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Research Article

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Rhatany indicators as a subsistent to synthetic indicators

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ABSTRACT

A titration is a technique where a solution of known concentration is used to determine the concentration of an unknown solution [1]. Typically, the titrant (the known solution) is added from a buret to a known quantity of the analyte (the unknown solution) until the reaction is complete. Knowing the volume of titrant added allows the determination of the concentration of the unknown. Often, an indicator is slowly added to the solution being titrated to usually signal the end of the reaction until the indicator changes color. The technique of titration is used to find out accurately how much of a chemical substance is dissolved in a given volume of a solution, that is, the concentration of the solution. An Indicator does not change color from pure acid to pure alkaline at specific hydrogen ion concentration, but rather, color change occurs over a range of hydrogen ion concentrations. This range is termed the color change interval called the pH range. Weak acids are titrated in the presence of indicators which change under slightly alkaline conditions. Weak bases should be titrated in the presence of indicators which change under slightly acidic conditions.

A reagent is a substance or compound that is added to a system in order to bring about a chemical reaction, or added to see if a reaction occurs [1]. Among the reagents used in the simple calibration is a visual color indicator phenolphthalein $C_{20}H_{14}O_4$ which turns from colorless to pink for a certain value of pH. There is also another type of reagents the instance of orange which is a detector turns to red color in acidic media, and to yellow color in base media. In this research we used various botanical reagents for the calibration of acids and bases either strong or weak where the change in color from blue to pink occurs.

INTRODUCTION

Rhatany is the common name for any of about seventeen species in genus Krameria, the sole genus in the plant family Krameriaceae. It is also the name given to krameria root, a botanical remedy consisting of the dried root of three species of Krameria, para rhatany (Krameria lappacea or Krameria argentea), and Peruvian Rhatany (Krameria triandra). Rhatany is a low shrub with large red flowers growing on dry sandy places and mountain-slopes, 3,000 to 8,000 feet above sea-level in several provinces of Peru, especially near the city of Huanuco. The roots as found in commerce consists of long cylindrical pieces, varying in thickness from 1/4 to 1/2 inch or more called long Rhatany, or knotted short thick large as a man's fist called short or stumpy Rhatany. The bark of the roots is thin, readily separable, rough, and scaly, of dark reddish-brown color outside, and bright brownish-red within. A strong tincture of these roots in brandy is used in Portugal to impart roughness to port wines. The genus Krameria was named after Kramer a Hungarian physician and botanist. The name Rhatany is said to describe the creeping character of the plant in the language used by the Peruvian Indians, while its Spanish name is derived from its dental properties.

The essential constituent of Rhatany is a peculiar tannic acid known as Rhataniatannic acid or Krameria tannic acid, closely allied to catechu-tannic acid. By the action of dilute acid it is decomposed into a crystallizable sugar, and Rhatania-red, while no gallic acid is present. Rhatanin is a homologue of tyrosine identical with angelin, geoffrayin, and andirin. It appears to contain also lignin, small quantities of gum starch, saccharine matter, peculiar acid, and

krameric acid. The biological action of Rhatany is caused by the astringent Rhataniatannic acid, which is similar to tannic acid. Infusions have been used as a gargle and a lozenge especially when mixed with cocaine as a local hemostatic and remedy for diarrhea. It has been found that it is useful for internal administration in chronic diarrhoea, dysentery, menorrhagia, incontinence of urine, haematuria, and passive hemorrhage from the bowels.

EXPERIMENTAL SECTION

Preparation of Extract:
The roots of Rhatany were purchased from a local then cleaned and cut into small pieces. 100 mg of these pieces were macerated with10 ml of ethanol and 10 ml of water for 24h.

Procedure:
Roots of Rhatany kramareceae cut into small pieces and macerated for 24h in 10 ml of ethanol and 10 ml of water. The extract was preserved in tightly closed glass container and stored away from direct sunlight. 10 ml of titrant with two drops of each indicator Rhatany was titrated against titrates and the color changes of the indicators are listed in table 1&2. The results of screening for strong acid-strong base (HCl-NaOH), strong acid- weak base (HCl-CH3COOH), weak acid-strong base (CH3COOH-NaOH) and weak acid-weak base (CH_3 cooh0-NH_3) are listed in table 3. Each titration is carried out five times by using 1N strength of acid and alkali, where the results recorded as mean ± SEM.

RESULTS AND DISCUSSION

For all type of titrations equivalence point obtained by ethanolic and water extract of Rhatany either coincided or very closed with equivalence point obtained by standard indicators. This represents the usefulness of alcoholic Rhatany extract as an indicator in acid base titrations. Its use in strong acid-strong base titration was found to be more significant over standard indicator as it gives sharp color change at equivalence point.

We can observe that indicators acts reversibly and gives sharp color change in both directions. The results obtained showed that the routinely used indicators could be replaced successfully by Rhatania extract as they are simple, accurate, and precise and can be prepared just before experiment. The proposed Rhatania indicators can be used as a substitute to synthetic indicators.

Table 1: Rhatany indica (R. I.)

Titrant	Indicator	Color	Titrate	Color(at end Pt)
HCl	Ph.Ph	Blue	NaOH	dirty brown
CH3COOH	Ph.Ph	Blue	NaOH	dirty brown
HCl	Ph.Ph	Blue	NH3	dirty brown
CH3COOH	Ph.Ph	Blue	NH3	dirty brown
H2SO4	Ph.Ph	Blue	Na2CO3	dirty brown

Table 2 Rhatany indica (R. I)

Titrant	Indicators	Color	Titrate	Color(at end Pt)
HCl		Blue	NaOH	Pink
CH3COOH			NaOH	Pink
HCl			NH3	Pink
CH3COOH			NH3	Pink
H2SO4			Na2CO3	

Table 3: Volume of titrate with standard indicator

Chemicals		Volumes of titrate required for equivalent Point with titrant (10 ml) with indicator.	
Titrant(1N)	Titrate(1N)	Std.Ind.	Rh.Ind
HCl	NaOH	10.1	10.00
CH3COOH	NaOH	09.5	09.8
HCl	NH3	09.8	10.00
CH3COOH	NH3	10.00	10.2
H2SO4	Na2CO3		

(STD .ind-phenolphthalin indicator). (Rh.ind- Rhanya indicator)

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