ORIGINAL ARTICLE

Herbal indicators as a substituent to synthetic indicators

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In acid - base titrations, indicators are used to show sharp color change at intervals of pH. Natural pigments in plants are highly colored substances and may show color changes with variation of pH.
An attempt has been made to investigate the indicator activity of methanolic extract of flower pigments and to replace synthetic indicators as they have certain disadvantages like chemical pollution, availability problems and high cost.
Methanolic extract of *Rosa indica* (L) from family Rosaceae and *Hibiscus rosa-sinensis* (L) from family Malvaceae gives sharp and intense color change as compared to phenolphthalein and methyl orange. Herbal indicators are evaluated by using strong acid - strong base, strong acid - weak base, weak acid - strong base, and weak acid - weak base. In all these titrations the extract was found to be very useful and accurate for indicating the equivalence point (neutralization point).
From photochemical investigation and qualitative chemical tests for *Rosa indica* and *Hibiscus rosa-sinensis* shows presence of anthocyanins; which are the pigmented flavonoids; which may be the reason for its activity as an indicator. Apart from the above advantages the isolation of pure compounds possessing indicator's properties help to know the mechanism by which they shows indicator's properties and new theories of indicators could be established.

Key words: End point, herbal indicator, methanolic extracts, titrations

INTRODUCTION

The use of *Rosa indica* belonging to family rosaceae[1] for various pharmacological activities is well known, and the presence of colored pigments and chemical constituents like flavonoids[2] are responsible for a thought about its use as an indicator in acid base titrations.

Rosa indica is a yearly flowering plant and easily available in India and also throughout the world in high quantity and present in almost every garden to enhance the beauty of gardens.

Presently available acid base indicators like phenolphthalein and methyl orange[3] are synthetic indicators, which produce chemical hazards,[4,5] availability problems and their high cost.

The *Hibiscus rosa-sinensis* is belonging to family Malvaceae.[1] The intention behind this study is simply to bring in market the use of flower pigments and to increase the wealth of traditional Indian medicinal system which is mostly plant-based and to help farmers regarding cultivation, collection of plants as well as to industry regarding preparation of above indicators, which lead to financial support to both farmers as well as industry. Titrate and titrant with indicators showed sharp and intense color change at the equivalence point that is at neutralization.[6]

MATERIALS AND METHODS

Plant Materials

Fresh flowers of *Rosa indica* and *Hibiscus rosa-sinensis* were collected from the Bhor region and the garden of R. D's. College Of Pharmacy Bhor, Pune (M. S.) and authenticated at the Dept. of Botany, A. T. College, Bhor.

Reagents

Analytical grade reagents like hydrochloric acid (HCl), sodium hydroxide (NaOH), acetic acid (CH_3COOH), ammonia (NH_3) and phenolphthalein were procured from R. D's. College Of Pharmacy Bhor, Pune (M.S.). Reagents and volumetric solutions were prepared as per Indian pharmacopoeia (I. P. 1996).

Preparation of Extract

1) *Rosa indica*: 1 gm fresh petals of *Rosa indica* were macerated for 24h in 10 ml of methanol.
2) *Hibiscus rosa-sinensis*: 1 gm of fresh petals of *Hibiscus rosa-sinensis* was macerated for 24h in 10 ml of methanol.

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Experimental Procedure

The petals of flower were cleaned by distilled water and cut into small pieces and macerated for 24h in 10 ml of methanol. The extract was preserved in tightly closed glass container and stored away from direct sunlight. The calibration of apparatus like burettes, pipettes, and other required instruments and standardization of acids and bases were done as per procedures given in Indian Pharmacopoeia (I. P. 1996).

10 ml of titrant with two drops of each indicator *Rosa indica* (R. I.) and *Hibiscus rosa-sinensis* (H. R.) was titrated against titrates and the color changes for the indicators are listed in the Tables 1 and 2.

The results of screening for strong acid-strong base (HCl - NaOH), strong acid- weak base (HCl – CH_3COOH), weak acid-strong base (CH_3COOH - NaOH) and weak acid-weak base (CH_3COOH – NH_3) are listed in Table 3. Each titration is carried out five times by using 1N strength of acid and alkali and results were recorded as mean ± SEM.

RESULTS AND DISCUSSION

For all type of titrations equivalence point obtained by methanolic extract of *Rosa indica* and *Hibiscus rosa-sinensis* either exactly coincided or very closed with equivalence point obtained by standard indicator phenolphthalein. This represents the usefulness of alcoholic flower extract as an indicator in acid base titrations. Its use in strong acid-strong base titration was found to be more significant over standard indicator as it gives sharp color change at equivalence point.

It is observed that indicators acts reversibly and gives sharp color change in both directions. The results obtained showed that the routinely used indicators could be replaced successfully by flower extract as they are simple, accurate, and precise and can be prepared just before experiment.

The proposed herbal indicators can be used as a substitute to synthetic indicators.

Table 1: *Rosa indica* (R. I.)

Titrant	Indicator	Color	Titrate	Color (at end pt.)
HCl	R. I.	Colorless	NaOH	Pink
CH_3COOH	R. I.	Colorless	NaOH	Pink
HCl	R. I.	Colorless	NH_3	Pink
CH_3COOH	R. I.	Colorless	NH_3	Pink

Table 2: *Hibiscus rosa-sinensis* (H. R.)

Titrant	Indicator	Color	Titrate	Colour (at end pt.)
HCl	H. R.	Colorless	NaOH	Violet
CH_3COOH	H. R.	Colorless	NaOH	Violet
HCl	H. R.	Colorless	NH_3	Violet
CH_3COOH	H. R.	Colorless	NH_3	Violet

Table 3: Volume of titrate with standard indicator

Chemicals		Volumes of titrate required for equivalent point with titrant (10 ml) with indicator.		
Titrant (1N)	Titrate (1N)	Std. Ind.	R. I. Ind.	H. R. Ind
HCl	NaOH	10.1 ± 0.2	10.1 ± 0.39	10.00 ± 0.46
CH_3COOH	NaOH	09.5 ± 0.35	09.8 ± 0.41	09.5 ± 0.26
HCl	NH_3	09.8 ± 0.62	10.00 ± 1.02	09.5 ± 0.44
CH_3COOH	NH_3	10.00 ± 0.40	10.2 ± 0.15	09.7 ± 0.57

(Std.Ind-Phenolphthalein Indicator), (R.I Ind - Rosa indica indicator), (H.R Ind - Hibiscus rosa-sinensis indicator)

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