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Withania somnifera and *curcuma longa* extract as herbal indicator

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Abstract

Indicator is a chemical agent which is used to recognize the attainment of end point in titration. After the reaction between the chemical and the standard solution is complete, the indicator should give a color change. A pH indicator is a chemical which changes the color of solution with change in pH in response to a chemical change. An acid-base indicator changes its color depending on pH change. Redox indicators are also commonly used (eg. - methylene blue). Synthetic indicators are frequently used in acid-base titrations. As synthetic indicators have certain drawback like unavailability, expensive. An experiment has been made to recognize the indicator property of various natural pigments. The main goal of this attempt is to replace the synthetic indicators. Natural indicators are inexpensive as compare to synthetic indicators. Ethanolic extract of *Withania somnifera* (Ashwagandha) and *Curcuma longa* (Turmeric) were evaluated and sample extract gives sharp and intense color change. Phenolphthalein was used as a standard indicator to compare the color change of sample extract. Result proved sample extracts to be acceptable as substitute of synthetic indicators in acid-base titrations.

Keywords: pH indicator, end point, acid-base titrations, synthetic indicators, natural indicators, ethanolic extracts, phenolphthalein

Introduction

Scientific name of ashwagandha is *Withania somnifera* (WS) belonging from family Solanaceae^[1]. WS is a small, wood shrub that grows about two feet in height. It is widely found in India and Africa. An erect, evergreen, 30-150 cm high, found throughout the drier parts of India in waste places and on bunds. Roots of WS are whitish brown, fleshy, leaves are simple ovate. Flowers are inconspicuous, greenish-yellow, in axillary. The roots are main part of the plant used therapeutically. The roots of ashwagandha are categorized as rasayanas, which are used to promote health and longevity by augmenting defense against disorder. The bright red fruits harvested in the late fall and seeds are dried for planting in the spring^[2]. The plant is use for as antioxidant, astringent and to treat ulcers^[3]. The active chemical constituents of ashwagandha plants are alkaloids, steroids, and ergostane type steroidallactones. Other constituents include saponins containing withanolides and additional acyl groups^[4, 5, 6].

Curcuma longa is a scientific name of turmeric belonging from family Zingiberaceae. It is a perennial plant having short stem with large oblong leaves and bears ovate, oblong rhizomes which are branched and brownish-yellow in color. Turmeric is found in South-East Asia, is used as a food as well preservative. Turmeric is cultivated in China, Sri-lanka, Taiwan, Myanmar, Bangladesh, Australia, Nigeria, West Indies, Jamaica and some Latin American countries. About 78% of world turmeric production, India is the largest producer of turmeric^[7]. Turmeric powder is used for treatment corzya, cough, diabetes, sinusitis etc.^[8] Turmeric contains fat (5.1%), protein (6.3%), carbohydrates (69.4%), minerals (3.5%) and moisture (23.1%)^[9]. Curcumin is the principle curcuminoid of turmeric, and other two are desmethoxycurcumin and bis-desmethoxycurcumin^[10]. Curcumin is hydrophobic in nature. It is soluble in dimethylsulfoxide, ethanol, acetone and oils. Curcumin contains 77% diferuloylmethane, 5% bis-desmethoxycurcumin and 18% desmethoxycurcumin^[11].

Materials and procedure

Apparatus

The apparatus like burette, conical flask, funnel, beaker, measuring cylinder, and pipette were used during experiment. The glass wares used during experiment were calibrated. All apparatus were well washed with detergents and distilled water. Sodium hypochlorite or laundry bleach used as a detergent. Hot distilled water also used for cleaning residue. New glass wares were soaked for several hours in acid water (a solution of 1% Nitric acid or hydrochloric acid).

Reagents

Ashwagandha powder and Curcumin powder were taken from laboratory of Ideal College of pharmacy and research institute, kalyan. Procurement of ethanol, distilled water, sodium hydroxide, hydrochloric acid and phenolphthalein was done in laboratories of Ideal College of pharmacy and research institute, kalyan. All reagents were prepared as per procedure given IP 1996.

Preparation of Extract

Small amount of sample powder was taken and transferred into cleaned conical flask containing 100 ml ethanol. Solution kept aside for 24 to 48 hours in dark and light resistant place. It was stored in dry place.

Procedure

There is strong acid (HCL) and strong base (NaOH) type titrations were performed. 10 ml of titrant was titrated against titrate with drops of curcumin extract and ashwagandha extract which was used as indicator. Color change for each indicator is listed below. Color change of each indicator was compared with color change of phenolphthalein indicator. Each titration was repeated three times to check accuracy of experiment.



Fig 1: Color change of standard phenolphthalein indicator.

Table 1: Titration against HCL and NAOH using ethanolic extract of curcumin.

S. No.	Vol. of titrate (ml)	Initial Burette reading (ml)	Final Burette reading (ml)	Mean Value of Volume of titrant (ml)
1.	10 ml	0.0	7 ml	
2.	10 ml	0.0	7.1 ml	7.1 ml
3.	10 ml	0.0	7.2 ml	

End point curcumin extract: yellow to dark red

Table 2: Titration against HCL and NAOH using ethanolic extract of ashwagandha.

S. No.	Vol. of titrate (ml)	Initial Burette reading (ml)	Final Burette reading (ml)	Mean value of Volume of titrant (ml)
1.	10 ml	0.0	7.2 ml	
2.	10 ml	0.0	7.3 ml	7.3 ml
3.	10 ml	0.0	7.4 ml	

End point of ashwagandha extract: yellow to orange

Table 3: Titration against HCL and NAOH using standard phenolphthalein indicator.

S. No.	Vol. of titrate (ml)	Initial Burette reading (ml)	Final Burette reading (ml)	Mean value of Volume of titrant (ml)
1.	10 ml	0.0	7 ml	
2.	10 ml	0.0	7.2 ml	7.2 ml
3.	10 ml	0.0	7.4 ml	

End point of phenolphthalein indicator: colourless to light pink colour.



Fig 2: Color change of curcumin extract yellow to dark red after titration.



Fig 3: Color change of ashwagandha extract yellow to orange after titration.

Results

Equivalence point obtained from ethanolic extract of curcumin and Ashwagandha were much closed to equivalence point obtained by standard phenolphthalein indicator. This shows the ethanolic extract of curcumin and ashwagandha powder can be used as acid-base indicators in replacement of synthetic indicators.

This study revealed that ethanolic extract of curcumin and Ashwagandha can be used as replacement of existing synthetic indicators because the equivalence point of extracts either coincided or much closed to equivalence point of phenolphthalein. It was also noticed that the extract gave sharp and intense color change at various pH changes.

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