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Use of Butea Monosperma Aqueous Extract as a Natural Indicator in Acid Base Titration

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ABSTRACT: Butea monosperma is a species of the genus Butea belonging to family Leguminosae or Fabaceae .The present work highlights the use of Butea monosperma aqueous flower extract as an acid base indicator in acid base titration. It is a small-sized dry-season deciduous tree, growing to 15m (49ft) tall. It is a fast-growing tree. The flowers are 2.5cm (0.98 inch) long, bright orange-red, and produced in racemes up to 15cm (5.9 in) long.[(1)]

KEYWORDS: Butea monosperma, Acid base indicator, Natural indicator.

I. INTRODUCTION

It is used for timber, resin, fodder, medicine, and dye. The wood is dirty white and soft. Being durable under water, it is used for well-curbs and water scoops. Spoons and ladles made of this tree are used in various Hindu rituals to pour ghee in to the fire. The leaves are usually very leathery and not eaten by cattle. The leaves were used by earlier generation of people to serve food instead of plastic plates. The gum is known as Bengal Kino and considered valuable by druggists because of its astringent qualities and by leather workers because of its tannin. In villages of many parts of India, for example in Maharashtra, this tree provides leaves that are used either with many pieced together or singly (only in case of banana leaf) to make a leaf plate for serving a meal. It was hypothesized that the flower extract could be utilized as an indicator for different types of acid base titrations. Hence the flavonoids were extracted, and identified for their potential use as an acid base indicator in various acid base titrations. [(1)]

II. MATERIAL AND METHODS

Analytical grade reagents were made available by Rajesh Bhaiyya Tope College of Pharmacy Aurangabad. Reagents and volumetric solutions were prepared as per standard books. Butea monosperma flowers were collected from plants growing in the Garden of Rajesh Bhaiyya Tope College of Pharmacy Aurangabad. The flowers were collected. The fresh petals were separated and directly put in the beaker containing 200ml of distilled water and kept for overnight. On second day the extract is filtered and directly used for the study. [(4)] The experimental work was carried out by using the same set of glassware's for all type of titrations. As the same aliquots were used for both titrations that is titrations by using standard indicators and aqueous flower extract, the reagent were not calibrated. The equimolar titrations were performed using 20ml of titrant with three drops of indicator. [(5)] All the parameters for experiment are given in table 01. The set of four experiments was carried out and mean and standard deviation were calculated from result.

III. RESULT AND DISCUSSION

The aqueous flower extract was screened for its use as an acid base indicator in acid base titrations, and the result of screening compared with the result obtained by standard indicators methyl red; for strong acid vs strong base (HCl and NaOH), strong acid vs weak base (HCl and NH_4OH), weak acid vs strong base (oxalic acid and NaOH) and weak acid vs weak base (oxalic acid and NH_4OH) titrations respectively. All these parameters are shown in table 1. For all titrations the equivalence points obtained by the aqueous flower extract matched with the equivalence point obtained by standard indicators except in weak acid vs weak base. Result of screening was listed in table 2. The Butea monosperma aqueous flower extract alone can serves the purpose of indicator acid titration. Another benefit of this titration is that it gives colorless end point at the equivalence point. If we add more amount of titrant (acid) it gives pink color solution.

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TABLE1. PARAMETERS USED FOR ANALYSIS AND THE COMPARISON OF COLOR CHANGE

Titrant	Titrate	Indicator color change	
		Standard (pH range)	Aqueous flower extract (pH range)
HCl	NaOH	Yellow to red (8.8-3.7)	Orange to colorless (8.9-4.1)
HCl	NH_4OH	pink to colorless (8.1-3.5)	Orange to colorless (8.2-4.5)
Oxalic acid	NaOH	pink to colorless (9.2-4.5)	Orange to colorless (9.1-5.4)
Oxalic acid	NH_4OH	Blue-green to orange (7.9-4.5)	Orange to colorless (8.1-5.1)

HCl: Hydrochloric acid, NaOH: Sodium hydroxide, NH_4OH: Ammonium hydroxide

TABLE2. Screening Result Of Various Titrations

Sr.No.	Titration	Strength in Mole (%)	Indicator	Reading with S.D.(±)
1	HCl Vs NaOH	100	Methyl Red	8.45±0.05
			Flower Extract	8.45±0.07
		50	Methyl Red	8.65±0.05
			Flower Extract	8.45±0.03
		25	Methyl Red	8.60±0.10
			Flower Extract	8.70±0.05
2.	NH_4OH Vs HCl	100	Methyl Red	5.47±0.05
			Flower Extract	5.45±0.08
		50	Methyl Red	5.55±0.05
			Flower Extract	5.45±0.05
		25	Methyl Red	5.55±0.03
			Flower Extract	5.60±0.04
3.	Oxalic acid Vs NaOH	100	Methyl Red	11.20±0.10
			Flower Extract	11.00±0.10
		50	Methyl Red	12.00±0.05
			Flower Extract	11.70±0.05
		25	Methyl Red	11.50±0.06
			Flower Extract	11.50±0.06
4	Oxalic acid Vs NH_4OH	100	Methyl Red	None
			Flower Extract	None
		50	Methyl Extract	None
			Flower Extract	None
		25	Methyl Red	None
			Flower extract	None

HCl:Hydrochloric acid, NaOH:Sodium Hydroxide, NH_4OH:Ammonium Hydroxide, S.D.:Standard Deviation

IV. CONCLUSION

The result obtained in all the types of acid base titrations lead us to conclude that it was due to the presence of flovonoids, sharp color changes occurred at the end point of the titrations. Lastly we can say that it is always beneficial to use of Butea monosperma aqueous flower extract as an indicator in all types of acid-base titrations because of its economy, simplicity and availability.

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