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Comparative Analysis of Acid - Base Titrationby Using - Natural Indicators Vs Synthetic indicators

R.Kanmani*[1], K.L.Senthilkumar*[2], P.D Gokulan*[3], P.Roshini*[4], R.Sathish Kumar*[5], V.Sivani*[6]

*[1]*Assistant Professor, Sri Vijay Vidyalaya College of Pharmacy, Tamilnadu, India.*
*[2]*Principal, Sri Vijay Vidyalaya College of Pharmacy,Tamilnadu, India.*
*[3]*Professor, Sri Vijay Vidyalaya College of Pharmacy,Tamilnadu, India.*
*[4,5,6]*B.Pharm Students, Sri Vijay Vidyalaya College of Pharmacy, Tamilnadu, India.*

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ABSTRACT

Aim: The present study involves the comparative analysis of natural indicator with synthetic indicator by using acid- base titration method.

Method: The petals of globe amaranth flower and the peel of lemon fruit were collected .And crushed using mortar pestle then maceration done for 24 hours using a solvent of ethanol and methanol .the filtrate were collected by using a muslin cloth .the filtrate which was prepared can be used as indicator in acid base titration and then stored in brown colour ambered coloured bottle .

Conclusion: Incomparative analysis of natural indicator with synthetic using the pH meter ,Ph of indicator was idendified .by acid –base titration method equivalence point of the indicator was determined .wave legth and absorbance was detected by uv – spectroscopy.as we conclude that natural indicator was found to be eco –friendly and are at low cost .

Keywords: gomphrena globosa, citrus limon, ethanol extract, methanol extract, pH meter , acid-base titration ,UV –spectroscopy.

I. INTRODUCTION

Titration is an analytical method used to determine the concentration or amount of a known or unknown substance in labs for analytical chemistry and biomedical sciencesIn acid-base titrations, the chemical substances show an apparent change in color of the analyte and titrant responding combination in order to assess and ascertain the equivalence point. very close to the point in the continuing titration known as the indicator. At varying pH values,each indicator displays a distinct color range.Though there are many different types of titrations, the development of a mathematical titration model is explained and decided primarily using acid-base titration in our investigation.For a very long time, synthetic indicators have been the preferred option for all kinds of acidbase titrations. However, an effort must be made to substitute natural indicators for synthetic ones due to various drawbacks, such as high cost, availability issues, and environmental contamination. A common laboratory technique for quantitative chemical analysis is titration, also known as titrimetry, which is based on the amount of a standard solution liquid, titrant, or solution with a known concentration to change the constituent into a different form . The synthesized substances are far more expensive for both analytical and research work, and they are also extremely polluting, dangerous, and deadly. Because natural goods are less harmful, inexpensive, readily available, and environmentally benign, numerous scientists worldwide are conducting substantial study in this area.

These natural markers would be readily available, affordable, eco-friendly, less hazardous, and simple to make and extract.Most pH indicators may be caused by weak organic acids or bases that have a tendency to donate or absorbelectrons.

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II. PLANT PROFILE

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Globe Amaranth flower

TAXONOMY CLASSIFICATION:

- **Kingdom**: Plantae
- **Subkingdom**: Tracheobionta
- **Super division**: Spermatophyte
- **Division**: Magnoliophyta
- **Class**: Magnoliopsida
- **Subclass**: Caryophyllidae
- **Order**:Caryophyllales
- **Family**: Amaranthaceae
- **Genus**: Gomphrena L
- **Species**: globosa
- **Synonyms**: Globe Amaranth

Citrus limonum Pericarpium

TAXONOMY CLASSIFICATION:

- **Root:** root
- **Kingdom:** plantae
- **Phylum:** tracheophyta
- **Class:** magnoliopsida
- **Order:** sapindales
- **Family:** rutaceae
- **Genus:** citrus
- **Species:** citrus limon

