Volume-4, Issue-6, June-2020: 9-16 P-ISSN: 2659-1561
International Journal of Recent Innovations in Academic Research E-ISSN: 2635-3040

Research Article

Studying on the Color Changes of Natural Dye Extracted from Red Rose by Using Four Methods

Cherry Soe

Department of Engineering Chemistry, Technological University (Taungoo), Myanmar
Email: cherrysoe004@gmail.com

Received: Jun 3, 2020 **Accepted:** Jun 13, 2020 **Published:** Jun 20, 2020

Abstract: All dyes are colored but all colored substances are not dyes. There are two types of dyes such as natural dye and synthetic dye. The synthetic dyes may be health hazard and so people try to use the natural dye instead of synthetic dye. The natural dyes can be extracted from various colored plants, animals, fruits and earth. The purpose of this study is to know about natural dyes and able to determine the variation of the color brightness of red rose flowers depending on mordant. In this study, four color extraction methods are used and also use three different mordant. To know color brightness, some pieces of cotton fabrics are immersed in natural dye, dried and recognized their colors. Nowadays, there are many pollutants and people's health are more important. So natural dye extraction, studying, sharing knowledge and using should be done more.
Keywords: Natural dyes, Synthetic dyes, Color brightness, Red rose, Mordant.

I. Introduction

The use of synthetic dye exponentially increases in many important industries, such as textile, pharmaceutical, food processing etc (Patil *et al.*, 2016). However, though synthetic dye exhibits superior fastness properties, it produces many side effects on the human body causing allergic reaction (Patil *et al.*, 2016). Synthetic dye is not easily degradable and bio-accumulated in a natural environment (Meena, 2013). The synthetic dye may cause pollution, skin diseases, health hazards to humans and other important organisms (Samanta and Agrawal, 2009). It is obviously due to the existing limitations and technical problems in the procurement of natural dyes (Aminul, 2010). The classes of dyes are defined by the application or end use, and hence the terms most applicable to textile dyeing are Acid dyes, Basic dyes, Direct dyes, Disperse dyes, Fluorescent brighteners, Reactive dyes, Sulphur dyes, Vat dyes, Pigments, Solvent dyes. Dyes are applied to various substrates like textile, leather, paper, hairs and so on from a liquid in which they are completely or at least partly soluble. The traditional dyes from animal or vegetal origins have been progressively replaced by synthetic dyes (Mira Ray, 1978). One such product from nature is the dye. Pigments from flowers, leaves, fruits, seeds, woods and roots were used as dye stuff for textiles and as paint in art and craft. Natural dyes are environment friendly, hygienic, user friendly and permanent than other colorants (Kumaresan *et al.*, 2011).

The replacement of natural dyes could happen until the introduction of synthetic dyes due to possible coloring property of natural dyes. Mordants are metal salts which produce an affinity between the fabric and the dye (Samanta and Agrawal, 2009). Recently, interest in the result of stringent environmental standards imposed by the environmental board and pollution control board of many countries in response to toxic and allergic reactions associated with synthetic dyes (Kamel *et al.*, 2005). Natural dyes not only release medicinal properties but

also improve the aesthetic value of the product and they are unique and eco-friendly (Neha Grover and Vidya Patri, 2011).

Several factors affect the ability of fabrics to provide adequate protection from ultraviolet radiation (UVR) such as fabric construction, chemical composition, textile auxiliaries, color and the finishing process. Dyes often provide a good blocking effect against ultraviolet light transmittance, and the protection level rises with an increase in dye concentration. Light colors reflect solar radiation more efficiently than dark ones, allowing incident radiation to penetrate through the fabric with reflecting actions (scattering) (Grifoni *et al.,* 2014).

The natural dyes from plants were traced a long time ago, In Myanmar, plants are found to be a good source of natural dye. For the extraction of natural dye, different plant parts are used such as seeds, flowers, leaves and barks (Patil *et al.,* 2016). In this study, red rose is one of the most attractive in all over the color flowers which is mainly used as an ornamental flower (Patil *et al.,* 2016).

