurred. Positive results when there is a blue-green color that fades slowly (Putri et al., 2015).

Testing of local cherry blossoms or small bungur (lagerstroemia indica l) indicator extracts in acid and base solutions

The local cherry blossom extract obtained was put in 2 drops into a drip plate and tested with 0.1 M HCl solution, 0.1 M NaOH, 0.1 M NH_4OH, and 0.1 M CH_3COOH, then observed color changes (Irwan, 2018).

Testing of local cherry blossom indicator extract or small bungur (Lagerstroemia Indica L) in buffer solution pH 1-12

The local cherry blossom extract obtained was put in 2 drops into a drip plate and tested with a buffer solution at different pHs, namely pH 1 to pH 12, and observed color changes (Riswanto & Aminah, 2020).

Papermaking of local cherry blossom extract or small bungur (Lagerstroemia Indica L)

The stages of this activity refer to (Indira, 2015) with such modifications.

a. Cut filter paper and HVS paper with a size of 12 x 6 cm. Pour the extraction results obtained

previously into the container. Then dipped filter paper and HVS paper into it until completely immersed and left ±for 5 hours in a closed state.
b. The filter paper and HVS paper were removed and then left at room temperature to dry.
c. Cut the filter paper and HVS paper that has been dried with a size of 12 x 1 cm.
d. Cherry blossom indicator paper is ready to be used as an acid-base indicator.

Testing of local cherry blossoms or small bungur (Lagerstroemia Indica L) indicator papers in acid-base solutions

Dipped local cherry blossom indicator paper has been made into the test solution that has been inserted into the drip plate, the test solution used is 0.1 M HCl solution, 0.1 M NaOH, 0.1 M NH_4OH and CH_3COOH 0.1 M then observed the color change that occurred (Riswanto & Aminah, 2020).

(Lagerstroemia Indica L) indicator papers in a buffer solution pH 1-12

Added as much as 5 mL of buffer solution into each test tube with a pH of 1-12. Then dip the indicator paper that has been made into the test tube until half of the paper is submerged. Observe the color changes that occur (Riswanto & Aminah, 2020).

Standardization of HCl/NaOH solution

Standardization of NaOH solution with oxalic acid

a. Weighed 1.26 grams of oxalic acid and then put it into a beaker, then added a little water and dissolved.
b. The solution was put into a measuring flask and added with distilled water up to 100 mL
c. The NaOH solution is added to the burette.
d. Pipette 10 mL of the oxalic acid solution then put it into an Erlenmeyer and add 3 drops of phenolphthalein indicator
e. Titrate the solution until the color changes.
f. The volume of the titrant obtained is recorded
g. Titration was carried out up to 3 repetitions (Riswanto & Aminah, 2020)

Standardization of HCl solution with NaOH

a. Fill the burette with NaOH. solution
b. Pipette 10 mL of the solution and put it into an Erlenmeyer. Then 3 drops of phenolphthalein indicator were added.
c. Titrate the solution until the color changes.
d. The volume of the titrant obtained is recorded
e. Titration was carried out up to 3 repetitions (Riswanto & Aminah, 2020).

Testing on acid-base titration

Strong acid-strong base titration

A total of 20 mL of 0.1 M HCl solution, was then put in an Erlenmeyer and then added 5 drops of local cherry blossom extract or small bungur (Lagerstroemia Indica L) until the solution changed color. Titrate with 0.1 M NaOH solution until a color change occurs. The titration was carried out 3 times, and the volume of titer used was recorded. For every addition of 2 mL of titer, the pH value of the mixture was measured using a pH meter until a color change occurred. Furthermore, this titration was replaced by replacing local cherry blossom extract with phenolphthalein as a comparison indicator (Riswanto & Aminah, 2020).

Strong acid-strong base titration

Add 20 mL of 0.1 M CH_3COOH, the solution into the Erlenmeyer. After that, add 5 drops of extract of local cherry blossoms or small bungur (*Lagerstroemia Indica L*) until the solution changes color, titrated with 0.1 M NaOH solution until the color changes. Titration was carried out 3 times and recorded the volume of titer used was. For every addition of 2 mL of titer, the pH value of the mixture was measured using a pH meter until a color change occurred. Repeat the titration by replacing the flower extract with a phenolphthalein indicator as a comparison (Riswanto & Aminah, 2020).

