Ethanolic extract of selenicereus undatus as substitutes to hazardous synthetic indicators in acid - base titration.

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Abstract

The present study was designed to identify the potential of Selenicereus undatus (Dragon Fruit) as an indicator for the acid-base type of titrations. Indicators used in titration show well-marked changes of color in certain intervals of PH. Today synthetic indicators are the choice of acid-base titrations but due to certain factors like environmental pollution, availability and cost there is a need for natural compounds as an indicator. The present work highlights the use of the acidified extract of the fruit of the dragon as an indicator in the acid-base type of titrations. Dragon fruit belongs to the family: cactus (pitaya or pitahaya). This natural indicator is easy to extract as well as easily available. Titration shows sharp color change at the equivalence point using two different Normality's of acids and alkalis viz.0.1&1.0N. Therefore, these natural indicators are found to be very useful, economical, and simple for an acid-base type of titration.

Keywords: *Selenicereus undatus*, Acid-base, Natural indicator, Eco-friendly.

Introduction

The *Selenicereus undatus* (Dragon Fruit) are very prominent since the year 2000 [1]. Dragon fruit additionally referred to as pitaya or pitahaya, maybe a member of the caryophylloid dicot family and is botanically found in 2 separate genera: caryophylloid dicot genus and *Selenicereus*. Fruit is named as pitaya because of the bracts or scales on the fruit skin and hence, the name of pitaya meaning ''the scaly fruit'' [2]. However, the foremost usually cultivated varieties are within the genus, caryophylloid dicot genus as well as the white-fleshed fruit, *hylocereusundatus*. Dragon fruit grows well in tropical and climatic zone climates, within the Indian state Kerala, Tamil Nadu geographic area, Gujarat, Orissa, West Bengal, state, and Andaman & Nicobar Islands have already preoccupied its cultivation, and also the calculable total space underneath Dragon fruit cultivated in these regions is also but four hundred HA.

The dragon fruit features a dramatic look, with bright red, purple, or yellow-skinned varieties and distinguished scales. The fruit is oval, elliptic, or pear-shaped. The flesh features a subtly tasteful sweet style or typically slightly bitter style. The flesh is either white or red, with edible black seeds dotted everywhere [3,4].

Dragon fruit is low in calories however made in vitamin C, minerals, and helpful plant compounds like polyphenols, carotenoids, and betacyanins. Additionally contain the antioxidants water-soluble vitamins, beta carotene, lycopene, and betalain [5,6]. Studies have connected diets high in antioxidants to a reduced risk of a chronic sickness [7]. Dragon fruit offers seven grams of fiber per serving, meeting your daily fiber wants. Dragon fruit's high offer of water-soluble vitamins and carotenoids might supply immune-boosting properties. Dragon fruit provides iron together with water-soluble vitamins, a mixture that will improve your body's absorption of this vital mineral. Dragon fruit may be a nice supply of atomic number 12, a nutrient required for over 600 organic chemistry reactions in your body.

Vitamin C (L-ascorbic acid) is crucial permanently to bone structure, cartilage, muscle, and blood vessels [5]. It promotes wound healing, and it should additionally facilitate forestall sickness. Dragon fruit is made in one of the numerous kinds of antioxidants which will facilitate repair of cell injury caused by aerobic stress and cut back inflammation. Fiber helps to spice up repletion improves digestion and regularity, and will facilitate lower blood steroid alcohol. Fiber additionally provides several different health edges, as well as the diminished risk of some kinds of cancer, obesity, upset, and polygenic disorder. Dragon fruit will improve hypoglycaemic agent resistance and reduce blood sugar levels in sort a pair of polygenic disorders (**Figure 1**).

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Figure 1. *Dragon Fruit (pitaya or pitahaya).*

Materials and Methods

Chemicals: Hydrochloric Acid, Sodium Hydroxide Acetic Acid, Oxalic acid, Sodium carbonate, Sulphuric acid, Ethanol was supplied by Mahalaxmi scientific Kolhapur [8,9].

Apparatus: Beaker, pipette, volumetric flask, funnel etc. (All are made up of Borosilicate Glass).

Experimental Work

Collection and authentication of plant material

The fresh fruits of Dragon fruit were collected in the month of Feb 2020 from a natural garden located in Mahabaleshwar (MH). Identification and authentication of collected plant material were done at the Department of Botany, Balwant College Vita (MH) [10].

Preparation of fruit indicator

Collected fruits were cleaned, washed with water, and shade dried. The dried fruit material was pulverized by using the electrical grinder and passed through mesh sieves. 0.1 gm of powder is dissolved into a small amount of ethanol (95%) to make up the volume to produce100 ml. The prepared solution was preserved in a tightly closed container and stored away from the direct sunlight [11].