The rose is locally called Hnin Si (in Myanmar) which is a woody and thorny plant, particularly rose is used as a symbol of love and is perennial flowering. Figure (1) (a) and (b) are shown as the flower of red rose and their petals.

Myanmar name	:	Hnin Si
Kingdom	:	Plantae
Class	:	Rosoideae
Order	:	Rosales
Family	:	Rosaceae
Sub family	:	Rosoideae
Genus	:	*Rosa*
Species	:	*Rosa Lincoln*

(Notes: Red Rose has over 150 species) (Leghri *et al.,* 2016).

a) Red Rose Flowers (b) Petals of Red Rose

Figure 1. Photographs of the using Red Rose

II. Materials and Methods

A. Sample Collection

For this study, the fresh flowers of red rose, 95% cotton fabric, some chemicals and equipment were collected from the local market. The required chemicals are 0.1 M ferrous sulphate, 0.1 M alum, 0.1 M copper sulphate, distilled water, 1% sodium hydroxide, 10%

sodium hydroxide, 1% acidic solution and 50% alcohol. The using apparatus are 200 ml beakers, 150 ml beakers, 100 ml volumetric flask, hotplate, funnels, glass tubes and glass rods.

B. Preparing and Scouring of Cotton Clothes

The twelve pieces (2.5 x 2.5 inches) of 95% cotton fabric to test were placed in a 200 ml beaker and boiled with 100 ml of 10% Sodium hydroxide solution for 15 minutes to remove starch and other impurities from the cloth. Then the cotton cloths were washed thoroughly with cold distilled water out of impurities.

C. Preparing of Mordant

1.52 g of Ferrous Sulphate was dissolved distilled water in 100 ml volumetric flask and volume made up to the mark with distilled water to obtain 0.1 M Ferrous Sulphate. 4.744 g of Alum was dissolved distilled water in 100 ml volumetric flask and volume made up to the mark with distilled water to obtain 0.1 M Alum.

1.60 g of Copper Sulphate was dissolved distilled water in 100 ml volumetric flask and volume made up to the mark with distilled water to obtain 0.1 M Copper Sulphate.

Three different mordants were used to facilitate the fixing of dye. These chemicals using mordant are 0.1 M ferrous sulphate (FeSO4), 0.1 M alum ($KAl(SO4)_2.12H_2O$) and 0.1 M copper sulphate ($CuSO_4$).

Extraction of color dye was carried out by four different methods. The three mordants were used in each of respective extraction method.

D. Extraction Method Preparation

Each 10 g fresh petals of red rose were placed in each of four cleaned 200 ml beakers to use for every four colored dye extraction methods and labeled with kind of solvents. Then they were used for a four dye extraction method using mordant. The resultant colors were recognized in all four extractions using each mordant was seen in Figures (2), (4) and (6).

E. Aqueous extraction method

100 ml distilled water was poured to 10 g fresh petals of red rose were placed in first cleaned 200 ml beaker and boiled at 100℃ for 30 minutes. The petals were decolorized and taken out from the extraction solvent and decant the filtrate. The solution was divided into three 150 ml beakers and then each of three different mordant 0.5 ml (0.1 M ferrous sulphate, 0.1 M alum, 0. 1 M copper sulphate) was added in each beaker respectively. Each 2.5 x 2.5 inches cotton fabric was immersed in each beaker to test dye color. After one hour, the clothes were taken and recognized their retained colors.

F. Alkaline extraction method

100 ml of 1 % Sodium hydroxide was poured to 10 g fresh petals of red rose were placed in second cleaned 200 ml beaker and boiled at 100℃ for 30 minutes. The decolorized petals were taken out from extraction solvent and filtered the colored solution which was divided into three 150 ml beakers and then each of three different mordant 0.5 ml (0.1 M ferrous sulphate, 0.1 M alum, 0.1 M copper sulphate) was added in each beaker respectively. Each 2.5 x 2.5 inches cotton fabric was also immersed in each beaker to test dye color. After one hour, the cloths were taken and recognized their different colors.