A weak base-strong acid titration

20 mL of 0.1 M NH_4OH solution was put into an Erlenmeyer. Then added 5 drops of extract of local cherry blossoms or small bungur (*Lagerstroemia Indica L*) and titrated with 0.1 M HCl solution until a color change occurs. The titration was carried out 3 times. The volume of titer used was recorded. For every addition of 2 mL of titer used, the pH value was measured using a pH meter until a color change occurred. Then the titration is repeated by replacing the local cherry blossom extract with methyl orange as a comparison indicator (Riswanto & Aminah, 2020).

Results and Discussion

Local cherry blossom extraction

The extraction of local cherry blossoms as an acid-base indicator is shown in the following **Figure1.**

Figure 1. Local cherry blossom extract

Table 1 Extracted results of local cherry blossoms

No	Treatment	Color
1	10 grams of local cherry blossoms + 100 mL of methanol	Brownish Yellow

Extraction of local cherry blossoms uses extraction by maceration method based on the solubility properties of the components in the solvent used, the reason for choosing this maceration method is because this maceration extraction method is quite simple and allows many compounds to be extracted because it does not use heat (Iswandi, 2022). The choice of methanol as a solvent is based on the polar nature of methanol which can dissolve flavonoid compounds that are also polar, including anthocyanins. The advantage of the extraction process using the maceration method is that the way of working and the equipment used are simple and do not require heating so there is little possibility of natural ingredients becoming damaged and decomposed. Data from the extraction of local cherry blossoms in **Figure 1** shows that the extract obtained is brownish-yellow. This can be an indication that local cherry blossoms contain anthocyanins, which are pigments that play a role in giving color to flowers, fruit, and leaves in plants (Priska et al., 2018).

Anthocyanin Qualitative Test Results

The results of qualitative testing of anthocyanins of local cherry blossom extract are shown in **Figure 2** and **Table 2.**

Figure 2. Anthocyanin qualitative test

Table 2. Qualitative test results of anthocyanin

No	Treatment	Color
1	Tube I 10 mL Extract + HCl 2 M is heated for 5 minutes	Red
2	Tube II 10 mL Extract + NaOH 2M	Dark green

extracts of local cherry blossoms

This qualitative test aims to test whether a plant contains anthocyanin compounds or not. The data on the qualitative test results of anthocyanins from local cherry blossom extract can be seen in **Figure 2** in the tube I, the results obtained are a red solution. While in tube II the results obtained a dark green solution. The color change indicates a positive test for the presence of anthocyanins in the sample. The ability to change the color that occurs in BSL (Local Chery Blossoms) extract is due to the presence of anthocyanins which in its structure contain flavium cations (red), which can change the shape of the structure by the influence of pH, the higher the pH, the structure changes to the anhydrous base which can expand delocal bonds, thus causing changes in the color with the stronger intensity becomes green or blue. Anthocyanin test is positive if NaOH solution is added if a green-blue color appears which fades slowly (Ekasari, 2020; Ifadah, 2021). The reaction that occurs in anthocyanins meets HCl and NaOH is shown in **Figure 3.**

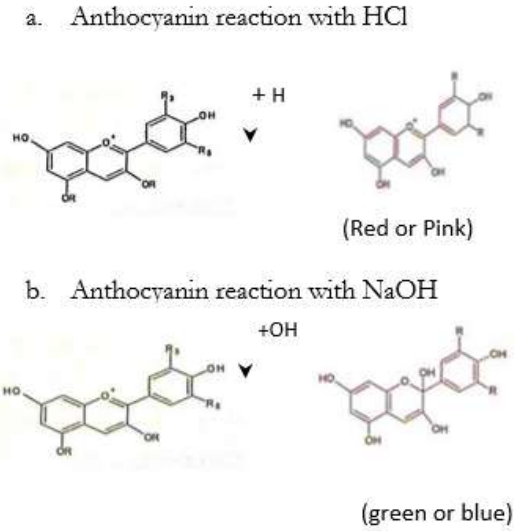


Figure 3 Anthocyanin reaction with HCl and NaOH **(Afandy et al., 2017)**

Color test results data of local cherry blossom extract indicators in acid-base solutions

The results of testing the color indicators of local cherry blossom extracts in an acid-base solution are shown in **Figure 4.**

