Variation on λ_{max} value of Lawsone (2-hydroxy-1,4-napthoquinone) in different solution in vitro: A preliminary study

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Abstract

The natural colourant Lawsone (2-hydroxynaphthalene1, 4dione) of henna has substantial use in cosmetic industry as well as in fashion and textile industries. In India, henna is traditionally used for beatification on the hands and feet. Also, various agents are used to enhance the colour of henna on skin as the dark colour is considered auspicious. The present study is an attempt to analyse the variation in λ_{max} of Lawsone (2-Hydroxy-1,4-naphthoquinone) in different solution in vitro.

Keywords : Henna, lawsone, 2-hydroxy-1,4-naphthoquinone, UV-visible spectrophotometry

Introduction

Natural dyes are considered safe because of their non-toxic, non-carcinogenic and biodegradable properties. Also natural dyes are said to be environment friendly as they do not pollute the environment. The demand for natural compounds as dyes is expanding day by day as the global trend shifts toward the use of environmentally friendly and biodegradable products.

2-hydroxy-1,4-napthoquinone (Lawsone) (Figure 1) is the naturally occurring principle compound responsible for the colour of Henna which is widely used all over the world for colouring skin and hair [1]. It is typically utilised in a variety of festivals and celebrations around the world. A paste of powdered henna is applied to the skin for a few hours to overnight skin colouring. Henna stains can last anywhere from a few days to a month, depending on the paste quality, time and skin type[2]. Apart from skin and hair, other material like leather, silk, and wool can also be dyed using henna. Henna's colour comes from lawsone, a maroon chemical molecule with a strong affinity for protein bonding. Henna is

relatively safe and there is no danger from pure unadulterated henna. It has therapeutic value as well as colouring potential[3].

Henna stains start off orange, then develop to a reddish brown colour over a period of time. Because the thickness of soles and palms of the hands and feet, they absorb the most lawsone and to the greatest depth, resulting in the deepest and longest-lasting stains. There are a number of substances applied over henna paste once it gets dried on skin to enhance its colour. Lot of studies have been done to study the colouring potential and fastness properties[4-6]. The present work is an attempt to study the effect of different solutions on λmax value of Lawsone (2-hydroxy-1,4-napthoquinone). The study is done using UVs-visible spectrophotometry as it is suitable and easily available technique for coloured compound[7].

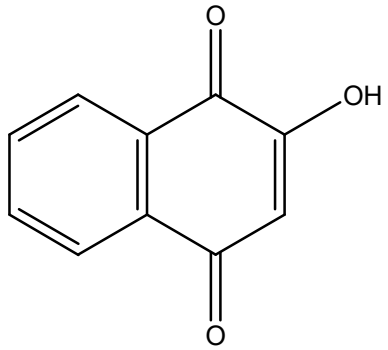

Figure 1: Chemical Structure of Lawsone (2-hydroxy-1,4-napthoquinone)

Experimental

2-hydroxy-1,4-napthoquinone was purchased from sigma Aldrich. The electronic absorption spectra of 2-hydroxy-1,4-napthoquinone (0.1% in water) was measured in different solutions like lemon juice , HCl , NaOH, Acetic Acid, Ammonia ,Tea, Vicks, Clove oil, Mustard oil, Vinegar, Coffee Powder, Methi Seeds, Camphor, Clove solution. The measurements were done using Labtronics Spectrophotometer (Model LT-39).

Result and Discussion

The data of spectrophotometrically evaluation of λ_{max} of 2-Hydroxy-1,4-naphthoquinone in different solution is summarized in Table 1 and comparison is shown in Figure (2).

Table 1: The electronic absorption spectra of 2-hydroxy-1,4-napthoquinone in different solutions.

