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Original Article

A study on pH indicator property of flowers of *Ipomea nil*

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Abstract

Acid – base indicators are organic dyes possessing different colours in varying solutions of pH. They are popularly employed to determine the equivalence point in acid-base titrations. They give sharp colour change with change in pH. Almost all indicators used for acid-base titrations are synthetic compounds. They are found to possess hazardous effects in human body. Certain highly coloured pigments obtained from plants produces change in colour with varying pH values. A study has been done to investigate the indicator property of aqueous extract of flower pigments and compare the results with that of already existing synthetic indicators. Pigments were extracted using hot water and a definite volume was added which gave accurate and reliable results for all the four neutralization titrations. The colour change with respect to the change in pH was also examined by adding a definite volume of the pigment to definite volume of buffer solutions that is, varying pH. The work proved to be acceptable in introducing flower pigments as a substitute to the synthetic acid-based indicators.

Key words : Ipomoea, pH indicators, flower pigments, neutralization indicators, phenolphthalein substitutes

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1. Introduction

Ipomoea is a large and diverse genus in the flowering plant family, Convulvulaceae[1]. It is known to have about 500 species in this genus. The m ost popular common name is morning glory. The Ipomoea genus is wide spread among the tropical and subtropical regions of the world.

Ipomoea nil is a plant of climber or runner variety. The flowers are pink in colour. There are also flowers with different colours for the same genus. Plant will be named prefixing the flower colour to the common name, morning glory[2], example: pink morning glory, blue morning glory etc.

A study was done to understand the pH indicator property of the flowers of this plant. Application of this property was done in neutralization titrations to check its efficiency in distinguishing the equivalence points.

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An acid – base indicator gives different colours in varying solutions of pH[3]. A synthetic acid – base indicator is studied to possess health hazards in human beings[4,5]. The Choice of the indicator for a neutralization titration depends on the pH range covered by the vertical portion of the titration curve[6] The extract of flowers of Ipomoea nil functioned effectively as acid – base indicator. It could be used as a substituent for the synthetic indicators during neutralization titrations. Out of the four different types of neutralization carried out using the flower extract as indicator, reliable results were obtained for the Strong acid against strong base and strong acid against weak base titrations.

2. Methodology

Plant materials

The fresh flowers of Ipomea nil were collected from the medicinal garden of Karavali College of Pharmacy, Mangalore. The flowers and the plant parts were identified and authenticated at department of Botany, Centre for environmental studies of Kannur University in Kerala.

Reagents

All the reagents used for the study were of analytical grade. Procurement of Ammonia, Hydrochloric acid, Sodium hydroxide, Ethanoic acid and phenolphthalein was done from the store of the Karavali College of Pharmacy, Mangalore.

All the volumetric solutions and reagents were prepared as per Indian Pharmacopoeia, IP 1996.

Glass wares

The glass apparatus like burettes, pipettes etc. used for the experiment and trials were calibrated as per the standard procedures.

Preparation of flower extract

Fresh petals of flowers of Ipomea nil were taken. 1 g of this was weighed accurately. It was then extracted with warm water. The aqueous extract was separated from the marc. The extract was properly stored in room temperature in a closed vessel.

Experimental Procedure

The fresh flowers of Ipomea nil were collected and cleaned with distilled water. The petals were then cut in to small pieces and transferred into a clean beaker. In another beaker, 100 ml of distilled water was taken and warmed gently. The warm water was poured to the beaker and kept aside for 15 minutes. The extract was then filtered, the marc was separated. The extract was transferred to a clean light resistant container. It was stored in a dry place.

Testing for Colour Change

Five different buffer solutions of varying pH were prepared. 25 ml of each of these buffer solutions were taken in a transparent glass vessel. To each of the solution, 0.5 ml of the extract was added. The production of different colours was noted. The details are furnished in Table No. 5.

Titrations

All the four types of neutralization titrations were performed – strong acid against strong base, strong acid against

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weak base, weak acid against strong base and weak acid against weak base. The volume of extract added for each titration was 0.5 ml. Each titration was repeated five times to check the precision of the experiment. The titrations were repeated with phenolphthalein as standard indicator. The results of the titrations were compared with the results of titrations using flower extract. The results proved to give the same or closer values for equivalence point in each titration. The results of the titrations are furnished in the tables below.

