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Research Article

INVESTIGATION OF SIMPLE, REASONABLE AND BENEFICIAL NATURAL INDICATOR FOR TITRATION WITH GO- GREEN REVOLUTION

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ABSTRACT

Basella alba L. is an important green leafy vegetable found commonly in the tropical regions of the world. The fruit sap is used as a substitute for synthetic indicator in volumetric analysis. The results obtained with the fruit sap have been compared with the synthetic indicators like phenolphthalein, methyl orange and methyl red indicator. It has been determined experimentally that the fruit sap can be successfully used in place of phenolphthalein, methyl orange and methyl red indicator for volumetric analysis. Basella alba fruit sap is pH sensitive and give different colours in acidic and alkaline medium.

INTRODUCTION

Basell alba is popularly known as vine spinach, Indian spinach, climbing spinach etc. and its Botanical name is *Basella rubra* and Hindi name is Poi or safed bachla. Its fruit juice is used as a good herbal treatment for conjunctivitis and leaf paste is advantageous for treating ulcers and abscesses. *Basella alba* has laxative attributes. Its leaves and stem are cooked and used to treat constipation, it is also effective for Diuresis. Its decoction is given to pregnant women to reduce labour pains. It is used against snake bites, insect bites etc. *Basella alba* is an edible perennial vine of the family Basellaceae. It is found in tropical Asia and Africa where it is widely used as a leaf vegetable. It is native to the Indian subcontinent, South East Asia and New Guinea. Synthetic compounds are highly polluting, hazardous and much more costly. Natural products are less hazardous, easily available and ecofriendly so natural extract are good substitute to synthetic indicator in titration (Mandir, 2015). Daily consumption of *Basella alba* has a positive effect on total body vitamin-A (Haskell *et al*., 2004). *Basella alba* fruit contains gomphrenin derivative which is betalain pigment (Glassgen *et al*., 1993).

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The mucilage of *Basella alba* consist of mixture of polysaccharides (Palanuvej *et al*., 2009). *Basella alba* showed good inhibitory activity against Aspergillus Niger (Premakumari *et al*., 2010). The leaf extracts (Methanolic extract and Aqueous extract) of *Basella alba* were investigated for in-vitro anti-inflammatory activity by human red blood cell membrane stabilization method (HRBC). Aqueous extract showed significant in-vitro anti-inflammatory activity compared to methanolic extract. The in-vitro anti-inflammatory activity of the extracts were concentration dependent, with the increasing concentration, the activity is also increased. *Basella alba* possesses a good anti- inflammatory activity and shows dose depending activity (Rodda *et al*., 2012). Methanolic fruit extract of Punica granatum (Punicaceae) was found to be very useful and accurate for indicating the equivalence point in acid-base titration (Agrawal *et al*., 2011). Aqueous extract of some of the easily available plants like Rose, Pomegranate peel and seeds, Onion, Sunflower, Tea, Kattha, Marigold, Java plum, Plum, Periwinkle and Beetroot act as a acid-base indicator in different types of titrations (Pathak *et al*., 2015). Aqueous and alcoholic extract of *Urena lobata* flower can be successfully used in place of phenolphthalein and methyl orange indicator for acid-alkali titrations (Singh, 2015). Fruit extract of *Basella alba* contains pigments Betacynin and flavonoids. The major red pigment present in dye extract is gomphrenin-I, which is

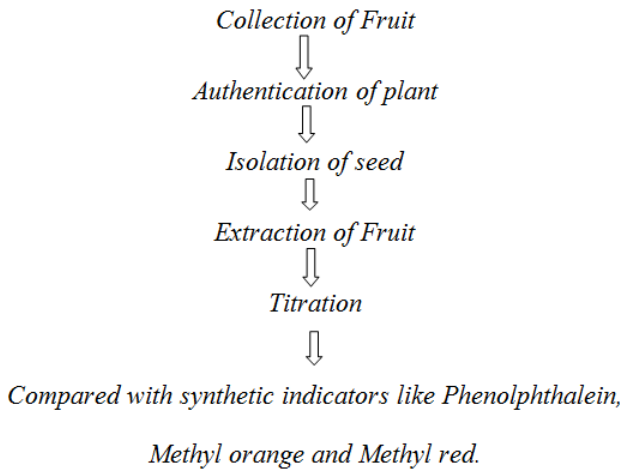

Table 1. Results of titration of acid and base using aqueous BR extract as indicator and synthetic indicator

