SHORT COMMUNICATION

A New Flavone from *Erythrina suberosa*, its Biological Screening and Application as pH Indicator

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Abstract:

A new flavone is isolated, characterized and its pH indicator property is studied for titration between strong/weak acids and bases. Flavone (Z)-3-hydroxy-2-(4-hydroxy-3-methoxyphenyl)-5-(isopentyloxy)-7-methoxy-6-(2-methylpent-1-en-1-yl) chromenylium chloride has been isolated by extracting ether and methanol. Compound is separated using column chromatography and identified with the help of spectroscopic techniques such as mass, ^{1}HNMR, IR and UV. Compound is also screened for its antibacterial and anti-fungal activity from the flower extract of Erythrina suberosa. Activity of the isolated compound is observed for E Coli bacteria as a gram-negative organism. The compound shows significant color change in acidic and alkaline medium and its potential as pH indicator is encouraging.

Keywords: anti-bacterial; anti-fungal activity; erythrina suberosa; flavone; pH indicator

1. Introduction

Researchers are more concerned about environmental pollution and climate change. They are working day and night to curb the pollution and decrease environmental pollution by developing methods and material which are less hazardous and biodegradable. Researchers are giving more emphasis on natural products as they are easily available, of low cost, bio-degradable and also have a wide range of biological and physiological activity.

Nowadays, researchers are isolating natural products from various parts of the plants [1-3]. Natural products are having fewer side effects therefore researchers are trying to find compounds with medicinal, bacteriological, antifungal, antibiotic, antitumor and anti-oxidant activities [4-7]. Some of the natural products show different colors at different pH, thus can be used as indicator. Colored or pigmented compounds impart color such as acylated or glycosidic flavones, isoflavones, flavonol, anthocyanin, anthraquionoids, indigoids, carotene etc present in flowers [8-9]. Degradation of the above compounds depends on isolation processes, storage and temperature. Due to hydrolysis at glycosidic bond these compounds loose color [10-12]. Flavones, flavonols and anthocyanin loose color due to thermal degradation to chalcones and coumarins. In view of this, herein we described for the first time isolation of flavone from erythrina suberosa, it's antibacterial and antifungal activities and application as pH indicator

2. Results and Discussion

Powder of flower petal was subjected to extraction using methanol/diethyl ether in Soxhlet apparatus. Extract thus obtained is concentrated to brownish sticky mass. Different fractions present are separated using column

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chromatography. Various combination of solvent mixtures are used such as ethylacetate : hexane, ethylacetate : methanol : acetic acid and ethyl acetate: ethylmethyl ketone for isolation of the compound . Separated fractions are monitored for its purity on TLC in different solvent system ethylacetate:hexane, hexane:chloroform, ethylacetate:methanol:acetic acid, ethyl acetate:ethylmethyl ketone, as well as chloroform acetone [15-16]. Chemical method for detection of different natural products is done as per the procedure available in literature [17]. Isolated compound were identified using UV, mass, IR. and ^{1}HNMR data.

Molecular formula: $C_{28}H_{35}ClO_6$, Melting point: 40-42 °C. ^{1}H NMR (400 MHz, DMSO-d$_6$, δppm: 12.1 (s, 1H), 8.5 (s, 1H), 7.2 (s, 1H), 6.8 (*j* = 8.4Hz, d, 1H), 6.7 (*j* = 8.4Hz, d, 1H), 6.5 (s, 1H), 5.3 (s, 1H), 4.04 (q, 2H), 3.5 (s, 3H), 3.29 (d, 3H), 2.7 (s, 3H), 2.4(q, 2H), 2.21 (m, 1H), 1.98 (m, 2H), 1.4 (m, 1H), 1.2 (q, 2H), 0.92 (d, 6H). 0.81 (t, 3H). IR cm^{-1}: 701, 1171, 1464, 1700, 1750, 2857, 2921, 3429. Mass (m/z): 467, 451, 429, 397, 391, 379, 205, 190, 181