Synonyms: Citrus medica var,limonum
Materials : : Sodium hydroxide, acetic acid, water, phenolphthalein and methyl red were used.globe amaranth flower,lemon peel , Standard flasks, burettes, pipettes, conical flasks, beakers,measuring cylinder, glass rods and funnel were used to carry out the experiment.
Collection of plant : Fresh flower and fruit peel were collected from the nearby villages around dharmapuri district, Tamilnadu, India.
Extraction procedure : Preparation of Ethanolic and methanolic extracts: The flowers and fruit peels were thoroughly washed with distilled water, cut in small pieces placed in a mortar and then macerated using the pestle. It was then transferred into a separate 250 ml iodine flask containing 50 ml absolute ethanol and methanol was kept in a cupboard away from light for 24 hours for proper extraction.The clear filtrate was then gathered for the titration after the content had been filtered.The clear filtrate from extraction was used as natural indicator,while phenolphthalein and methyl red like synthetic indicators were used as standard indicators.
PH Range Determination: Standardize the pH meter, Prepare the natural solution, Measure the pH of the natural indicator solution, Determination the ph range.
Ethanolic extract :flower extract -6.10, peel extract -5.41
Methanolic extract :flower extract -5.61 ,peel extract -4.90

Titration Procedure :

Titrant of 20 ml with 2 to 3 drops of indicator of standard indicator(Phenolphthalein and Methyl red) was titrated against two pair of acid-base. 1 ml of the methanolic and ethanolic plant extract is taken separately in different conical flasks. .was added as an indicator for the titrations such as weak acid (CH3COOH) against strong base (NaOH) and the trials were repeated three times to check the precision. The titrations were again carried out using the standard (synthetic) indicators phenolphthalein and methyl red. . The outcomes of titrations utilizing the natural indication were contrasted with the findings obtained. Each titration

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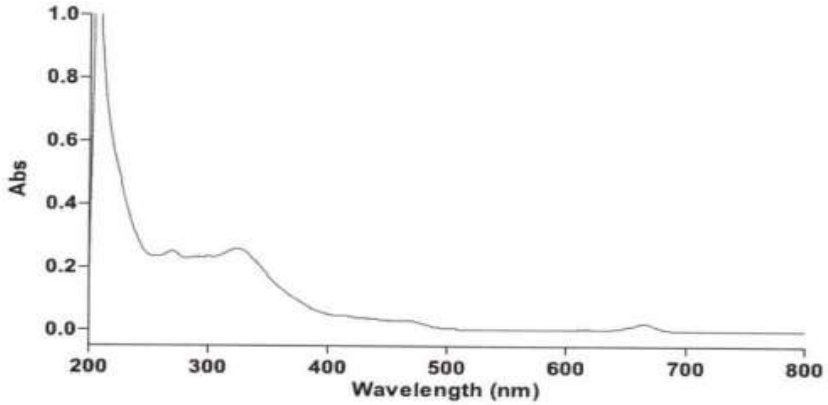
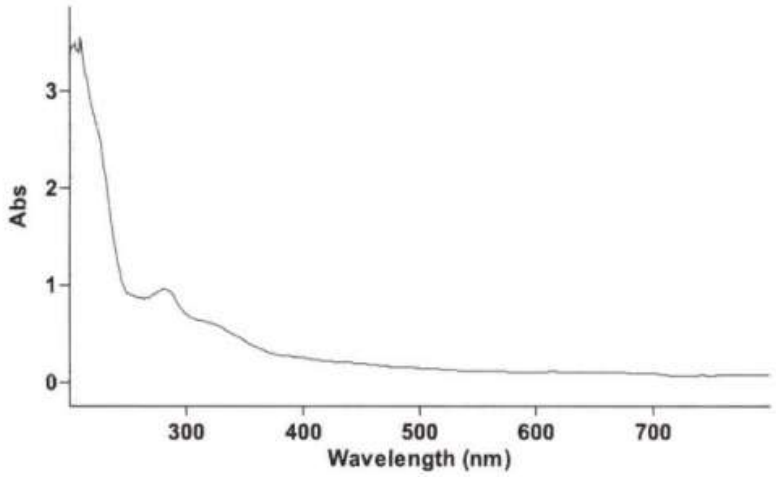
was repeated for 3 times. The results were recorded.

