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USE OF *EUGENIA JAMBOLANA* FRUIT EXTRACT AS A NATURAL INDICATOR IN ACID BASE TITRATION

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ABSTRACT

Eugenia jambolana family myrtaceae is a large deciduous tree, 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 *Eugenia jambolana* 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.

Key words: *Eugenia jambolana,* Acid base indicator, Natural indicator, Jambule fruit.

INTRODUCTION

Eugenia jambolana, belongs to the family myrtaceae and is a large deciduous tree originally from India. It is large evergreen glabrous tree having height up to 30 m and 3.6 m girth. Bark is a pale brown, slightly rough on old stems. Leaves are opposite, simple, entire, elliptic to broadly oblong, smooth, glossy, somewhat leathery, 7.5-15 cm long and short pointed at tips. The fruits are variable in size up to 2.5 cm long, ellipsoid or oblong, crowned with the truncate calyx-limb, black with pink juicy pulp[1].

The chemical constitutions of the fruit are raffinose, glucose, fructose[2], citric acid[3], mallic acid[4] and gallic acid. The sourness of fruits may be due to presence of gallic acid. Venketeswarla[5], reported that the colour of the fruits might be due to the presence of

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anthocyanins namely delphinidine-3-gentiobioside and malvidin-3-laminaribioside along with petunidin-3- gentiobioside.[5, 6]

In traditional medicines, it has wide range of uses like the bark is digestive, astringent to the bowels, anthelmintic, good for sore throat, bronchitis, asthma, thirst, biliousness, dysentery, blood impurities and ulcers.[7] The fruits are astringent to the bowels, increases 'vata', removes bad smell from the mouth and biliousness. The seed is astringent to the bowels, good for diabetes and the sprouts are carminatives.[7]

As flavanoid, anthocyanines present in jambolana fruit are pH sensitive[8], it has been hypothesized that the fruit extract could be utilized as an indicator for different types of acid base titrations. The equivalence points obtained by using fruit extract matched with the equivalence points obtained by standard indicators.

EXPERIMENTAL

Material and methods

Analytical grade reagents were made available from Satara College of Pharmacy, Satara. Reagents and volumetric solutions were prepared as per official books [9,10]. The fresh fruits of jambolana were collected and authenticated from Department of Botany, Y.C. College, Satara. The fruits were cleaned with water and seeds were separated. Remaining pieces were collected and fifty grams of these pieces 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. Then ether was added to this chloride solution to precipitate the pigment. The crude pigment so obtained was dissolved in minimum volume of hydrochloric acid and was reprecipitated by adding ether. This pigment was further recrystallized from alcohol[11]. The anthocyanin isolated by this method was confirmed by using various characteristics tests[8].

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.

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

Titrant	Titrand	Indicator color change	
		Standard (pH range)	**Fruits extract (pH range)**
HCl	NaOH	Green to pink (4 - 6)	Wine red to colorless (4.5 - 7)
HCl	NH_3	Pink to colorless (6.6 - 8)	Green to violet (3 - 5)
CH_3COOH	NaOH	Green to pink (4.5 - 6)	Wine red to colorless (4.2 – 5.5)
CH_3COOH	NH_3	Pink to colorless (4 - 6)	Green to violet (4.5 - 6)

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

Titration (Titrant v/s titrand)	Strength (M)	Indicator	Mean of five titrations ± S.D.
HCl v/s NaOH	0.1	Methyl red	11.2 ± 0.12
		Fruits extract	11.1 ± 0.14
	0.5	Methyl red	10.8 ± 0.13
		Fruits extract	10.9 ± 0.15
	1	Methyl red	10.7 ± 0.15
		Fruits extract	10.8 ± 0.11
	5	Methyl red	9.9 ± 0.18
		Fruits extract	9.9 ± 0.17
HCl v/s NH_4OH	0.1	Phenolphthalein	5.1 ± 0.16
		Fruits extract	5.0 ± 0.20
	0.5	Phenolphthalein	5.2 ± 0.15
		Fruits extract	5.1 ± 0.18

Titration (Titrant v/s titrand)	Strength (M)	Indicator	Mean of five titrations ± S.D.
HCl v/s NH_4OH	1	Phenolphthalein	5.3 ± 0.18
		Fruits extract	5.2 ± 0.09
	5	Phenolphthalein	4.9 ± 0.22
		Fruits extract	4.8 ± 0.24
CH_3COOH v/s NaOH	0.1	Methyl red	10.5 ± 0.05
		Fruits extract	10.8 ± 0.12
	0.5	Methyl red	10.5 ± 0.13
		Fruits extract	10.7 ± 0.16
	1	Methyl red	10.2 ± 0.12
		Fruits extract	10.2 ± 0.13
	5	Methyl red	9.9 ± 0.08
		Fruits extract	9.9 ± 0.12
CH_3COOH v/s NH_4OH	0.1	Mixed indicator	4.5 ± 0.09
		Fruits extract	4.5 ± 0.15
	0.5	Mixed indicator	4.4 ± 0.16
		Fruits extract	4.4 ± 0.18
	1	Mixed indicator	4.4 ± 0.12
		Fruits extract	4.4 ± 0.17
	5	Mixed indicator	4.4 ± 0.16
		Fruits extract	4.4 ± 0.15

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 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. For all titrations, the equivalence points obtained by the fruit extract matched with the equivalence points obtained by standard indicators.

CONCLUSION

The jambolana 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 sharp colour changes, which occurred at the end point of the titrations. Lastly we can say that it is always beneficial to use jambolana fruit extract as an indicator in all types of acid base titration because of its economy, simplicity and wide availability.

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