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Possibilities of Applying Herbal Indicators in Titremetric Analysis

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ABSTRACT

Today as a result of environmental pollution as well as global economic crunch there became a growing need to utilize indigenous natural resources as materials in laboratory due to their environmental friendliness easy availability and lower price compared to the synthetic standard indicators. The paper therefore explores the possibility of using natural/herbal indicators as acid-base indicators the study aimed at investigating the suitability of Hibiscus rosa - sinensis and Rosa x damascene. The results showed that in strong-acid strong base titration all the extract under study are suitable and also show result of strong -acid weak-base. It was recommended that the use of these flower extracts as acid-base indicators should be incorporated in teaching of acid base titration especially in the secondary schools.

KEY WORDS: Hibiscus rosa – sinensis, Rosa x damascene, herbal indicators, extract, titration

I. INTRODUCTION

The aim of this study is to enhance the wealth of the traditional Indian medicinal system and to bring the use of flower pigments to the market. There are two major classes of flower pigments carotenoids and flavonoids. Carotenoids include pigments (which produce yellow, orange and red colour). Flavonoids include anthocyanin pigments (which produce red, purple, magenta and blue colours).[1]

Indicator are substance that reveals through characteristic colour changes, the degree of acidity or basicity of solution. They are weak organic acids or bases which exist in more than one structural form of which at least one form coloured.[2]

Intense colour is desirable so that very little indicator is needed. An acid base titration is to determine the concentration of acid or base by exactly neutralizing the acid and base with acid or base known concentration. This allows for connotative analysis of concentration of unknown acid or base solution.[3]

Anthocyanins can be extracted form multitude of coloured plant or plant parts, including from rose and hibiscus petals.

The flowers have five petals typically with frilled or pinked margin and are pale to dark yellow.

The rapid development of science and technology into the 21st century is affectively many aspects in life. Green chemical is closely related to how to overcome environmental factor.[4]

The contribution of approach is more directed to process and chemical product that are safer and environment friendly and also not dangerous of health.

Indicators that are usually used as commercial indicator diverted from synthesis of chemicals industry such as phenolphthalein and methyl orange, bromothymol blue and many others.[5]

Commercial indicators have some weakness that are expensive and have toxic effect they also cause environmental pollution. This is the reason more in trust finding alternative source of indicators comes from natural resources. These alternatives of indicator will be cheaper, more available and easier to extract, less toxic to user and environmental friendly.[6-10]

Therefore the idea to make acid base indicator derived from resource development by researchers using rose and rosella (Hibiscus).

The selection of these flowers is because they are easy to find around the house and traditional market are also at affordable price.

II. MATERIAL AND METHODS

Plant materials:

Fresh flowers of **Rosa x damascene** (sample A) and **Hibiscus rosa – sinensis** (sample

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B) was collected from our college herbal garden i.e **Apex Institute of Pharmacy**

Reagents and glassware's:

Analytical reagents like Hydrochloric acid (HCl), Sodium hydroxide (NaOH), Acetic acid (CH_3 COOH), Ammonium hydroxide (NH_4OH) and Nitric acid (HNO_3), Chloroform, n-Hexane, Phenolphthalein and Methyl red and same analytical glassware as per the reagent grade were made available from **Apex Institute of Pharmacy.**

Method

Preparation of Flower Extract:

Cleaned fresh flower petals of **Rosa x damascene** and **Hibiscus rosa – sinensis**and transferred into a 500ml beaker and added 90% of ethanol and HNO3 to produce the 50% of concentration of extract this was followed by maceration process.

Meceration

The petals were plucked from the flowers and cleaned with the help of distilled water. The petals were transferred into the beaker and macerated with Ethanol and HNO_3 individually each for 24h.[11-13]

The beaker was closely packed and stored away from sunlight. This process was continued for 3 days. After 3 days the extract was evaporated from its initial volume until the volume reaches 40-50% of volume.