On the basis of the above data structure of the compound is elucidated as (Z)-3-hydroxy-2-(4-hydroxy-3-methoxyphenyl)-5-(isopentyloxy)-7-methoxy-6-(2-methylpent-1-en-1-yl)chromenylium chloride (Figure:1). The compound melts between 40 to 42 °C this might be due to partial degradation of the compound.
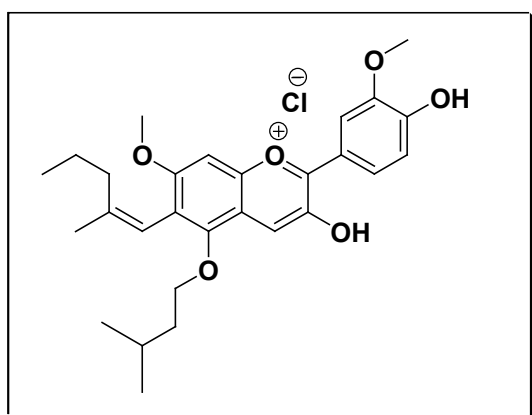

Figure. 1

pH indicator property

The compound is also studied for its color change in acidic and alkaline media and show

different colors in these medium. Titrations of different acids and bases with four different concentrations were studied. Absolute error, relative error and percentage errors are calculated for different set of titrations. Results for strong acid Vs Strong base (Table 1), weak acid Vs Strong base (Table 2) strong acid Vs weak base (Table 3), weak acid Vs weak base (Table 4), strong acid Vs Strong base reverse titration (Table 5), and % OH and alkali error (Table 6) suggest that compound is suitable to be used as pH indicator for acid-base titrations at various concentrations. Since the compound is biodegradable [18-20], it has advantage over synthetic and non-biodegradable indicators used for titrations.

Table 1. Percentage relative error in strong acid Vs strong base.

Titrations	Absolute error	Relative error	Relative % error
4 N HCl Vs 4 N NaOH	0.0	0.0	0.0%
1 N HCl Vs 1 N NaOH	0.0	0.0	0.0%
0.1 N HCl Vs 0.1 N NaOH	+ 0.1	+ 0.009	0.9%
0.01 N HCl Vs 0.01 N NaOH	+ 1.7	+ 0.16	16%

Table 2. Percentage relative error in weak acid Vs strong base.

	Absolute error	Relative error	Relative % error
4 N CH$_3$COOH Vs 4 N NaOH	0.0	0.0	0.0%
1 N CH$_3$COOH Vs 1 N NaOH	0.0	0.0	0.0%
0.1 N CH$_3$COOH Vs 0.1N NaOH	+ 0.2	+ 0.019	1.9%
0.01 N CH$_3$COOH Vs 0.01 N NaOH	+ 1.6	+ 0.16	16%

Microbial analysis

The compound is screened for biological

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activity. It is found be more active against gram negative bacteria E-coli with a zone diameter of 1 cm and staphylococcus aurena as a gram positive bacteria having a zone diameter of 0.5 cm. The compound found to be inactive against the fungal cultures used for the study i.e aspergillus niger and candida albicans.

Table 3. Percentage relative error in strong acid Vs weak base.

	Absolute error	Relative error	Relative % error
4 N HCl Vs 4 N NH_3	+ 0.2	+ 0.019	1.9%
1 N HCl Vs 1 N NH_3	+ 0.7	+ 0.07	7.0%
0.1 N HCl Vs 0.1 N NH_3	+ 0.7	+ 0.07	7%

Table 4. Percentage relative error in weak acid weak base.

	Absolute error	Relative error	Relative % error
1 N CH_3COOH Vs 1 N NH_3	+ 0.9	+ 0.08	8%
0.1 N CH_3COOH Vs 0.1 N NH_3	+ 0.9	+ 0.09	9.0%

Table 5. Percentage relative error in Reverse Titration.

	Absolute error	Relative error	Relative % error
0.1 N HCl Vs 0.1 N NaOH	- 0.6	- 0.05	5.0%

Table 6. OH error and alkali error.

