

Extraction of Malabar Spinach Fruit as Natural Acid-Base Indicator

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Abstract: Today synthetic indicators are the choice of acid-base titration. But due to environmental pollution, availability and cost, the search for natural compounds as an acid-base indicator was started. The present vocation highlights the exploit of Malabar Spinach extract of the fruits of plants as an acid-base indicator in titration. This natural indicator is easy to extract and non-toxic in nature. This investigation shows that the extract of Malabar spinach fruit as a natural indicator has great potential and shows promising results when compare to synthetic indicator. In the acid base titration this natural indicator gives sharp color change at equivalence point. According to all the evidence obtained after titrimetric analysis that natural indicator shows effective and accurate results as compare to synthetic indicator. The advantage of using natural indicator is that they can be prepared freshly, economical as well as ecofriendly.

Keywords: Malabar Spinach fruit extract, Acid-base titration, Natural Indicator.

I. INTRODUCTION

Literature survey revealed that, many researchers have conducted studies on isolation, separation [1-3] and characterization of compounds present in plants; they also studied the extractions procedures, optimization of extraction conditions to get pre and maximum yield of naturally occurring compounds form various parts of plants. Literature survey also shows that chemists are studying the medicinal [4-12] bacteriological and antioxidant [13] activities of the extracted compounds.

Fruit extract of Malabar spinach used as a natural indicator in acid base titration [14]. In this experiment, some of these indicators will be extracted and the change in color will be investigated. Many substances around us can be used as an indicator of acid and alkali. For example, leaf, flower, turmeric, etc. This is because the solution of these materials gives a different color on acid, alkali and neutral.

Origin of Malabar spinach is India and Indonesia and it naturally has grown in tropical Asia and tropical Africa [15]. Malabar spinach is extremely heat tolerant and fast-growing perennial vine which is widely cultivated as a cool-season vegetable. Fruits are fleshy, stalk- less, spherical and purple in colour. In India, it is commonly known as "poi" all over country, except hills. The plant is succulent, branched, smooth, twining and herbaceous vine reaching a length of several meters, the stems are green or purplish. The leaves are heart-shaped, 5 to 12 cm in length, stalked with a pointed tip [16].



Images of Malabar Spinach Fruits.

Malabar spinach has been used to cure various diseases, namely anticancer, antiviral, antioxidant, anti-inflammatory, anti-ulcer, anti-microbial, anti-hypoglycemic, wound healing from ancient times[17]. Malabar spinach is also rich in vitamins A, and C, and Iron and Calcium [18].

The present study reported the use of fruit extract of Malabar Spinach in acid base indicator acid-base titration. The equivalence point obtained by the fruit extract coincides with the equivalence point obtained by standard indicator.

IMPORTANCE OF MALABAR SPINACH AS INDICATOR:

Fruit extract of Malabar spinach is used as a natural indicator in acid-base titration to detect endpoint because of the sharp color occurring with the change in pH value. The original colour of the dye is violet and their pH value is 4.9 [19]. Anthocyanin are water-soluble pigments present in the Malabar Spinach extract. Its appearance is greatly dependent on its pH value. This characteristic of anthocyanin enables it to act as a natural pH indicator. Normally synthetic colorants used for acid base titration are hazardous to human beings and the environment while natural indicators are economical, simple, easily available and eco-friendly [20].

II. METHODOLOGY

PREPARATION OF FRUIT EXTRACT

Fresh fruits of Malabar spinach was obtained from garden. All the fruits were collected and cleaned separately with distilled water. The cleaned fruits were triturated with the help of mortar and pestle and the resulted mixture was filtered through muslin cloth and resulting extract used as a natural indicator in acid base titration. The extract can be converted into powder by drying the extract at room temperature in dark area. And the powder also can be used as indicator in acid-base titration. The extract of the fruit is stored in amber colour container at room temperature or in a cool place away from sunlight.

The titrant of 10ml with 2 or 3 drops of indicator of both natural and standard indicator (methyl red) was titrated against two pair of acid-base.(Na₂CO₃with H₂SO₄ and NH₄OH with HCl).