Table No.5 : Colour change of indicator with pH change

Buffer solution	Observed colour (on adding flower extract indicator)
Acid Phthalate buffer, pH 3	Bright red
Neutralized phthalate buffer, pH 5	Light red
Phosphate buffer , pH 7	Pale red
Alkaline borate buffer, pH 9	Dark green
Alkaline borate buffer, pH 10	Dark green

3. Results & Discussion

The study proved that the equivalence point of titrations using the flower extract either coincided or almost reached closer to that of using phenolphthalein indicator. The flower extract indicator gave sharp colour change at the equivalence point. It was also observed that the extract acted reversibly and gave sharp colour change in both directions.

Table 1a. Titration of HCl against NaOH using aqueous Ipomoea nil extract indicator.

Sr. No	Vol. of acid (mL)	Burette reading		Volume of titrant, Mean value(mL)
		Initial	Final	
1.	10	0.0	9.8	
2.	10	0.0	9.9	
3.	10	0.0	9.9	9.88
4.	10	0.0	9.9	
5.	10	0.0	9.9	

End point : Appearence of green colour

Table 1b. Titration of HCl against NaOH using Phenolphthalein indicator.

Sr. No	Vol of acid (mL)	Burette reading		Volume of titrant, Mean value(mL)
		Initial	Final	
1.	10	0.0	9.8	
2.	10	0.0	9.9	
3.	10	0.0	9.9	9.88
4.	10	0.0	9.9	
5.	10	0.0	9.9	

End point : Appearance of Pale pink colour

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Table 2a. Titration of HCl against NH_3 using aqueous Ipomoea nil extract indicator

Sr. No	Vol of acid (mL)	Burette reading		Volume of titrant, Mean value(mL)
		Initial	Final	
1.	10	0.0	9.7	
2.	10	0.0	9.8	
3.	10	0.0	9.8	9.76
4.	10	0.0	9.7	
5.	10	0.0	9.8	

End point : Appearence of green colour

Table 2b. Titration of HCl against NH_3 using Phenolphthalein indicator

Sr. No	Vol of acid (mL)	Burette reading		Volume of titrant, Mean value(mL)
		Initial	Final	
1.	10	0.0.	9.8	
2.	10	0.0.	9.7	
3.	10	0.0	9.7	9.76
4.	10	0.0	9.8	
5.	10	0.0	9.8	

End point : Appearance of Pale pink colour

Table 3a. Titration of Acetic acid against NaOH using aqueous Ipomoea nil extract indicator

Sr. No	Vol of acid (mL)	Burette reading		Volume of titrant, Mean value(mL)
		Initial	Final	
1.	10	0.0.	9.5	
2.	10	0.0.	9.5	
3.	10	0.0	9.3	9.46
4.	10	0.0	9.5	
5.	10	0.0	9.5	

End point : Appearence of green colour

Table 3b. Titration of Acetic acid against NaOH using Phenolphthalein indicator

Sr. No	Vol of acid (mL)	Burette reading		Volume of titrant, Mean value(mL)
		Initial	Final	
1.	10	0.0.	9.6	
2.	10	0.0.	9.6	
3.	10	0.0	9.6	9.56
4.	10	0.0	9.4	
5.	10	0.0	9.6	

End point : Appearence of pale pink colour

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Table 4a. Titration of Acetic acid against NH_3 using aqueous Ipomoea nil extract indicator

Sr. No	Vol of acid (mL)	Burette reading		Volume of titrant, Mean value(mL)
		Initial	Final	
1.	10	0.0.	9.8	
2.	10	0.0.	9.9	
3.	10	0.0	9.9	9.84
4.	10	0.0	9.8	
5.	10	0.0	9.8	

End point: Appearence of green colour.

Table 4b. Titration of Acetic acid against NH_3 using Phenolphthalein indicator

Sr. No	Vol of acid (mL)	Burette reading		Volume of titrant, Mean value(mL)
		Initial	Final	
1.	10	0.0.	9.8	
2.	10	0.0.	9.7	
3.	10	0.0	9.8	9.76
4.	10	0.0	9.8	
5.	10	0.0	9.7	

End point : Appearance of Pale pink colour.

4. Conclusion

The study revealed that the aqueous extract of the flowers of "Ipomea nill" can be used as a substitute to the existing indicators due to it's advantages like simple preparation, effective performance and ability to produce accuracy and precision in results.

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