Figure 4. Color indicator extract of local cherry blossoms in acid-base solution

The local cherry blossom extract tested using this acid and alkaline solvent resulted in a clear color change. The solvents used were a strong acid (HCl 0.1 M), a strong base (NaOH 0.1 M), a weak acid (CH3COOH 0.1 M), and a weak base (NH4OH 0.1 M). The results of testing local cherry blossom extract in an acid-base solution can be seen in **Figure 3** as seen in the local cherry blossom extract tested in 0.1 M HCl solution which is pink because of the structure containing the red flavium cation, 0.1 M NaOH solution a dark green because there is

a change in the structure to an anhydrous base which can lead to an expansion of the delocal bond which is stronger in intensity so that there is a color change, and a 0.1 M CH3COOH solution is pale pink, the color becomes pale due to the increase in pH and 0.1 M NH4OH solution is light green. The ability to change the color of local cherry blossom extract in acidic and alkaline conditions can be caused by the presence of anthocyanins (Wati & Hasby, 2020). According to Yusuf et al. (2021) Anthocyanins are red or purple in acid, while at alkaline pH they are green or yellow. Anthocyanins are amphoteric compounds that can react both with acids and bases (Puspitasari et al., 2022).

Color test result data of local cherry blossom extract indicator in buffer solution pH 1-12

The results of testing the color indicators of local cherry blossom extract in a buffer solution are shown in **Figure 5**.

Figure 5. Color of local cherry blossom indicator extract in buffer solution

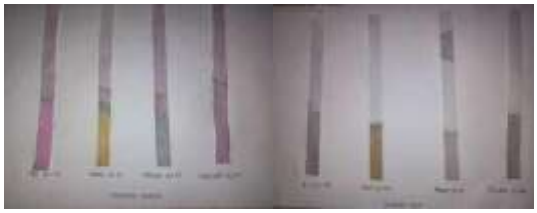
A buffer solution is a solution that can buffer (maintain) its pH from the addition of acids, bases, or dilution of water. The pH of the buffer solution does not change (constantly) after the addition of a certain amount of acid, base, or water. Buffer solutions can neutralize the addition of acids or bases from the outside. Testing of local cherry blossom indicator extract in a pH 1-12 buffer solution aims to determine the pH trajectory of the indicator by dripping local cherry blossom extract in a pH 1-12 buffer solution. The color changes that occur in the use of local cherry blossom extract will be used as a reference for the use of indicators in acid-base titrations.

The results of testing local cherry blossom extract using a buffer solution of pH 1-12 can be seen in **Figure 5**. The results obtained can be an indication that local cherry blossom extract can be used to determine the pH value. Color changes that occur in various pH ranges are caused by the presence of anthocyanins. At pH 1-4, it is pink because of the presence of flavilium cations. With increasing pH, the color becomes pale so that it is colorless in line with the formation of a pseudo base seen at pH 5-7, the higher the pH, the structure changes to an anhydrous base which can expand delocal bonds, thus causing a stronger color change, the intensity becomes blue or blue. green is seen at pH 8-12 (Ekasari, 2020).

Based on the results obtained, local cherry blossoms can be used as natural indicators based on the presence of color changes at each change in pH. The occurrence of color changes in various pH ranges is caused by the main content of the dye in local cherry blossoms in the form of anthocyanin compounds. Anthocyanins are more stable in acidic media at low pH, especially strong acids than using alkaline or neutral solutions.

Test result data for a paper color indicator of local cherry blossom extract in acid-base solutions

The results of testing the color of local cherry blossom extract indicator paper in an acid-base solution are shown in **Figure 6**.



(a) **(b)**

Figure 6. Color indicator paper of local cherry blossom extract in acid-base solution (a) filter paper (b) HVS paper

