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FLOWER EXTRACT AS AN IMPROVISED INDICATOR IN ACID – BASE TITRATION

Mahadi D. Garba and S. Abubakar
Department of Chemistry, Federal College of Education (Tech), Bichi, Kano State.
mahdgar@yahoo.com

ABSTRACT

Different flowers were collected and the extracts were tested for indicator properties in acidic and basic solutions. The results showed different colour changes in alkaline and colourless in acid solutions. When used in acid-base titration, the end points colours and the average titre values obtained matched with that of standard phenolphthalein indicator. The finding indicates an alternative way of enriching laboratory practical with an instructional material that is useful, economical, simple and accurate for the said titration. Therefore, it is recommended for integrated science and chemistry instructions.
Keywords: *Flower, acid, base, indicator, titration.*

INTRODUCTION

In Nigeria, factors militating against science education are the increasing unavailability and high cost of conventional science teaching materials (Along, 1981 and Garba, 2001). This has threatened the potential for the increase in students' scientific knowledge for National development. The use of local materials has been the subject of cost oriented study by scientists over the years. Flower is one of such local (non-conventional) material that could be used in place of standard indicator in science (chemistry and integrated science) teaching.

Indicators are chemical substances added in small quantity to a solution to determine the acidity or alkalinity of the solutions. They reveal, through characteristics colour changes, the degree of acidity or basicity of solutions. Indicators are weak organic acids or bases that exist in more than one structural form (tautomers) of which at least one form is coloured (Kokil, et al., 2007). It changes colour, depending on the acidity or alkalinity of the solution.

Robert (1966) described indicators extracted from roses and other plant materials in a Book, ''the experimental history of colours'' published in 1966. It included the ability to turn plant juices red among the properties of acids. The possibilities listed were only a few of many. Extraction of acids, bases and indicators from locally available materials (Oloyede, 1997) and indicator from *Catharanthus roseus* flower (Kokil, et al., 2007) were reported. Any highly coloured fruit or vegetable or flower petal has the potential for use as acid base indicator (Oloyede, 1997).

In this study, the potential of some flowers as indicator in acid - base titration was assessed. The results of the study would enrich teaching and learning instruction in science, especially integrated science and chemistry. It would also enhance students' at understanding the diversity of the natural environment in science and motivate teachers' interest toward improvisation of teaching / learning materials.

MATERIALS AND METHODS

In the preparation, chemicals of analytical grade purity and distilled water were used. All glassware were washed with detergent, rinsed with water and dried in oven. The organic solvents were used without further purification.

Flowers collection

Six plants namely; flamboyant (*delonix regia*), Bougainvillea (*bougainvillea globra*), Oleander, Pumpkin and Chinese rose (*hibiscusrose senensis*), and Dutchman's pipe (*aristolochiaceae durior*) flowers were collected from the FCE (T), Bichi premises' and Department of biological sciences, Bayero University, Kano. The plants' identities were confirmed at FCE (T), Bichi and Botanical garden of Bayero University, Kano.

Extraction procedure

The fresh flower petals were separated from the whole flower and washed to remove dirt. About 5g of the petals were grounded in a mortar with a pestle, and then transferred into a beaker. 20cm^3 mixtures of ethanol and acetone in a ratio 1:1 was added and macerated carefully for about 5 minutes (Bajah, et al., 1988). The colour from the petals was in the solution as the extract. This was cooled and filtered into a clean, labeled bottle with a stopper. The procedure was repeated.

Testing the indicator properties of the Extracts

The filtrate (extract) of each flower was tested with acid and base solutions and the results recorded (Table 1).Three drops of the extract was added into 25cm^3 of 0.1M Sodium hydroxide and was titrated against 0.1M Hydrochloric acid solution. The procedure was repeated with each extract and standard phenolphthalein indicator. The average titre values were recorded (Table 1).

RESULTS AND DISCUSSION

The results of extracts colour changes in acid and base solutions, where all the extracts are colourless in the acid solution but different colours in the base (alkali) solution are as shown in Table 1. Since, the extracts produced colour changes; it implied that they can be used to detect acidity or alkalinity of solutions. It also revealed the potentials of flower extracts as indicator and confirmed the assertion that; nearly all brightly coloured flowers can be used as indicators (Oloyede, 1997).

The titration conducted with three drops of the extracts showed a colour change at each equivalent –piont (end-point). The endpoint colours were the same (colourless) for each extract (as the colour changed in acid) and the average titre values obtained matched with the commercial (standard) phenolphthalein indicator compared (Table 1). The results of this study are similar to the observations reported on *catharanthus roseus* extract (Kokil, et al., 2007) and *Hibiscus flowers* (Oloyede, 1997).

The findings therefore, indicate an alternative way of equipping laboratory with practical instructional material (indicator) using plants that are around or within the environment.

Table 1: Extracts colours in acids and bases and titrations results

S/N	Flower	Extract Colour	Colour in Acid	Colour in base	Mean ± std. dev. of the titre value (cm^3)
1	Bougainvillea	Reddish	Colourless	Greenish yellow	24.75±0.16
2	Oleander	yellowish	Colourless	Greenish yellow	24.60±0.32
3	Flamboyant	Reddish	Colourless	Orange red	24.70±0.23
4	Chinese rose	Reddish	Colourless	Orange red	24.55±0.21
5	Pumpkin	Yellowish	Colourless	Greenish yellow	24.65±0.18
6	Dutchman's pipe	Purplish	Colourless	Purplish brown	24.60±0.17
7	Phenolphthalein	_____	Colourless	Pink	24.70±0.14

CONCLUSION

It can be concluded that, the flower extracts showed different colour changes in acid and base solutions and their titration equivalent points (end-points) matched with standard indicator, it is plausible to suggest plants flowers as alternative source of indicator that is simple, useful, economical, and accurate for acid- base titration.

Therefore, teachers of chemistry and integrated science should exploit the importance of brightly coloured flowers within their environment to show the versatility of natural environment in science teaching.

The study also recommends the spectral interpretation of the flowers extracts should be carried out in order to ascertain their structures.

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