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ECO-FRIENDLY NATURAL FLOWER EXTRACT AS AN ORGANIC ACID BASE TITRATION INDICATOR

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ABSTRACT

Chemicals that serve as indicators are crucial. Therefore, synthetic indicators have traditionally been the best choice for all kinds of acid-base titration. Because they exhibit a distinct color shift at pH intervals in all kinds of titrations. However, an endeavor must be made to replace synthetic indication with natural indicator due to some drawbacks, such as high cost, availability challenges, lengthy and complicated synthesis, toxic waste products, and environmental concerns. Hibiscus, Rose, and Butterfly pea anthocyanin color pigment were made by macerating flowers. The quantitative amount of color pigment was measured using a UV-visible spectrophotometer.

KEYWORDS: pH indicator, natural pigments, titrations, Anthocyanin, Hibiscus, Rose, and Butterfly pea.

INTRODUCTION

Acid-base indicators are chemicals that measure the concentrations of acid and base. This indicator will change color at specific pH levels. Because of the titration process, this indicator can be used to show the concentration of base and acidic hydrogen ions. Acid base indicators are commonly used to identify the current pH of the medium or to highlight the equivalence point of acid base titration. Indicators are colors or pigments that can be derived from a variety of sources, including algae, fungi, and plants. This capability allows it to be utilized as a green indicator rather than a more conventional synthetic indicator such as phenolphthalein, which has a chemical basis and could be detrimental to human health (Verma, 2019). Methanolic extract from the flowers of Targets Erecta, Dianthus Plumaris, Antirrhinum Majus, Morus Alba, Rosa Indica, Hibiscus Rosa Sinesis, and other plants has been effectively developed by several scientists. The aqueous extract of the flowers of Dendrobium Sp. and Hippeastrum Puniceum was utilized in this work as a natural and efficient indicator for acid-base titration. Orchids belong to the Orchidaceae family, which is a vast and varied group of flowering plants with often vivid and fragrant blooms. The genus Dendrobium, which is mostly made up of epiphytic and lithophytic orchids, belongs to the family Orchidaceae. The flowers petals are usually 3–5 cm wide and curve backward. The forward-extending petal is called the labellum, and it contains three lobes (Pimpodkar, 2014). The dry climate of the Australian outback and the great altitude of the Himalayan Mountains are only two of the many environments to which orchids have adapted. They come from either China or Japan. Hippeastrum puniceum is a bulbous perennial that originated in the tropical regions of South America but has now naturalized. It is a member of the Amaryllidaceae family. A plant's leaves are all bright green, strap-shaped 30–60 cm long by 2.5–3 cm wide, and tapering to a sharp apex at the end. Each plant has four to six leaves. The bottoms of the orange-red petals are paler. Almost all red, blue, or purple flowers contain anthocyanin, a type of organic pigment that can change color with pH.4. A variety of naturally occurring colored materials, such as grape juice, brown tea, and other flower pigments, change color in response to the acidity or alkalinity of their surroundings. We refer to these compounds as acid-base indicators (Rosa, 2010). The majority of indicators in use today are artificial. Because synthetic indicators have certain disadvantages, such as high cost, availability, and chemical contamination, natural indicators derived from various plant parts, such as flowers, fruits, and leaves, will be more beneficial. In addition to negative effects on users such Diarrhea, Pulmonary edema, Hypoglycemia, and Pancreatitis, some of these synthetic indicators can also result in environmental pollution, gastrointestinal distress, skin rash, eruptions, erythema, and epidermal necrosis. These explanations for the detrimental effects of synthetic indicators have increased interest in finding alternatives. These plant-based substitutes are most likely more affordable, easily accessible, less hazardous to consumers, and environmentally benign (Bhise, 2014).

Because the flower extracts and prepared indicators were more stable than those of other flowers, Hibiscus, rose, and Butterfly pea were chosen for study was shown in Figure 1.

Figure 1: Photographs of Hibiscus, Rose, and Butterfly pea flower.

MATERIALS AND METHODS

In April, Hibiscus, Rose, and Butterfly pea flowers were gathered from the Botanical Garden of ours Pemraj Sarda College, Ahilyanagar. From the temple rubbish, white and purple orchids were gathered. The Chemistry Department of Pemraj Sarda College, Ahilyanagar verifies each flower's validity.

Glassware and Reagents provided analytical grade reagents, which were successfully used in the investigation. A clean and uniform set of glassware was used during the entire experiment. The volumetric solutions and reagents were made in accordance with the Indian Pharmacopoeia.