OH error	Alkali errors
0.012%	24.4%

3. Material and Methods

Flowers were collected about 5 Kg from Harsool nearby area of Aurangabad, identified as Erythrina suberosa. Petals were separated, dried in dark and macerated before extraction. All the chemicals used for present work were of analytical grade from SD-Fine chemicals Ltd and used without further purification otherwise

mentioned. Solutions required during the study were prepared in glass double distilled water and standardized as per the standard procedures available in literature [13-14].

4. Conclusions

The compound isolated from erythrina suberosa showed different colour in acidic and alkaline medium which reveals that it can be used as pH indicator. This will help in reducing the use of synthetic dyes as pH indicators which are non-bio-degradable.

References and Notes

[1] Pathan, M. A. A. K.; Mazahar, F. *J. Chem., Biol. Phys. Sci.* **2011,** *2*, 43.

[2] Mingbo, Z.; Yoichiro, I.; Pengfei, T. *J. Chromat. A* **2005**, *1090*, 193.

[3] Jia-P, L.; Yew, H. L.; Jin, S.; Han-M, S.; Choon, N. O. *J. Chromat B* **2007**, *848,* 215.

[4] Zafar, I.; Muhammad, L.; Abdul, J.; Ghulam, M.; Muhammad, N. K. *J. Ethnopharmacol.* **2005**, *102*, 256.

[5] Adam, J. M.; Barry, J. B.; Martin, B. H.; Daryl, D. R. *Phytochemistry* **2006**, *67*, 759. [Crossref]

[6] Evelise, F. P.; Kelson, A. R.; Valdir, A. F.; Katiuscia, R.; Maria, C. A. M.; Adair, R.S. S. *Pharmacol., Biochem. Behav.* **2006,** *83*, 90.

[7] Zoran, M.; Silvana, P.; Milica, P.; Nada, K.; Jelena, K. *Fitoterapia* **2007**, *78*, 265. [Crossref]

[8] Young, A. S.; Sung-H, K. *Dyes Pigm.* **2005**, *64*, 153. [Crossref]

[9] Indrayan, A. K.; Guleria, B. S. *J. Ind. Chem. Soc.* **2001**, *78*, 476.

[10] Swain, T. Chemistry and biochemistry of Plant pigments. ed. T. W. Goodwin academicÇ London 1976, p 425.

[11] Forster, M. *J. Chem. Ed*. **1978**, *55*, 107. [Crossref]

[12] Indrayan, A. K.; Shukla, R. K.; Kumar, R. *Asian J. Chem.* **1999**, *11,* 141.

[13] Jeffery, G. H.; Bassett, J.; Mendham, J.; Denney, R. C. Vogel's Text Book of Quantitative Analysis,: 5th Ed, John Wiley, 1999, p. 289.

[14] Skoog, D. A.; Holler, F. J.; Nieman, T. A. Principles of instrumental analysis; Harcourt Asia Publisers 1st Ed, 2001, p. 613.

[15] Sadasivam, S.; Manickam, A. Biochemical methods 2nd Edition New age international publishers 1999, p.222.

[16] Harwood, L. M.; Moody, C. J.; Percy, J.M. Experimental Organic chemistry: Ed 2nd , Blackwell publishers, 2003, p.129.

[17] Thimmaiah, R. Standard Methods of Biochemical Analysis: Kalyani Publishers 1999, 8, 472, 476, 485.

[18] Palamidis, N,; Markakis, P. Stability of grape

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Orbital: Electron. J. Chem. 11 (5): 330-333, 2019

anthocyanin in carbonated beverages, Semana Vitivinicola 1978, p.33, 2633, 2635, 2637-2639.

[19]   Maccarone, E,; Maccarrone, A,; Rapisarda, P. *J. Food Sci.* **1985** *50*, 901. [Crossref]

[20]   Von, E. J. H.; Schwartz, S. J. Food Chemistry. 3rd edition Marcel Dekker Inc.:New York   1996, p.651-723.

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