Titration of strong acid vs strong base

(HCl vs NaOH)

(0.1 N) HCl and (0.1 N) NaOH solution were prepared and standardized as per the procedure described. Titration was carried out by taking 50 ml of previously standardized 0.1 N HCl in a burette and 10 ml of 0.1 N NaOH solutions in a conical flask. Then gradually 0.1 N HCl added with a continuous swirling of the solution in the conical flask until the color changed from colourless to yellow. Prepared fruit ethanolic solution was used as an indicator. The above experiment was repeated thrice a time. The same procedure is followed by using a phenolphthalein indicator instead of a dragon fruit ethanolic solution indicator as standard.

H_2SO_4 vs NaOH

(0.1 N) H_2SO_4 and (0.1 N) NaOH solution were prepared and standardized as per the procedure described. Titration was carried out by taking 50 ml of previously standardized 0.1 N H_2SO_4 in a burette and 10 ml of 0.1 N NaOH solutions in a conical flask. Then gradually 0.1 N H_2SO_4 was added with the continuous swirling of the solution in the conical flask until the color changed from colourless to yellow. Prepared fruit ethanolic solution was used as an indicator. The above experiment was repeated thrice a time. The same procedure is followed by using a phenolphthalein indicator instead of a dragon fruit ethanolic solution indicator.

Titration of weak acid vs strong base ($C_2H_2O_4$ vs NaOH)

(0.1 N) $C_2H_2O_4$ and (0.1 N) NaOH solution were prepared and standardized as per the procedure described. Titration was carried out by taking 50ml of previously standardized 0.1 N $C_2H_2O_4$ in a burette and 10 ml of 0.1 N NaOH solutions in a conical flask. Then gradually 0.1 N $C_2H_2O_4$ is added with a continuous swirling of the solution in the conical flask until the color change from colorless to yellow. Prepared fruit ethanolic solution was used as an indicator. The above experiment was repeated thrice a time. The same procedure is followed by using a phenolphthalein indicator instead of a dragon fruit ethanolic solution indicator.

Titration of strong acid vs weak base

(0.1 N) HCl and (0.1 N) Na_2CO_3 solution were prepared and standardized as per the procedure described. Titration was carried out by taking 50 ml of previously standardized 0.1 N HCl in a burette and 10 ml of 0.1 N Na_2CO_3 solutions in a conical flask. Then gradually 0.1 N HCl added with a continuous swirling of the solution in the conical flask until the colour changed from colourless to yellow. Prepared fruit ethanolic solution was used as an indicator. The above experiment was repeated thrice a time. The same procedure is followed by using a phenolphthalein indicator instead of a dragon fruit ethanolic solution indicator (**Figure 2**).

Statistical analysis

The experiments were performed in triplicates and the data obtained from the experiments were expressed as mean ± standard.

Result and Discussion

The fruit extract was screened for its use as an acid-base titration and the result of this screening were compared with the results obtained by standard phenolphthalein indicator. The result of the screening for strong acid and strong base (HCL & NaOH), weak acid, and strong base (oxalic acid ($C_2H_2O_4$ and NaOH), are shown in Table 1 the table represents the mean of three titrations standards. For all types of titrations

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Figure 2. *Titration of SA vs SB (a)(b) WA vs SB, (c)WA vs SB (d) and SA vs WB (e).*

Table 1. *Observation table.*

S No.	Type of Titration	Titrant	Titrate	Indicator colour Change		Burette Reading (mL)*	
				Standard indicator	Prepared Indicator	Standard indicator (Mean±SD)	Prepared Indicator (Mean±SD)
1	SA vs SB	HCL	NaOH	Colourless to Pink	Colour less to yellow	15.5±0.5 ml.	16±0.5 ml
		H_2SO_4	NaOH	Colourless to Pink	Colour less to yellow	40.5±0.2 ml.	40± 1.2 ml.
2	WA vs SB	NaOH	$C_2H_2O_4$	Colourless to Pink	Colour less to yellow	28±0.3 ml	29±0.5 ml
3	WA vs SB	NaOH	CH_3COOH	Colourless to Pink	Colour less to yellow	6±0.2 ml	6±0.4 ml
4	SA vs WB	Na_2CO_3	HCL	Colourless to Pink	Colour less to yellow	18 ±0.2 ml	18.5 ±0.7 ml

*(*n=3)*

equivalence point obtained by the dragon fruit either exactly coincided or very closely with the equivalence point obtained by standard indicators. This represents the usefulness of fruit extract as an indicator in acid-base titrations. Its use in the weak acid weak base was found to be more significant over standard indicator as it gives a sharp color change in a narrow pH range. The results obtained showed that the routinely used indicator can be replaced successfully by fruit extracts (**Table 1**).

Conclusion

The result obtained in all types of acid-base titrations leads us to conclude that it was due to the presence of flavonoids sharp color changes, which occurred at the endpoint of titrations. The end of it states that dragon fruit extract is a natural indicator in all types of acid-base titration because of its economic, simple, and accurate.

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