S.NO.	Component (Deionized water based solutions)	λmax
1.	Napthoquinone	423
2.	Lemon Juice	380
3.	Conc. HCl	380
4.	Dil. HCl	381
5.	Conc. NaOH	430
6.	Dil. NaOH	427
7.	Acetic Acid	388
8.	Ammonia	426
9.	Tea	418
10.	Vicks	416
11.	Vicks Overnight	440
12.	Clove Oil	439
13.	Mustard Oil	435
14.	Vinegar	439
15.	Coffee	388
16.	Methi seeds	492
17.	Camphor	431
18.	Clove Solution	429

From the spectrophotometric studies, we have analysed that the addition of methi seeds solution have an marked effect on the λ_{max} value of 2-hydroxy-1,4-naphthoquinone. The addition of acid solution such as dil HCl, lemon, glacial acetic acid decreases the λ_{max} value of 2-hydroxy-1,4-naphthoquinone.The addition of base (NaOH), tea, vicks, clove oil, coffee etc. does not have any marked effect on the λ_{max} value.

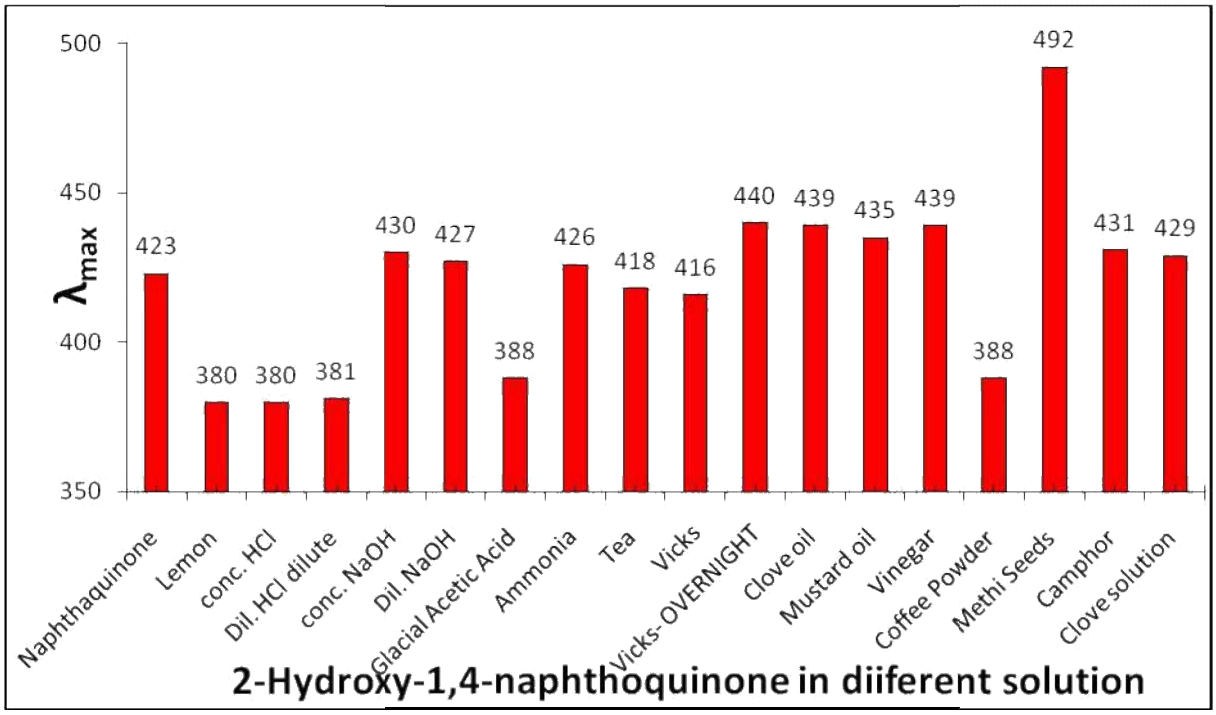

Figure 2. λ_{max} values of 2-hydoxy-1,4-naphthoquinone in different solutions

We have scientifically related the color and λ_{max} value of 2-hydroxy-1,4 naphthoquinone which is a color imparting component of henna. We have given in vitro effect of number of solution on the color of the henna.

Conclusion

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Henna is a part of many Indian traditions and extensively used in all the festivals, so the scientific findings can be used in future to develop a herbal product for better coloring properties of henna.

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Declaration :

Authors declare that they have no conflicts of interest.

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