Preparation of Flower Extract

To create concentrated extract, flower petals were crushed in a mortar and then put into a conical flask with 100 ml of water. This was followed by the extraction process known as maceration. After that, each extract was stored out of direct sunlight in a firmly sealed container (Ikoku, 2014).

Techniques

Using Color Changes to Determine pH By Test-tubes

Fill two test tubes with a few drops of each of the acidic and basic solutions, and then add a few drops of the produced extract to each test tube. Then, look for a change in color. Results are displayed in Figure 2 and Table No. 1, (Jaspreet, 2011).

Figure 2: Color Changes by pH.

By pH paper

After rubbing the flower petals onto paper strips and letting them dry for a few minutes at room temperature, add a few drops of base and acid to the strips. Table 1 and Figure 2 presented the findings.

Table 1: pH Determination.

Flower	**Colour Change (By pH paper)**	**Observations**
Hibiscus Flower	Acidic: Colourless Basic: Green	HCl: Colourless NaOH: Green
Rose Flower	Acidic: Orange Basic: Yellow	HCl: Pink NaOH: Yellow
Butterfly Pea Flower	Acidic: Pink Basic: Yellow	HCl: Pink NaOH: Green

Stability Study

The extract was kept at a low temperature. The titration method was used to conduct the stability research. The stability study is monitored for a maximum of fifteen days. Table 2 displays the observation (Pathade, 2009).

Table 2: Stability Study.

Days	**Hibiscus**	**Rose**	**Butterfly Pea**
1	9.5	9.8	10.2
3	9.2	9.5	10.0
5	9.6	9.7	10.3
7	9.5	9.1	10.0
9	10.3	10.0	10.5
11	10.0	10.2	10.5
13	10.5	10.3	10.0
15	10.2	10.1	10.3

Detection of Anthocyanin

A 10 ml volumetric flask was filled with 1 ml of flower extract, 9 ml of pH 1 KCl solution, and then homogenized to determine the anthocyanin content using a differential pH.

The Anthocyanin extract was prepared by same procedure. Anthocyanin extract absorbance was measured and recorded at the maximum wavelengths of 500 and 700 nm., which is displayed in Figure 3, (Pradeep, 2013).

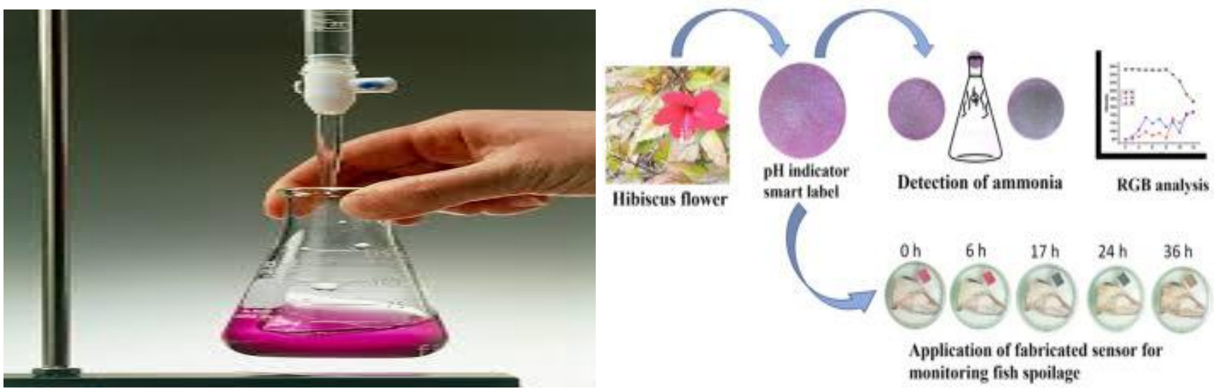

Figure 3: Detection of Anthocyanin.

As shown in Figures 4 and 5, as well as Tables 3 and 4, the study's findings showed that the equivalence points of acid-base titrations using each distinct flower extract either coincided with or were almost as close to those of using standard phenolphthalein indicator. Each flower extract indicator produced a sharp color change at the equivalence point during titration. (Angriani, 2019).

Table 3: UV Absorbance Data of Hibiscus, Rose, Butterfly Pea.

