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Isolation of natural universal indicator and preparation of pH paper from *Calotropis gigantea* Linn. floral aqueous and ethanolic extract and study of their applications and benefits.

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Abstract- A variety of products, including test papers, pH paper strips, acid-base indicators, and medications, were made using floral extract. Many pigments, including minerals, flavonoids, and anthocyanin, are found in floral extracts. These pigments are highly sensitive to pH changes. The ethanolic and aqueous extracts of the petals of the *Calotropis gigantea* flower (Rui) were made in the current study. In various pH ranges of buffer solutions, noticeable color differences of flower extract of *C. gigantea* are observed. Many color pigments found in aqueous and ethanolic floral extract of *C. gigantea* are extremely sensitive to different chemical as per their pH variations. The synthetic indicators which are commonly used in our laboratory and the natural indicators which are prepared from aqueous and ethanolic floral extracts, provide almost identical outcomes. Using the same extracts, the pH paper and indicator have been prepared. The pH paper prepared is environmentally friendly, biodegradable and is helpful for laboratory work. This kind of research is a cheap, efficient, and natural substitute for artificial litmus paper, dye and Chemicals. *C. gigantea* extract indicator is more cost-effective and yield results with the same accuracy as synthetic indicators in acid base type titrations

Key words: *Calotropis gigantea*, Aqueous and ethanolic extracts, Natural Indicator, Universal Indicator, pH paper, Eco friendly, Economic

INTRODUCTION

There are many ways to identify a compound's acidic, basic, or neutral nature in chemistry practicals and other medical fields. For detection of acidic and basic nature of the given chemicals or solvents, blue and red litmus are preferably used for water soluble compounds. Instead of litmus paper and other costly indicators, we used floral petals extracts of *Calotropis gigantea* Linn. It is one of the local plants which is found nearby area of Nashik and easily grow, is commonly known as Ruhi. It has clusters of waxy flowers that are white and faint purple in colour. These flowers have five petals with the stamens held in a tiny, graceful "crown" that rises from the center. This is one of the short shrubs.[1-3]

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Scientific classification-

Kingdom	-	Plantae
Order	-	Gentianales
Family	-	Apocynaceae
Sub Family	-	Asclepiadaceae
Genus	-	*Calotropis*
Species	-	*C. gigantea*

The ethanolic extract of this flower petals were prepared in the laboratory by using simple water bath method with 50-60°C temperature and the aqueous extract are prepared in beaker on heating temperature 70-80°C.[4]

MATERIALS & METHODS

i. Plant materials:-

The fresh flowers petals of *Calotropis gigantea* were collected in winter season from Saikheda College ground, Niphad, Nashik. Freshly collected flowers are shown in fig.1

Fig-1 Flowers of *Calotropis gigantea* Linn.

ii. Chemicals:-

All chemicals H_2SO_4, KOH, CH_3COOH, NH_4OH, phenolphthlein, methyl orange, phenol red potassium chloride, disodium hydrogen Phosphate, Phosporic acid, hydrochloric acid, alcohol (ethanol) was used analytical grade and used as it is.

iii. Method of extraction:-

The *Calotropis gigantea* flower petals were separated and cleaned with distilled water. Petals were kept in sunlight until they get completely withered. The dried petals were grinded into fine powder with a mortal and pestal.[4-9] 5gms of dried powder was dissolved in 50 ml of water and ethyl alcohol separately.[10-18] After 10 minutes ethyl alcohol containing beaker was kept in water bath at constant temperature 60°C for next 10 minutes, while aqueous extract was prepared by continuous heating at temperature 80°C for 10 minutes. After cooling the resulting solution filtered and filtrate were directly used an indicator.[15-18]

iv. Preparation of buffer solution:-

Different buffer solutions from 2 to 12 pH were prepared from Potassium chloride, disodium hydrogen, Phosphate, Phosphoric acid and hydrochloric acid etc. As per standard procedure and checked for color change properties of both aqueous and ethanolic extract in different pH region. pH meter used to measure the pH of buffer solutions.[19,20]

v. Preparation of pH paper :-

In this part of work, we select simple filter paper which was used in our day to day work of laboratory. Those papers were cut in simple rectangle strips (1cm X 6cm) and, are dipped in both the ethanolic and aqueous flower extract separately for 1 hour and dried under the shed. Dried strips of papers used for further testing like acidic, basic and pH range testing.[21-28]

Fig-2- Strips in extracts

RESULTS & DISCUSSIONS

Acid base titration- Firstly, we observed color of solvents, selected flower petals, and their extract and the observations are recorded in table no.1. The flower was tested for its potential as an indication in acid-base titration, and the outcomes have been compared with those of methyl orange, phenol red, and phenolphthalein, three common indicators. We employed both the aqueous and the ethanolic extract for these titrations. The results for different type of acid base titrations are listed in table no. 2. Chemicals having of 0.01 N concentration acids H_2SO_4, CH_3COOH, and bases KOH, NH_4OH were utilized for these titrations.[7,20,29,30]

