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TERMINALIA CATAPPA LEAF EXTRACT AN ECOFRIENDLY INDICATOR IN VOLUMETRIC ANALYSIS

Gupta Poonam[1], Jain Pramod[2] and Jain Pushpa[3]

[1]Assistant Professor, Chemistry Department,
Swami Vivekanand College of Engineering, Indore, INDIA

[2]Professor- Chemistry, Govt. Holkar Science College, Indore, INDIA

[3]Professor- Botany, Mata JijaBai Government Girls P.G. College, Indore, INDIA.

ABSTRACT

Terminalia catappa belongs to the family combretaceae. It is commonly known as tropical almond, wild almond, Indian almond, Malabar almond, Singapore almond or Sea almond. It is a large deciduous tree originally from India. The bright color of flower, fruit or root peel extract is attributed to certain pigments. Using this property an attempt has been made to use the natural extract as substitute for synthetic acid-base indicator. The extract obtained from leaves of Terminallia catappa is pH sensitive and give different colors in acidic and basic conditions. These plants are very common and are easily available.The extract obtained from them can be used as acid base indicator which is ecofriendly and economic.

KEYWORDS: *Terminalia catappa, Anthocyanin, Natural indicator.*

INTRODUCTION :

Terminalia catappa is known as wild almond. It is a large deciduous tree which belongs to family Combretaceae. Its origin is from India. It grows up to 90 feet with horizontal whorls of branches offering clusters of foot long, obviate leaves that turn pink-red to red-yellow before falling.It contains hydrolyzable tannins punicalagin (major tannin), punicalin, terflavins A and B, tergallagin, tercatain, chebulagic acid, geraniin, granatin B (Orilagin) flavonoids (isovitexin, vitexin, isoorientin, rutin) and triterpinoids ursolic acid, 2α, 3β,23-trihydroxyurs-12-en-28 oic acid and asiatic acid).[1-2] The leaves , bark and fruit of the tree is being commonly used as folk medicines for antidiarrhea , antipyretic and haemostatic purposes.[3] The leaves of the tree have been used for the prevention and treatment of Hepatitis and liver related diseases.[4] T. catappa leaves contains several flavonoids, tannins, saponins, triterpinoid and phytosterols. Due to the above chemical richness, the leaves and bark are used as different traditional medicines worldwide. It has been reported that when aqueous and cold leaf extract is used intraperitoneally, it causes regeneration of the β- cells of the islets of Langerhans, decreases blood sugar, serum, cholesterol, triglycerides, low density lipoprotein (LDL), creatinine, urea and alkaline phosphatase level, while increases the high density lipoprotein (HDL) level in diabetes mellitus (DM).[5]

Extract of T. catappa leaves have shown activity against Plasmodium falciparaum chloroquine resistant (FcB1) and CQ sensitive (HB3) strains.[6]It has also been used by fish breeders for many years, and is active against some bacterial pathogens.[7] Tropical almond contains phytochemicals such as steroids, triterpenes, carbohydrates, triterpenoids saponins, alkaloids, polyphenols, flavonoids, tanins and glycosides.[8] The essential oils of

T.catappa leaves when hydrolyzed and analyzed by gas chromotography-mass spectrometry showed the prescence of (Z)-phytol (41.2%), alkane hydrocarbons(25.5%), palmitic acid (11.0%) and (E)-nerolidol (4.7%).[9]

The methanolic, acetone and N, N- dimethyl formamide extract of *T.catappa* leaf show antibacterial and antifungal activity.The antibacterial activity of leaf is found to be more pronounced than antifungal activity. The Gram positive bacteria appeared to be more susceptible than Gram negative bacteria.[10]The leaf of the plant contain punicalin and punicalagin which show antiinflammatory effect.[11]The methanolic and aqueous extract of fruit show antidiabetic effect.[12]The aqueous extract of leaf also show analgesic property.[13]The antioxidative property of leaf extract can be evaluted by using 1,1-Diphenyl-2-picrylhydrazyl(DPPH).80% methanolic leaf extract exihibit highest per cent (73.42%) inhibition of free radicals.Thus T.catappa leaf extract can be used as a natural source of managing and dealing with an oxidative stress related health condition.[14]

The anthocyanins are glucosides which are responsible for pigmentation. The colour of plant does not depend only on the pigments structure but also on the plant's sap or precisely its pH and the concentration of the pigments.[15] Methanolic extract of *Catharanthus roseus and Hibiscus rosa sinensis* can be used in acid-base titration.[16] The floral extract of *Rosa damascene* can be used as a natural indicator in volumetric analysis.[17]Extract of bark and wood exhibit antifungal activity.[18]