G. Acidic extraction method

The 100 ml of 1% acidic solution was added to 10 g fresh petals of red rose were placed in third 200 ml beaker and boiled at 100℃ for 30 minutes. The decolorized petals were taken out from extraction solvent (Patil *et al.*, 2016). Finally, the solution was filtered by using a filter cup. The solution was divided into three portions to test and poured in respective 150 ml beakers. The three mordant 0.5 ml (0.1 M ferrous sulphate, 0.1 M alum and 0.1 M copper sulphate) was added in each beaker respectively. Each 2.5 x 2.5 inches cotton cloth was immersed in each beaker to test dye color. After one hour, the resultant colors were recognized.

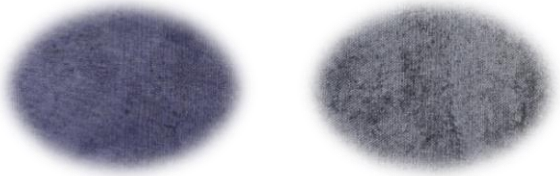
H. Alcoholic extraction method

100 ml of 50 % alcohol solution was added to 10 g fresh petals of red rose were placed in final 200ml beaker and boiled at 100℃ for 30 minutes. The decolorized petals were taken out from extraction solvent (Patil *et al.*, 2016). And then the solution was filtered and taken to further test with mordant.

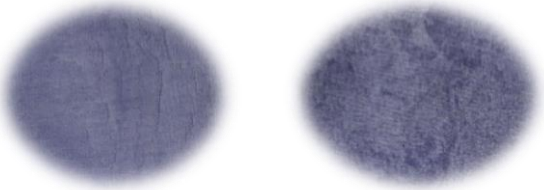
The solution was divided into three 150 ml beakers and three different mordant (0.1 M ferrous sulphate, 0.1 M alum, 0.1 M copper sulphate) was added in each beaker respectively. The 2 x 2 inches cotton clothes were immersed in each beaker and dyed. After one hour, the color brightness was recognized.

III. Results and Discussion

The different colors were obtained from various extracts of red rose flowers. The extracts show variation in color and mainly depend upon the extraction solvents.



1. Aqueous Extract **2. Alkaline Extract**



3. Acidic Extract **4. Alcoholic Extract**

Figure 2. Application of 0.1 M Ferrous Sulphate ($FeSO_4$) different extracts on cotton fabric

Table 1. Rating of brightness properties of dye using 0.1 M Ferrous Sulphate ($FeSO_4$)