The test results of local cherry blossom extract indicator paper in an acid-base solution can be seen in **Figure 6**. The local cherry blossom extract indicator paper used in this test is divided into two, namely filter paper and HVS paper. The color of the local cherry blossom extract indicator paper using filter paper was tested in a bright pink solution of strong acid (HCl 0.1 M) because anthocyanins are stable at low pH, namely acidic pH, a strong base (NaOH 0.1 M) is yellow due to pH. The anthocyanins lose their stability as the pH increases to become alkaline, the weak acid (CH_3COOH 0.1 M) is pale pink because the pH is increasing towards the base so that it will lose its color or from pink to pale pink and a weak base, (NH_4OH 0.1 M) is light green because it has been at an alkaline pH. While the color of the local cherry blossom extract indicator paper using HVS paper was tested in a pink solution of strong acid (HCl 0.1 M) because anthocyanins are stable at low pH, namely acidic pH, a strong base (NaOH 0.1 M) is yellow due to pH. The anthocyanins lose their stability as the pH increases to become alkaline, the weak acid (CH_3COOH 0.1 M) is pale pink because the pH is increasing towards the base so it will lose its color and the weak base (NH_4OH 0.1 M) is light green. pale because it has been at an alkaline pH. It can be seen that the indicator paper of local cherry blossom extract using filter paper is better at giving changes /differences in color gradation in each solution than HVS paper (Ekasari, 2020).

Test results data for paper color indicators of local cherry blossom extract in buffer solution pH 1-12

The purpose of testing local cherry blossom extract indicator paper in a buffer solution of pH 1-12 is to determine the pH trajectory of the indicator paper. The results in **Figure 7** show that a buffer solution of pH 1-12, local cherry blossom extract indicator paper using filter paper gives various color changes, namely pH 1-4, is pink due to the presence of flavilium cations which in this condition anthocyanins are in a stable state, buffer solution pH 5-7 is green because the pH is increasing and anthocyanins will lose their stability so that the color turns green, the pH 8-12 solution is yellow because it undergoes hydrolysis in the glycosidic bond and the aglycone ring opens, thus forming various labile aglycones so that the color becomes yellow.

(a) (b)

Figure 7 Color of local cherry blossom extract indicator paper in buffer solution (a) filter paper (b) HVS paper.

While the local cherry blossom indicator paper using HVS paper gives various color changes in the form of a pink pH 1 solution. The pH 2-3 buffer solution is pale pink, the pH 5-7 buffer solution is colorless, the pH 8-10 buffer solution is yellowish green, and the pH 11-12 buffer solution is yellow. The results obtained can be an indication that local cherry blossom extract indicator paper using filter paper is better than HVS and can be an indication to be used to determine the pH trajectory value (Priska et al., 2018).

Test results on acid-base titration

Titration of strong acids and strong bases

Data from the titration of a strong acid (0.1 M HCl) with a strong base (0.1 M NaOH). Before the titration is carried out, standardization is carried out first a solution needs to be standardized to obtain a definite concentration of the solution. the results of standardization of NaOH solution with oxalic acid data on three repetitions of standardization with the volume of oxalic acid at 10 mL each and the volume of NaOH being 18.2 mL, 18 mL, and 17 mL, with a color change from colorless to purple.

The results of 20 mL titration in each solution with the kalpataru flower extract indicator and phenolphthalein indicator are presented in **Tables 3** and **4**. Data from observations of titration of strong acid (HCl 0.1 M) and strong base (NaOH 0.1 M) can be seen in **Tables 3** and **4** showing the results of titration of strong acid – a strong base from local cherry blossoms, the indicator used as The comparison in a strong acid–strong base titration is the phenolphthalein indicator. Based on these observations, using the indicator of local cherry blossom extract, the endpoint of the titration obtained was the addition of 20 ml of 0.1 M NaOH with an average pH of 7.0 and the color change that occurred from pink to colorless at the endpoint. titration.

Table 3. Data from titration of 20 mL HCl and NaOH with BSL (local cherry blossoms) extract an indicator

No	The volume of NaOH (mL)	pH Titration			average pH	Discoloration
		1	2	3		
1.	0	1.03	1.04	1.03	1.03	Pink
2.	2	1.10	1.09	1.11	1.10	Pink
3.	4	1.25	1.27	1.26	1.26	Pink
4.	6	1.39	1.35	1.39	1.39	Pink
5.	8	1.40	1.39	1.40	1.40	Pink
6.	10	1.45	1.45	1.43	1.45	Pink
7.	12	1.50	1.56	1.55	1.55	Pink
8.	14	1.68	1.69	1.67	1.68	Pink
9.	16	2.09	2.10	2.12	2.10	Pink
10.	18	5.01	5.02	5.03	5.02	Pink
11.	20	7.00	7.01	7.00	7.0	Colorless
12.	22	10.55	10.50	10.52	10.52	Colorless

Paint: HCl concentration 0.0959 M and NaOH 0.112 M

The comparison indicator used is the phenolphthalein indicator, the endpoint of the titration obtained is the addition of 20 mL of 0.1 M NaOH with an average pH of 7.01 and the color change that occurs from colorless to purple. Based on this, it is proven that the pH range of color change of local cherry blossom extract is still in the range of changes in the pH of the phenolphthalein indicator.