Table 1- Color of the solvent and aqueous and ethanolic extract

Name of the solvent and aqueous and ethanolic extract	Color
Flower petals	Purple
Petals powder	Faint pink
H_2O	colorless
C_2H_5OH	colorless
Aqueous extract of *C. gigantea*	Pink
Ethanolic extract of *C. gigantea*	Dark Pink

Table 2- Results for different type of acid base titrations

Titrant 10 ml (0.01N)	Titrand (0.01N)	Indicator colour changes	Standard ethanolic floral extract of CG	Aqueous floral extract of CG
H_2SO_4	KOH	Colourless to pink (PH)	Pink to green	Pink to greenish yellow
H_2SO_4	NH_4OH	Pink to yellow (MO)	Pink to dark green	Pink to dark green
CH_3COOH	KOH	Colourless to pink (PH)	Pink to yellow	Pink to dark green
CH_3COOH	NH_4OH	Yellow to red (PR)	Pink to green	Pink to fluorescent green

PH: Phenolphthlein, MO: Methyl orange, PR: Phenol red,
CG- *Calotropis gigantea*

The color changes of ethanolic and aqueous extracts are tested for all four types of titrations and observed the color change, which are noticeable in comparison with our traditional chemical indicators. When we performed the titrations and note the observations, we found that Phenolphthalein indicator is applicable for strong acid v/s strong base and weak acid v/s strong base and for strong acid v/s weak base methyl orange indicator required and for forth titration weak acid v/s weak base phenol red indicator shows color change. Instead of using 3 different indicators, we may use only single extract so we called it as universal indicator. The end points of this titrations using these extracts are stable.[3,6,15-29,21]

Testing of aqueous and ethanolic CG extracts in buffer solution:

Different buffer solutions were prepared as per standard procedure to check out the color change in different pH solutions from 2 to 12, we used ten different test tubes, in which 4 to 5 ml buffer solution was taken. All test tubes kept in test tube stand and 2 drops of aqueous extract added respectively in each test tube. After addition of the aqueous extract in buffer containing test tubes of various pH colour change was observed. In acidic medium extract shows dark pink color and at neutral range extract show colorless solutions and at basic pH green color appears in test tube. We recorded same observations for ethanolic CG petals extract in different buffer solutions. Further observation reveals that the prepared extract used as a universal indicator. It is one of the innovative works in chemistry.

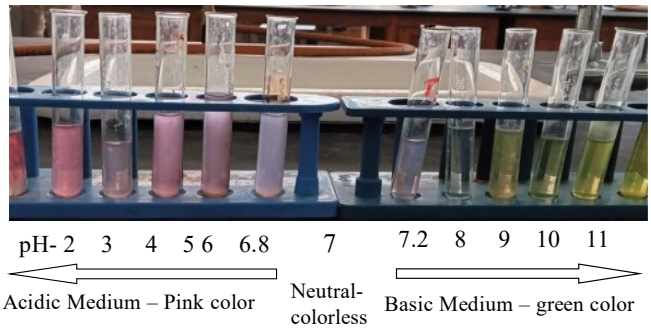

Fig. 3- Results of aqueous and ethanolic CG extracts in buffer solution

Use of CG pH Paper in different buffer solutions for testing its color change

We attempted to create CG pH Paper, which is among the greatest substitutes for artificial chemicals and litmus papers. We made this conclusion on the basis of examining its property as a universal indicator in many titrations and buffer solutions. Results of sections of simple filter paper

Table 4- CGEE and CGAE paper color change in acid, base and buffer solutions

Chemicals and Buffer solutions	CGEE paper color	CGAE paper color
H_2SO_4	Dark pink	pink
CH_3COOH	pink	pink
KOH	Dark green	Dark green
NH_4OH	green	green
2 pH	Dark pink	pink
3 pH	Dark pink	pink
4 pH	Dark pink	pink
5 pH	pink	Faint pink
6 pH	Milky pink	Very Light pink
7 pH	Colorless	Colorless
8 pH	Faint green	Light green
9 pH	Yellowish green	green
10 pH	Green	Green
11 pH	Dark green	Dark green

strips soaked in CGEE(*Calotropis gigantea* ethanolic extract) and CGAE (*Calotropis gigantea* aqueous extract) after being dipped in acid, water, base and various buffer solutions are shown in observation table 3. The best outcomes are shown by CGAE paper strips based on various observations. The greatest substitute for traditional pH paper is CGEE and CGAE papers.[3,24,25,31-33]

CONCLUSION

The work demonstrates both the inventive notion of preparing pH paper and the inventive choice of flower. This work is safe, affordable, and environmentally beneficial. In addition to being useful as an acid-base indicator, the aqueous and ethanolic extracts also exhibit highly stable end points and equivalence points. Ethanolic as well as aqueous extracts are used to prepare pH paper that is stable and exhibits color change over time. We can seal and stored them and may use them after a long time as a pH paper. It is also highly helpful in laboratories of schools and colleges, located in remote areas. Students from such places get the opportunity to prepare the extracts and used it in practical's by collecting the flowers of *C. gigantea.*

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