S. No	Solvents	Brightness
1.	Aqueous	100%
2.	Alkaline	50%
3.	Acidic	25%
4.	Alcoholic	75%

P-ISSN: 2659-1561
E-ISSN: 2635-3040

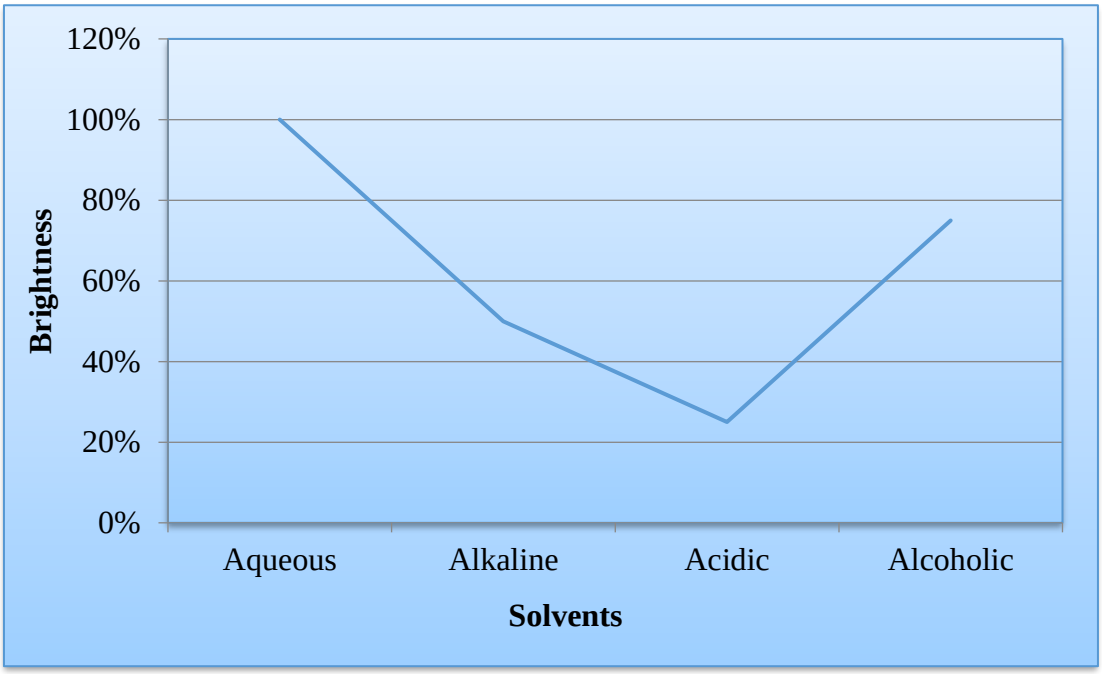


Figure 3. Graph for application of 0.1 M Ferrous Sulphate ($FeSO_4$) different extracts on cotton fabric

1. Aqueous Extract 2. Alkaline Extract

3. Acidic Extract 4. Alcoholic Extract

Figure 4. Application of 0.1 M Alum ($KAL(SO_4)_2\ 12H_2O$) with different extracts on cotton fabric

Table 2. Rating of brightness properties of dye using 0.1 M Alum ($KAL(SO_4)_2\ 12H_2O$)

S. No	Solvents	Brightness
1.	Aqueous	100%
2.	Alkaline	25%
3.	Acidic	75%
4.	Alcoholic	50%

P-ISSN: 2659-1561
E-ISSN: 2635-3040

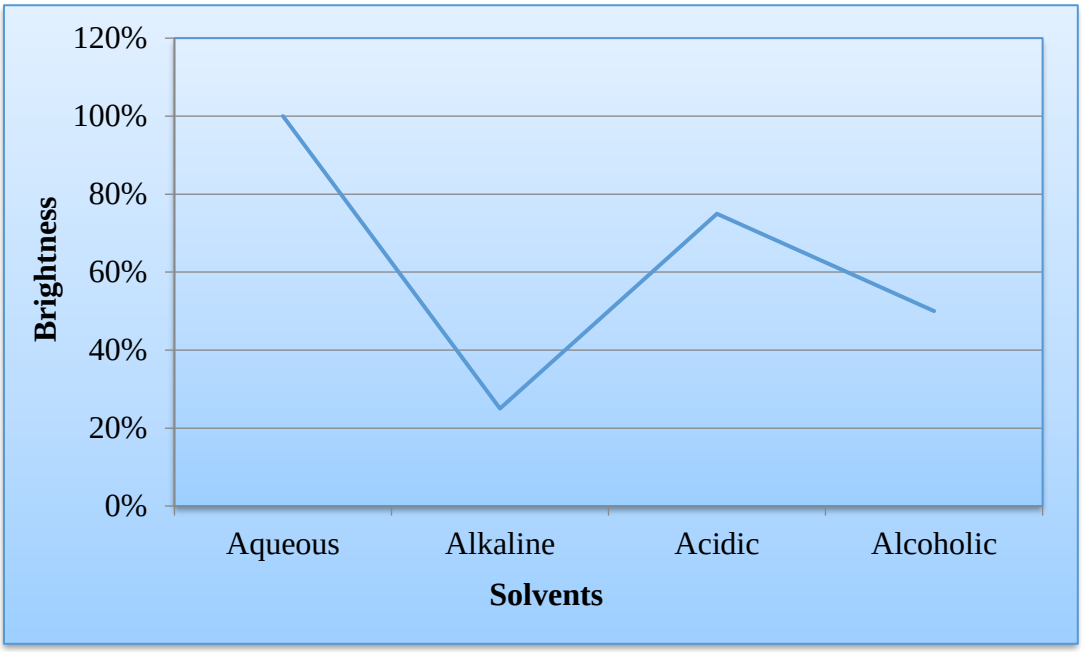
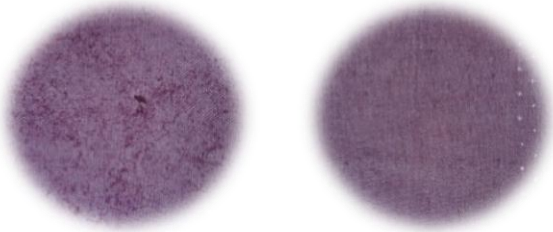


