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Effectiveness of *Calotropis Gigantea* Linn Flower Extract as Indicator for Acid-Base Titration and Development of Litmus Paper

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ABSTRACT

A study has been done to examine the indicator action of methanolic extract of flower *Calotropis gigantea* Linn and development of litmus paper. *Calotropis gigantea* Linn belongs to family Apocynaceae, Methanolic extract of flower *Calotropis gigantea* Linn was examined and compared with that of previously present synthetic indicators. Flowers were extracted using methanol, a specific volume was added which gave perfect and reliable results for all the four different types of neutralization titrations. Developed litmus paper shows changed colour in Basic medium. The work shows that natural indicator and developed litmus paper was very useful, economical, simple and accurate.

Keywords: Acid-base titration, natural indicator, *Calotropis gigantea* Linn.

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INTRODUCTION

Calotropis gigantea Linn (Apocynaceae) is a glabrous or snow-white, laticiferous shrubs or small trees, about 3-4 m tall generally known as the swallow-wort or milkweed Fig. 1 and is used as one of the most important drug in Traditional System of Medicine to treat various ailments. Scientific classification of *Calotropis gigantea* Linn summarized in Table 1.



Figure 1: *Calotropis Gigantea* Linn Plant

Table 1: Scientific classification of *calotropis gigantea* linn:

Kingdom	Plantae
Order	Gentianales
Family	Apocynaceae
Subfamily	Asclepiadoideae
Genus	Calotropis
Species	<i>Calotropis gigantea</i>

Its stems are erect, up to 20 cm in diameter. The leaves are broadly elliptical to oblong-obovate in shape, with the size of 9-20 cm x 6-12.5 cm but subsessile. The cymes are 5-12.5 cm in diameter. The inflorescence stalk is 5-12 cm long; the stalk of an individual flower is 2.5-4 cm long. Sepal lobes are broadly egg-shaped with a size of 4-6 mm x 2-3 mm. Petal is 2.5-4 cm in diameter. It has clusters of waxy flowers that are either white or lavender in colour. Each flower consists of five pointed petals and a small, elegant "crown" rising from the center, which holds the stamens. The plant has oval, light green leaves and milky stem (Carol et al., 2012). The flower of the plant contains the alkaloids, carbohydrates, Glycosides, Phenolic compounds/tannins, Proteins and amino acids, Flavanoids, Saponins, Sterols, and Resins (Kumar et al., 2013). In Ayurveda and Siddha system of medicine flowers are used to treat asthma, catarrh, anorexia, helminthic infections, inflammations and fever. Flower shows anti-diabetic (Choudhary et al., 2011, Gupta & Chaphalkar, 2016) antimicrobial and cytotoxic activity (Habib & Karim, 2009) inhibition of Ehrlich's ascites

carcinoma (Habib et al., 2010) antioxidant and free radical scavenging potential (Patel et al., 2014, Usmani, 2013) analgesic (Pathak & Argal, 2007) schizontocidal activity (Sharma & Sharma , 2007).

As flavonoids is present in flowers of *Calotropis gigantea* Linn and are pH sensitive¹¹, it was hypothesized that the flower extract could be utilized as an indicator for different types of acid base titrations (Chatwal , 2007).

MATERIALS AND METHOD

Plant materials:

The fresh flowers and plant parts of *Calotropis gigantea* Linn were collected from the Medicinal garden of Ashokrao Mane College of Pharmacy, Peth-Vadagaon, Taluka-Hatkanagle, District-Kolhapur on 29/01/2019. The flowers and the plant parts were identified and authenticated at Department of Botany, Yashwantrao Chavan Warana Mahavidyalaya, Warananagar with reference to Flora of Kolhapur District PP 226.

Reagents:

All the reagents and chemical used for study were of analytical grade provided by Ashokrao Mane College of Pharmacy, Peth-Vadagaon. All the volumetric solutions and reagents were prepared as per Indian Pharmacopoeia 1996.

Glass wares:

The glassware like burettes, pipettes, volumetric flask used for the experiment was calibrated as per the standard procedures in as per Indian Pharmacopoeia 1996

Preparation of flower extract:

Calotropis gigantea Linn flower were collected washed and dry for 3 hours. 10 gm *Calotropis gigantea* Linn flower petals are cut into small pieces then these petals are soaked into methanol for 24 hours for extraction of pigment present in flower. Then after 24 hours solution is filtered to get pure methanolic extract of *Calotropis gigantea* Linn which we can use as natural indicator..

