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Research Article

USE OF *PHYLLANTHUS RETICULATUS* FRUIT EXTRACT AS A NATURAL INDICATOR IN ACID BASE TITRATION

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ABSTRACT

Phyllanthus Reticulatus (Euphorbiaceae) is a large deciduous plant, originally from India. The pulps of the fruit are pH sensitive and give different colors in acidic condition (pink) and basic condition (greenish yellow). The present work highlights the use of *Phyllanthus Reticulatus* fruit extract as an acid base indicator in different types of acid base titrations. The equivalence points obtained by the fruit extract matched with the equivalence points obtained by standard indicators. Therefore, this natural indicator is found to be a very useful, economical, simple and accurate for acid base titration.

Keywords: *Phyllanthus Reticulatus*, Acid base indicator, Natural indicator.

INTRODUCTION

Phyllanthus reticulates, family Euphorbiaceae is a climbing shrub which grows all over India.[1] It is a monoecious scandent shrub or small bushy tree having height 8 to 10 ft.[2] Fruits are depressed-globose berry, up to 7 mm in diameter, usually bluish-black when ripe with dark purplish pulp.[3] The plants of this genus were reported to contain lignans, flavonoids, triterpenoids, alkaloids, polyphenolic compounds.[4,5] Flavonoids and polyphenolic compounds have a potential role in the prevention of various diseases through their antioxidant activity.[6] The plant is used for a variety of ailments, including smallpox, syphilis, asthma, diarrhea and bleeding from gums.[7] Moreover, it is also claimed the plant has antidiabetic activity in tribal area.[8] This plant also showed hypotensive, hypocholesterolemic effects[5] and its folkloric use in gastric complaints including colic, constipation etc.[9]

Flavanoids are colored compounds that can be isolated from various parts of plants like flowers, fruits and are pH sensitive.[10-13] Therefore it has been hypothesized that the fruit extract could be utilized as an indicator for different types of acid base titrations. The pulps of the fruit are pH sensitive and give different colors in acidic condition (pink) and basic condition (greenish yellow). The equivalence points obtained by using fruit extract matched with the equivalence points obtained by standard indicators.

MATERIALS AND METHODS

Material and methods

Analytical grade reagents were made available from Yeshoda Technical Campus, Satara. Reagents and volumetric solutions were prepared as per official books.[14] Fresh fruits of *Phyllanthus reticulates* were collected and authenticated from Department of Botany, Y.C. College, Satara. The fruits were cleaned with water and seeds were separated. 50 grams of pieces of fruits were macerated for 30 minutes with 100 mL solution containing nine parts of ethanol and one part of dilute hydrochloric acid. After pressing the mark, filtrate was collected and used in the various titrations.

The experiment was carried by using the same set of glasswares for all types of titrations. As the same aliquots were used for both titrations i.e. titrations by using standard indicators and fruits extract, the reagents were not calibrated. The equimolar titrations were performed using 10 mL titrant with three drops of indicator. A set of five experiments was carried out and mean and standard deviation were calculated from results. All the parameters for experiment are given in Tables 1 and 2.

RESULTS AND DISCUSSION

The fruits extract was screened for its use as an acid base indicator in acid base titrations and the results of this screening were compared with the results obtained by standard indicators like methyl red, phenolphthalein and mixed indicator [methyl orange: bromocresol green (0.1: 0.2)] for strong acid-strong base (HCl and NaOH), strong acid weak base (HCl and NH_4OH) and weak acid - strong base (CH_3COOH and NaOH) and weak acid - weak base (CH_3COOH and NH_4OH) titrations. The important observations were noticed in the all titrations that the end points were colorless but having greenish shed. In case of weak acid - weak base titration, more quantity of fruit indicator was required and before the end point color of solution was violet. For all titrations, the equivalence points obtained by the fruit extract matched with the equivalence points obtained by standard indicators.

Table 1: Parameters used for experiment and the results of screening

Sr. No	Titrant	Titrand	Indicator color change	
			Standard	Fruits extract
1	NaOH	HCl	red to colorless	red to colorless
2	NH_3	HCl	colorless to pink	wine red to violet black
3	NaOH	CH_3COOH	red to colorless	red to colorless
4	NH_3	CH_3COOH	colorless to pink	wine red to violet black

Table 2: Parameters used for experiment and the results of screening

Sr. No	Titration (Titrant v/s Titrand)	Strength	Indicators	Mean of five titrations ± S.D.
1	NaOH v/s HCl	0.1	Methyl red	9.6 ± 0.13
			Fruit extract	9.4 ± 0.18
		0.5	Methyl red	10.0 ± 0.13
			Fruit extract	9.8 ± 0.16
		1	Methyl red	10 ± 0.09
			Fruit extract	10.1 ± 0.12
2	NH_3 v/s HCl	0.1	Phenolphthalein	14.3 ± 0.2
			Fruit extract	14 ± 0.26
		0.5	Phenolphthalein	14 ± 0.18
			Fruit extract	13.6 ± 0.21
		1	Phenolphthalein	11.5 ± 0.12
			Fruit extract	10.7 ± 0.20
3	NaOH v/s CH_3COOH	0.1	Methyl red	9.5 ± 0.23
			Fruit extract	9.6 ± 0.28
		0.5	Methyl red	9.5 ± 0.21
			Fruit extract	9.6 ± 0.21
		1	Methyl red	9.9 ± 0.19
			Fruit extract	9.8 ± 0.21
4	NH_3 v/s CH_3COOH	0.1	Mixed indicator	14.4 ± 0.26
			Fruit extract	14 ± 0.27
		0.5	Mixed indicator	11.8 ± 0.24
			Fruit extract	11.3 ± 0.26
		1	Mixed indicator	11.2 ± 0.22
			Fruit extract	11 ± 0.24

CONCLUSION

The *Phyllanthus reticulates* fruit extract alone can serve the purpose of indicator in weak acid and weak base titration, where generally mixed indicators are employed. The results obtained in all the types of acid base titrations lead us to conclude that it was due to the presence of flavanoids. Lastly we can say that it is always beneficial to use *Phyllanthus reticulates* fruit extract as an indicator in all types of acid base titration because of its economy, simplicity and wide availability.

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