Figure 5. Graph for application of 0.1 M Alum (KAL $(SO_4)_2 12H_2O$) with different extracts on cotton fabric

1. Aqueous Extract **2. Alkaline Extract**



3. Acidic Extract **4. Alcoholic Extract**

Figure 6. Application of 0.1 M Copper Sulphate ($CuSO_4$) with different extracts on cotton fabric

Table 3. Rating of brightness properties of dye using 0.1 M Copper Sulphate ($CuSO_4$)

S. No	Solvents	Brightness
1.	Aqueous	75%
2.	Alkaline	25%
3.	Acidic	50%
4.	Alcoholic	100%

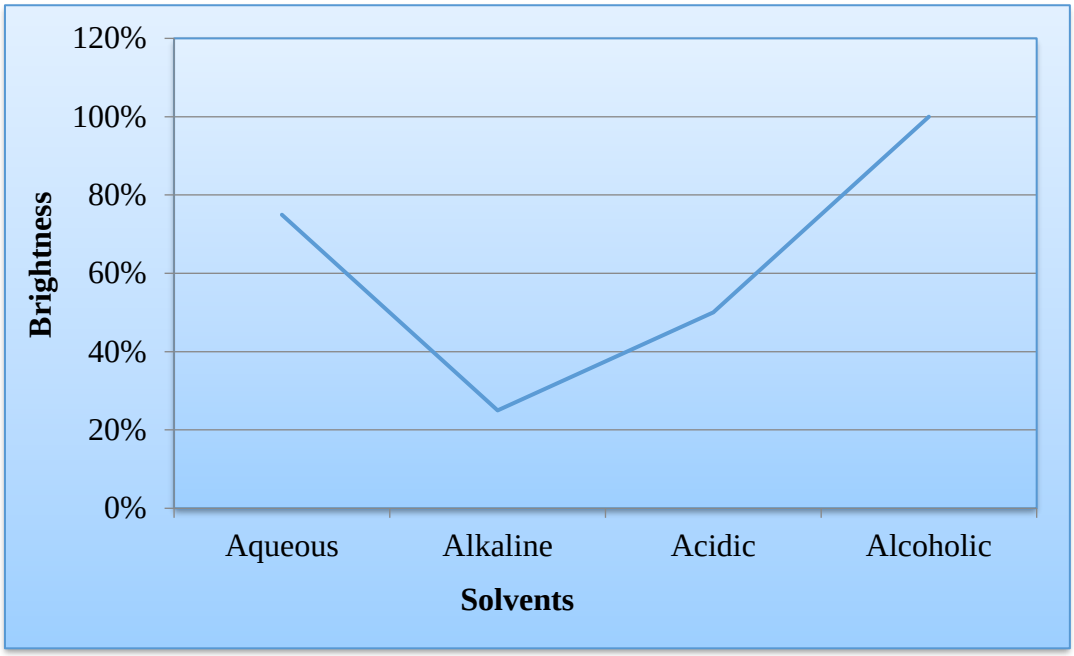


Figure 7. Graph for application of 0.1 M Copper Sulphate ($CuSO_4$) with different extracts on cotton fabric