The results of using local cherry blossom extract and phenolphthalein indicator as a comparison can be seen in the curve in **Figure 8**. In

Figure 8 the strong acid-base titration curve using local cherry blossom extract with phenolphthalein indicator as a comparison, that in the addition of NaOH solution 0 .1 M from a volume of 0 mL to a volume of 22 mL, the two curve lines are not much different and tend to coincide which indicates that the pH values obtained from the two indicators are not much different. This indicates that the use of local cherry blossom extract indicators can be used for titration of strong acids and strong bases.

Table 4. Data from titration of 20 mL HCl and NaOH with phenolphthalein indicator

No	The volume of NaOH (mL)	pH Titration			average pH	Discoloration
		1	2	3		
1.	0	1.08	1.08	1.07	1.08	Colorless
2.	2	1.10	1.11	1.11	1.11	Colorless
3.	4	1.27	1.27	1.26	1.27	Colorless
4.	6	1.41	1.45	1.41	1.41	Colorless
5.	8	1.51	1.50	1.52	1.51	Colorless
6.	10	1.52	1.51	1.52	1.52	Colorless
7.	12	1.64	1.62	1.62	1.62	Colorless
8.	14	1.66	1.68	1.68	1.68	Colorless
9.	16	2.00	2.05	2.03	2.03	Colorless
10.	18	5.03	5.02	5.03	5.03	Colorless
11.	20	7.01	7.00	7.01	7.01	Purple
12.	22	10.51	10.50	10.50	10.50	Purple

Paint: HCl concentration 0.0959 M and NaOH 0.112 M

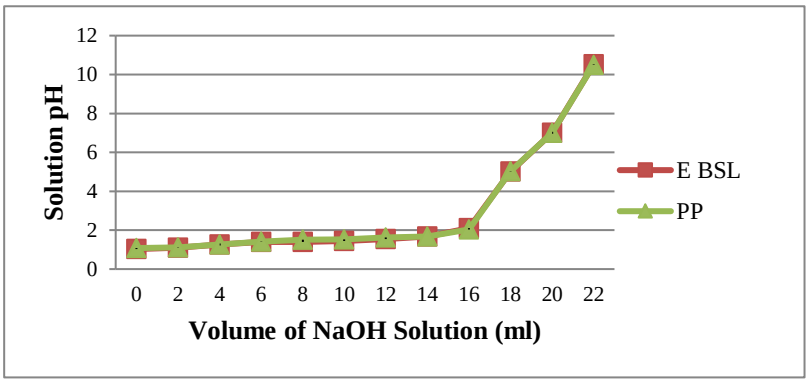


Figure 8. Titration Curves of Strong Acids and Strong Bases

Titration of Weak Acid and Strong Base

Data from the titration of a weak acid (CH_3COOH 0.1 M) with a strong base (NaOH 0.1 M). Before the titration, the CH_3COOH solution is titrated first Data on the results of standardization of CH_3COOH solution with NaOH. The results were obtained in 3 repetitions with each volume of CH_3COOH as much as 10 mL and NaOH 16.8 mL, 16.8 mL, and 16.7 respectively. mL with a color change range from colorless to purple.

The results of 20 mL titration in each solution with local cherry blossom extract indicator and phenolphthalein indicator are presented in **Tables 5** and **6.**

The data from the observations of the titration of a weak acid (CH3COOH 0.1 M) and a strong base (NaOH 0.1 M) can be seen in **Tables 14** and **15** based on these observations, for the use of local cherry blossom extract, the endpoint of the titration obtained on the addition of 22 mL 0.1 M NaOH with an average pH of 7.14 and a color change that occurs from pink to yellow at the end point of the titration. The comparison indicator used was the phenolphthalein indicator, the endpoint of the titration was obtained by adding 22 mL of 0.1 M NaOH with an average pH of 7.16 and the color change that occurred from colorless to purple. The results of observations of local cherry blossom extract and phenolphthalein indicator as a comparison can be seen in the curve shown in **Figure 9.**

In **Figure 9** the titration curve of a weak acid and a strong base using a local cherry blossom indicator with a comparison indicator namely phenolphthalein indicator, that in the addition of NaOH solution 0, 1 M from a volume of 0 mL to 22 mL, the two curve lines are not much different and tend to coincide which indicates that the pH values obtained from the two indicators are not much different. This indicates that the use of local cherry blossom extract indicators can be used for titration of strong acids and strong bases.