The floral extract of *Boerhavia erecta* L flower was used as natural indicator in acid-base titration.[19]The synthetic indicators are highly polluting, hazardous and much more costly. Natural products are less hazardous, easily available and ecofriendly so natural extract are good substitute to synthetic indicator in titration.[20] The floral extract of *Gerbera jamesonii and Tegertes erecta act* as natural indicator in titration.[21]Moringa oleifera contains tannins, quinines, alkaloids, saponins, flavonoids and glycoside .It can be used as natural indicator in titration.[22]

Holmskioldia sangninea flower extract was used as a natural indicator in acid-base titration. The end points obtained by the flower extract coincided with the end points obtained by standard indicator.[23]The flower extract of *Erythrina varigata, Euphorbia mili and Nelumbo nucifera* were used as acid-base indicator in different types of titration. The equivalence point obtained by the flower extract was coincident with the equivalence point obtained by standard indicators. This natural indicator was found to be very useful, economical, simple and accurate for indicating the neutralization point.[24]

MATERIAL AND METHOD

Terminilia catappa leaves were collected from the garden of Government Holkar Science College. The leaves were dried under sun and the dried leaves were pulverized. 20 gm of dried leaf powder was taken and dissolved in 50 ml of water and 50 ml of alcohol separately.The solution were stirred thoroughly and were kept in dark bottles.This aqueous and methanolic solution were used as natural indicator for acid base titration.

Analytical grade reagents like HCl, CH_3COOH, NaOH, NH_4OH, Methanol, Methyl orange, Phenol red and Phenolphthalein were used.The acid and base solution were used in the strength of 1.0N and 0.5N.

RESULT AND DISCUSSION

In the present study, methanolic and aqueous extract of *Terminalia Catappa* leaves were selected as natural internal indicator for acid base titration. Four different types of titration were performed between strong acid strong base (HCl v/s NaOH); strong acid weak base (HCl v/s NH4OH); weak acid strong base (CH_3COOHv/s NaOH) and weak acid weak base (CH_3COOH v/s NH_4OH). The change in colour of solution with synthetic indicator, methanolic leaf extract and aqueous leaf extract is shown in table [1]. It has been observed that both methanolic and aqueous natural indicators exhibit sharp colour change like synthetic indicator.

Table [1] Experimental Analysis and comparison of color change:

Titrant	Titrate	Color change	Methanolic Leaf extract of TC	Aqueous Leaf extract of TC
HCl	NaOH	Colorless to pink (PH)	Yellow to Colorless	Dark Yellow to Colorless
HCl	NH_4OH	Pink to yellow(MO)	Light Yellow to Colorless	Dark Yellow to colorless
CH_3COOH	NaOH	Colorless to pink(PH)	Yellow to Colorless	Dark Yellow to colorless
CH_3COOH	NH_4OH	Yellow to red(PR)	Dark Yellow to Light Yellow	Dark Yellow to Light Yellow

PH = Phenolphthalein; MO = Methyl orange; PR = Phenol red ; HCl = Hydrochloric Acid ; NaOH = Sodium Hydroxide ; CH_3COOH = Acetic Acid ; NH_4OH = Ammonium Hydroxide ; TC = Terminalia Catappa.

Table [2] Statistical data of Methanolic and Aqueous Leaf extract of Terminalia catappa as natural indicator.

Titration	Normality	MLE	t-value & ± SD	ALE	t-value & ± SD
NaOH/HCl	1.0N 0.5 N	PH v/s MLR PH v/s MLR	**0.225±.50000** **0.062±0.3605**	PH v/sALE PH v/s ALE	**0.081±0.4041** **0.188±0.5291**
NH_4OH/HCl	1.0N 0.5 N	MO v/s MLR MO v/s MLR	**1.000±0.1000** **0.025±0.2309**	PH v/s ALE PH v/s ALE	**0.184±0.5773** **0.005±0.1154**
NaOH/CH_3COOH	1.0N 0.5 N	PH v/s MLR PH v/s MLR	**0.621±1.096** **0.373±0.6082**	PH v/s ALE PH v/s ALE	**0.074±0.5000** **0.697±0.5131**
NH_4OH/CH_3COOH	1.0N 0.5N	PR v/s MLR PR v/s MLR	**0.004±0.1000** **0.187±0.3214**	PR v/s ALE PRv/s ALE	**0.580±0.2645** **0.267±0.3785**

All values are t-value ± S.D. for n=2, MLE = Methanolic Leaf Extract; ALE=Aqueous Leaf Extract.

CONCLUSION

The synthetic indicators are very hazardous to health and cause pollution, therefore to solve this problem floral or leaf sap is the best alternative as internal indicator for volumetric analysis. The accuracy of results has been judged by performing a variety of acid base titration. It is concluded that leaf sap act as a natural indicator in all types of acid base titrations because it is economical, easily available, non poisonous accurate and precise.

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