Flower	λ max	Absorbance	
		KCl	Sodium Acetate
Hibiscus Flower	520 nm	0.01	0.017
	700 nm	0.005	0.01
Rose Flower	520 nm	0.01	0.015
	700 nm	0.002	0.02
Butterfly Pea Flower	520 nm	0.1	0.15
	700 nm	0.002	0.015

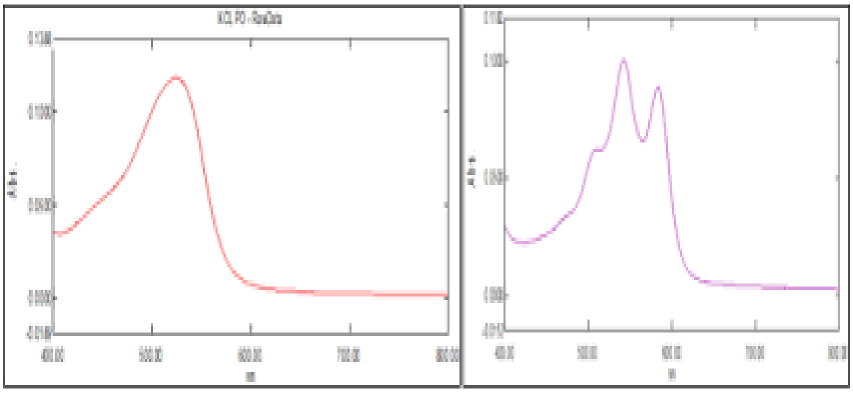

Figure 4: Spectra of Hibiscus flower in KCl and in Sodium Acetate.

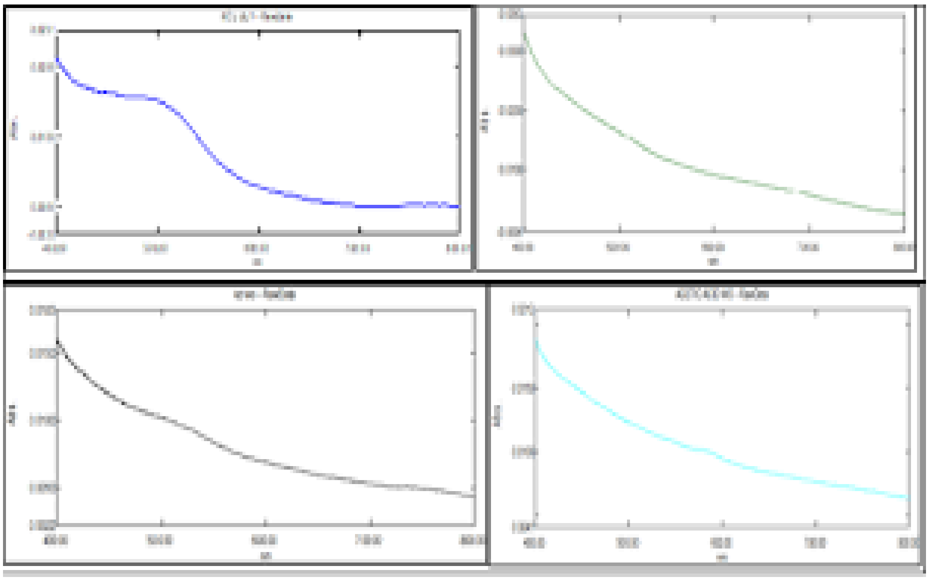

Figure 5: Spectra of Rose flower and Butterfly pea in KCl and in Sodium Acetate.

Table 4: Observation table of Titration Hibiscus, Rose, and Butterfly pea.

Phenolphthalein		Flower Extract	
Hibiscus Flower			
Initial	**Final**	**Initial**	**Final**
0.0 ml	9.5	0.0 ml	10.5
0.0 ml	9.7	0.0 ml	10.1
0.0 ml	9.8	0.0 ml	10.3
Mean	**9.7**	**Mean**	**10.3**
Rose Flower			
0.0 ml	9.5 ml	0.0 ml	9.0
0.0 ml	9.5 ml	0.0 ml	9.1
0.0 ml	9.4 ml	0.0 ml	9.0
Mean	**9.5 ml**	**Mean**	**9.0**

Butterfly Pea Flower			
0.0 ml	10.0	0.0 ml	9.5
0.0 ml	10.0	0.0 ml	9.5
0.0 ml	10.0	0.0 ml	9.3
Mean	**10.0**	**Mean**	**9.4**

CONCLUSION

The study discovered that each flower's aqueous extract from advantages, such as its ease of preparation, efficiency, and ability to yield precise and accurate results in line with green chemistry, make it a viable substitute for synthetic indicators.

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