Table 5. Data from the titration of 20 ml of CH_3COOH and NaOH with BSL (local cherry blossoms) extract an indicator

No	The volume of NaOH (mL)	pH Titration			average pH	Discoloration
		1	2	3		
1.	0	1.13	1.13	1.15	1.13	Pink
2.	2	2.82	2.81	2.82	2.82	Pink
3.	4	3.52	3.52	3.53	3.52	Colorless
4.	6	3.68	3.68	3.70	3.68	Colorless
5.	8	3.82	3.83	3.81	3.82	Colorless
6.	10	3.96	3.95	3.97	3.95	Colorless
7.	12	4.06	4.07	4.09	4.07	Colorless
8.	14	4.20	4.18	4.20	4.20	Colorless
9.	16	4.35	4.38	4.39	4.38	Colorless
10.	18	4.61	4.65	4.66	4.65	Colorless
11.	20	5.45	5.46	5.44	5.45	Colorless
12.	22	7.12	7.14	7.15	7.14	Yellow
13.	24	10.17	10.17	10.16	10.17	Yellow

Paint: Concentration of CH_3COOH 0.187 M and NaOH 0.112 M

Table 6. Data from titration of 20 ml CH_3COOH and NaOH with phenolphthalein indicator

No	The volume of NaOH (mL)	pH Titration			average pH	Discoloration
		1	2	3		
1.	0	1.15	1.14	1.15	1.15	Colorless
2.	2	2.86	2.85	2.86	2.86	Colorless
3.	4	3.50	3.51	3.50	3.50	Colorless
4.	6	3.65	3.64	3.66	3.65	Colorless
5.	8	3.80	3.81	3.80	3.80	Colorless
6.	10	3.93	3.92	3.94	3.93	Colorless
7.	12	4.07	4.06	4.05	4.06	Colorless
8.	14	4.19	4.18	4.17	4.18	Colorless
9.	16	4.36	4.39	4.39	4.39	Colorless
10.	18	4.66	4.67	4.65	4.66	Colorless
11.	20	5.46	5.47	5.48	5.47	Colorless
12.	22	7.17	7.16	7.15	7.16	Purple
13.	24	10.17	10.16	10.15	10.16	Purple

Paint: Concentration of CH_3COOH 0.187 M and NaOH 0.112 M

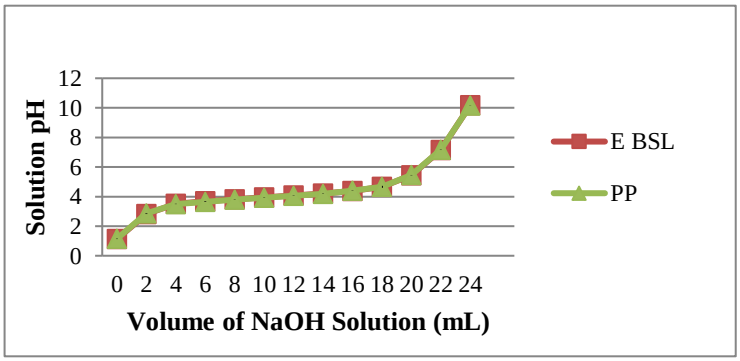


Figure 9. Weak acid and strong base titration curve

Titration of a weak base and strong acid

Data from the titration of a weak base (NH4OH 0.1 M) with a strong acid (HCl 0.1 M). Before the titration is carried out, the solution is standardized first, data on the results of standardization of NH4OH solution with HCl the results obtained in 3 repetitions with each volume

of NH_4OH 10 ml and HCl 4 ml, 4.2 ml and 4 ml with a color change range from yellow to red.
The results of 20 mL titration in each solution with local cherry blossom extract indicator and phenolphthalein indicator are presented in **Tables 7** and **8.**

Table 7. Data from titration of 20 mL NH_4OH and HCl with BSL (local cherry blossoms) extract an indicator