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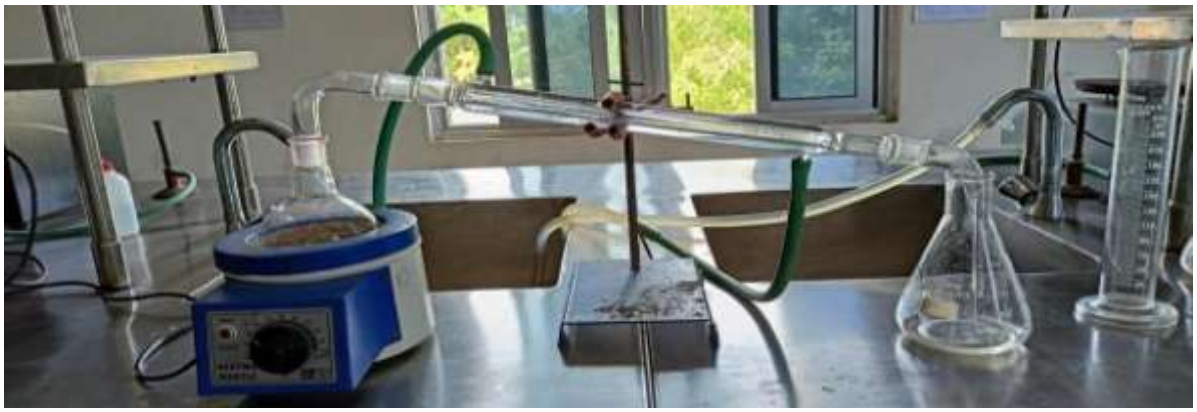
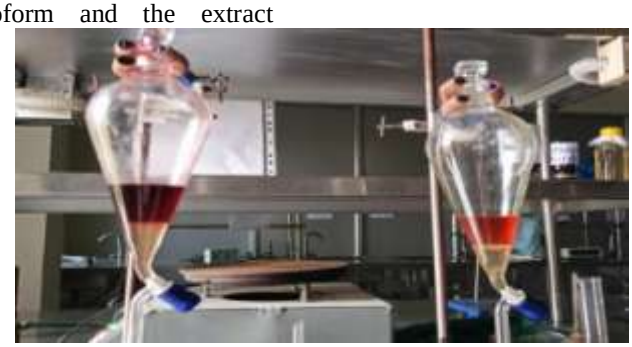


Then the resulted maceration extract was extracted by using n-hexane for the 3 times by using separating funnel and then continued with the extraction using chloroform and the extract collected was stored into tightly closed amber coloured container away from sunlight. Here our natural indicator is prepared.



Method 1:

By using the extract of rose and hibiscus we had tested on acid and base at different pH range. For this test we had used the strong and weak acid base HCl, NaOH, CH_3COOH, HNO_3 and Aniline and result were tabulated in table 1and table 2.

Method 2:

Taken 10 ml of analyte with 4 to 5 drops of each extract of **Rosa x damascene** and **Hibiscus rosa – sinensis as indicator** and titrated with titrates i.e strong acid-strong base (HCl – NaOH), strong acid-weak base (HCl – NH_4OH), weak acid-strong base (CH_3COOH – NaOH), weak acid-weak base (CH_3COOH – NH_4OH) and the colour changed for the indicators shown in Table 3 and table 4.

Titration of each extract was taken out for 3 times by using 0.1N of acid and base and the average value had recorded.

The above result of titration was being compared by carrying out titration of same acid and base by standard indicators like phenolphthalein and methyl red and the result were shown in table 5 and table 6.

III. RESULT AND DISCUSSIONS

We have tested the colour of Rosa x damascene and Hibiscus rosa – sinensis with different pH and the colour produced by them have been shown in following table1 and 2

Table 1: Colour produced by Rosa x damascene

REAGENT	pH	COLOUR
NaOH	13	Green
HCl	3.01	Yellowish green

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HNO_3	1.6	Light Green
Aniline	9.3	Ppt formed
CH_3 COOH	2.8	Blood red

Table 2: Colour produced by Hibiscus rosa – sinensis

REAGENT	pH	COLOUR
NaOH	13	Light yellow
HCl	3.01	Greenish yellow
HNO_3	1.6	Light green
Anniline	9.3	Ppt formed
CH_3 COOH	2.8	Green

After getting the result at different pH of reagents we came to know that ROSE and HIBISCUS shows the positive result.

