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Morus Alba Fruit- Herbal alternative to synthetic Acid Base indicators

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Abstract: Indicators used in titration show well marked changes of colour in certain intervals of pH. Most of these indicators are organic dyes and are of synthetic origin. *Morus alba* linn belonging to the family: Moraceae (Urticaceae); it is commonly called as white Mullberry; toola; tuk; shetu. Today synthetic indicators are the choice of acid-base titrations. But due to environmental pollution, availability and cost, the search for natural compounds as an acid-base indicator was started. The present work highlights the use of the acidified methanolic extract of the fruit of *morus alba* as an acid-base indicator in acid-base titrations. This natural indicator is easy to extract as well as easily available. Titration shows sharp colour change at the equivalence point. Therefore, this natural indicator is found to be a very useful, economical, simple and accurate for acid base titration.

Key words: *Morus alba* linn, acid base indicator, Natural indicator, mulberry fruit

Introduction:

Morus alba linn belonging to the family: Moraceae (Urticaceae); it is commonly called as white Mullberry; toola; tuk; shetu. It is a medium sized deciduous tree, originally from Baluchistan, also found wild on the temperate Himalayas and cultivated in Kashmir, Punjab and Maharashtra near Mahabaleshwar[1].

The stem bark is large; brown; rough; fissures; mostly vertical leaves, very variable in size and shape (5-7.5 cm long). Flowers are greenish, the sexes often on different branches occasionally on different trees. Male spikes are 1.3-3.8 cm long; female spikes are ovoid penduculate. Fruits up to 2.5 cm long, usually less ovoid, white or nearly black when ripe, the latter form red when not fully ripe[2].

The main content of the fresh, ripe Mulberry fruit is water (85-89 %); carbohydrates (7.8-9.2 %); protein (0.4-1.5 %); fats (0.4-0.5 %); free acids (1.1-1.7 %); fiber (0.9-1.4 %); minerals (0.7-0.9 %). Chemical constituents of fruits are anthocyanins, anthoquinones, glycosides, and oleanic acid[2,3,4].

The sweet, deep red juice of the white or red fruit is used for sore throat and acts as the pleasant refrigerant in cases of fever. The fruit is employed by the Hakims as the remedy for the dyspepsia and melancholia. The bark is considered purgative and anthelmentic. In china, the root bark is considered as restorative tonic and astringent remedy chiefly in nervous disorders[2,4].

Material and methods:-

Analytical grade reagents i.e. hydrochloric acid (HCL), sodium hydroxide (NaOH), acetic acid (CH_3COOH), ammonia (NH_3), phenolphthalein and methyl red were procured from the Appasaheb Birnale College of Pharmacy, Sangli. Reagents and volumetric solutions were prepared as per Indian Pharmacopoeia.

The fresh fruits were collected from a garden located in Mahabaleshwar (M.S.) and authenticated at Department of Botany, Wellingdon College, Sangli (M.S.). The fruits were cleaned and cut into small pieces. 100 gm of these pieces were macerated with 150 ml of solution containing 9 parts of methanol and 1 part of dilute hydrochloric acid for 45 min[5]. The extract was preserved in tightly closed container and stored away from the direct sun light.

The experiment was carried out by using same set of glassware for all type of titrations. The reagents were not calibrated; as same aliquouts were used for both titrations i.e. titrations by using slandered indicator and fruit extract.

5 ml of titrant with 3 drops of indicator was titrated[6]. All the parameters for the experiment are given in Table1. Each titration was carried five times and results were recorded. Mean and standard deviation was calculated from the results.

The Methanolic extract of fresh fruit of *Morus alba* linn was screened for its use as indicators for Acid-Base titration and the results of this screening were compared with the results obtained by using standard indicators.

Result and discussion:

The fruit was screened for its use as an acid base indicator in acid base titrations and the result of this screening were compared with the results obtained by standard indicators methyl red, phenolpthalin

The results of the screening for strong acid strong base (HCL & NaOH), strong acid weak base (HCL & NH_3), weak acid strong base (CH_3COOH & NaOH) and weak acid weak base (CH_3COOH & NH_3) are listed in Table2. The table represents mean of five titrations ± standard deviation. The screening was carried out using three different molar strength of acids and alkalies viz. 0.1, 0.5, & 1.0 M.

For all types of titrations equivalence point obtained by the fruit extract either exactly coincided or very closed with the equivalence point obtained by the standard indicators. This represent the usefulness of fruit extract as an indicator in acid base titrations. Its use in weak acid weak base was found to be more significant over standard indicator as it gives sharp colour change in a narrow pH range. The results obtained showed that the routinely used indicator can be replaced successfully by fruit extracts.

Conclusion:

The results obtained in all the types of acid base titrations lead us to conclude that it was due to the presence of flavonoids sharp colour changes, which occurred at end point of titrations. At the end of it states that *morus alba* fruit extract as an natural indicator in all types of acid base titrations because of its economic, simple, accurate and precise.

Table no.1: Parameters for titration.

Titrant	Titrand	Indiactor color change and (pH range)	
		Standerd[5]	Fruit Extract
HCL	NaOH	Pink to colourless (8.2-10.0) (PH)	Blue to Pink (5.5-8.5)
HCL	NH_3	Pink to colourless (8.2-10.0) (PH)	Blue to Pink (5.5-8.5)
CH_3COOH	NaOH	Pink to colourless (8.2-10.0) (PH)	Blue to Pink (5.5-8.5)
CH_3COOH	NH_3	Yellow to Pink (4.2-6.3) (MR)	Blue to Pink (5.5-8.5)

Key: PH= Phenlophthalein, MR = Methyl Red.

Table no.2: Mean volume (in ml) at the equivalence point for the titrations*

Strength (in M)	Hydrochloric acid v/s Sodium Hydroxide		Hydrochloric acid v/s Ammonia		Acetic acid v/s Sodium Hydroxide		Acetic acid v/s Ammonia	
	PH	FE	PH	FE	PH	FE	MR	FE
0.1	4.92±0.07	4.54±0.05	10.06±0.10	9.98±0.07	3.96±0.10	4.02±0.07	4.06±0.08	3.96±0.10
0.5	5.00±0.10	4.84±0.05	10.92±0.07	11.02±0.10	6.96±0.05	6.82±0.07	17.06±0.08	16.98± 0.07
1	10.96±0.10	10.60±0.09	5.70±0.10	5.98±0.13	9.30±0.17	9.00±0.06	8.78±0.13	8.32 ± 0.026

* Mean of five titrations ± S.D., Key: M= Molar Strength, FE = Fruit Extract, PH = Phenolphthalein, MR = Methyl Red.

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