INDICATORS	TITRANT VOLUME	COLOUR CHANGE
Phenolphthalein	25.5	Colourless to pink
Methyl red	26	Red to yellow
Ethanol extract gomphrena globosa extract	21	Colourless to yellow
Ethanol extract Lemon peel	20	Clourless to yellow
Methanol extract gomphrena globosa extract	27.5	Colourless to yellow
Methanol extract Lemon peel	25.2	White colour to yellow

UV SPECTRUM ANAYSIS :



Ethanol flower extract



Ethanol lemon peel extract

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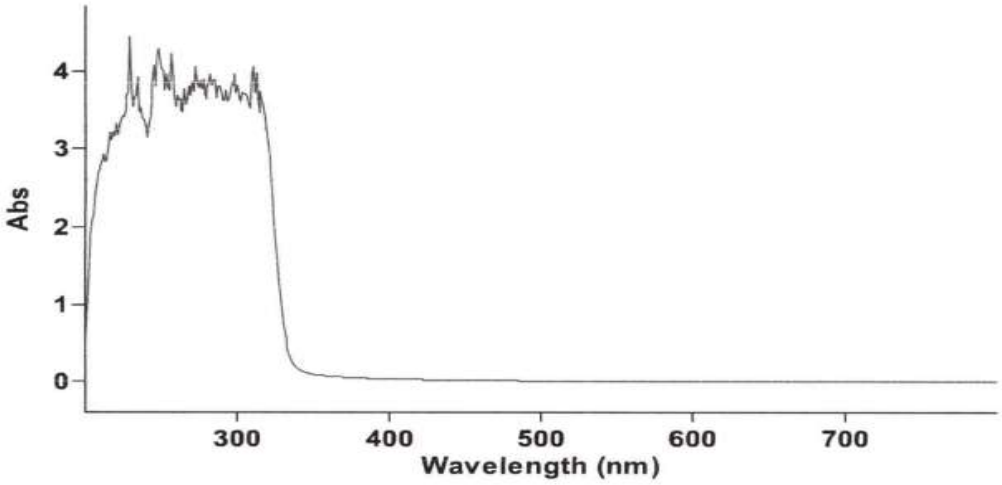
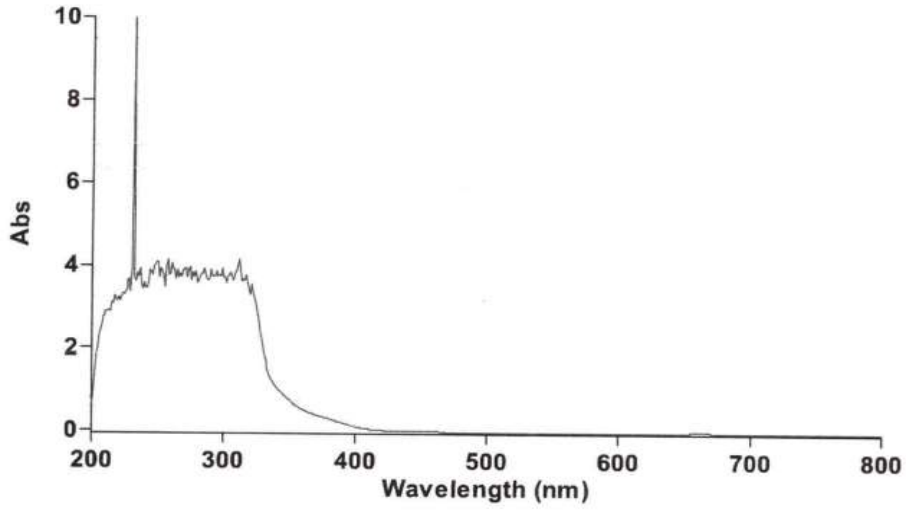


Methanol flower extract



Methanol lemon peel extract

III. CONCLUSION

Based on the given information above, the use of natural indicator in acid base titration is more beneficial because of its economy, easy to prepare, simplicity, easy availability, pollution free, inert and accurate results. Given the limitations of natural indicators, such as their broader pH range and less distinct color change, they are generally lesssuitable than synthetic indicators like methyl red for accurate acid-base titrations .The extract that have their own UV absorbance and a specific pH. The study emphasizes the importance of understanding the pH range and reliability of indicators for less accurate and successful acid-base titrations.

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