Taken 10 ml of analyte with 4 to 5 drops of each extract of **Rosa x damascene** and **Hibiscus rosa – sinensis as indicator** and titrated with titrates and the colour changed for the indicators shown in Table 3 and table 4

Table 3: Titration result of Rosa x damascene as an indicator

Analyte	Indicator	Colour initial	Titrant	Colour observed
HCl	Rose	Pink	NaOH	Yellow
CH_3COOH	Rose	Pink	NaOH	Yellow
HCl	Rose	Pink	NH_4OH	Colourless
CH_3COOH	Rose	Pink	NH4OH	Light yellow

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Table 3: Titration result of Hibiscus rosa – sinensis as an indicator

Analyte	Indicator	Colour initial	Titrant	Colour observed
HCl	Hibiscus	Light yellow	NaoH	Yellow
CH3COOH	Hibiscus	Colourless	NaoH	Yellow
HCl	Hibiscus	Pale yellow	NH4OH	Light green
CH3COOH	Hibiscus	Colourless	NH4OH	Yellow

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Table 5: Titration result of standard indicator Phenolphthalein and compared with result of of Rosa x damascene and Hibiscus rosa – sinensis

Chemicals		**Volume to titrate equivalent to titrant (10) with indicator**		
Analyte 0.1N	**Titrant 0.1N**	**Std. Indicator PT**	**R.D Indicator**	**H.R indicator**
HCl	**NaoH**	10.5 ± 0.5	11.1 ± 0.5	12.2 ± 0.2
CH_3COOH	**NaOH**	17.5 ± 0.2	17.4 ± 0.1	18.6 ± 0.3
HCl	**NH_4OH**	8.02 ± 0.4	5.6 ± 0.1	6.5 ± 0.2
CH_3COOH	**NH_4OH**	9 ± 0.3	10.1 ± 0.4	9.5 ± 0.2

[Std. standard, PT- Phenolphthalein, R.D- Rosa x damascene, H.R- Hibiscus – sinensis]

Table 6: Titration result of standard indicator Methyl Red and compared with result of of Rosa x damascene and Hibiscus rosa – sinensis

Chemicals	**Volume to titrate equivalent to titrant (10) with indicator**

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Analyte 0.1N	Titrant 0.1N	Std. Indicator MR	R.D Indicator	H.R indicator
HCl	**NaoH**	10 ± 0.5	11.1 ± 0.5	12.2 ± 0.2
CH3COOH	**NaoH**	16.8 ± 0.4	17.4 ± 0.1	18.6 ± 0.3
HCl	**NH4OH**	4.5 ± 0.4	5.6 ± 0.1	6.5 ± 0.2
CH3COOH	**NH4OH**	6.3 ± 0.4	10.1 ± 0.4	9.5 ± 0.2

[Std. standard, MR- Methyl Red, R.D- Rosa x damascene, H.R- Hibiscus – sinensis]

The study proved that the equivalence point of acid-base titrations using extract of flowers are almost as same as the using standard phenolphthalein and methyl red indicators. Each hydro alcoholic extract indicator gave sharp colour change.[12-13]

Based on all the above results, the ethanolic extract of **Rosa x damascene and Hibiscus rosa – sinensis** are exactly coincided with standard indicator. For all type of titration the usefulness of alcoholic flower extract as pH indicator and as indicator in acid – base titration. The result in which we observed that routinely used indicator could be replaced successfully by the flower extract because they are accurate, precise and it is simple to prepared just before experiment. The natural indicator can be put forward to be used as substitute of synthetic indicator.

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