In comparison of combination of each mordant in four different dye extractions from red rose flowers, the aqueous extraction got 100 % color brightness by using mordant ferrous sulphate ($FeSO_4$) and alum ($KAl(SO_4)_2.12H_2O$) but using mordant copper sulphate ($CuSO_4$) gave 75 % color brightness. In the alkaline extraction, mordant ferrous sulphate ($FeSO_4$) gave 50 % color brightness but using copper sulphate ($CuSO_4$) and alum ($KAl(SO_4)_2.12H_2O$) gave 25 % color brightness on cotton fabrics. Acidic extraction received more color changes as 25 % color brightness by combination of mordant ferrous sulphate ($FeSO_4$), 75 % color brightness by alum ($KAl(SO_4)_2.12H_2O$) and 50 % color brightness on cotton fabrics using copper sulphate ($CuSO_4$).For Alcoholic extraction obtained 100 % color brightness by using mordant copper sulphate ($CuSO_4$) but using ferrous sulphate ($FeSO_4$) gave 75 % color brightness and 0.1 M alum ($KAl(SO_4)_2.12H_2O$) gave 50 % color brightness. The rating of brightness properties of dye with the three different mordants were seen in table (1), (2) and (3). The graph for application of ferrous sulphate ($FeSO_4$) with different extracts on cotton fabric was shown in figure (3). Figure (5) showed the graph of application of alum ($KAl(SO_4)_2.12H_2O$) with different extracts on cotton fabric. And the graph for application of copper sulphate ($CuSO_4$) with different extracts on cotton fabric was shown in figure (7).

IV. Conclusions

On these dye extraction methods, different using mordant may give different colors. So mordant can be used alternately to moderate various beautiful colored dyes. Dyes obtained from red rose flowers can be used as cost effective and economically commercial for various industries such as textile, cosmetics, leather, food and pharmaceuticals. If only red rose petals can give many different natural dyes, the more various kinds of colored flowers, fruits, leaves and …etc. can be analyzed to extract natural dyes for people healthy all over the world. These natural dyes are environmentally friendly and harmless when compared to the synthetic dyes. Thus, Natural dyes have been essential to us to be aware of environmental benefit.

Conflicts of interest

There is no conflict of interest of any kind.

References

1. Chowdhury, A.I., Molla, A.I., Sarker, M., Rana, A.A., Ray, S.K., Nur, H.P. and Karim, M.M. 2006. Preparation of edible grade dye and pigments from natural source bixa orellenae linn. International Journal of Basic and Applied Sciences, 10(4): 7-22.

2. Devi, M., Ariharan, V.N. and Prasad, P.N. 2013. Annato: eco-friendly and potential source for natural dye. International Research Journal of Pharmacy, 4(6): 106-108.

3. Grifoni, D., Bacci, L., Di Lonardo, S., Pinelli, P., Scardigli, A., Camilli, F., Sabatini, F., Zipoli G. and Romani, A. 2014. UV protective properties of cotton and flax fabrics dyed with multifunctional plant extracts. Dyes and Pigments, 105: 89-96.

4. Grover, N. and Patni, V. 2011. Extraction and Application of natural dye preparations from the floral parts of *Woodfordia fruticasa* (Linn) Kurz. India Journal of National Products and Resources, 2(4): 403-408.

5. Kamel, M.M., El-Shishtawy, R.M., Yussef, B.M. and Mashaly, H. 2005. Ultrasonic assisted dyeing: III. Dyeing of wool with lac as a natural dye. Dyes and Pigments, 65(2): 103-110.

6. Kumaresan, M., Palanisamy, P.N. and Kumar, P.E. 2012. Application of eco-friendly natural dye obtained from *Cordia sebestena* on cotton using combination of mordants. Journal of Natural Product and Plant Resources, 2(1): 32-38.

7. Leghari, A.J., Laghari, U.A. and Laghari, A.H. 2016. Cultivation of rose (*Rosa indica* L.). Journal of Floriculture and Landscaping, 2: 1-4.

8. Mira Ray. 1979. Dyes in Ancient and Medieval India. India Journal of History of Science, 13: 83-113.

9. Patil, D.B., Patil, K.N., Gaikwad, P.V., Patil, P.J., Shewale, U.L. and Bhamburdekar, S.B. 2016. Extraction of natural dye from rose flower for dyeing cotton fabrics. International Journal for Innovative Research in Multidisciplinary Field, 2(8): 135-137.

10. Samanta, A.K. and Agrawal, P. 2009. Application of natural dyes on textile. Indian Journal of fiber and Textile Research, 34: 384-399.

Citation: Cherry Soe. 2020. Studying on the Color Changes of Natural Dye Extracted from Red Rose by Using Four Methods. International Journal of Recent Innovations in Academic Research, 4(6): 9-16.