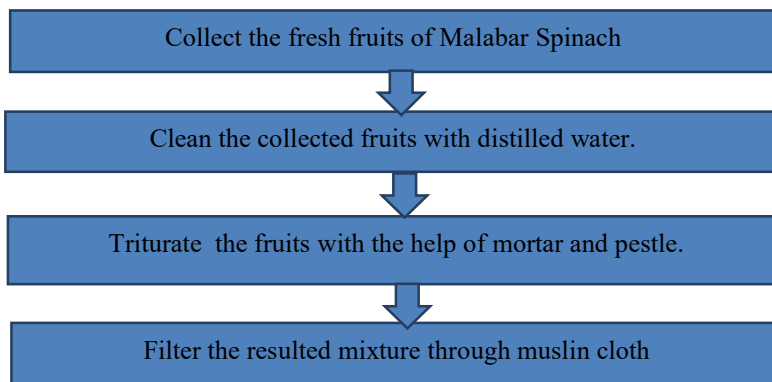


Table 1: - Color change in titration.

Titrant Titrate	Synthetic indicator	Colour change	Natural Indicator	Colour change
Na ₂ CO ₃ vs H ₂ SO ₄	Methyl Red	Yellow to Pink	MS extract	Blue to pink
NH ₄ OH vs HCl	Methyl Red	Orange to red	MS extract	Blue to pink

(MS= Malabar Spinach, MR= Methyl Red)

Table 2: - Acid base titration chart

S. No.	Indicator	Titration					
		Titrand volume in conical flask		Titrand (burette Reading)		ColourChange	
				Initial Reading	Final Reading		
Natural Indicator							
1.	MS extract	Na ₂ CO ₃	10 ml	H ₂ SO ₄	0.0 ml	5.2 ml	Blue to purple

		Na ₂ CO ₃	20 ml	H ₂ SO ₄	0.0 ml	10.4 ml	
2.	MS extract	NaOH	10 ml	HCl	0.0 ml	7.3 ml	Blue to purple
		NaOH	20 ml	HCl	0.0 ml	14.7 ml	
Synthetic Indicator							
1.	Methyl Red	Na ₂ CO ₃	10 ml	H ₂ SO ₄	0.0 ml	5.6	Yellow to pink
		Na ₂ CO ₃	20 ml	H ₂ SO ₄	0.0 ml	11.2	
2.	Methyl Red	NaOH	10 ml	HCl	0.0 ml	7.7	Orange to red
		NaOH	20 ml	HCl	0.0 ml	15.4	

III. RESULT AND DISCUSSION

The indicator was synthesized by using natural source and screened for acid base titration and the obtained results were compared with synthetic standard indicator i.e., Methyl Red. The end points of the completion of reaction using natural indicators were near to the ending titration results obtained by standard indicator. The result may also be accomplished that the natural indicator may suitable for utilization as acid base titration analysis. The end of the analysis or chemical reaction may basically denoted by changing the color which usually done by addition of indicator, the change in color shows end point of titrimetric analysis was due to presence of anthocyanin and other chemical constituents. The titrant and titrate with the indicator shows intense and sharp color change, which shows the end of titration. All the evidence shows that the naturally synthesized indicators are equally significant and effective as standard and other chemically synthesized indicator for acid base titrimetric analysis and the chemically synthesized indicators could be replaced successfully by the indicator which synthesized by using fruit extract. The fruit extract forms easily and the prepared indicator having some characteristics features like economical, nontoxic, not show any harmful effect on human and their surrounding environment, ecofriendly as well as the result obtained by natural indicator was as accurate as chemically synthetic indicators. In the observation we observed that, it is beneficial to use Malabar Spinach fruit extract in acid base titration because they showed sharp color change in end point of the titration. So we concluded that this may be because of the presence of anthocyanins. Anthocyanin which is mainly present in all colored flowers and in some fruits which may be is responsible for their color. So it is important for preparing a natural indicator that the fruit we choose be supposed to be colored, it means to presence of anthocyanin and other chemical constituents which provides color changing property in different medium (acid and base) to use it as a natural indicator.

IV. CONCLUSION

According to the results obtained from acid base titrimetric analysis, it was concluded that the color change produced by natural indicators which denote end point of the titrimetric analysis. We also concluded that the plant indicators (Malabar Spinach) which give positive results at end point can be substitute to synthetic indicators. The chemically synthesized indicators are toxic in nature and have hazardous characteristics which may create problem to human health and environment where as the indicator synthesized form fruit extract is more beneficial because of their economical feature, simplicity, easy to prepare, ecofriendly, nontoxic nature and provide accurate result.

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