Preparation Of Litmus Paper Indicator (Nikam et al., 2014)

The extract was not only developed and used as indicator but also generated litmus paper indicator strip. Whatman filter paper were soaked in concentrated extract in methanol for 24hr and tested for the developing the strips as litmus paper indicator strip alternative to litmus paper. In basic medium it showed light yellow colour while in acidic medium it doesn't showed any color changes (Fig.2)

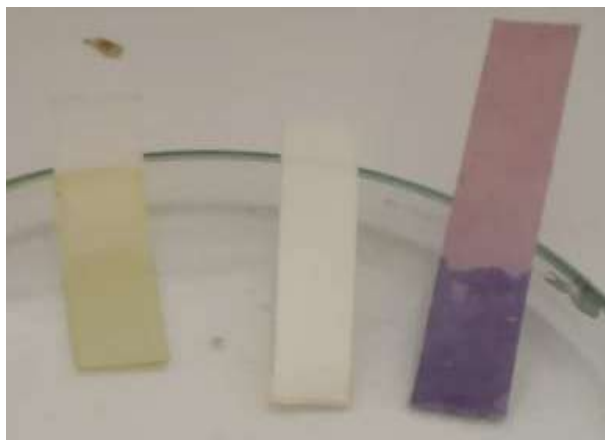


Figure 2: Change in colour of developed litmus paper as comparison to red litmus paper.

RESULTS AND DISCUSSION

The experiment was carried by using the same set of glassware's for all types of titrations. As the same aliquots were used for both titrations i.e. titrations by using phenolphthalein, mixed indicators (Methyl red: Bromocresol blue in 1:1).and flower extract. The reagents were not calibrated. The equimolar titrations were carried using 10 ml of titrate with three drops of standard indicator and flower extract. The titration of strong acid-strong base, strong acid-weak base, weak acid-strong base, weak acid-weak base was carryout. All these parameters are shown in Table-2. For all titrations the equivalence point obtained by the flower extract matched with the equivalence point obtained by standard indicators. A set of five reading was carried out and mean of reading and standard deviation were calculated from reading. Results were shown in Table-3. Stability of indicator colour was checked after every hour.

Table 2: Parameters Used For Analysis and the Comparison of Color Change.

Titrant	Titrate	Indicator Color Change	Standard Flower Extract
HCl	NaOH	Pink to Colorless	Faint Yellow to Colorless
CH ₃ COOH	NaOH	Pink to Colorless	Faint Yellow to Colorless
CH ₃ COOH	NH ₃	Colorless to Faint orange	Faint Yellow to Colorless
HCl	NH ₄ OH	Pink to Colorless	Faint Yellow to Colorless

Table 3: Screening Results of various titrations.

Sr. No.	Titration (Titrant v/s Titrate)	Strength in Moles (M)	Indicator	Readings with S.D. (±)
1	HCl V/S NaOH	0.1	Flower Extract	6.12±0.26
			Phenolphthalein	6.90±0.02
		0.5	Flower Extract	9.32±0.38
			Phenolphthalein	9.98±0.04
		1	Flower Extract	9.74±0.18
			Phenolphthalein	9.80±0.02
2	CH ₃ COOH V/S NaOH	0.1	Flower Extract	6.66±0.15
			Phenolphthalein	6.94±0.05

3	HCl V/S NH ₄ OH	0.5	Flower Extract	7.64±0.11
			Phenolphthalein	9.14±0.05
		1	Flower Extract	10.44±0.11
			Phenolphthalein	9.32±0.07
		0.1	Flower Extract	21.36±0.13
			Phenolphthalein	19.98±0.04
		0.5	Flower Extract	11.82±0.08
			Phenolphthalein	15.82±0.065
		1	Flower Extract	13.94±0.11
			Phenolphthalein	20.82±0.06
		0.1	Flower Extract	20.54±0.11
			Mixed indicator	20.38±0.04
4	CH ₃ COOH V/S NH ₃	0.5	Flower Extract	19.34±0.11
			Mixed indicator	12.54±0.05
		1	Flower Extract	22.34±0.16
			Mixed indicator	14.72±0.05

CONCLUSION

Calotropis gigantea Linn flower extract single-handedly can serve the purpose of indicator in weak acid and weak base titration, where generally mixed indicators are employed. Another benefit of this titration is that it gives colored end point at the equivalence point with stability of result after 5-6 hours. Litmus paper also developed which shows colour changed in alkaline medium. From results it can be concluded that it shows sharp color change occurs at the end point and because of economy, simplicity and availability, it is beneficial to use *Calotropis gigantea* Linn flower extract as an indicator in all types of acid base titrations.

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