Titration (Titrant Vs Titrate) & Normality	S.I	End point	Mean of three titration ±SD	NAI	End point	Mean of three titration ±SD
HCl Vs NaOH (1N)	PH	Colorless to pink	9.3667±0.11547	B.R	Yellow to orange	11.1667±0.28868
HCl Vs NaOH (.5N)	PH	Colorless to pink	8.2333 ±0.40415	B.R	Yellow to light pink	11.8333±0.28868
CH_3COOH Vs NaOH (1N)	PH	Colorless to pink	9.9333 ±0.46188	B.R	Yellow to orange	8.0333±0.05774
CH_3COOH Vs NaOH (.5N)	PH	Colorless to pink	10.5333±0.05774	B.R	Yellow to light pink	7.1667±0.28868
HCl Vs NH_4OH (1N)	MO	Pink to yellow	9.7333 ±0.05774	B.R	Pale yellow to wine red	9.1000±0.17321
HCl Vs NH_4OH (.5N)	MO	Pink to yellow	9.7333 ±0.05774	B.R	Pale yellow to wine red	9.8667±0.11547
CH_3COOH Vs NH_4OH (1N)	MR	Yellow to red	11.7333±0.23094	B.R	Muddy yellow to light pink	7.5000±0.86603
CH_3COOH Vs NH_4OH (.5N)	MR	Yellow to red	12.0333±0.05774	B.R	Muddy yellow to light pink	7.7000±0.51962

PH=Phenolphthalein; MO=Methyl Orange; SI=Synthetic Indicator; NAI=Natural Aqueous Indicator;
B.R= Basella Rubra; ±SD=Standard Deviation

Table 2. Statistical Interpretation of Aqueous fruit extract of *Basella rubra*

Titrant Vs Titrate (Strength in Normality)	^{t}cal value	Interpretation (^{t}cal < ^{t}tab* (0.05)
HCl Vs NaOH (1N)	0.003	H_0 Accepted (0.003<2.776)
HCl Vs NaOH (.5N)	0.012	H_0 Accepted (0.012 <2.776)
CH_3COOH Vs NaOH (1N)	0.017	H_0 Accepted (0.017 <2.776)
CH_3COOH Vs NaOH (.5N)	0.003	H_0 Accepted (0.003 <2.776)
HCl Vs NH_4OH (1N)	0.034	H_0 Accepted (0.034 <2.776)
HCl Vs NH_4OH (.5N)	0.057	H_0 Accepted (0.057 <2.776)
CH_3COOH Vs NH_4OH (1N)	0.007	H_0 Accepted (0.007<2.776)
CH_3COOH Vs NH_4OH (.5N)	0.006	H_0 Accepted (0.006 <2.776)

* ^{t}tab at 5% level of significance for 4 d f = 2.776

the compound of Betalain family. Fruit extract of *B.alba* can be used as a natural colorant on fabrics (Mitra, 2015). Methanolic and aqueous fruit extract of *Opuntia ficus indica* in acid-base titration (Suvam 2014). *Phyllanthus reticulatus* fruit extract act as a acid-base indicator in different types of acid-base titrations (Patil, 2012). Flavonoids are colored compounds that can be isolated from various parts of plants like flowers, fruits and are p^H sensitive (Jadhav *et al*., 2009; Jadhav *et al*., 2009; Jadhav *et al*., 2008). Ethanolic fruit extract of *Bixa orellana* act as a Natural indicator in volumetric analysis (Pimpodakar *et al*., 2014). The advantage of natural indicators is that they are biodegradable thus helps in minimizing the use of synthetic non degradable dyes, hence *Bixa orellana* was used as an indicator for titration (Khan *et al*., 2012). *Ipomoea cairica* and *Caesalpinia pulcherrima* also act as a acid-base indicator in titration (Muhammad *et al*., 2016).

MATERIALS AND METHODS

Fresh fruits of *Basella alba L.* were collected from medicinal plant garden of Swami Vivekanand College of Pharmacy, Indore.

Analytical grade reagents like HCl, NaOH, CH_3COOH, NH_4OH, Phenolphthalein, Methyl orange, Methanol were used. The acid and base solutions were used in the strength of 1.0 N and 0.5N. . In the present study aqueous fruit extract of *Basella rubra* was taken as a natural indicator for acid base titration. The strength of acids and bases (HCl, CH_3COOH, NaOH, NH_4OH) taken were 1.0N and 0.5N. Four different types of titration strong acid/strong base, strong acid/weak base, weak acid/strong base, and weak acid/weak base (HCl V/s NaOH, HCl V/s NH_4OH, CH_3COOH V/s NaOH, CH3COOH V/s NH_4OH) were carried out using standard indicators and aqueous fruit extract. The results of these titrations are given in Table 1. Following flow chart shows the sequence of steps taken from collection to titration

RESULTS AND DISCUSSION

Statistically as calculated value is less than tabulated value at 5% level of significance for 4 degrees of freedom therefore, our null hypothesis is accepted and we conclude that natural indicator is as useful as synthetic indicator. T-test analysis results are presented in Table 2.

The statistics indicated at 5% level of significance. Thus natural fruit extract give satisfactory results as compared to routinely used synthetic indicators with same degree of accuracy. The proposed natural indicator is inexpensive, easily available and easy to prepare. Thus from Green chemistry point of view, this natural indicator can be successfully employed for routine volumetric analysis.

Conclusion

The results obtained in all the types of acid-base titrations lead us to conclude that natural indicator give sharp color changes at the end point of the titrations. It is concluded that, it is always beneficial to use *Basella rubra* fruit extract act as a natural indicator in all types of acid-base titrations because it is economical, simple, accurate and easily available.

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