No	The volume of NaOH (mL)	pH Titration			average pH	Discoloration
		1	2	3		
1.	0	8.82	8.83	8.81	8.82	Green
2.	2	8.40	8.45	8.41	8.41	Green
3.	4	7.90	7.96	7.95	7.95	Green
4.	6	7.02	7.03	7.06	7.03	Green
5.	8	5.50	5.50	5.53	5.50	Green
6.	10	3.34	3.35	3.33	3.33	Orange
7.	12	2.87	2.86	2.88	2.86	Orange

Paint: Concentration of NH_4OH 0.1168 M and HCl 0.0959 M

Table 8. Data on titration of 20 mL of NH_4OH and HCl with methyl orange (MO) indicator

No	The volume of NaOH (mL)	pH Titration			average pH	Discoloration
		1	2	3		
1.	0	8.84	8.83	8.83	8.83	Orange
2.	2	8.40	8.40	8.41	8.40	Orange
3.	4	7.98	7.96	7.97	7.97	Orange
4.	6	7.02	7.01	7.02	7.02	Orange
5.	8	5.48	5.50	5.49	5.49	Orange
6.	10	3.32	3.31	3.32	3.32	Red
7.	12	2.85	2.83	2.84	2.84	Red

Paint: Concentration of NH_4OH 0.1168 M and HCl 0.0959 M

Data from the observations of the titration of a weak base (NH4OH 0.1 M) and a strong acid (HCl 0.1 M) can be seen in **Tables 7** and **8**. HCl 0.1 with an average pH of 3.33 and a color change occurred from green to orange at the end point of the titration. The comparison indicator used is the methyl orange indicator, the endpoint of the titration obtained at the addition of 10 mL with an average pH of 3.32 and the color change that occurs from orange to red. The indicator methyl orange is an acid-base indicator that is red in acidic conditions and orange in alkaline conditions. In theory, the pH range of the methyl orange indicator is in the range of 3.1 - 4.4 (Day & Underwood, 2002).

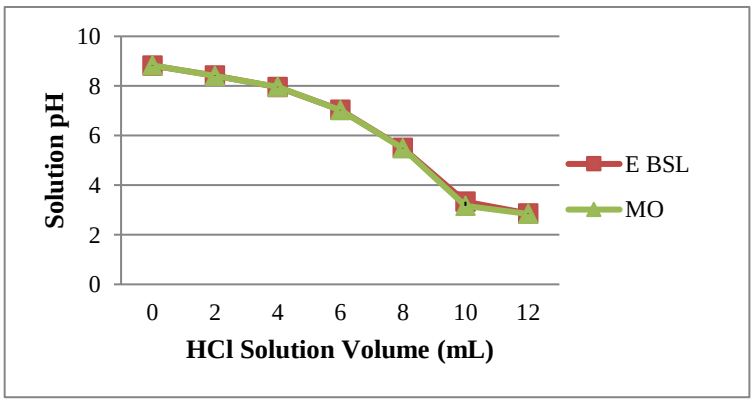


Figure 10. Weak base and strong acid titration curves

It proves that the pH range of local cherry blossom color changes is still in the range of changes in the pH of the methyl orange indicator. The results of observations of local cherry blossom extract and methyl orange indicator as a comparison can be seen in the curve in **Figure 10**. In **Figure 10** the titration curve of a weak base and a strong acid using local cherry blossom extract with methyl orange indicator as a comparison, that in the addition of HCl solution 0.1 M from a volume of 0 mL to 12 mL, the two curve lines are not much different and tend to coincide which indicates that the pH values obtained from the two indicators are not much different. This indicates that the use of

local cherry blossom extract indicators can be used for the titration of weak bases and strong acids.

Conclusions

Based on the results obtained in the study of local cherry blossoms (*Lagerstroemia indica L*) the following conclusions can be drawn: Extracts of local cherry blossoms can be used as alternative acid-base indicator extracts and paper, Types of acid-base titration suitable for use of flower extract indicators Sakura local precisely in the titration of strong acids - strong bases and weak acids - a strong base is good to use as a substitute for phenolphthalein indicator while in the titration of a weak base - a strong acid is good to use instead of methyl orange. With the pH range for phenolphthalein is 8-11 and the pH range for methyl orange at 3-4, the stability of local cherry blossom extract indicator paper on filter paper can be used for a maximum of 25 days while the stability of HVS paper can only be used for 1 day.

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