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ROSELLE CALYX (ZOBORODO) AS A SUBSTITUTE TO ORGANIC INDICATOR (METHYL ORANGE)

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ABSTRACT

Roselle calyx samples were dried, pulverized into powder and extracted with distilled water for 24 hours by maceration method. The acidity and alkalinity indicator properties of the extracts were tested with prepared acid and base solutions. The results showed colour change with all the samples. But titration using the samples as indicator shows that only the end points of the purple sample matched well with that obtained using conventional (methyl orange) indicator. The study recommends the use of the purple variety as substitute to standard indicator in volumetric analysis.

Keywords: Roselle Calyx, Indicator, Volumetric, Gravimetric

INTRODUCTION

Roselle plant is a native to the old world tropics, used for the production of baste fibre and as an infusion. It is annual or perennial herb or woody based shrubs, growing to 2-2.5m tall. The leaves are deeply lobed arranged alternatively on the stems. Flowers borne simply in the leaf axils and are up to 12.5cm wide, the typically calyx consist of five (5) large sepals. Fresh calyces are greenish and vary in colour at maturity, it usually appears purple, red and white, and the colour differences are due to genetic constitution and variety of the seeds. The calyx stems, and leaves are acidic and closely resemble cranberry in flavour (Mohammed, et al, 2002).

Hibiscus sabdariffa L. commonly named Roselle is a medicinal plant in the malvaceae family originated in Egypt. Its original name is 'Karkade' and via common names in different geographical locations. In Australia, Roselle calyx is called rosella or rosella fruit, zobo in western Nigeria, (Yoruba called the white variety 'Isapa' (pronounced 'Ishapa'). Zoborodo in Northern Nigeria, Chaye-torosh in Iran and Karkade in some other Arabic countries including Saudi Arabia and Sudan. Hibiscus is considered to be a tropical plant that grows annually. The plant has many different varieties of seeds around the world including India, Africa, Sudan, Jamaica, China, Philippines and the United States (Morton, 1978).

Roselle plant is considered to have great importance due to its edibility and other economic and medical value. The fibre may

be used as a substitute for juice in making burlap. It also used in folk medicine as a diuretic, mild laxative and treatment for cardiac nerve diseases and cancer. The leaves and fruits are claimed to be effective in controlling High blood pressure (Okonkwo and Josiah, 2010). Red calyces are widely used as food colouring, green leaves are used like a spicy and gives flavour in fish and rice dish. Lotion made from leaves used in treatment of sores and wounds. The seeds are used to be diuretic and tonic in action and the brownish-yellow seed oil is claimed to heal sores on camels (Perry, 1980).

Many plants or plant parts contains chemical from the naturally coloured anthocyanin family of compounds. This can be extracted from a multitude of coloured plant or plant parts including leaves (Red Cabbage), flowers (Poppy, Geranium and Roselle Calyx), Berries (blue berries, black currant) and also from the Stems (rhubarb). They usually produce colour in acid and base solution (Allen, 1939; Oloyede, 1997).

The most common method to get an idea about pH of solution is to use an acid-base indicator. An indicator is an organic compound used to point out the equilibrium of two or more reactants. Normally an indicator causes the colour change of reaction at different conditions. Many substances have been used as indicators to determine the equilibrium of reaction, the choice of indicator depends upon the strength of acids and base used. Most of the indicators are themselves weak acids. Many indicators behaves on the molecular level in a similar fashion (the details may be different), but the result is a change in electronic structure along with the removal of a hydrogen ion from the molecule. Plant pigments in flowers and leaves also behave in this fashion. The pigments show different (characteristic) colour change as the colour of Hydrogen and metallic ions change in solutions (Charles, and Ophardt, 2003). The utilization of natural dyes extracts as indicators in acid – base titration has been reported (Eze and Okereafo, 2002; Daworiye et al, 2006). In this study, the potential of Calyx as substitute of methyl orange indicator was investigated.

MATERIALS AND METHODS

All chemicals used were of analytical grade reagent unless stated otherwise. All glassware used was washed with detergent solution and rinsed with water and dried in an oven at 105^0C.

Sample collection and pre-treatment

Three varieties (viz, purple, red and white) of fresh calyces were obtained from Rimi market in Kano metropolis. The calyces were washed and dried in an oven for about 45-60 minutes at 105^0C. It was then grinded and sieved to obtain the powdered crystal. 4.0 gram was weighed and transferred into a beaker, 50cm^3 of distil water was added and allowed to macerate for 20-24 hours, the solution was filtered into a clean and dried levelled bottle. The procedure was repeated for all the varieties of Roselle calyces.

Testing the indicator properties of the samples

The filtrate of each sample was tested in acid and basic solution and the results were recorded (table 1). Two drops of the sample was added into 25cm^3 of 0.2M sodium hydroxide and titrated against 0.16M Hydrochloric acid solution. The procedure was repeated for each sample and the standard methyl orange indicator. The average titre values were recorded (table 1).

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RESULTS

Table 1: Samples colours in acids and bases and titration end-points.

S/NO	Sample	Extract Colour	Colour in Acid	Colour In Base	Titre Value (cm^3) Mean ± STD. DEV.
1	Purple	Purplish	Pinkish	Greenish	29.83 ± 0.15
2	Red	Reddish	Colourless	Colourless	Nil
3	White	Orange	Colourless	Colourless	Nil
4	Methyl orange	----------	Red	Yellow	29.63± 0.57

The results of the threeextract samples changes colour in acid and base solutions. The red and white calyces, turned to colourless in both acid and base solutions while purple sample changed to greenish as shown in Table 1. The colour change produced by the purple sample in acid and base solution implied that Roselle solutions can be used to detect acidity or alkalinity of solutions.

The results of the titration conducted involving $25cm^3$ of 0.2M sodium hydroxide (base) against 0.16M hydrochloric acid with three drops of each samples are shown in Table 1. The result showed no end point obtained with red and white sample of the extract. Because there was no colour change observed in both acid and base solutions. This suggests that aqueous extract of red and white sample of Roselle calyx cannot serve as a suitable indicator in acid – base titration. However, the purple sample changes colour from pinkish to greenish and the end point gave a comparable value with that of standard methyl orange indicator. This indicates the potential of purple Roselle calyx sample as a substituent of methyl orange indicator.

DISCUSSION

In general the colour changes of the samples shows the potential of the samples as indicators and confirmed the assertion that nearly all brightly coloured flowers (calyces) can be used as indicators (Oloyede, 1997).

The result of this study are similar to the observations reported on Flower extract as an improvised indicator in acid-base titration (Mahadi et al, 2012), Hibiscus flowers (Oleyede, 1997), catharantus roseus extract (Kokil, et al, 2007) and dyes from local plants (Daworiye, et al., 2006).

The findings therefore provide a means of improvising and equipping laboratory with practical instructional material (indicator) using the available plants around the environment.

It can be concluded from the results that aqoues extract of purple Roselle sample can serve as suitable indicator in acid – base titration, while red and white sample were found completely unsuitable. These findings therefore suggest the plausibility of using Roselle calyces as an alternative to organic indicator (methyl orange).

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